BANGLADESH ARMY UNIVERSITY OF SCIENCE AND TECHNOLOGY (BAUST)

Curriculum for the Degree of

B.Sc. Engineering in Computer Science and Engineering
(B.Sc. Engineering in CSE)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Faculty of Electrical and Computer Engineering
Bangladesh Army University of Science and Technology (BAUST)
Saidpur Cantonment, Saidpur-5310, Nilphamari

CURRICULUM COMMITTEE

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)

The undergraduate course curriculum for the B.Sc. Engineering in Department of Computer Science and Engineering (CSE) degree offered by the Department of Computer Science and Engineering (CSE) of Bangladesh Army University of Science and Technology (BAUST) has been prepared and reviewed by the committee as mentioned below.

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C. External Members (Professional Organization/ Industry)

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General Manager

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D. Departmental/Internal Members (CSE)

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Bangladesh Army University of Science and Technology (BAUST)

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2. ____

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Assistant Professor

Department of Computer Science and Engineering (CSE)

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2. ____

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3. ____

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7. ____

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F. Recommended by,

1. ____

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Head

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Disclaimer

The information contained in this bulletin is intended to provide guidance to those who are concerned with undergraduate studies in Computer Science and Engineering. No responsibility will be borne by the Department of Computer Science and Engineering and/or the Bangladesh Army University of Science and Technology if any inconvenience or expenditure is caused because of the information of this bulletin. Also, the information contained in it is subject to change at any time without any prior notification.

CONTENTS

Outcomes Based Education (OBE) Curriculum

Part A:

1. **Title of the Academic Program**
   B.Sc. Engineering in Computer Science and Engineering (B.Sc. Engineering in CSE).

2.
3. **Name of the University**
   Bangladesh Army University of Science and Technology (BAUST).

4. **Vision of the University**
   The University aspires to transform into a center of excellence in Science, Engineering and Technology programs by providing innovative, multi-disciplinary courses and extensive research facilities to the young generation of the country and beyond. It endeavors to make the University a hub of knowledge and be recognized as a leading university of the country.

5. **Mission of the University**
   i. Providing state of the art education to achieve disciplinary knowledge, problem solving skill, ability to lead and communication skill.
   ii. Providing a collaborative environment enabling free exchange of ideas to flourish research, creativity and innovation.
   iii. To remain updated & responsive to the diverse needs of society and transform in a sustainable way.

6. **Name of the Program Offering Entity**
   Department of Computer Science & Engineering (Dept. of CSE).

7. **Vision of the Program Offering Entity**
   The Department of Computer Science and Engineering aspires to produce highly competent and skilled students to excel in research and innovation for sustainable development.
   The Dept. of CSE of BAUST seeks to become national leader at the undergraduate levels among all universities in the fields of Computer Science & Engineering. Establishment of quality academic culture in the department for the attainment of intended skills, knowledge and attitude in the field of Computer Science & Engineering as well as in the diverse

technologies in the society based. CSE Engineering graduates can accommodate to the current and future needs in the industry.

8. **Mission of the Program Offering Entity**

The mission of the CSE Department:

i. To educate students to meet with the new challenges in the progress of computer science, and software and information technology, to provide innovative, creative solutions for societal needs.
ii. To create and disseminate innovative knowledge through basic and applied research in the Computer Science and Engineering.
iii. To contribute in the development of skilled human resource to impact society in a sustainable way.
iv. To embed leadership qualities amongst the students to follow successful professional career paths and to pursue advanced studies in computer engineering and a life-long learner in cutting edge developments in the field of Computer, Communication and modern technologies.

9. **Objectives of the Program Offering Entity**

The objectives of this program are to:

a) To produce skilled, well disciplined, self-motivated and dedicated engineers and computer professionals.
b) To make provisions for research and development and dissemination of knowledge in appropriate fields of science and technology.
c) Develop research and innovations.
d) Transfer, apply, and adapt computing knowledge to the society.
e) Participate in engagements and promote service learning.
f) Foster a dedicated alumnus group from satisfied to restore and enrich students.

10. **Name of the Degree**

B.Sc. Engineering in Computer Science and Engineering (B.Sc. Engineering in CSE).

11. **Description of the Program**

The Department of Computer Science and Engineering (CSE) plays vital and in fact indispensable role in all fields of modern human activities. Consequently, CSE has established itself as one of the most important branches of engineering. Recent development in CSE has a considerable impact on society. The goal of CSE Department is to cultivate highly-motivated and well-trained professionals who will lead the CSE arena. The Department of Computer Science and Engineering will offer various specialized educational programs to create many competent engineers with profound knowledge of academic theories and practical approaches for the development of our country and all human society, in the world. In Bangladesh, it has already been declared as a thrust sector. Keeping this in mind, the department is offering the perfect environment to produce Computer Science and Engineering specialist.

The following facilities are provided by the department of CSE:

11.1 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory and other facilities. Departmental undergraduate courses are laboratory intensive and these requirements will be catered by following laboratories:

1. Software Engineering Lab
2. Networking Lab
3. Digital Lab
4. System Engineering Lab
5. Programming and Algorithm Lab
6. Microprocessors and Microcontrollers Lab
7. Robotics and Interfacing Labs
8. VLSI and Automation Lab
9. Database and Data Warehouse Lab
10. Signal and Image Processing Lab
11. Operating System Lab

Students also have to undertake laboratory classes in Physics, Chemistry, English, and other Engineering including Electronics and Mechanical Engineering.

Note: The laboratories of CSE Department are also used by the students of other departments for sessional classes and research work of relevant subject/courses if necessary. Similarly, if necessary undergraduate students of this department can access to the facilities of other departments and centers during project, thesis and research works.

11.2 Co-curricular Activities

Students of this Department regularly participates and achieves success in co-curricular activities such as programming contests, software and hardware project competitions etc.

11.3 Programming Contest

The department of CSE regularly arranges programming contest. From its inception, students from BAUST have participated in all the ICPC regionals in Bangladesh.

11.4 Software and Hardware Project Competitions

Through software and hardware project competitions, the students get to taste the joy of creation and real-life problem solving. The department of CSE arranges theses competition time to time.

11.5 CSE Festival

CSE Fest gives the students an opportunity to explore various types of related activities such as project showcasing, seminars, Quizzes, programming contest, robotics contest, gaming etc. The Fest also brings the industry and the future engineers close together.

11.6 Workshop/Training

Workshops, seminars, and training are routine activity in this department. By arranging these events regularly, the department is giving the students an opportunity to satisfy their interest in special areas.

12. **Graduate Attributes (Based on Assessment)**

Attribute 1: Deep discipline knowledge and intellectual breadth.

Attribute 2: Creative and critical thinking, and problem solving.

Attribute 3: Teamwork and communication skills.

Attribute 4: Professionalism and leadership readiness.

Attribute 5: Intercultural and ethical competency.

13. **Program Educational Objectives (PEOs)**

PEOs	PEO statement
PEO1	Graduates will progress in their chosen profession through pursue a degree in the respective field of study and get advancement in career.
PEO2	Graduates will build reputation through appreciation from others by demonstrating their dependability as successful and ethical team members and achieving leadership roles in organizations and/or on teams.
PEO3	Graduates will develop, identify, and apply relevant and current technologies, skills, and resources to build and operate sustainable business enterprises through a variety of career paths.
PEO4	Graduates will contribute to society's educational, cultural, social, technical, and economic growth by using their knowledge and skills ethically.

14. **Program Learning Outcomes (PLOs)**

1. **PLO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **PLO2: Problem analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

3. **PLO3: Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

4. **PLO4: Investigation:** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5. **PLO5: Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **PLO6: The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7. **PLO7: Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, for sustainable development.

8. **PLO8: Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.

9. **PLO9: Individual work and teamwork:** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

10. **PLO10: Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

11. **PLO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work as a member or a leader of a team to manage projects in multi-disciplinary environments.

12. **PLO12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

15. **Mapping Mission of the University with PEOs**

PEOs	PEO Statement	Institutional Mission Statements		
		Mission Statement 1	Mission Statement 2	Mission Statement 3
PEO1	Graduates will progress in their chosen profession through pursue a degree in the respective field of study and get advancement in career.	YES	YES	
PEO2	Graduates will build reputation through appreciation from others by demonstrating their dependability as successful and ethical team members and achieving leadership roles in organizations and/or on teams.	YES	YES	
PEO3	Graduates will develop, identify, and apply relevant and current technologies, skills, and resources to build and operate sustainable business enterprises through a variety of career paths.	YES	YES	YES
PEO4	Graduates will contribute to society's educational, cultural, social, technical, and economic growth by using their knowledge and skills ethically.			YES

16. **Mapping PLOs with the PEOs**

PLOs	PEO1	PEO2	PEO3	PEO4
PLO1	Y			
PLO2	Y			
PLO3	Y			
PLO4	Y			
PLO5	Y		Y	
PLO6				Y
PLO7			Y	Y
PLO8	Y	Y		Y
PLO9		Y		
PLO10	Y			Y
PLO11		Y	Y	
PLO12	Y			Y

Y=Yes

17. **Mapping courses with the PLOs**

Course Code	Program Learning Outcomes (PLOs)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CSE 1100	Y		Y						Y			
CSE 1101	Y	Y	Y							Y		
CSE 1102	Y		Y	Y					Y			
EEE 1163	Y	Y	Y	Y								
EEE 1164	Y	Y	Y		Y				Y			
MATH 1141	Y	Y	Y	Y								
PHY 1131	Y	Y	Y									
PHY 1132	Y	Y	Y						Y	Y		
ENG 1127	Y		Y							Y		Y
CSE 1201	Y	Y	Y							Y		
CSE 1203	Y	Y	Y							Y		
CSE 1204	Y	Y	Y	Y					Y	Y		
CSE 1208	Y				Y			Y		Y		
EEE 1269	Y	Y	Y									

EEE 1270	Y	Y	Y									
ENG 1228	Y	Y			Y				Y	Y		
MATH 1243	Y	Y										
CE 1250	Y				Y	Y			Y	Y		
HUM 1221	Y							Y	Y			Y
CSE 2100	Y		Y		Y				Y			
CSE 2101	Y	Y							Y			
CSE 2102	Y	Y	Y							Y		
CSE 2103	Y	Y								Y		
CSE 2104	Y	Y	Y									
CSE 2105	Y	Y										
CSE 2108	Y	Y	Y		Y							
CHEM 2133	Y	Y										
MATH 2145	Y	Y										
CSE 2201	Y	Y	Y									
CSE 2202	Y	Y	Y		Y							
CSE 2203				Y	Y						Y	
CSE 2205	Y	Y	Y		Y							
CSE 2206	Y		Y		Y				Y	Y		
EEE 2269	Y	Y										
EEE 2270		Y		Y	Y							
MATH 2247	Y	Y		Y								
HUM 2221	Y	Y					Y	Y				Y
CSE 3100	Y		Y		Y				Y			
CSE 3101	Y	Y	Y							Y		
CSE 3102	Y	Y	Y							Y		
CSE 3103	Y	Y	Y									
CSE 3104	Y		Y							Y		
CSE 3105	Y	Y	Y	Y							Y	
CSE 3107	Y	Y	Y							Y		
CSE 3109	Y	Y	Y							Y		
CSE 3110						Y			Y		Y	
ME 3181	Y					Y	Y	Y				

CSE 3200	Y		Y		Y	Y		Y	Y	Y	Y	Y
CSE 3201	Y	Y	Y	Y						Y		
CSE 3202	Y	Y	Y		Y							
CSE 3203	Y	Y								Y		
CSE 3204					Y				Y	Y		
CSE 3205	Y	Y	Y							Y		
CSE 3206	Y	Y	Y		Y							
CSE 3207	Y	Y								Y		
CSE 3209	Y		Y					Y		Y	Y	
CSE 3210	Y		Y	Y	Y						Y	
CSE 4000		Y	Y			Y	Y	Y	Y	Y	Y	Y
CSE 4100					Y			Y		Y		
CSE 4101	Y	Y		Y								Y
CSE 4102		Y	Y		Y							
CSE 4103	Y	Y								Y		
CSE 4104		Y	Y		Y							
HUM 4123				Y			Y					Y
CSE 4000	Y	Y	Y	Y	Y	Y			Y			
CSE 4215						Y		Y		Y		Y
HUM 4273				Y							Y	Y
IPE 4297				Y							Y	Y

Part B:

17. Structure of the Curriculum

a) Duration of the program: Years: 04 Semesters: 08

b) Admission Requirements (Eligibility of Students for BAUST Admission)

The students must fulfill the following requirements:

Bangladeshi Students:

i) B.Sc. Engg. in CSE / EEE / ME / IPE / CE: Bangladeshi applicants who have passed HSC/Alim or equivalent or A level or equivalent examinations are eligible to apply, if he/she fulfills the following conditions:

a) HSC/Alim or equivalent examination in Science Group with Mathematics, Physics and Chemistry with minimum GPA 3.0 (with additional subject) and SSC/Dakhil or equivalent with minimum GPA 3.0. The total GPA of SSC/Dakhil or equivalent and HSC/Alim or equivalent should be at least GPA 7.0 (with additional subjects).

b) GCE O Level: Minimum C Grade in five subjects including, Mathematics, Physics and Chemistry (in the scale of A=5, B=4, C=3, D=2 and E=1). A Level: Minimum C Grade in 2 subjects including Mathematics, Physics/ Chemistry. The sum total of GPA in GCE A and O level should be 6. The candidates with E grade in any subject will not be considered.

c) Diploma holders from Government Polytechnic Institute in relevant subjects are eligible to apply with at least a CGPA of 3.0 in Diploma and GPA 3.0 in SSC/Dakhil or equivalent. A Diploma holder may apply for a subject in B.Sc. Engineering without having the relevant Diploma background but from science discipline.

d) Applicants who have passed HSC or equivalent in the last three (3) consecutive years are eligible to apply.

e) Applicants who have obtained a total GPA of 9.0 or more in HSC/Alim or equivalent and SSC/Dakhil or equivalent are eligible for direct admission (without Admission Test). Direct admission facility may also be offered to the Diploma holders having minimum GPA 3.50 in relevant subjects (or minimum GPA 3.75 for a Diploma holder without having the relevant diploma background from science discipline) and at least GPA 3.00 in SSC/Dakhil or equivalent level.

ii) Bachelor of Business Administration (BBA) and BA (Hons) in English. Bangladeshi applicants who have passed HSC/Alim or equivalent or A level or equivalent examinations are eligible to apply, if he/she fulfills the following conditions:

a) HSC/Alim or equivalent examination (from any discipline) with minimum GPA of 3.0 (with additional subject) and SSC/Dakhil or equivalent with minimum GPA 3.0. The total GPA of HSC/Alim or equivalent and SSC/Dakhil or equivalent should be at least 6.5 (with additional subjects).
b) GCE O Level: Minimum C Grade in five subjects. A Level: Minimum C Grade in 2 subjects. The sum total of GPA in GCE A and O level should be 6. The candidates with E grade in any subject will not be considered.
c) Applicants who have passed HSC or equivalent in the last three (3) consecutive years are eligible to apply.
d) Applicants who have obtained a total GPA of 8.0 or more in HSC/Alim or equivalent and SSC/Dakhil or equivalent are eligible for direct admission (without Admission Test).
e) Diploma holders from science and commerce discipline are eligible to apply with at least a GPA of 3.0.

Foreign Students:

Foreign nationals who have successfully passed in their Secondary School and Higher Secondary or their equivalent examination (after 12 years of schooling) having at least 50% marks from foreign educational institutes.

i) Have English as medium of instruction or IELTS-5.0/TOEFL-79 on IBT.
ii) Apply within two years from the date of completion of the standard twelve years Course curriculum.
iii) Candidates for engineering programs must have Mathematics, Physics and Chemistry in Secondary or Higher Secondary or equivalent examination.
iv) Candidates having contagious and communicable diseases or cardiac problems are not eligible for admission.

Number of Seats:

The number of seats per department is given in following tables.

Allocation of Seats

Name of the Department	Number of Seats
Computer Science and Engineering	100
Information and Communication Technology	100
Electrical and Electronic Engineering	100
Mechanical Engineering	100
Industrial Production Engineering	100
Civil Engineering	100
Business Administration	100
English	100

Selection Procedure

Applicants eligible for Admission Test will be selected on the basis of total GPA of SSC & HSC or 'O' and 'A' level results. Name of the eligible applicants will be published in the University website (www.baust.edu.bd) and Notice Board.

Syllabus for Admission Test

i) B.Sc. Engg. in CSE/EEE/ME/IPE/CE/ICT

A Written and MCQ test will be conducted on Mathematics, Physics, Chemistry and English (Comprehension and Functional) as per the syllabus of HSC. The test will be of 100 marks and 2 hours duration. The distribution of marks is given below:

SN	Subjects	Marks
1	Mathematics	40
2	Physics	30
3	Chemistry	20
4	English	10
	Total	**100**

ii) Bachelor of Business Administration (BBA)

Bachelor of Business Administration (BBA). A written and MCQ test will be conducted on Bangla, English (as per the syllabus of HSC), ICT, General Knowledge and Analytical Ability. The test will be of 100 marks and 2 hours duration. The distribution of marks is given below for different Department students:

Question Pattern and Mark Allocation

Business		Science		Arts	
Subjects	**Marks**	**Subjects**	**Marks**	**Subjects**	**Marks**
Bangla	10	Bangla	10	Bangla	10
English	30*	English	30*	English	30*
ICT	10	ICT	10	ICT	10
Principles of Business	25	Math	25	General Knowledge	40
Accounting	25	Analytical Ability	25	Analytical Ability	10
Total	**100**	**Total**	**100**	**Total**	**100**

*Thirty marks for English will be divided into two parts i.e. MCQ-10 and Written-20. In the written part, students will answer two questions. The written questions will consist of essay, paragraph on any recent issue. MCQ pattern will be followed in all other parts of the test.

iii) BA (Hons) in English

A written and MCQ test will be conducted on Bangla, English (as per the syllabus of HSC) and General Knowledge. The test will be of 100 marks and 2-hour duration. The distribution of marks is given below:

SN	Subjects	Marks
1.	English (MCQ & Descriptive)	65
2.	Bangla	25
3.	General Knowledge	10
	Total	**100**

Final Selection

Students will be selected on the basis of results of the admission test. Merit List will be based on the basis of marks as shown below:

Details	Percentage
Descriptive and MCQ Admission Test	100%

Admission Procedure

a) **Bangladeshi Students:** The selected candidates must collect Admission Form from Admission Section of Registrar Office and complete admission and registration formalities within the given time frame with BAUST Admission Section and respective Faculty by paying prescribed fees. The following rules will apply in this regard:

   i) Candidate failing to complete admission formalities within the prescribed date and time, his/ her selection will be considered as cancelled.

   ii) Student who fails to attend the class without any permission from concerned authority within four weeks of the commencement of 1st semester class, his/her admission will be considered as cancelled.

   In such cases, the vacancies will be filled up by the candidates in the first merit list, other merit list(s) may be published from the waiting candidates for admission if required, who will have to follow the same procedure for admission.

b) **Foreign Students:** A maximum of 20 (twenty) students from a single country (per Faculty) and a maximum of 10 (ten) students in a single department shall be allowed.

   i. Please go through the "**Information for International Students**" available on BAUST website (www.baust.edu.bd)

   ii. Please download the prescribed application form from the link or apply online.

   iii. Fill it up properly; incomplete application will not be processed. A separate sheet can be attached if the space provided is found insufficient.

   iv. The documents that need to be attached with the application are:

      a) All academic records (certificates)
      b) Marks certificate of the last public examination passed
      c) Photo (Passport size; taken within 3 months)
      d) A copy of the detailed syllabus of the last public examination passed
      e) A copy of valid passport showing the name, photo, nationality and the passport number of the applicant
      f) Any other document supporting the requirements (if any) of the faculty concerned.
      g) NOC/PCF
      h) Character Certificate.
      i) Medical Certificate.

Send the signed application form along with all necessary documents by post to the following address, and also send a scanned copy of the whole set of application to the

e-mail: admission@baust.edu.bd
Room No. 104 (Admission Office)
Administration Building
BAUST
Saidpur – 5310,
Bangladesh
Tel.: +88-01769-675554
Email: admission@baust.edu.bd

v. **The International Student's Admission Office** will scrutinize all applications and forward all the valid applications to the competent authority for evaluation. During the evaluation process an applicant may be asked to submit further documents if necessary. Only short-listed applicants will be notified through their e-mails for further processing of their applications.

vi. Admission will be finalized after receiving the NOC/Clearance certificate from the competent authority of Bangladesh Government, and after verifying original academic records and transcripts.

Cancellation of Admission

The cancellation of admission is not permissible. However, on special circumstances, such cancellation may be considered as per the following guidelines:

SN	Description	Refundable
1	Before commencement of the classes.	100% of the Establishment Fee and 100% of the Semester Fee.
2	Within the 1st Week of commencement of the classes.	The Caution money, 75% of the Establishment Fee and the Semester Fee.
3	Within 2nd weeks of commencement of the classes.	The Caution money, 50% of the Establishment Fee and the Semester Fee.
4	After 2nd weeks of commencement of the classes.	Caution Money Only.

Medical Checkup

Candidates selected through above procedure will have to go for medical checkup in BAUST/CMH, Saidpur Cantonment. If the medical authority considers any candidate unfit for study in university due to critical/contagious/mental diseases as shown in medical policy of university will be declared ineligible for admission.

Dope Test

BAUST ensures a drug free campus for every student. The University firmly believes that the use of drugs and other illegal substances can have a negative effect on the performance of the student's intellectual and spiritual development. The potential for alcohol and drug abuse threatens the viability of the student's professional development. In furtherance of these beliefs, BAUST has instituted an alcohol and drug testing policy to maintain wellness for students. Students will have to go through Dope Test during admission time.

Credit Transfer

BAUST students who wish to transfer their credits to a foreign university are advised to go through the website of that university very carefully and must understand all the procedure regarding admission, tuition and other fees, available financial aid and insurance policy, and available part-time work facility for the students etc. before enrollment.

i) **Transfer from other University**

Students with good academic records from other recognized University are eligible for transfer of their credits to BAUST. Students willing to transfer from another university must have transcripts of courses and grades, together with the copies of certificate/ mark sheet of SSC or HSC or transcripts of O and A levels. These Transcripts will be evaluated against the minimum entry requirement at BAUST.

ii) **Exemption of Courses**

Students with extensive academic or professional experience may apply to waive courses by completing a Request for Course Waiver form. This form should be submitted to the Coordinator of the Program/ Head of the Dept./Dean of the Faculty with the relevant academic transcripts or evidence of an appropriate certification.

Students having completed any course of Bachelor’s degree from other recognized university are eligible for waiver provided that he/ she obtained at least a ‘C+’ grade or over 50 percent marks in that specific course. Waiver is given to only in the case of those courses which are included in the syllabus of the program; the student wants to get admitted. Course waiver requires approval from equivalence committee of BAUST.

c) **Total minimum credits requirement to complete the program**

Minimum credit hour requirements for the award of Bachelor’s degree in engineering (B.Sc. Engineering) and other disciplines shall be decided as per the existing rules.

d) Total class weeks in a semester:

14 class weeks in a semester.

e) Minimum CGPA requirements for graduation

The minimum CGPA requirement for obtaining a Bachelor's degree in Engineering and other disciplines is 2.20.

f) Maximum academic years of completion

A student is expected to complete the whole course within 4 years (8 terms). For an unavoidable reason if a student fails to complete the course within the stipulated time of 4 years, he/she must complete all degree requirements within a maximum period of 6 academic years (12 terms). Failure to complete all degree requirements within the given time frame may disqualify a student from continuation of his/her study at the university.

g) Category of Courses

i. General Education Courses

SN	Course Code	Course Name	Credit
Arts & Humanties			
1	ENG 1127	English	3.00
2	ENG 1228	Developing English Skill Sessional	0.75
3	HUM 1221	Bengali Language and Literature	2.00
4	HUM 2221	History of the Emergence of Bangladesh	2.00
5	HUM 4123	Engineering Economics	2.00
Basic Science/STEM			
6	PHY 1131	Physics	3.00
7	PHY 1132	Physics Sessional	0.75
8	CHEM 2133	Chemistry	3.00
9	MATH 1141	Differential Calculus, Integral Calculus and Coordinate Geometry	3.00
10	MATH 1243	Ordinary Differential Equations and Partial Differential Equations	3.00
11	MATH 2145	Vector Calculus, Linear Algebra and Complex Variable	3.00
12	MATH 2247	Laplace Transformation and Fourier Analysis	3.00
Interdisciplinary Department (Dept. of EEE, ME, IPE, CE, DBA)			
13	EEE 1163	Introduction to Electrical Engineering	3.00
14	EEE 1164	Introduction to Electrical Engineering Sessional	1.50

SN	Course Code	Course Name	Credit
15	EEE 1269	Electronic Circuits	3.00
16	EEE 1270	Electronic Circuits Sessional	0.75
17	EEE 2269	Electrical Drives and Instrumentation	3.00
18	EEE 2270	Electrical Drives and Instrumentation Sessional	0.75
19	ME 3181	Basic Mechanical Engineering	3.00
20	HUM 4273	Financial, Cost and Managerial Accounting	2.00
21	IPE 4297	Industrial Management	3.00
22	CE 1250	Engineering Drawing and CAD Sessional	0.75
		Total Credit	**49.25**

ii. Core Courses

SN	Course Code	Course Name	Credit
1	CSE 1100	Introduction to Computer System Sessional	1.50
2	CSE 1101	Structured Programming Language	3.00
3	CSE 1102	Structured Programming Language Sessional	1.50
4	CSE 1201	Discrete Mathematics	3.00
5	CSE 1203	Object Oriented Programming Language I	3.00
6	CSE 1204	Object Oriented Programming Language I Sessional	1.50
7	CSE 1208	Numerical Methods Sessional	1.50
8	CSE 2101	Digital Logic Design	3.00
9	CSE 2102	Digital Logic Design Sessional	1.50
10	CSE 2103	Data Structures and Algorithm I	3.00
11	CSE 2104	Data Structures and Algorithm I Sessional	1.50
12	CSE 2105	Applied Statistics for Computer Science	3.00
13	CSE 2108	Object Oriented Programming Language II Sessional	1.50
14	CSE 2201	Data Structures and Algorithm II	3.00
15	CSE 2202	Data Structures and Algorithm II Sessional	1.50
16	CSE 2203	Theory of Computation	3.00
17	CSE 2205	Database Management Systems	3.00
18	CSE 2206	Database Management Systems Sessional	1.50

SN	Course Code	Course Name	Credit
19	CSE 3101	Software Engineering	3.00
20	CSE 3102	Software Engineering Sessional	0.75
21	CSE 3103	Microprocessors, Microcontrollers and Embedded Systems	3.00
22	CSE 3104	Microprocessors, Microcontrollers and Embedded Systems Sessional	0.75
23	CSE 3105	Computer Architecture	3.00
24	CSE 3107	Data Communication	3.00
25	CSE 3109	Compiler	3.00
26	CSE 3110	Compiler Sessional	0.75
27	CSE 3200	Web Engineering Project	1.50
28	CSE 3201	Artificial Intelligence	3.00
29	CSE 3202	Artificial Intelligence Sessional	0.75
30	CSE 3203	Operating System	3.00
31	CSE 3204	Operating System Sessional	1.50
32	CSE 3205	Computer Networks	3.00
33	CSE 3206	Computer Networks Sessional	1.50
34	CSE 3207	Mathematical Analysis for Computer Science	3.00
35	CSE 3209	Information System Design	3.00
36	CSE 3210	Information System Design Sessional	0.75
37	CSE 4101	Computer Security	3.00
38	CSE 4102	Computer Security Sessional	0.75
39	CSE 4103	Computer Graphics	3.00
40	CSE 4104	Computer Graphics Sessional	0.75
41	CSE 41XX	CSE Option I	3.00
42	CSE 41XX	CSE Option I Sessional	0.75
43	CSE 41XX	CSE Option II	3.00
44	CSE 41XX	CSE Option II Sessional	0.75
45	CSE 42XX	CSE Option III	3.00
46	CSE 42XX	CSE Option III Sessional	0.75
47	CSE 42XX	CSE Option IV	3.00
48	CSE 42XX	CSE Option IV Sessional	0.75
49	CSE 4215	Professional Issues and Ethics for Computer Science	2.00
	Total Credit Hours		**103.25**

iii. Elective/ Optional Courses

Elective/Optional I:

SN	Course Code	Course Name	Credit
Division of Hardware, Networking, Security & Communication Engineering			
1	CSE 4125	Internet of Things (IoT)	3.00
2	CSE 4126	Internet of Things (IoT) Sessional	0.75
3	CSE 4135	Basic Multimedia Theory	3.00
4	CSE 4136	Basic Multimedia Theory Sessional	0.75
5	CSE 4137	Data and Network Security	3.00
6	CSE 4138	Data and Network Security Sessional	0.75
Division of Algorithms & Software Engineering			
7	CSE 4129	Advanced Algorithms	3.00
8	CSE 4130	Advanced Algorithms Sessional	0.75
9	CSE 4133	Fault Tolerant System	3.00
10	CSE 4134	Fault Tolerant System Sessional	0.75
11	CSE 4141	Object Oriented Software Engineering	3.00
12	CSE 4142	Object Oriented Software Engineering Sessional	0.75
13	CSE 4143	Basic Graph Theory	3.00
14	CSE 4144	Basic Graph Theory Sessional	0.75
Division of Data Science, AI & Robotics Engineering			
15	CSE 4123	Data Science and Analytics	3.00
16	CSE 4124	Data Science and Analytics Sessional	0.75
17	CSE 4127	Big Data and Business Intelligence	3.00
18	CSE 4128	Big Data and Business Intelligence Sessional	0.75
19	CSE 4131	Artificial Neural Networks and Fuzzy Systems	3.00
20	CSE 4132	Artificial Neural Networks and Fuzzy Systems Sessional	0.75
Division of Multidiscipline (Computing, Signal Processing, Control Engineering, Biological Science, VLSI)			
21	CSE 4145	Bioinformatics	3.00
22	CSE 4146	Bioinformatics Sessional	0.75

Elective/Optional II:

SN	Course Code	Course Name	Credit
Division of Hardware, Networking, Security & Communication Engineering			
23	CSE 4149	Advance Computer Networks	3.00
24	CSE 4150	Advance Computer Networks Sessional	0.75
25	CSE 4153	Digital System Design	3.00
26	CSE 4154	Digital System Design Sessional	0.75
27	CSE 4163	Multimedia Communication	3.00
28	CSE 4164	Multimedia Communication Sessional	0.75
Division of Algorithms & Software Engineering			
29	CSE 4155	Peripherals, Interfacing and Embedded Systems	3.00
30	CSE 4156	Peripherals, Interfacing and Embedded Systems Sessional	0.75
31	CSE 4157	Remote Sensing	3.00
32	CSE 4158	Remote Sensing Sessional	0.75
33	CSE 4159	Web Architecture	3.00
34	CSE 4160	Web Architecture Sessional	0.75
35	CSE 4161	Parallel Processing and Distributed System	3.00
36	CSE 4162	Parallel Processing and Distributed System Sessional	0.75
37	CSE 4165	Computational Geometry	3.00
38	CSE 4166	Computational Geometry Sessional	0.75
39	CSE 4171	Distributed Algorithms	3.00
40	CSE 4172	Distributed Algorithms Sessional	0.75
Division of Data Science, AI & Robotics Engineering			
41	CSE 4139	Machine Learning	3.00
42	CSE 4140	Machine Learning Sessional	0.75
43	CSE 4147	Robotics	3.00
44	CSE 4148	Robotics Sessional	0.75
45	CSE 4167	Advanced Robotics	3.00
46	CSE 4168	Advanced Robotics Sessional	0.75
47	CSE 4169	Computer Vision	3.00
48	CSE 4170	Computer Vision Sessional	0.75
Division of Multidiscipline (Computing, Signal Processing, Control Engineering, Biological Science, VLSI)			
49	CSE 4121	Digital Signal Processing	3.00
50	CSE 4122	Digital Signal Processing Sessional	0.75
51	CSE 4151	Mobile Computing and Applications	3.00
52	CSE 4152	Mobile Computing and Applications Sessional	0.75

Elective/Optional III:

SN	Course Code	Course Name	Credit
Division of Hardware, Networking, Security & Communication Engineering			
53	CSE 4223	Cyber Security and Blockchain	3.00
54	CSE 4224	Cyber Security and Blockchain Sessional	0.75
55	CSE 4225	Information Retrieval and Security	3.00
56	CSE 4226	Information Retrieval and Security Sessional	0.75
Division of Algorithms & Software Engineering			
57	CSE 4221	Applied Statistics and Queuing Theory	3.00
58	CSE 4222	Applied Statistics and Queuing Theory Sessional	0.75
59	CSE 4237	Cloud Computing	3.00
60	CSE 4238	Cloud Computing Sessional	0.75
61	CSE 4239	High Performance Computing	3.00
62	CSE 4240	High Performance Computing Sessional	0.75
Division of Data Science, AI & Robotics Engineering			
63	CSE 4227	Pattern Recognition	3.00
64	CSE 4228	Pattern Recognition Sessional	0.75
65	CSE 4245	Digital Image Processing	3.00
66	CSE 4246	Digital Image Processing Sessional	0.75
Division of Multidiscipline (Computing, Signal Processing, Control Engineering, Biological Science, VLSI)			
67	CSE 4233	Simulation and Modelling	3.00
68	CSE 4234	Simulation and Modelling Sessional	0.75
69	CSE 4255	Biomedical Signal Processing	3.00
70	CSE 4256	Biomedical Signal Processing Sessional	0.75

Elective/Optional IV:

SN	Course Code	Course Name	Credit
Division of Hardware, Networking, Security & Communication Engineering			
71	CSE 4229	Telecommunication Engineering	3.00
72	CSE 4230	Telecommunication Engineering Sessional	0.75
73	CSE 4231	Information Theory and Coding	3.00
74	CSE 4232	Information Theory and Coding Sessional	0.75
75	CSE 4235	Network Programming	3.00
76	CSE 4236	Network Programming Sessional	0.75
77	CSE 4241	Geographical Information System	3.00
78	CSE 4242	Geographical Information System Sessional	0.75
Division of Algorithms & Software Engineering			
79	CSE 4253	Quantum Computing	3.00
80	CSE 4254	Quantum Computing Sessional	0.75
Division of Data Science, AI & Robotics Engineering			
81	CSE 4247	Deep Learning	3.00
82	CSE 4248	Deep Learning Sessional	0.75
83	CSE 4251	Data Warehousing and Data Mining	3.00
84	CSE 4252	Data Warehousing and Data Mining Sessional	0.75
Division of Multidiscipline (Computing, Signal Processing, Control Engineering, Biological Science, VLSI)			
85	CSE 4243	Control Systems	3.00
86	CSE 4244	Control Systems Sessional	0.75
87	CSE 4249	VLSI Design	3.00
88	CSE 4250	VLSI Design Sessional	0.75
89	CSE 4257	Computer Science in Nanotechnology	3.00
90	CSE 4258	Computer Science in Nanotechnology Sessional	0.75
91	CSE 4259	Computer Science in Medicine	3.00
92	CSE 4260	Computer Science in Medicine Sessional	0.75

iv. **Capstone course/Internship/Thesis/Projects/Portfolio (as applicable for the discipline/ academic program)**

SN	Course Code	Course Name	Credit
1	CSE 2100	Software Development Project I	0.75
2	CSE 3100	Software Development Project II	0.75
3	CSE 4100	Industrial Training	1.00
4	CSE 4000	Project / Thesis	6.00
		Total Credit	**8.50**

18. Year/Level/Semester/Term wise distribution of courses

Undergraduate students of the Department of Computer Science and Engineering (CSE) have to follow a particular course schedule. The term-wise distributions of the courses are given below:

a. First Year/Level/Semester/Term courses

LEVEL-1, TERM-I				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 1100	Introduction to Computer System Sessional		3.00	1.50
CSE 1101	Structured Programming Language	3.00	-	3.00
CSE 1102	Structured Programming Language Sessional	-	3.00	1.50
EEE 1163	Introduction to Electrical Engineering	3.00	-	3.00
EEE 1164	Introduction to Electrical Engineering Sessional	-	3.00	1.50
MATH 1141	Differential Calculus, Integral Calculus and Coordinate Geometry	3.00	-	3.00
PHY 1131	Physics	3.00	-	3.00
PHY 1132	Physics Sessional	-	1.50	0.75
ENG 1127	English	3.00		3.00
	Total	**15.00**	**10.50**	**20.25**

LEVEL-1, TERM-II				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 1201	Discrete Mathematics	3.00	-	3.00
CSE 1203	Object Oriented Programming Language I	3.00	-	3.00
CSE 1204	Object Oriented Programming Language I Sessional	-	3.00	1.50
CSE 1208	Numerical Methods Sessional	-	3.00	1.50
EEE 1269	Electronic Circuits	3.00	-	3.00
EEE 1270	Electronic Circuits Sessional	-	3.00	0.75
ENG 1228	Developing English Skill Sessional	-	1.50	0.75
MATH 1243	Ordinary Differential Equations and Partial Differential Equations	3.00	-	3.00
CE 1250	Engineering Drawing and CAD Sessional	-	1.50	0.75
HUM 1221	Bengali Language and Literature	2.00		2.00
	Total	**14.00**	**10.50**	**19.25**

b. Second Year/Level/Semester/Term courses

LEVEL-2, TERM-I				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 2100	Software Development Project I	-	1.50	0.75
CSE 2101	Digital Logic Design	3.00	-	3.00
CSE 2102	Digital Logic Design Sessional	-	3.00	1.50
CSE 2103	Data Structures and Algorithm I	3.00	-	3.00
CSE 2104	Data Structures and Algorithm I Sessional	-	3.00	1.50
CSE 2105	Applied Statistics for Computer Science	3.00		3.00
CSE 2108	Object Oriented Programming Language II Sessional	-	3.00	1.50
CHEM 2133	Chemistry	3.00	-	3.00
MATH 2145	Vector Calculus, Linear Algebra and Complex Variable	3.00	-	3.00
	Total	**15.00**	**10.50**	**20.25**

LEVEL-2, TERM-II				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 2201	Data Structures and Algorithm II	3.00	-	3.00
CSE 2202	Data Structures and Algorithm II Sessional	-	3.00	1.50
CSE 2203	Theory of Computation	3.00	-	3.00
CSE 2205	Database Management Systems	3.00	-	3.00
CSE 2206	Database Management Systems Sessional	-	3.00	1.50
EEE 2269	Electrical Drives and Instrumentation	3.00	-	3.00
EEE 2270	Electrical Drives and Instrumentation Sessional	-	1.50	0.75
MATH 2247	Laplace Transformation and Fourier Analysis	3.00	-	3.00
HUM 2221	History of the Emergence of Bangladesh	2.00	-	2.00
	Total	**17.00**	**7.50**	**20.75**

c. Third Year/Level/Semester/Term courses

LEVEL-3, TERM-I				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Theory**	
CSE 3100	Software Development Project II	-	1.50	0.75
CSE 3101	Software Engineering	3.00	-	3.00
CSE 3102	Software Engineering Sessional	-	1.50	0.75
CSE 3103	Microprocessors, Microcontrollers and Embedded Systems	3.00	-	3.00
CSE 3104	Microprocessors, Microcontrollers and Embedded Systems Sessional	-	1.50	0.75
CSE 3105	Computer Architecture	3.00	-	3.00
CSE 3107	Data Communication	3.00	-	3.00
CSE 3109	Compiler	3.00	-	3.00
CSE 3110	Compiler Sessional	-	1.50	0.75
ME 3181	Basic Mechanical Engineering	3.00		3.00
	Total	**18.00**	**6.00**	**21.00**

LEVEL-3, TERM-II				
Course Code	Course Title	Hours/Week		Credit
		Theory	Sessional	
CSE 3200	Web Engineering Project		3.00	1.50
CSE 3201	Artificial Intelligence	3.00	-	3.00
CSE 3202	Artificial Intelligence Sessional	-	1.50	0.75
CSE 3203	Operating System	3.00	-	3.00
CSE 3204	Operating System Sessional	-	3.00	1.50
CSE 3205	Computer Networks	3.00	-	3.00
CSE 3206	Computer Networks Sessional	-	3.00	1.50
CSE 3207	Mathematical Analysis for Computer Science	3.00	-	3.00
CSE 3209	Information System Design	3.00	-	3.00
CSE 3210	Information System Design Sessional	-	1.50	0.75
	Total	**15.00**	**12.00**	**21.00**

****LEVEL-4: INDUSTRIAL TRAINING**

Course Code	Course Title	Credit Hour		Credit
		Theory	Sessional	
CSE 4100	Industrial Training	-	3 Weeks	1.00

**Note: This course is mandatory. Evaluation report from industry is to be submitted at the end of the training and accordingly to be incorporated in the tabulation sheet. The course may start from end of the semester Level-3, Term-II and will be ended in semester Level-4, Term-I.

d. Fourth Year/Level/Semester/Term courses

LEVEL-4, TERM-I				
Course Code	Course Title	Hours/Week		Credit
		Theory	Sessional	
CSE 4000	Project / Thesis	-	6.00	3.00
CSE 4100	Industrial Training	-	2.0	1.00
CSE 4101	Computer Security	3.00	-	3.00
CSE 4102	Computer Security Sessional	-	1.50	0.75
CSE 4103	Computer Graphics	3.00	-	3.00
CSE 4104	Computer Graphics Sessional	-	1.50	0.75
CSE 41XX	CSE Option I	3.00	-	3.00
CSE 41XX	CSE Option I Sessional		1.50	0.75
CSE 41XX	CSE Option II	3.00	-	3.00
CSE 41XX	CSE Option II Sessional		1.50	0.75
HUM 4123	Engineering Economics	2.00	-	2.00
	Total	**14.00**	**14.00**	**21.00**

LEVEL-4, TERM-II				
Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 4000	Project / Thesis*	-	6.00	3.00
CSE 42XX	CSE Option III	3.00	-	3.00
CSE 42XX	CSE Option III Sessional	-	1.50	0.75
CSE 42XX	CSE Option IV	3.00	-	3.00
CSE 42XX	CSE Option IV Sessional	-	1.50	0.75
CSE 4215	Professional Issues and Ethics for Computer Science	2.00	-	2.00
HUM 4273	Financial, Cost and Managerial Accounting	2.00	-	2.00
IPE 4297	Industrial Management	3.00	-	3.00
	Total	**13.00**	**9.00**	**17.50**

e. Elective/Optional I and II

Course Code	**Course Title**	**Hours/Week**		**Credit**
		Theory	**Sessional**	
CSE 4121	Digital Signal Processing	3.00	-	3.00
CSE 4122	Digital Signal Processing Sessional	-	1.50	0.75
CSE 4123	Data Science and Analytics	3.00	-	3.00
CSE 4124	Data Science and Analytics Sessional	-	1.50	0.75
CSE 4125	Internet of Things (IoT)	3.00	-	3.00
CSE 4126	Internet of Things (IoT) Sessional	-	1.50	0.75
CSE 4127	Big Data and Business Intelligence	3.00	-	3.00
CSE 4128	Big Data and Business Intelligence Sessional	-	1.50	0.75
CSE 4129	Advanced Algorithms	3.00	-	3.00
CSE 4130	Advanced Algorithms Sessional	-	1.50	0.75
CSE 4131	Artificial Neural Networks and Fuzzy Systems	3.00	-	3.00
CSE 4132	Artificial Neural Networks and Fuzzy Systems Sessional	-	1.50	0.75
CSE 4133	Fault Tolerant System	3.00	-	3.00
CSE 4134	Fault Tolerant System Sessional	-	1.50	0.75
CSE 4135	Basic Multimedia Theory	3.00	-	3.00
CSE 4136	Basic Multimedia Theory Sessional	-	1.50	0.75
CSE 4137	Data and Network Security	3.00	-	3.00
CSE 4138	Data and Network Security Sessional	-	1.50	0.75
CSE 4139	Machine Learning	3.00	-	3.00
CSE 4140	Machine Learning Sessional	-	1.50	0.75

CSE 4141	Object Oriented Software Engineering	3.00	-	3.00
CSE 4142	Object Oriented Software Engineering Sessional	-	1.50	0.75
CSE 4143	Basic Graph Theory	3.00	-	3.00
CSE 4144	Basic Graph Theory Sessional	-	1.50	0.75
CSE 4145	Bioinformatics	3.00	-	3.00
CSE 4146	Bioinformatics Sessional	-	1.50	0.75
CSE 4147	Robotics	3.00	-	3.00
CSE 4148	Robotics Sessional	-	1.50	0.75
CSE 4149	Advance Computer Networks	3.00	-	3.00
CSE 4150	Advance Computer Networks Sessional	-	1.50	0.75
CSE 4151	Mobile Computing and Applications	3.00	-	3.00
CSE 4152	Mobile Computing and Applications Sessional	-	1.50	0.75
CSE 4153	Digital System Design	3.00	-	3.00
CSE 4154	Digital System Design Sessional	-	1.50	0.75
CSE 4155	Peripherals, Interfacing and Embedded Systems	3.00	-	3.00
CSE 4156	Peripherals, Interfacing and Embedded Systems	-	1.50	0.75
CSE 4157	Remote Sensing	3.00	-	3.00
CSE 4158	Remote Sensing Sessional	-	1.50	0.75
CSE 4159	Web Architecture	3.00	-	3.00
CSE 4160	Web Architecture Sessional	-	1.50	0.75
CSE 4161	Parallel Processing and Distributed System	3.00	-	3.00
CSE 4162	Parallel Processing and Distributed System Sessional	-	1.50	0.75
CSE 4163	Multimedia Communication	3.00	-	3.00
CSE 4164	Multimedia Communication Sessional	-	1.50	0.75
CSE 4165	Computational Geometry	3.00		3.00
CSE 4166	Computational Geometry Sessional	-	1.50	0.75
CSE 4167	Advanced Robotics	3.00	-	3.00
CSE 4168	Advanced Robotics Sessional	-	1.50	0.75
CSE 4169	Computer Vision	3.00	-	3.00
CSE 4170	Computer Vision Sessional	-	1.50	0.75
CSE 4171	Distributed Algorithms	3.00	-	3.00
CSE 4172	Distributed Algorithms Sessional	-	1.50	0.75

f. Elective/Optional III and IV

Course Code	Course Title	Hours/Week		Credit
		Theory	Sessional	
CSE 4221	Applied Statistics and Queuing Theory	3.00	-	3.00
CSE 4222	Applied Statistics and Queuing Theory Sessional	-	1.50	0.75
CSE 4223	Cyber Security and Blockchain	3.00	-	3.00
CSE 4224	Cyber Security and Blockchain Sessional	-	1.50	0.75
CSE 4225	Information Retrieval and Security	3.00	-	3.00
CSE 4226	Information Retrieval and Security Sessional	-	1.50	0.75
CSE 4227	Pattern Recognition	3.00	-	3.00
CSE 4228	Pattern Recognition Sessional	-	1.50	0.75
CSE 4229	Telecommunication Engineering	3.00	-	3.00
CSE 4230	Telecommunication Engineering Sessional	-	1.50	0.75
CSE 4231	Information Theory and Coding	3.00	-	3.00
CSE 4232	Information Theory and Coding Sessional	-	1.50	0.75
CSE 4233	Simulation and Modelling	3.00	-	3.00
CSE 4234	Simulation and Modelling Sessional	-	1.50	0.75
CSE 4235	Network Programming	3.00	-	3.00
CSE 4236	Network Programming Sessional	-	1.50	0.75
CSE 4237	Cloud Computing	3.00	-	3.00
CSE 4238	Cloud Computing Sessional	-	1.50	0.75
CSE 4239	High Performance Computing	3.00	-	3.00
CSE 4240	High Performance Computing Sessional	-	1.50	0.75
CSE 4241	Geographical Information System	3.00	-	3.00
CSE 4242	Geographical Information System Sessional	-	1.50	0.75
CSE 4243	Control Systems	3.00	-	3.00
CSE 4244	Control Systems Sessional	-	1.50	0.75
CSE 4245	Digital Image Processing	3.00	-	3.00
CSE 4246	Digital Image Processing Sessional	-	1.50	0.75
CSE 4247	Deep Learning	3.00	-	3.00
CSE 4248	Deep Learning Sessional	-	1.50	0.75
CSE 4249	VLSI Design	3.00	-	3.00
CSE 4250	VLSI Design Sessional	-	1.50	0.75
CSE 4251	Data Warehousing and Data Mining	3.00	-	3.00
CSE 4252	Data Warehousing and Data Mining Sessional	-	1.50	0.75
CSE 4253	Quantum Computing	3.00	-	3.00
CSE 4254	Quantum Computing Sessional	-	1.50	0.75
CSE 4255	Biomedical Signal Processing	3.00	-	3.00

CSE 4256	Biomedical Signal Processing Sessional	-	1.50	0.75
CSE 4257	Computer Science in Nanotechnology	3.00	-	3.00
CSE 4258	Computer Science in Nanotechnology Sessional	-	1.50	0.75
CSE 4259	Computer Science in Medicine	3.00	-	3.00
CSE 4260	Computer Science in Medicine Sessional	-	1.50	0.75

g. Summary

Summary of the credit hour requirement to get B.Sc. Engineering degree in Computer Science and Engineering (CSE) are as follows:

Level and Term	**Hours/Week**		**Credits/Week**		**Credits**	**No of Theory Courses**
	Theory	**Sessional**	**Theory**	**Sessional**		
Level-1 Term-I	15.00	10.50	15.00	5.25	20.25	5
Level-1 Term-II	14.00	10.50	14.00	5.25	19.25	5
Level-2 Term-I	15.00	10.50	15.00	5.25	20.25	5
Level-2 Term-II	17.00	7.50	17.00	3.75	20.75	6
Level-3 Term-I	18.00	6.00	18.00	3.00	21.00	6
Level-3 Term-II	15.00	12.00	15.00	6.00	21.00	5
Level-4 Term-I	14.00	14.00	14.00	7.00	21.00	5
Level-4 Term-II	13.00	9.00	13.00	4.50	17.50	5
Grand Total	**121.00**	**80.00**	**121.00**	**40.00**	**161.00**	**42**

Part C:

19. Description of all courses of the program

LEVEL-1, TERM-I

CSE 1100: Introduction to Computer System Sessional

Course Details		
Course Code: CSE 1100	Course Title: Introduction to Computer System Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
The structured programming language Sessional course is designed to introduce the fundamental concepts and mechanisms computer hardware and software. It helps to identify which hardware are used and which software are commonly used. This sessional course begins with practicing introductory concepts of computer and then covers other important topics such as Microsoft Word, Microsoft Excel, Microsoft Powerpoint, Paint and Basic web technologies.		
Objective		
1. To know basic ideas of computer hardware and software. 2. To learn how to use software to complete any project. 3. To develop problem solving skills.		
Course Content		
Introducing major components of a computer; Hardware: processor, memory, I/O devices; Operating system, application softwares: Word processor, Spreadsheet, Slideshow maker.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic working principle of computer components, their organization inside a working computer.	Y											
CLO2	Using knowledge of computer components to identify and solve computer issues.			Y									

CLO3	Prepare article, presentation and present on the topics of computer.									Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic working principle of computer components, their organization inside a working computer.	Lecture, Lab Participation	M, F
CLO2	Using knowledge of computer components to identify and solve computer issues.	Lecture, Group work, Discussion	Q, M, F
CLO3	Prepare article, presentation and present on the topics of computer.	Lecture, Group work, Discussion	PR, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 1101: Structured Programming Language

Course Details		
Course Code: CSE 1101	Course Title: Structured Programming Language	Credits: 3.00 Contact Hours: 3.00
Rationale		
The structured programming language course introduces the fundamental concepts and mechanisms of computer programming skills. It helps to develop baseline programming knowledge to design and develop algorithms to solve real-world problems. This course begins with introductory concepts of structured programming language and then covers other important topics such as Control Statements, Loop, Array, String, Function, Pointer, Structure, File, Storage Classes, Error Handling, and Command-Line Parameters.		
Objective		
1. To know basic ideas of flowchart and algorithm.		

2. To know basic ideas of programming.
3. To develop problem solving skills.

Course Content

Programming concepts; Program development stages; Flow charts; Structured programming language: data types, operators, expressions, control structures; Functions and program structure: Function basics, parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays, Strings, Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable-length argument list; Pointer and it's used; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Illustrate flow chart and describe algorithm to solve problems using computers.	Y											
CLO2	Analyze the fundamental principles, usual characteristics and appropriate mechanisms of a structured programming language.		Y										
CLO3	Develop fundamental programming skills of program design and development.			Y									
CLO4	Develop the communication skill by presenting topics on Structured programming language.										Y		

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	Delivery Methods and Activities	Assessment Methods
CLO1	Illustrate flow charts and describe algorithms to solve problems using computers.	Lecture, Class Participation	CT, F, MT

CLO2	Analyse the fundamental principles, usual characteristics and appropriate mechanisms of a structured programming language.	Lecture, Discussion, Group Work	CT, MT
CLO3	Develop fundamental programming skills of program design and development.	Lecture, Discussion, Group Work	ASG
CLO4	Develop the communication skill by presenting topics on Structured programming language.	Discussion, Group work	Pr/ASG
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Midterm Exam)			

CSE 1102: Structured Programming Language Sessional

Course Details		
Course Code: CSE 1102	Course Title: Structured Programming Language Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
The structured programming language Sessional course is designed to introduce the fundamental concepts and mechanisms of computer programming skills. It helps to develop baseline programming knowledge to design and develop algorithms to solve real-world problems practically. This sessional course begins with practicing introductory concepts of structured programming and then covers other important topics such as Control Statements, Loop, Array, String, Function, Pointer, Structure, File, Storage Classes, Error Handling and Command-Line Parameters.		
Objective		
1. To know basic ideas of programming languages with Implementation using Computer. 2. To learn how to program with C to solve real-world problems. 3. To develop problem-solving skills.		
Course Content		
Laboratory works based on CSE – 1101		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes** (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Design flow charts, describe algorithms, and solve problems using computers.			Y									
CLO2	Analyze the fundamental principles, usual characteristics, and appropriate mechanisms of a structured programming language practically.	Y			Y								
CLO3	Apply knowledge to think about the problems, and their solutions and translate it into programming language practically.			Y						Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Design flow charts, describe algorithms, and solve problems using computers.	Lecture, Lab Participation	M, F
CLO2	Analyze the fundamental principles, usual characteristics, and appropriate mechanisms of a structured programming language practically.	Lecture, Group work, Discussion	Q, M, F
CLO3	Apply knowledge to think about the problems, and their solutions and translate it into programming language practically.	Lecture, Group work, Discussion	PR, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

EEE 1163: Introduction to Electrical Engineering

Course Details

Course Code: EEE 1163	Course Title: Introduction to Electrical Engineering	Credits: 3.00 Contact Hours: 3.00

Rationale

This course is designed to teach about fundamental concepts, solution techniques and different practical applications of DC and AC circuits.

Objective

1. To know basic ideas of electrical circuit.
2. To design different electric circuit.

Course Content

Fundamental electrical concepts and measuring units; Direct current (dc): Current, voltage, resistance, power and energy; Series/Parallel Circuits; Methods of network analysis and Network Theorems; Capacitors, Inductors and introduction to magnetic circuits. Alternating current (ac): Instantaneous current, voltage and power for various combinations of R, L and C circuits; Effective current and voltage, average power; Phasor representation of sinusoidal quantities; Sinusoidal Single-Phase Circuit Analysis; Introduction to three phase circuits; Power factor and power equation (Δ and Y circuits).

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply knowledge of mathematics, science, and engineering to the analysis of electrical circuits.	Y		Y									
CLO2	Analyse different theorem in electrical circuits.		Y										
CLO3	Design different circuits with various circuit elements and realizing their appropriate rating to get desired outputs.			Y	Y								

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching- Learning Strategy	Assessment Strategy
CLO1	Apply knowledge of mathematics, science, and engineering to the analysis of electrical circuits.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	T, MT, F
CLO2	Analyse different theorem in electrical circuits.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	T, MT, F
CLO3	Design different circuits with various circuit elements and realizing their appropriate rating to get desired outputs.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	PR, ASG
(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

EEE 1164: Introduction to Electrical Engineering Sessional

Course Details		
Course Code: EEE 1164	Course Title: Introduction to Electrical Engineering Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
This course is designed to teach about practical experiments on fundamental concepts, theorems, and different circuit problems.		
Objective		
To know basic ideas of electrical circuit. To verify basic electrical laws and circuit theorems To design different electric circuit.		
Course Content		
This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 1163. In the second part, students will design simple systems using the principles learned in EEE 1164.		

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Familiarization with electrical circuits and apply the knowledge of basic electrical components and networks practically.	Y		Y									
CLO2	Analyse the differences between theoretical knowledge with the practical observations.		Y										
CLO3	Verify basic electrical laws and circuit theorems.		Y										
CLO4	Design different elementary circuit related projects based on practical problems using circuit theorems and electrical components.			Y		Y				Y			
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Familiarization with electrical circuits and apply the knowledge of basic electrical components and networks practically.	Lecture, Experiments	R, Q, T
CLO2	Analyse the differences between theoretical knowledge with the practical observations.	Lecture, Experiments	R, Q, T
CLO3	Verify basic electrical laws and circuit theorems.	Lecture, Experiments	R, Q, T
CLO4	Design different elementary circuit related projects based on practical problems using circuit theorems and electrical components.	Lecture, Experiments	R, Q, T
(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

MATH 1141: Differential Calculus, Integral Calculus and Coordinate Geometry

Course Details		
Course Code: MATH 1141	Course Title: Differential Calculus, Integral Calculus and Coordinate Geometry	Credits: 3.00 Contact Hours: 3.00

Rationale

This is a Required/Core Course. This course is designs to introduce the students with the basic concepts of differential calculus, integral calculus and coordinate geometry. Upon the successfully completion of this course students will be able to find the limits of functions, derivatives of functions and integration of functions and can solve associated problems arising in engineering. Also, students will be able to solve coordinate geometry related problems.

Course Content

Limit, continuity and differentiability, successive differentiation of various types of functions, Leibnitz's theorem, Rolle's theorem, Mean Value theorem, expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder (expansion of remainder), expansions of functions differentiation and integration, indeterminate form, partial differentiation, Euler's theorem, tangent and normal, sub tangent and subnormal in Cartesian and polar coordinates, maxima and minima of functions of single variables, curvature, asymptotes,

Definition of integrations, integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction, definite integrals, definite integral properties and its use in summing series, Wally's formula, improper integrals, Beta function and Gamma function, multiple integral and its application, area, volume of solid of revolution, area under a plane curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and polar coordinate, arc lengths of curves in Cartesian and polar coordinates

Transformation of coordinates axes and its uses; General equations of second degree and their reduction to standard forms; Pair of straight lines; System of circles; Coaxial circles and limiting points; Equations of parabola, ellipse and hyperbola in Cartesian coordinates; Tangents and normal; Pair of tangents; Chord of contact; Chord in terms of its middle point.; Parametric coordinates; Conjugate diameters; Asymptotes.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Ability to ascertain the basic terminology and theorems associated with	Y											

	differentiation, integration, and coordinate geometry.												
CLO2	Ability to learning the concepts of differentiation, and integration to solve problems arising in engineering sectors.	Y											
CLO3	Ability to make procurement of real-life application-based works according to differential calculus, integral calculus and analytical geometry.	Y											

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Define the basic terminology and theorems associated with differentiation, integration, and coordinate geometry.	Lecture, Discussion, Practical/Tutorial/Studio, Student-centered learning	MT, T, Q
CLO2	Find the differentiation, integration of different types of functions.	Lecture and Discussion, Problem Based Learning	MT, T, Q
CLO3	Apply the acquired concepts of differentiation, and integration to solve problems arising in engineering.	Lecture and Discussion, Problem Based Learning	F, T

(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

PHY 1131: Physics

Course Details		
Course Code: PHY 1131	Course Title: Physics	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to teach about basic physics in the field of waves-oscillations and wave mechanics, optics and laser, and structure of matter and electricity-magnetism. The course will be emphasized the fundamental concepts, theories and solve quantitative problems which can be applicable in a wide spectrum of engineering disciplines.		
Objective		
1. To know basic ideas of waves and oscillations, wave mechanics. 2. To have clear understanding of light.		
Course Content		
Waves-Oscillations and Wave mechanics: Waves-Oscillations: Differential equation of simple harmonic oscillator, total energy and average energy, Combination of simple harmonic oscillations, spring-mass system, damped oscillation, forced oscillation, resonance, stationary wave, phase velocity, group velocity. Wave mechanics: Fundamental postulates of wave mechanics, Schrodinger's equation (time dependent and time independent), Operators, Uncertainty principle, energy of a free particle. Optics and Laser: Theories of light: Interference of light, Young's double slit experiment, Fresnel's bi-prism. Interference in thin films, Newton's rings, Interferometers, Diffraction of light: Fresnel and Fraunhofer diffractions, Diffraction by single slit, diffraction by double slits, diffraction gratings, Resolving power of optical instruments, Polarization of light: production and analysis of polarized light, polarization by double refraction, Brewster's law, Malus law, Nicole prism, optical activity and polarimeter. Laser, spontaneous and stimulated emission, Helium-Neon laser, laser applications, Fiber optics. Structure of Matter and Electricity: Structure of Matter: Crystalline & non-crystalline solids, single crystal and polycrystalline solids, crystal system, co-ordination number, packing factor, Miller indices, defects in solids, Bragg's law, Bonds in solids, Introduction to energy band, distinction between metal, insulator and semiconductor. Electricity: Coulomb's law, electric field, Gauss' law and its application, electric potential, capacitors and capacitance, dielectrics on atomic view, dielectric and Gauss's law, Ohm's law, resistivity-an atomic view, current		

density and drift velocity, Ampere’s law, Faraday’s law; Lenz’s law, self-inductance and mutual inductance.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Knowing about different basic parameters in the field of waves and oscillations, wave mechanics, optics and laser, structure of matter and electricity and magnetism.	Y											
CLO2	Explaining and analyzing different theories and formulas for waves-oscillations, wave mechanics, optics and laser, structure of matter, electricity and magnetism such as various wave equations, energy of waves, wave functions, Schrodinger equation, Brewster’s law, Malus law, laser, Miller indices, packing factor, Coulomb’s law, Gauss’s law, Ampere’s law, Faraday’s laws of electromagnetic induction etc.		Y										
CLO3	Solving quantitative problems in the field of waves and oscillations, wave mechanics, optics and laser, structure of matter and electricity and magnetism.			Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Knowing about different basic parameters in the field of waves and oscillations,	Lecture and Discussion, Co-operative and	T, MT, F

	wave mechanics, optics and laser, structure of matter and electricity and magnetism.	Collaborative Method, Problem Based Learning (PBL)	
CLO2	Explaining and analyzing different theories and formulas for waves-oscillations, wave mechanics, optics and laser, structure of matter, electricity and magnetism such as various wave equations, energy of waves, wave functions, Schrodinger equation, Brewster's law, Malus law, laser, Miller indices, packing factor, Coulomb's law, Gauss's law, Ampere's law, Faraday's laws of electromagnetic induction etc.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	T, MT, F, ASG
CLO3	Solving quantitative problems in the field of waves and oscillations, wave mechanics, optics and laser, structure of matter and electricity and magnetism.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning.	T, MT, F, ASG
(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

PHY 1132: Physics Sessional

Course Details		
Course Code: PHY 1132	Course Title: Physics Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This is a laboratory based sessional course for the basic physics in the field of oscillations, mechanics, optics and electricity. The course will emphasize the fundamental experiments on different fields of physics which can be applicable in a wide spectrum of engineering disciplines. This laboratory course will enable students to understand basic physics practically as well as do work with team or individual.		

Objectives

1. To know basic ideas of waves and oscillations, wave mechanics.
2. To have clear understanding of light.

Course Content

Quantitative measurement of different parameters in the field of oscillations, optics, electricity and properties of materials such as: acceleration due to gravity, wavelength of light, resistance of a galvanometer, spring constant and the rigidity modulus etc. This course is designed to verify practically the theories and concepts learned in PHY 1131.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Acquaint with different parameters concerning oscillations, mechanics, optics and electricity.	Y											
CLO2	Able to describe the different phenomena about oscillations, mechanics, optics and electricity.		Y										
CLO3	Be skilled to apply theoretical knowledge to perform experiments by an individual or by a group to determine acceleration due to gravity, wavelength of light, resistance of a galvanometer, spring constant, the rigidity modulus etc.			Y						Y			
CLO4	Be able to prepare a report for an experimental work.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching- Learning Strategy	Assessment Strategy

CLO1	Acquaint with different parameters concerning oscillations, mechanics, optics and electricity.	Lecture, Experiments	R, Q, F
CLO2	Able to describe the different phenomena about oscillations, mechanics, optics and electricity.	Lecture, Experiments	R, Q, F
CLO3	Be skilled to apply theoretical knowledge to perform experiments by an individual or by a group to determine acceleration due to gravity, wavelength of light, resistance of a galvanometer, spring constant, the rigidity modulus etc.	Lecture, Experiments	R, Q, F
CLO4	Be able to prepare a report for an experimental work.	Lecture, Experiments	R, Q, T
(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

ENG 1127: English

Course Details		
Course Code: ENG 1127	Course Title: English	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course will develop students' writing skills necessary for their academic and professional success. It will also help the students to learn and follow the conventions of standard written English in sentence structure, punctuation, grammar usage and spelling. This course will also provide fundamental aspects of reading, writing, listening and speaking skills. The course will help students to develop their language and communication skills through interactive participation in the class. Students will practice brainstorming, freewriting, paragraph and argumentative essay writing. In addition, they will practice listening and speaking activities. By attending this course		

student can build up communicative skills which they can utilize in their academic as well as professional life.

Objective

To develop student's listening, reading and writing ability.

Course Content

General discussion: Introduction, various approaches to learning English, Grammatical Problem: Construction of sentences, grammatical errors, sentence variety and style, conditionals, vocabulary and diction; Reading Skill: Discussion readability, scan and skin reading, generating ideas through purposive reading, reading selective stories, Approaches to Communication: Communication today, business communication, and different types of business communication,

Listening Skill: The phonetics and correct English pronunciation, Speaking Skill: Practicing dialogue, storytelling.

Writing Skill: Principles of effective writing, organization, planning and development of writing, composition (Paragraph, Comprehension), précis writing, amplification, General Strategies for the Writing process: Generating ideas, identifying audiences, and purposes, construction arguments, stating problems, drafting and finalizing, Report Writing: Defining a report, classification of reports, structure of a report and writing of report.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Acquire their knowledge of fundamental grammatical structures and functions	Y											
CLO2	Read and write grammatically correct sentences. Utilize the strategies of free hand writing in other courses	Y											
CLO3	Use the language for their daily life communication with the native speakers and nonnative speakers more efficiently			Y							Y		**Y**

CLO4	Write paragraph, easy, report, summary, précis writing, cover letter and cv writing												Y

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Acquire their knowledge of fundamental grammatical structures and functions	Lecture and Discussion, Problem Based Learning, Pop quiz, Case study	Q, ASG, F
CLO2	Read and write grammatically correct sentences. Utilize the strategies of free hand writing in other courses	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study	Q, ASG, F
CLO3	Use the language for their daily life communication with the native speakers and nonnative speakers more efficiently	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study	Q, F, CS
CLO4	Write paragraph, easy, report, summary, précis writing, cover letter and cv writing	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study	Q, F, CS

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; CS – Case study; F – Final Exam, MT- Mid Term Exam)

LEVEL-1, TERM-II

CSE 1201: Discrete Mathematics

Course Details		
Course Code: CSE 1201	Course Title: Discrete Mathematics	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course is designed to develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument.		
Objective		
1. To know basic ideas of set, relations and functions. 2. To have clear understanding of mathematical logic.		
Course Content		
Mathematical Logic: propositional calculus and predicate calculus; Set theory: sets, relations, partial ordered sets, functions; Mathematical reasoning and proof techniques; Counting: permutations, combinations, principles of inclusion and exclusion; Discrete Probability; Recurrence relations and recursive algorithms; Growth of functions; Graph theory: graphs, paths, trees, cycles; Algebraic structures: groups, rings and filed.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Define an argument using logical notation and determine if the argument is or is not valid.	Y											
CLO2	Construct simple mathematical proofs and possess the ability to verify them.		Y										
CLO3	Demonstrate the understanding of sets, relations and functions and modeling problems using graphs and trees.			Y									

CLO4	Develop the communication skills by presenting different topics on graphs and trees.										Y		
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching- Learning Strategy	Assessment Strategy
CLO1	Define an argument using logical notation and determine if the argument is or is not valid.	Lecture, Class Participation,	ASG
CLO2	Construct simple mathematical proofs and possess the ability to verify them.	Lecture, Group work, Discussion	MT
CLO3	Demonstrate the understanding of sets, relations and functions and modeling problems using graphs and trees.	Lecture, Group work, Discussion	F
CLO4	Develop the communication skills by presenting different topics on graphs and trees.	Discussion, Group work	PR, Pr
(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 1203: Object Oriented Programming Language I

Course Details		
Course Code: CSE 1203	Course Title: Object Oriented Programming Language I	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course is structured to cover fundamental and important topics in object oriented programming, such as philosophy of object oriented programing, necessity of object oriented programing for handling real world projects, introduction to class and objects, formation of class and object to handle different activity,		

object oriented programing principles, encapsulation, inheritance, polymorphism, abstraction, generic and template, exception handling, standard template library, applying object oriented approach in a sample project.

Objective

1. To know basic ideas of Object-Oriented Programming (OOP).
2. To know basic ideas of programming.
3. To develop problem solving skills.

Course Content

Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references, In-line functions, friend functions, reference; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O, inserter, extractor; Template functions and classes; namespaces, overview of Standard Template Library; Multithreaded Programming**.**

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn and utilize the fundamental features of an object-oriented programming language**.**	Y											
CLO2	Realize the advantages of object-oriented design and learn when it is an appropriate methodology to use.		Y										
CLO3	Able at apply object-oriented approach for real life complex problems having multiple objects			Y									
CLO4	Demonstrate standard programming style and identify the impact of style on developing and maintaining programs			Y									

CLO5	Improve the knowledge presentation skill by presenting topics on Object Oriented Programming**.**										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Learn and utilize the fundamental features of an object-oriented programming language**.**	Lecture, Class Participation	T
CLO2	Realize the advantages of object-oriented design and learn when it is an appropriate methodology to use.	Lecture, Group work, Discussion	MT
CLO3	Able at apply object-oriented approach for small problems having multiple objects	Lecture, Group work, Discussion	T, F
CLO4	Demonstrate standard programming style and identify the impact of style on developing and maintaining programs	Lecture, Group work, Discussion	F
CLO5	Improve the knowledge presentation skill by presenting topics on Object Oriented Programming**.**	Discussion, Group work	PR/ASG

(T – Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 1204: Object Oriented Programming Language I Sessional

Course Details

Course Code: CSE 1204	Course Title: Object Oriented Programming Language I Sessional	Credits: 1.50 Contact Hours: 3.00

Rationale

Object Oriented Programming Language Sessional course is designed to cover the practical knowledge of fundamental and important topics in object oriented programming, such as philosophy of object oriented programing, necessity of object oriented programing for handling real world projects, introduction to class and objects, formation of class and object to handle different activity, object oriented programing principles, encapsulation, inheritance, polymorphism, abstraction, generic and template, exception handling, standard template library, applying object oriented approach in a sample project.

Objective

1. To know basic ideas of Object-Oriented Programming (OOP).
2. To know basic ideas of programming.
3. To develop problem solving skills.

Course Content

Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references, In-line functions, friend functions, reference; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O, inserter, extractor; Template functions and classes; namespaces, overview of Standard Template Library; Multithreaded Programming**.**

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn and utilize the fundamental features of an object-oriented programming language**.**	Y								Y			
CLO2	Realize the advantages of object-oriented design and learn when it is an appropriate methodology to use.		Y										

CLO3	Able at apply object-oriented approach for small problems having multiple objects.			Y									
CLO4	Demonstrate standard programming style and identify the impact of style on developing and maintaining programs.				Y								
CLO5	Improve the knowledge presentation skill by presenting topics on Object Oriented Programming**.**										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Learn and utilize the fundamental features of an object-oriented programming language**.**	Lecture, Class Participation	CT
CLO2	Realize the advantages of object-oriented design and learn when it is an appropriate methodology to use.	Lecture, Group work, Discussion	MT
CLO3	Able at apply object-oriented approach for small problems having multiple objects.	Lecture, Group work, Discussion	CT, F
CLO4	Demonstrate standard programming style and identify the impact of style on developing and maintaining programs.	Lecture, Group work, Discussion	F
CLO5	Improve the knowledge presentation skill by presenting topics on Object Oriented Programming**.**	Discussion, Group work	PR/ASG

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 1208: Numerical Methods Sessional

Course Details		
Course Code: CSE 1208	Course Title: Numerical Methods Sessional	Credits: 1.50 Contact Hours: 3.00

Rationale

This course aims to provide students with knowledge of problem solving with the basics of MATLAB/Python software by using it in the numerical technique problems.

Objective

1. To learn basic theorems and techniques of numerical analysis.
2. To be introduced with Engineering Tools like MATLAB, Python Software.
3. To learn to use Engineering Tools in solving numerical problems.
4. To solve complex numerical problems using Software Engineering Tools.

Course Content

Approximations and Errors: Accuracy and precision, Error definitions, Round-off errors, Truncation errors. Roots of Equations: The bisection method, the false-position method, the iteration method, the Newton-Raphson method. Interpolation: Newton's forward and backward formula for interpolation with equal distance, Newton's divided-difference interpolating polynomials, Lagrange interpolating polynomials. Curve Fitting: Linear regression, Linear curve fitting methods, least square method, non-linear curve fitting methods, Polynomial of nth degree, Power function, Exponential function, Polynomial regression. Numerical Differentiation and Integration: The trapezoidal rule, Simpson's rules, Integration with unequal segments. Numerical Solutions of Ordinary Differential Equations: Solution by Taylor's series, Picard's method, Euler's method, Modifications and improvements of Euler's methods, Runge-Kutta methods.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the knowledge of basic numerical techniques practically.	Y											
CLO2	Analyze the necessity and utilize engineering tools like MATLAB/Python for solving numerical problems.					Y							

CLO3	Design different complex problems and solve them with MATLAB.								Y				
CLO4	To be skilled in using engineering tools like MATLAB at the end of the course.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Apply the knowledge of basic numerical techniques practically.	Lecture and Lab Work	F, Q and R
CLO2	Analyze the necessity and utilize engineering tools like MATLAB/Python for solving numerical problems.	Discussion and Lab Works	F, LT and R
CLO3	Design different complex problems and solve them with MATLAB.	Lecture, Lab Work, and Group Works	F, LT and R
CLO4	To be skilled in using engineering tools like MATLAB at the end of the course.	Discussion, and Group Works	F, LT and R

(CT – Class Test; PR – Project; LT – Lab Test; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam; MT- Mid Term Exam)

EEE 1269: Electronic Circuits

Course Details		
Course Code: EEE 1269	Course Title: Electronic Circuits	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET etc. Students equipped with the knowledge provided in the course will be able to participate in design, development and operation in the different area of electronics system.		

Objective
1. To learn the basics of electric circuit. 2. To learn the characteristics of different types of diodes and transistors.
Course Content
Introduction to semiconductors, p-n junction diode, I–V characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply; Bipolar Junction Transistor (BJT): principle of operation, Transistor circuit configurations (CE, CB, CC), BJT biasing, BJT. Transistor modeling, small-signal analysis of single and multi- stage amplifiers, frequency response of BJT amplifier. Field Effect Transistors (FET): Principle of operation of JFET and MOSFET, Depletion and enhancement type MOSFETs, switching circuits using FETs, CMOS, biasing of FETs, FET small signal analysis, Low and high frequency response of FETs; Operational amplifiers and its applications; Feedback and oscillators circuits; Operation, characteristics and application of SCR, TRIAC, DIAC and UJT; Introduction to IC fabrication processes.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Arise a clear understanding of the basic operation and characteristics of semiconductor devices like diodes, BJTs and FETs.	Y											
CLO2	Analyse and compare the characteristics of different types of diodes and transistors.		Y										
CLO3	Design rectifier, multiplier, amplifier circuit etc. with electronics equipment to solve real world problems			Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Arise a clear understanding of the basic operation and characteristics of semiconductor devices like diodes, BJTs and FETs.	Lecture, White board Writing	MT, F
CLO2	Analyze and compare the characteristics of different types of diodes and transistors.	Lecture, White board Writing	MT, F
CLO3	Design rectifier, multiplier, amplifier circuit etc. with electronics equipment to solve real world problems	Lecture, White board Writing	MT, F, ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

EEE 1270: Electronic Circuits Sessional

Course Details		
Course Code: EEE 1270	Course Title: Electronic Circuits Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
This course provides the student with the fundamental skills to identify and utilize various electronic components and devices with their specifications to implement and verify the outputs of hardware circuits.		
Objective		
1. To learn the basics electric circuit. 2. To analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier and amplifier Circuits		
Course Content		
This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in EEE 1269. In the second part, students will design simple real life application circuit using the principles learned in EEE 1269.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.	Y											
CLO2	Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier and amplifier Circuits.		Y										
CLO3	Design different elementary circuit related projects based on practical problems using electronic components.			Y									
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.	Lecture, Experiments	R, Q, T
CLO2	Analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier and amplifier Circuits.	Lecture, Experiments	R, Q, T
CLO3	Design different elementary circuit related projects based on practical problems using electronic components.	Lecture, Experiments	R, Q, T
(T – Lab Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

ENG 1228: Developing English Skill Sessional

Course Details		
Course Code: ENG 1228	Course Title: Developing English Skill Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

This course is designed to give clear idea about how to speak understand and speak English quickly and smartly to the students.

Objective

1. To develop student's listening, reading and writing ability.
2. To develop student's freehand writing ability.

Course Content

Sessional work based on ENG 1127

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Determine and get a clear idea about how to speak understand and speak English quickly and smartly.	Y				Y					Y		
CLO2	Organize them within the shortest possible time to present their ideas and opinions.	Y									Y		
CLO3	Find out the main points of any long article within a very limited time.		Y										
CLO4	Recognize the techniques of any effective writing.		Y							Y			
CLO5	Overcome language barrier.									Y	Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Determine and get a clear idea about how to speak understand and speak English quickly and smartly.	Lecture, White Board Writing	Class Participation / Observation, Presentation, Assignment
CLO2	Organize them within the shortest possible time to present their ideas and opinions.	Lecture, White Board Writing	Presentation
CLO3	Find out the main points of any long article within a very limited time.	Lecture, White Board Writing	Class Participation, CT/Assignment
CLO4	Recognize the techniques of any effective writing.	Lecture, White Board Writing	Report Writing
CLO5	Overcome language barrier.	Lecture, White Board Writing	Class and Home Assignment
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

MATH 1243: Ordinary Differential Equations and Partial Differential Equations

Course Details		
Course Code: MATH 1243	Course Title: Ordinary Differential Equations and Partial Differential Equations	Credits: 3.00 Contact Hours: 3.00
Rationale		
Background of arising Differential Equations and Introduction, Differential Equation of first order and first degree, Solution of exact and linear Differential Equations of first order and first degree, Differential Equation of first order but higher degree, Solution of higher order, Differential Equation, Introduction to PDE, Linear and Non-linear Partial Differential Equations, Application of Differential Equations.		
Objectives		
1. To identify the type of a given differential equation and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equations. 2. To evaluate first order differential equations including separable, homogeneous, exact, and linear.		

3. Introduce students to how to solve second order and higher order linear differential equations.
4. Learn Solving procedure of nonhomogeneous equations.
5. To familiarize with solving technique of differential equations using variation of parameters.
6. To teach students to solve linear systems of ordinary differential equations.
7. Introduce students to partial differential equations.
8. Introduce students to solve linear and non-linear Partial Differential with different methods.
9. Introduce students to physical problems in Engineering that results in partial differential equations.

Course Content

Background of arising Differential Equations and Introduction, Differential Equation of first order and first degree, Solution of exact and linear Differential Equations of first order and first degree, Differential Equation of first order but higher degree, Solution of higher order. Differential Equation by various Method, Introduction to PDE, Linear Partial Differential Equations, Linear Partial Differential Equations with constant coefficients, Non-linear Partial Differential Equations, Application of Differential Equations. The learning approach is to apply engineering principles to performance analysis and forecast of differential equation. Students will achieve comprehension of the fundamental hypothetical premise of the differential equation and their application to a scope of issues of pertinence to practical engineering

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To have a thorough understanding of the fundamental concepts and techniques used in Differential Equations.	Y											
CLO2	To build the ability to analyze and solve the Ordinary Differential Equations.	Y											
CLO3	To enable the students to find out exact solutions of the linear and nonlinear Partial differential equations		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)**	**Teaching- Learning Strategy**	**Assessment Strategy**

	(Upon completion of the course, the students will be able to)		
CLO1	To have a thorough understanding of the fundamental concepts and techniques used in Differential Equations.	Lecture, Class Participation	MT, Pr /ASG
CLO2	To build the ability to analyze and solve the Ordinary Differential Equations.	Lecture, Discussion, Group Work	F, MT
CLO3	To enable the students to find out exact solutions of the linear and nonlinear Partial differential equations	Lecture, Discussion, Group Work	F, Pr /ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CE 1250: Engineering Drawing and CAD Sessional

Course Details		
Course Code: CE 1250	Course Title: Engineering Drawing and CAD Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course is designed to give clear idea about Engineering drawing using AutoCAD software to the students.		
Objective		
To learn the basics of Engineering Drawing. Design solutions for complex structural engineering problems for different environmental context.		
Course Content		
Identification of drawing instruments and their uses; Measuring scales and units; Paper sizes; Lettering; Free hand sketching; Alphabet of lines; Geometrical construction of tangents, ellipse, involutes and spiral; Dimensioning; Isometric, Orthographic and Oblique Projection; Sectioning; Conventional representation		

of some common features and abbreviation; Deployment of surfaces and Cams. Use of modern engineering software AutoCAD software and their applications.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain the Engineering drawing which helps to communicate ideas and information.	Y									Y		
CLO2	Communicate all needed information from the engineer to workers or manufacturer who constructs any kind of structural element.	Y								Y	Y		
CLO3	Design solutions for complex structural engineering problems for different environmental context.	Y				Y	Y						

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Explain the Engineering drawing which helps to communicate ideas and information.	Lecture, White Board Writing, PPT	T, Q, AG, MT, F
CLO2	Communicate all needed information from the engineer to workers or manufacturer who constructs any kind of structural element.	Lecture, White Board Writing, PPT	T, PR, Q, R, MT, F
CLO3	Design solutions for complex structural engineering problems for different environmental context.	Lecture, White Board Writing, PPT	T, PR, Q, AG, R, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

HUM 1221: Bengali Language and Literature

Course Details		
Course Code: HUM 1221	Course Title: Bengali Language and Literature	Credits: 2.00 Contact Hours: 2.00

সার-সংক্ষেপ **(Synopsis):**

বাংলা ভাষা ও সাহিত্য সম্পর্কে মৌলিক ধারণা প্রদান করার উদ্দেশ্যে কোর্সটি সিলেবাসের অন্তর্ভুক্ত হয়। প্রাচীনকাল থেকে আধুনিককাল পর্যন্ত নানা বিবর্তন ও পরিবর্তনের মাধ্যমে বাংলা ভাষা আজকের সমৃদ্ধি লাভ করেছে। তথ্য –প্রযুক্তির বিকাশের সাথে সাথে যোগাযোগের মাধ্যম হিসেবে ভাষার ব্যবহার এবং বোধ জাগ্রত করার মূল হাতিয়ার হিসেবে মাতৃভাষার গুরুত্ব সম্পর্কে তুলে ধরার একটি ক্ষেত্র হিসেবে বাংলা ভাষা ও সাহিত্য নামক কোর্সটি অত্যন্ত গুরুত্বপূর্ণ ভূমিকা পালন করবে; সেইসাথে আন্তর্জাতিক অঙ্গনে বাংলা ভাষা ও সাহিত্যকে প্রতিষ্ঠাকরণ এবং আধুনিক যোগাযোগের মাধ্যম হিসেবে বাংলা ভাষার মাধুর্যকে তুলে ধরবে। আদর্শ ও দেশপ্রেমিক জাতি গঠনে সহায়ক ভূমিকা পালন করবে।

পাঠের বিষয় **(Course Content)**

ক. প্রধান বিষয় (Main Content)

১. বাংলা ব্যাকরণ

২. নির্মিতি

৩. বাংলা সাহিত্য

খ. বিস্তারিত বিষয় (Detailed Content)

১. বাংলা ব্যাকরণ**:** বাংলা ভাষার উৎপত্তি ও ক্রমবিকাশ, ধ্বনি ও বর্ণ, স্বরধ্বনি ও ব্যঞ্জনধ্বনি, স্বরবর্ণ ও ব্যঞ্জনবর্ণ, বাংলা বানানের নিয়ম, ণ-ত্ব বিধান ও ষ-ত্ব বিধান, যতিচিহ্ন, বঙ্গানুবাদ ইত্যাদি।

২. নির্মিতি**:**

প্রতিবেদন বা রিপোর্ট লিখন, পত্র লিখন (ছুটি, নিমন্ত্রণ পত্র, ব্যবসা-বাণিজ্য, চাকরির আবেদন)

দিনলিপি, অভিজ্ঞতা বর্ণনা, বক্তব্য লিখন, ই-মেইল, এসএমএস, ফেসবুক, সংলাপ রচনা, ক্ষুদেগল্প লেখা ইত্যাদি।

ব্যবহারিক বাংলা (সংক্ষিপ্ত আলোচনা):

একুশে ফেব্রুয়ারি, মুক্তিযুদ্ধ, বাংলা নববর্ষ, বাংলা উৎসব, ষড়ঋতু, বাংলা ভাষা, লোকসংস্কৃতি, মানবতা ও নৈতিকতা, বিশ্বায়ন, তথ্য-প্রযুক্তি ইত্যাদি।

৩. বাংলা সাহিত্য**:**

কবিতা**:** বঙ্গবাণী, বঙ্গভাষা, খাঁচার ভিতর অচিন পাখি, নির্ঝরের স্বপ্নভঙ্গ, আজ সৃষ্টি সুখের উল্লাসে, বাংলার মুখ আমি, অমর একুশে, স্মৃতিস্তম্ভ, তোমাকে পাওয়ার জন্য হে স্বাধীনতা, আমার পরিচয় ইত্যাদি।

ছোটগল্প**:**

পোস্টমাস্টার, বায়ুযানে পঞ্চাশ মাইল, পুঁইমাচা, মৌন নয়, নয়নচারা, একাত্তরের দিনগুলি, খাঁচা, অপঘাত ইত্যাদি।

প্রবন্ধ**:**

বাঙ্গালা ভাষা, সভ্যতার সংকট, তৈল, যৌবনে দাও রাজটিকা, বর্তমান বিশ্বসাহিত্য, আমাদের বাংলা উচ্চারণ, আমাদের আত্মপরিচয়।

নাটক**:**

কবর

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	শুদ্ধভাবে ভাষা বিষয়ক জ্ঞান অর্জন করা, নিজের শেকড়ের অনুসন্ধানে চেতনাকে প্রবাহিত করা।	Y								Y			
CLO2	ভাষা বিষয়ক জ্ঞান অর্জন, বোধের বিকাশ এবং তা বাস্তব জীবনে প্রয়েগে উৎসাহিত করা।	Y							Y				
CLO3	সাহিত্য ও সংস্কৃতির অনুশীলনের মাধ্যমে নিজ দেশ ও জাতিকে জানা। জাতির ইতিহাস ও ঐতিহ্য অনুসন্ধানের পাশাপাশি ধারাবাহিক চর্চায় অনুপ্রণিত করা এবং বাস্তব জীবনে প্রয়োগ করা।	Y											**Y**

বিঃ দ্রঃ এখানে ১, ২, ৩ সংখ্যাগতভাবে সর্বনিম্ড়ব থেকে সর্বোচ্চ পর্যন্ত ম্যাচিং লেবেল নির্দেশ করে। (Numerical Method Used for mapping which indicates 3 as high , 2 as medium and 1 as low level of matching)

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	শুদ্ধভাবে ভাষা বিষয়ক জ্ঞান অর্জন করা, নিজের শেকড়ের অনুসন্ধানে চেতনাকে প্রবাহিত করা।	Lecture, Class Participation	CT, Q, Asg, F
CLO2	ভাষা বিষয়ক জ্ঞান অর্জন, বোধের বিকাশ এবং তা বাস্তব জীবনে প্রয়েগে উৎসাহিত করা।	Lecture, Group work, Discussion	CT, Q, Asg, F
CLO3	সাহিত্য ও সংস্কৃতির অনুশীলনের মাধ্যমে নিজ দেশ ও জাতিকে জানা। জাতির ইতিহাস ও ঐতিহ্য অনুসন্ধানের পাশাপাশি ধারাবাহিক চর্চায় অনুপ্রণিত করা এবং বাস্তব জীবনে প্রয়োগ করা।	Lecture, Group work, Discussion	CT, Q, Asg, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

LEVEL-2, TERM-I

CSE 2100: Software Development Project I

Course Details		
Course Code: CSE 2100	Course Title: Software Development Project I	Credits: 0.75 Contact Hours: 1.50
Rationale		
The Individual Software Development Project I course is designed to make its learners able to solve advanced level industry problems and develop real time projects professionally.		
Course Content		
Develop a software project using C/C++/Java.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.			Y									
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Y											
CLO4	Able to develop industry level web-based applications individually.									Y			

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching- Learning Strategy	Assessment Strategy
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.	Lecture, Discussion, and Group Works	PR, Q
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.	Lecture, Discussion, and Group Works	PR
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Lecture, Discussion, and Group Works	PR, Q
CLO4	Able to develop industry level web-based applications individually.	Lecture, Discussion, and Group Works	PR
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 2101: Digital Logic Design

Course Details		
Course Code: CSE 2101	Course Title: Digital Logic Design	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to learn about different logic gates, to design and analysis of digital circuits, gather knowledge about different types of computer chips and learn to represent signals and sequences of a digital circuit through numbers.		

Course Content
Number systems and codes; Digital logic: Boolean algebra, De-Morgan`s theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and de-multiplexers; Flip-flops, race around problems; Counters; asynchronous counters, synchronous counters and their applications; Registers and basic memory unit; Synchronous and asynchronous logic design; Design of sequential circuit: State diagram; State minimizations and assignments; Pulse mode logic; Fundamental mode design; PLA design.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Remember and understand the number system and Boolean algebra and basic properties of Boolean algebra to simplify simple Boolean functions	Y											
CLO2	Understanding and applying the tabulation and Karnaugh map methods for simplifying combinational circuits		Y										
CLO3	Identify the basic sequential logic components: SR Latch, Different Flip-Flops and their usage and able to analyze sequential logic circuits		Y										
CLO4	Design and develop different digital systems like shifters, counters, registers by presenting in front of the class									Y			

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Remember and understand the number system and Boolean algebra and basic	Lecture, Class Participation	CT

	properties of Boolean algebra to simplify simple Boolean functions		
CLO2	Understanding and applying the tabulation and Karnaugh map methods for simplifying combinational circuits	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Identify the basic sequential logic components: SR Latch, Different Flip-Flops and their usage and able to analyze sequential logic circuits	Lecture, Group work, Discussion	CT, MT, F
CLO4	Design and develop different digital systems like shifters, counters, registers by presenting in front of the class	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 2102 Digital Logic Design Sessional

Course Details		
Course Code: CSE 2102	Course Title: Digital Logic Design Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
This course aims to provide students with knowledge of problem solving with digital logic circuits & systems. The basic building blocks of combinational and sequential circuits are introduced to enable students to develop circuit solutions to problems and to understand the design and operation of hardware models of digital systems.		
Course Content		
Boolean and Logic gates: Logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Combinational Circuits: Arithmetic and data handling logic circuits, Adder, 71 Subtractor, Comparator decoders and encoders, multiplexers and de-multiplexers; Sequential Circuits: Flip-flops, race around problems; Counters: Asynchronous counters, synchronous counters and their		

applications; Memory: Registers and basic memory unit; Logic Design: Synchronous and asynchronous logic design; Design of sequential circuit: State diagram; State minimizations and assignments based on course CSE 2101.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Operate laboratory equipment by implementing and simulating simple combinational digital circuits.	Y											
CLO2	Analyze a given problem and apply the acquired knowledge to design both combinational and sequential circuits.		Y										
CLO3	Understand the relationship between abstract logic characterizations.			Y									
CLO4	Practical implementations while designing a system.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Operate laboratory equipment by implementing and simulating simple combinational digital circuits.	Lecture, Class Participation, Lab works	MT, R, Q
CLO2	Analyze a given problem and apply the acquired knowledge to design both combinational and sequential circuits.	Lecture, Group work, Discussion, Project	R, Q, PR, Pr
CLO3	Understand the relationship between abstract logic characterizations.	Lecture, Group work, Discussion, Project, Presentation	R, Q, PR, Pr

CLO4	Practical implementations while designing a system.	Lecture, Group work, Discussion, Project, Presentation	R, Q, V, PR, Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam; MT- Mid Term Exam; V- Viva)			

CSE 2103: Data Structures and Algorithm I

Course Details		
Course Code: CSE 2103	Course Title: Data Structures and Algorithm I	Credits: 3.00 Contact Hours: 3.00
Rationale		
This Data Structures & Algorithms I course is designed to offer a flawless concept on the vital parts of the data structures and algorithms related to computer science. This course begins with the introduction of basic concepts of some commonly used data structures and algorithms and then covers complexity analysis, linked list, stack, queue, tree, graph, sorting, searching and various relevant important topics.		
Course Content		
Internal data representation; Abstract data types; Algorithm performance and elementary asymptotic analysis (Introduction to Big-O notation); Elementary data structures: array, linked list, stack, queue, tree and tree traversal, graphs and graph representation, heap, binary search tree; Sorting algorithms: Bubble Sort, Selection Sort, Insertion Sort; Searching: linear search and binary search; Advanced data Structures: balanced binary search trees, skip list, advanced heaps; Hashing.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Illustrate the basics of static and dynamic data structures and relevant conventional algorithms.	Y											
CLO2	Solve complex engineering problems with no obvious solution using wide	Y											

	ranging or conflicting algorithms and data structures.												
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.		Y										
CLO4	Identify and reveal bugs in the program then diagnose needed basic operations with algorithms and data structures.		Y										
CLO5	Develop the communication skill by presenting topics on data Structures and algorithms										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Illustrate the basics of static and dynamic data structures and relevant conventional algorithms.	Lecture, Class Participation	CT
CLO2	Solve complex engineering problems with no obvious solution using wide ranging or conflicting algorithms and data structures.	Lecture, Group work, Discussion	ASG/PR, F MT, F
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Identify and reveal bugs in the program then diagnose needed basic operations with algorithms and data structures.	Lecture, Group work, Discussion	CT, F
CLO5	Develop the communication skill by presenting topics on data Structures and algorithms	Discussion, Group work	ASG/PR, Pr

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam).

CSE 2104: Data Structures and Algorithm I Sessional

Course Details		
Course Code: CSE 2104	Course Title: Data Structures and Algorithm I Sessional	Credits:1.50 Contact Hours: 3.00

Rationale

This course is designed to provide a clear concept on the implementation of the essential parts of the data structures and algorithms related to computer science. This course begins with the implementation of some commonly used data structures including Array, linked list, Stack, and Queue and then covers various relevant important topics related to this course.

Course Content

Array operations: Operations on static array list, operations on dynamic array list; String matching algorithm: Brute force algorithm, KMP algorithm; Array Searching: Linear and Binary search; Linked List: Single linked list, Doubly linked list, Circular linked list; FIFO-LIFO: Stack, Queue; Graph Theory: Graph representation; Tree: Tree traversals, Binary search tree, segment tree

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate advantages and disadvantages of specific algorithms and data structures.	Y											
CLO2	Select basic data structures and algorithms for autonomous realization of simple programs or program parts.	Y											
CLO3	Initiate practical knowledge to determine and demonstrate bugs in programs.		Y			Y							
CLO4	Formulate new solutions for problems or improve existing code using learned algorithms and data structures.		Y	Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcome**	**Teaching- Learning Strategy**	**Assessment Strategy**

	(Upon completion of the course, the students will be able to)		
CLO1	Demonstrate advantages and disadvantages of specific algorithms and data structures.	Lecture, Discussion	MT, E, Q, V
CLO2	Select basic data structures and algorithms for autonomous realization of simple programs or program parts.	Lecture, Discussion, Group works	MT, E, Q, V, F
CLO3	Initiate practical knowledge to determine and demonstrate bugs in programs.	Lecture, Discussion, Group works	R, E, Q, V
CLO4	Formulate new solutions for problems or improve existing code using learned algorithms and data structures.	Discussion, Group works	E, Q, R, V, F
(E-Evaluation, Q – Quiz; V-Viva; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 2105: Applied Statistics for Computer Science

Course Details		
Course Code: CSE 2105	Course Title: Applied Statistics for Computer Science	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course covers the fundamental theories of statistics and applies them on different practical applications in the field of information technology, data sets, and analyses their effects.		
Course Content		
Summarizing data, basic descriptive statistics, Measure of Central Tendency, Standard deviation and other measures of dispersion; Moments, Skewness and kurtosis; Probability, conditional probability, independence, Bayes theorem, random variables, joint and conditional distributions, Discrete probability distribution: Binomial, Poisson and Negative binomial; Continuous probability distribution: Normal and Exponential; expectation, variance, and covariance, central limit theorem. Markov inequality, Chebyshev inequality, the law of large numbers, Markov chains, simulation, the PageRank algorithm, populations and sampling, sample mean, standard error, maximum likelihood estimation, Bayes estimation, hypothesis		

testing, categorical data, comparative experiments, multiple linear regression, analysis of variance, statistical inferences and model diagnostics, confidence intervals.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic theories of applied statistics	Y											
CLO2	Classify, interpret, infer, and test applied statistics theories and problems.	Y											
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcome** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic theories of applied statistics	Lecture, Class Participation	CT, MT
CLO2	Classify, interpret, infer, and test applied statistics theories and problems.	Lecture, Discussion, Group Work	ASG, F
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology	Lecture, Discussion, Group Work	MT, F

(CT – Class Test; ASG – Assignment; F – Final Exam, MT- Mid Term Exam)

CSE 2108: Object Oriented Programming Language II Sessional

Course Details		
Course Code: CSE 2108	Course Title: Object Oriented Programming Language II Sessional	Credits: 1.50 Contact Hours: 3.00

Rationale

This course is designed to provide a comprehensive knowledge about Inheritance, Polymorphism, Encapsulation and other Object-Oriented methodologies to do programming in an effective manner and solve the practical life problems by building real-time projects.

Course Content

Object-Oriented Programming (JAVA): Basic concepts on java, basic operation, command line, objects and classes in Java, class inheritance, polymorphism, exception handling, abstract classes, interfaces, Java Array, String, JAVA I/O (serialization) and stream, Generic Class and methods; Collection Frameworks; Concurrency; GUI: Swing components and swing Layouts.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the concept of OOP with Java.	Y				Y							
CLO2	Use the advance programming features such as GUI design, exception handling and multi-threading.			Y		Y							
CLO3	Demonstrate how to design and develop a complete real-world software solution.					Y				Y			

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Apply the concept of OOP with Java.	Lecture, Class Participation, Lab works	MT, R, Q, F
CLO2	Use the advance programming features such as GUI design, exception handling and multi-threading.	Lecture, Group work, Discussion, Project	R, Q, PR, F

CLO3	Demonstrate how to design and develop a complete real-world software solution.	Lecture, Group work, Project, Presentation	R, Q, V, PR, Pr
(PR – Project; Q – Quiz; Pr – Presentation; R - Report; F – Final Exam; MT- Mid Term Exam; V- Viva)			

CHEM 2133: Chemistry

Course Details		
Course Code: CHEM 2133	Course Title: Chemistry	Credits: 3.00 Contact Hours: 3.00
Rationale		
To learn the basic concepts of inorganic, organic & physical chemistry.		
Course Content		
Structure of the elements: Different atom models, Quantum numbers, electronic configuration. Periodic Classification of Elements: Periodic properties of elements, Properties and uses of noble gases. Chemical Bonding: Types, properties, Lewis theory, VBT, MOT, Hybridization and shapes of molecules. Phase Rule: Definition of phase, components and degree of freedom Phase rule, Phase diagram of mono component system. Chemical kinetics: Introduction, Rate of reaction, Rate laws, rate of chemical reaction & factor affecting the rate, Definition of molecularity and order of reaction, difference between them, Definition of zero order, first order and second order reaction, Derivation of rate equation, Concept of half-life of reaction, the Arrhenius equation and activation energies. Chemical equilibrium: Definition of reversible reaction and chemical equilibrium, Graphical representation of chemical equilibrium, Law of mass action and it's explanation, Concept of Kp and Kc, Relation between Kp and Kc, Derivation of Kp and Kc for some special reaction. Selective organic reactions: Addition, substitution, oxidation-reduction, and polymerization (Plastic and fiber, Rubber etc.) Solutions and Their Classification: Unit expressing concentration, Procedure of solution preparation Colligative properties of dilute solutions: Definition and name of the colligative properties, Rault's law of lowering of vapour pressure, Explanation of lowering of vapour pressure Acid-Base Chemistry: pH & Ionization of water Concept of Acid and Base, Strength of Acid and Base, Definition of pH, Calculation of pH for different solution, pH scale and determination of nature of solution using pH, buffer solutions. Electrical properties of solution: Electrolysis, Electrical conductance, Faraday's Laws of electrolysis, Description of different cell and their reactions. Thermochemistry: Enthalpy of a reaction,		

Exothermic and endothermic reaction, Concept of delta H, Calculation of enthalpy for different reaction, Laws of thermochemistry.

Environmental Pollution from Industry: Purification of industrial flue gases and gases from aerosols, effluents of industrial units and their purification, solid industrial wastes. Ecological problems of chemical technology: The problem of sustenance and the chemicalindustry.

Overview of CWC, OPCW and National Authority: History of Chemical weapons, CWC and formation/function of OPCW. Formation/function of BNACWC and national legislations on CWC in Bangladesh. Classification of chemical weapons, schedule chemicals and their effects. Dual use of chemicals and chemical threat.

Basics of Chemical Hazards and Safety: Introduction to chemical safety, loss prevention, hazard, risk, occupation and process safety, safety program, inherent safety, chemical safety, and security. Hazard communication. Health risks of chemical exposure. Evaluation and control of chemical exposure in workplace. Major hazards control: how to prevent chemical accidents. Chemical accidents: case studies. Chemical safety standards and regulations: National/International.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To remember and understand and firm grasp of the basic principles of chemistry.	Y											
CLO2	To encourage creative thinking and development of a deeper understanding and intuitive feel.		Y										
CLO3	To apply the principle & understand advanced level of relevant field.	Y											

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	To remember and understand and firm grasp of the basic principles of chemistry.	Lecture, White board Writing	CT, F

CLO2	To encourage creative thinking and development of a deeper understanding and intuitive feel.	Lecture	CT, F
CLO3	To apply the principle & understand advanced level of relevant field.	Lecture	MT, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

MATH 2145: Vector Calculus, Linear Algebra and Complex Variable

Course Details		
Course Code: MATH 2145	Course Title: Vector Calculus, Linear Algebra and Complex Variable	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course provides clear concepts of Vectors and Scalars, The Dot and Cross Product of Vectors, Vector Differentiation, Gradient, Divergence and Curl, Vector Integration, Green's, Stoke's and Gauss's Theorem. Introduction to system of linear equation, inverse of matrix, vector space, subspace, basis, dimension, rank, nullity, linear transformation, kernel, range, Eigen value, Eigen vector, inner product spaces, how to solve linear system by various method. This course is proposals to introduce the students with the basic concepts of complex variables, complex integration. Upon the effectively accomplishment of this course students will be bright to know the complex number system and can solve associated problems arising in engineering. The focus is to illustrate engineering applications of these principles comparable to vector calculus, linear algebra. The learning approach is how the students can deal the engineering problems related to linear algebra and complex variable. Students will achieve comprehension of the fundamental knowledge from this course and they will be able to apply it in the branch of engineering.		
Course Content		
Scalars and vectors, equality of vectors; Addition and subtraction of vectors, Multiplication of vectors by scalars. Scalar and vector product of two vectors, their geometrical interpretation; Triple products and multiple products, Differentiation of vectors. Gradient, Divergence and Curl of point functions and physical significance. Green's, Gauss's and stoke's theorem.		

Introduction to systems of linear equations. Gaussian elimination. Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Euclidean n-space. Linear transformation from Rn to Rm. Properties of linear transformation from Rn to Rm, Real vector spaces and subspaces. Basis and dimension. Rank and nullity. Inner product spaces. Gram-Schmidt process and QR-decomposition. Eigenvalues and eigenvectors. Diagonalization. Linear transformations. Kernel and Range. Application of linear algebra to electric networks.

Complex number system, General function of a complex variable, Limits and continuity of a function of complex variable and related theorems, Limits and continuity of a function of complex variable and related theorems, Complex function , differentiation, the Cauchy- Rieman Equations, Cauchy's form of remainder(expansion of remainder) , expansions of functions differentiation and integration, Line integral of a complex function, Cauchy's Integral formula, Liouvillie's Theorem, Taylor's and Laurent's Theorem, Singular Residues, Cauchy's Residue Theorem.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Compute the derivatives and line integrals of vector function and learn their applications.	Y											
CLO2	Evaluate surface and volume integrals and learn their inter relations and applications.		Y										
CLO3	Illustrate the basic terminology of basic complex variables and functions and explain the complex differentiation and integration with the concept of various complex related theorems.	Y											
CLO4	Apply the acquired concepts of complex information to solve problems arising in engineering mathematics.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Compute the derivatives and line integrals of vector function and learn their applications.	Lecture, White board Writing	CT, F
CLO2	Evaluate surface and volume integrals and learn their inter relations and applications.	Lecture	CT, F
CLO3	Illustrate complex variables and functions and explain the complex differentiation and integration with the concept of various complex related theorems.	Lecture	MT, F
CLO4	Apply the acquired concepts of complex information to solve problems arising in engineering mathematics.	Lecture	ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

LEVEL-2, TERM-II

CSE 2201: Data Structures and Algorithm II

Course Details		
Course Code: CSE 2201	Course Title: Data Structures and Algorithm II	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course is structured to cover fundamental and important topics in data structures and algorithms, such as algorithm's complexity analysis, various types of trees, heaps, disjoint set, greedy algorithms, dynamic programming, sorting algorithms, flow networks, string matching algorithms, graph representation and sorting, backtracking, NP problems and approximation algorithms.		
Course Content		
Introduction to algorithms; Correctness proof and techniques for analysis of algorithms; Master Theorem; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic Programming; Graph algorithms: Basic search and traversal techniques, Topological sorting, Connected components, Spanning trees, Shortest paths, Flow algorithms; Lower bound theory; NP completeness, NP-hard and NP-complete problems; Coping with Hardness: backtracking, branch and bound, approximation algorithms.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate a familiarity with major algorithms and data structures.	Y											
CLO2	Synthesize efficient algorithms and data structures in common engineering design situations			Y									
CLO3	Illustrate important algorithmic design paradigms and method of analysis		Y										
CLO4	Write rigorous correctness proof and analyze the complexity of classic algorithms and data structure		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Demonstrate a familiarity with major algorithms and data structures.	Lecture, Class Participation	CT
CLO2	Synthesize efficient algorithms and data structures in common engineering design situations	Lecture, Group work, Discussion	ASG, Pr
CLO3	Illustrate important algorithmic design paradigms and method of analysis	Lecture, Group work, Discussion	MT
CLO4	Write rigorous correctness proof and analyze the complexity of classic algorithms and data structure	Lecture, Group work, Discussion	F
	(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)		

CSE 2202: Data Structures and Algorithm II Sessional

Course Details		
Course Code: CSE 2202	Course Title: Data Structures and Algorithm II Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
The Data Structure and Algorithm II sessional course is designed to provide hands on implementation of commonly used data structure and algorithms. The lab begins with the implementation of some commonly used data structures and then covers the implementation of some important algorithms with required modifications and optimizations.		
Course Content		
Laboratory works based on CSE 2201 course.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Understand the implementation of any data structure or algorithm	Y											
CLO2	Implement any algorithm from its pseudo code and writing pseudo code from its algorithm		Y										
CLO3	Choose appropriate data structure and algorithm at the appropriate scenario.					Y							
CLO4	Apply changes and modifications in the existing data structure and algorithms to reduce the time and space complexity of any problem.			Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understand the implementation of any data structure or algorithm	Lecture, Lab work	Y
CLO2	Implement any algorithm from its pseudo code and writing pseudo code from its algorithm	Discussion, Lab work	FT, ASG
CLO3	Choose appropriate data structure and algorithm at the appropriate scenario.	Lecture, Group work, Lab work	ASG
CLO4	Apply changes and modifications in the existing data structure and algorithms to reduce the time and space complexity of any problem.	Discussion, Group work	Q

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 2203: Theory of Computation

Course Details		
Course Code: CSE 2203	Course Title: Theory of Computation	Credits: 3.00 Contact Hours: 3.00

Rationale

The course is designed to learn how problems can be efficiently solved on a model of computation using algorithms and the elementary ways in which a computer works.

Course Content

Regular language: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, regular expressions, non-regular languages, the pumping lemma; Context-free language: Context free grammars, Chomsky normal form, Greibach Normal Form, Pushdown automata; Turing Machines: basic machines, configuration, computing with Turing machines, combining Turing machines; Decidability: decidable languages, undecidability.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Comprehend the mathematical foundations of computation including automata theory.				Y								
CLO2	Determine the foundation of theory of formal languages and grammars.					Y							
CLO3	Differentiate, correlate and design finite automata, pushdown automata, Turing machine, formal languages and grammars.				Y								
CLO4	Demonstrate mathematical proofs for computation and algorithms.											Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy

CLO1	Comprehend the mathematical foundations of computation including automata theory.	Lecture, Tutorials, Discussions	CT
CLO2	Determine the foundation of theory of formal languages and grammars.	Lecture, Tutorials, Discussions	MT
CLO3	Differentiate, correlate and design finite automata, pushdown automata, Turing machine, formal languages and grammars.	Lecture, Tutorials, Discussions	CT, F
CLO4	Demonstrate mathematical proofs for computation and algorithms.	Lecture, Tutorials, Discussions	ASG, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 2205: Database Management Systems

Course Details		
Course Code: CSE 2205	Course Title: Database Management Systems	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course focuses on the fundamental concepts of database management, including data models, schema normalization, relational algebra and SQL basics, query optimization, transactions, concurrency and recovery, database security, and so on.		
Course Content		
Introduction to database systems; Models: Entity-Relationship model, Relational model; Relational algebra; SQL; Advanced SQL; Some applications using SQL. Integrity constraint; Relational database design; File organization and retrieval, file indexing and hashing; Transaction manager; Concurrency controller; Recovery manager; Security system; Database administration; Introduction to advanced database management systems: distributed database, parallel database, data mining and warehousing, multimedia, object-oriented, object-relational, real-time database.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Comprehend the basic concepts of the database management systems.	Y											
CLO2	Identify and analyze complex engineering problems using the concepts of the database management systems.		Y										
CLO3	Design solutions for complex engineering problems using the concept of database management systems.			Y									
CLO4	Use modern database tools to design and develop solutions for complex engineering database problems.					Y							

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Comprehend the basic concepts of the database management systems.	Lecture, Tutorials, Discussions	CT, MT, F
CLO2	Identify and analyze complex engineering problem using the concepts of the database management systems.	Lecture, Tutorials, Discussions	CT, F
CLO3	Design solutions for complex engineering problems using the concept of database management systems.	Lecture, Tutorials, Discussions	ASG, MT, F
CLO4	Use modern database tools to design and develop solutions for complex engineering database problems.	Lecture, Tutorials, Discussions	ASG, MT, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 2206: Database Management Systems Sessional

Course Details		
Course Code: CSE 2206	Course Title: Database Management Systems Sessional	Credits: 1.50 Contact Hours: 3.00

Rationale

This course covers the fundamentals of database management, such as developing skills in designing real-world databases using data models, implementing those designs using a commercial database framework (MySQL), and so on.

Course Content

Database Design, Project Build up, MySQL installation, MySQL Statements: Create, Alter, Drop, Rename and Truncate Tables, Insert, Update and Delete data, Select, Order By, Limit, Aggregate Functions, Where, Wind Cards, Set Operations, Join Expressions, Group By, Having, Indices, Sub Queries, View, SQL Functions, Stored Procedures, Stored Functions and Triggers.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the basic concepts of a commercial database management system.	Y											
CLO2	Design solutions for complex engineering problems using the concept of database management systems.			Y									
CLO3	Use modern database tools to design and develop solutions for complex engineering database problems.					Y							
CLO4	Function effectively as an individual and as a member or leader of a teams to develop solutions for complex engineering database problems.									Y			
CLO5	Develop the communication skill through report writing and presentation as a member and leader of a team.										Y		

Y=yes			
Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the basic concepts of a commercial database management system.	Lecture, Discussions and Practice	CE, MT, Q
CLO2	Design solutions for complex engineering problems using the concept of database management systems.	Lecture, Tutorials, Discussions	PR
CLO3	Use modern database tools to design and develop solutions for complex engineering database problems.	Lecture, Discussions, Practice	CE, MT, Q, F
CLO4	Function effectively as an individual and as a member or leader of teams to develop solutions for complex engineering database problems.	Project Based Method	PR
CLO5	Develop the communication skill through report writing and presentation as a member and leader of a team.	Problem Based Method	PR, R, V
(Class Evaluation – CE; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

EEE 2269: Electrical Drives and Instrumentation

Course Details		
Course Code: EEE 2269	Course Title: Electrical Drives and Instrumentation	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to deliver clear concepts about electrical machines especially DC (generator, motor), AC (synchronous generator, synchronous motor) machines, induction motor and transformer:		

types, constructions, working principles, advantages, disadvantages, practical applications etc. This course also designed to teach about the characteristics of measurement system with functional elements, classification of instruments and measurement of electrical as well as non-electrical quantities using different types of instruments.

Course Content

Transformation ratio equations, Losses, Ideal Transformer, Voltage regulation, Matching transformer; Alternators: Faradays Law, Dynamo, Generated voltage equation, Voltage regulation, DC Generator; Synchronous motor and Induction motor; DC motor; Stepper motors; Thyristor and Microprocessor based speed control of motors. Instrumentation amplifiers: Differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices; Spectrum analyzers and Logic analyzers; Data acquisition and Interfacing to microprocessor-based systems; Transducers: Types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and opto-electronic transducers; Noise reduction in instrumentation.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To make the students familiar with basic principle, construction, operation and testing of transformer and induction motor.	Y											
CLO2	Understand the fundamentals and basic concepts of DC machines, synchronous generator and synchronous motor.	Y											
CLO3	To understand the fundamental measurement of Electrical quantities	Y											
CLO4	To deal with the measurement and control related task effectively in the practical fields.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**

CLO1	To make the students familiar with basic principle, construction, operation and testing of transformer and induction motor.	Lecture, White board Writing	T, F
CLO2	Understand the fundamentals and basic concepts of DC machines, synchronous generator and synchronous motor.	Lecture	MT, F
CLO3	To understand the fundamental measurement of Electrical quantities	Lecture	T, F
CLO4	To deal with the measurement and control related task effectively in the practical fields.	Group Discussion	ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

EEE 2270: Electrical Drives and Instrumentation Sessional

Course Details		
Course Code: EEE 2270	Course Title: Electrical Drives and Instrumentation Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course is designed to teach about fundamental concepts and theorems on DC generator, DC motor, synchronous generator, synchronous motor, transformer and induction motor through experimental work in the laboratory.		
Course Content		
Laboratory works based on EEE 2270		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Analyze the performance criteria of DC and synchronous machines to select for an industrial application.				Y								

CLO2	Perform various tests, find efficiency and voltage regulation of electrical machines		Y										
CLO3	Analysis of the differences between theoretical knowledge with the practical observations.					Y							

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Analyze the performance criteria of DC and synchronous machines to select for an industrial application.	Lecture	R, Q, T
CLO2	Perform various tests, find efficiency and voltage regulation of electrical machines	Lecture,	R, Q, T
CLO3	Analysis of the differences between theoretical knowledge with the practical observations.	Group Discussion	ASG, Q, T, V

(E-Evaluation, T – Lab Test; PR – Project; Q – Quiz; V-Viva; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam

MATH 2247: Laplace Transformation and Fourier Analysis

Course Details		
Course Code: MATH 2247	Course Title: Laplace Transformation and Fourier Analysis	Credits: 3.00 Contact Hours: 3.00

Rationale

This course is designed to introduce the students with the basic concepts of Fourier Transform, Fourier integral, Fourier series, Laplace transform, inverse Laplace transform, Convolution theorem. The focus is to illustrate engineering applications of these principles comparable to Fourier analysis and Laplace transformation. The learning approach is how the students can deal the engineering problems related to linear algebra. Students will achieve comprehension of the fundamental knowledge from Fourier analysis and Laplace transformation and they will be able to apply it in the branch of engineering.

Course Content

Fourier Analysis: Real and complex forms of Fourier series. Finite transforms. Fourier integral. Fourier transforms and their uses in solving boundary value problems of wave equations. Laplace Transformation: Definition, Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transform. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorems on Laplace transform. Partial fraction. Solution of differential equations by Laplace transforms. Evaluation of improper integrals.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Define basic terminology and theorems associated with Laplace and Fourier transform, Fourier integral and Fourier series.	Y	Y										
CLO2	Find the Laplace transform, inverse Laplace transform, Fourier integral, Fourier transform and Fourier series of different types of functions.	Y	Y										
CLO3	Solve the differential equations and integrate the functions using the Laplace and inverse Laplace transform, and interpret the result geometrically.	Y	Y		Y								
CLO4	Apply the acquired concepts of Laplace and Fourier transform, Fourier integral and Fourier series to solve problems arising in engineering.		Y		Y								

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)**	**Teaching- Learning Strategy**	**Assessment Strategy**

	(Upon completion of the course, the students will be able to)		
CLO1	Define the basic terminology and theorems associated with Laplace and Fourier transform, Fourier integral and Fourier series.	Lecture, Class Participation	MT, T, F
CLO2	Find the Laplace transform, inverse Laplace transform, Fourier integral, Fourier transform and Fourier series of different types of functions.	Lecture, Discussion, Group Work	F, MT
CLO3	Solve the differential equations and integrate the functions using the Laplace and inverse Laplace transform, and interpret the result geometrically.	Lecture, Discussion, Group Work	F, T
CLO4	Apply the acquired concepts of Laplace and Fourier transform, Fourier integral and Fourier series to solve problems arising in engineering.	Discussion, Group work	Pr /ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

HUM 2221: History of the Emergence of Bangladesh

Course Details		
Course Code: HUM 2221	Course Title: History of the Emergence of Bangladesh	Credits: 2.00 Contact Hours: 2.00
Rationale		
This course has been designed for undergraduate engineering students to help them learn the rich history of Bangladesh, to understand present Bangladesh in the light of history and to provide them with basic knowledge of historical events which eventually led to the formation of Bangladesh and constitution of Bangladesh, current trends in economic development and thereby to enhance their understanding of present phenomena in the light of history which will make them responsible citizen. The course aims at		

making students familiar with the history of emergence of Bangladesh as a sovereign state as well as the emergence of Bangla as the state language.

Course Content

Discussion on introduction, syllabus and examination, Naming Bangladesh, Characteristics of land nature and settlements of ancient Bengal, Ethnic structure and characteristics of Bengalis, Partition of Bengal (1905), Hindu-Muslim response, partition of Bengal cancelled (1911), Two-Nation Theory (1939), Lahore Resolution (1940).

The proposal for undivided independent Bengal, 1947 and Consequences, Mountbatten plan, The Indian Independence Act, 1947 and country division 1947, The creation of Pakistan (1947), Differences between East Pakistan and West Pakistan, Language Movement (1952): Background and follow of events. The United Front of Haque-Vasani-Suhrawardi, Election of 1954 and Consequences, Military Rule (1958), Cause of the Promulgation of Martial Law in 1958, Ayub Khan’s Rise to Power and Characteristics (Political Repression, Basic Democracy, Islamisation), Education Movement of 1962, Election of 1965, Pak-India war (1965), Six Point Movement of 1966, The Agortola Case, 1968, The Mass-Upsurge of 1969 and Eleven Point Movement, Election of 1970, Non-Co-Operation Movement and the 7th March Address of Bangabondhu, Operation Searchlight, Declaration of Independence by Bangabondhu and His Arrest, The Liberation of War (1971), Genocide, Repression of Women, Refuges, Formation of Bangladesh by Mujb Nagar Government and Proclamation of Independence, The Spontaneous Early Resistance and Subsequent Organized Resistance (Mukti Force, Mukti Bahini, Guerillas and the Frontal War force.

Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, The Campaigns Abroad and Formation of Public Opinion), The Rule of Super Powers in the Liberation War, The Anti-Liberation Activities of the Peace Committee, Al-Badar, Al-Shams, Rajakar Bahini and Killing of the Intellectuals, Formation of Joint Command and Victory December 16 on 1971, The Surrender of Pakistani Forces and the Rise of Independent Sovereign Bangladesh, Bangabondhu’s Return home.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To identify and explain the main events of the History of Emergence of Independent Bangladesh.						Y						
CLO2	Understand the inevitability of the emergence of Bangladesh as a sovereign state and analyse about how Bangladesh												Y

	come to be, about how we gained independence												
CLO3	Evaluate the most fundamental aspects of our education that entails learning about the history of Bangladesh												Y

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	To identify and explain the main events of the History of Emergence of Independent Bangladesh.	Lecture, Class Participation	T, MT, ASG, F
CLO2	Understand the inevitability of the emergence of Bangladesh as a sovereign state and analyse about how Bangladesh come to be, about how we gained independence	Lecture, Discussion, Group Work	T, MT, ASG, F
CLO3	Evaluate the most fundamental aspects of our education that entails learning about the history of Bangladesh	Lecture, Discussion, Group Work	T, MT, ASG, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

LEVEL-3, TERM-I

CSE 3100: Software Development Project II

Course Details		
Course Code: CSE 3100	Course Title: Software Development Project II	Credits: 0.75 Contact Hours: 1.50
Rationale		
The Individual Software Development Project – II course is designed to make its learners able to solve advanced level industry problems and develop real time projects professionally.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.			Y									
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Y											
CLO4	Able to develop industry level web-based applications individually.									Y			

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.	Lecture, Discussion, and Group Works	PR, Q
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.	Lecture, Discussion, and Group Works	PR
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Lecture, Discussion, and Group Works	PR, Q
CLO4	Able to develop industry level web-based applications individually.	Lecture, Discussion, and Group Works	PR
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3101: Software Engineering

Course Details		
Course Code: CSE 3101	Course Title: Software Engineering	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course is structured to cover fundamental and important topics in software engineering, such as information system analysis and design, modular software development approach, necessity of modular software development for handling real world projects, use of different UML (Unified Modeling Language) diagrams, software project management, emotional intelligence, importance of being team player, application of different software development model, software design pattern, code refactoring, object oriented software engineering, software quality assurance, software testing, apply the different standards and principles of software engineering in a real world project.		
Course Content		
System Design: Information and System; SDLC; System Design Strategy; Object Oriented Design; Designing Architecture, Components and Interfaces; Scalability-Load Balancing-Caching. Modular		

Software Development: Concepts (abstraction, refinement, modularity and hierarchy) and classification; Cohesion and Coupling; Introduction to modeling language (Use case diagram, Sequence diagram and Activity diagram). Software Design, Coding Standards and Project Management: Design Principles (SOLID); models (waterfall, incremental, agile, RAD etc.); Design Patterns (Singleton, Abstract Factory, Chain of Responsibility etc.); Code refactoring techniques; CBA (Cost-Benefit Analysis); Team Management Strategies; Project Scheduling and Budgeting.

Software Quality Assurance (SQA): SQA Scope and Implementation; Testing; Different Software Testing Strategies; Verification, Validation and Debugging; Quality Factors and Metrics for Different Software Engineering Phases; Software Monitoring and Maintenance.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements, and designing different kind of system and architectural models for building software systems.			Y									
CLO3	Develop testing mechanisms for assuring software quality including the dependability and availability.		Y										
CLO4	Develop the communication skill by presenting topics on software engineering.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the essentials of software development process.	Lecture, Class Participation	CT, F

CLO2	Analyze the user requirements, and designing different kind of system and architectural models for building software systems.	Lecture, Group work, Discussion	CT, MT, F
CLO3	Develop testing mechanisms for assuring software quality including the dependability and availability.	Lecture, Group work, Discussion	ASG, F
CLO4	Develop the communication skill by presenting topics on software engineering.	Lecture, Group work, Discussion	ASG, Pr, PR
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3102: Software Engineering Sessional

Course Details		
Course Code: CSE 3102	Course Title: Software Engineering Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
The Software Engineering Sessional course provides a practical experience on developing innovative enterprise solutions for real life problems by applying software engineering fundamentals which involve understanding the applicability of different software process models for different context, employing different software development standards like; design pattern, code refactoring etc., performing requirement analysis, designing system architecture as well as system models using unified modelling language, developing prototypes using prototyping tools and evaluating the prototype using test cases.		
Objective		
1. To understand the process of designing, building, and maintaining software systems through a practical approach by having experience on developing software systems for solving real-life problems innovatively. 2. To acquire the skill of applying different software development coding principles practically in a software project along with project management and testing strategies.		

3. To get familiar with documenting software process model, requirement analysis, system architecture, system models formally for a software system

Course Content

System Design: Information and System; SDLC; System Design Strategy; Object Oriented Design; Designing Architecture, Components and Interfaces; Scalability-Load Balancing-Caching. Modular Software Development: Concepts (abstraction, refinement, modularity and hierarchy) and classification; Cohesion and Coupling; Introduction to modeling language (Use case diagram, Sequence diagram and Activity diagram). Software Design, Coding Standards and Project Management: Design Principles (SOLID); models (waterfall, incremental, agile, RAD etc.); Design Patterns (Singleton, Abstract Factory, Chain of Responsibility etc.); Code refactoring techniques; CBA (Cost-Benefit Analysis); Team Management Strategies; Project Scheduling and Budgeting.

Software Quality Assurance (SQA): SQA Scope and Implementation; Testing; Different Software Testing Strategies; Verification, Validation and Debugging; Quality Factors and Metrics for Different Software Engineering Phases; Software Monitoring and Maintenance.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements and design the system model.		Y										
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes.			Y									
CLO4	Develop the communication skill by presenting topics on software engineering sessional.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**

CLO1	Understand and apply the essentials of software development process.	Class Discussion and Participation	PR, Pr, R, Q, Viva
CLO2	Analyze the user requirements and design the system model.	Project Progress and Report	PR, Pr, R, Q, Viva
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes.	Project Progress and Report	PR, Pr, R, Q, Viva
CLO4	Develop the communication skill by presenting topics on software engineering sessional.	Project Presentation	Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 3103: Microprocessors, Microcontrollers and Embedded Systems

Course Details		
Course Code: CSE 3103	Course Title: Microprocessors, Microcontrollers and Embedded Systems	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to teach students the concepts, principles and functioning of basic microprocessors and assembly language. This course aims to provide a fundamental foundation of assembly language, microprocessor architecture, and discusses different interfaces and design of systems based on microprocessors.		
Objective		
1. To provide an understanding of microprocessor and their use in instrumentation, control and communication systems. 2. To familiarize students with the architecture and operation of typical microprocessors and impart knowledge on the low-level language of microprocessor. 3. To teach the basics of programming and interfacing of common microprocessors. 4. To investigate in depth the microprocessor-based systems.		

5. To provide strong foundation for being able to design real world applications using microprocessors.

Course Content

Introduction to 8-bit, 16-bit, and 32-bit microprocessors: architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Bus interface; Arithmetic co-processor; Microcontrollers; Integrating microprocessor with interfacing chips; Programmable peripheral interfacing chip with interface to A/D and D/A converters; Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; Introduction to embedded systems: overview of the design flow, Embedded systems specifications and modeling; Embedded hardware platforms and peripherals; Interfacing to the external world through sensors and actuators.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Interpret microprocessor's internal architecture and their operation.	Y											
CLO2	Analyze how the high-level language structure is converted to low level languages and how a processor executes a program line by line.		Y										
CLO3	Design programs to interface microprocessor to external devices.			Y									
CLO4	Apply knowledge and programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and solve assembly language programs			Y									

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**

CLO1	Interpret microprocessor's internal architecture and their operation.	Lecture, Class Participation	T1, M, F
CLO2	Analyze how the high-level language structure is converted to low level languages and how a processor executes a program line by line.	Lecture, Group work, Discussion	T2, T3, F
CLO3	Design programs to interface microprocessor to external devices.	Lecture, Group work, Paper reading	M, F
CLO4	Apply knowledge and programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and solve assembly language programs	Paper Reading, Discussion, Group work, Presentation	ASG PR, R
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 3104: Microprocessors, Microcontrollers and Embedded Systems Sessional

Course Details		
Course Code: CSE 3104	Course Title: Microprocessors, Microcontrollers and Embedded Systems Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course introduces basics of assembly language programming, microprocessors architecture, and discusses different interfaces and design of systems based on microprocessors.		
Objective		
1. To achieve practical knowledge on the low-level language of microprocessor. 2. To obtain understanding of microprocessor-based systems and their use in instrumentation, control and communication systems.		

3. Investigate microprocessor-based systems and produce software for this system, interface microprocessor-based systems and understand usage of programmable logic controllers.

Course Content

Basics of Assembly Language: Instruction set, Instruction types and their formats; Assembly program format; Assembly process; Interrupts and system services; Addressing methods; High level control structure formation; Use of subroutines and macros; Numeric processing and string processing. Experiments will be performed using Microprocessor and Microcontroller.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand how low-level languages are implemented and how a processor executes a program line by line.	Y											
CLO2	Design basic assembly programs and define where used.			Y									
CLO3	Experiment with a basic microprocessor using assembly language in a group Project.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand how low-level languages are implemented and how a processor executes a program line by line.	Lecture, Lab Participation	M, F
CLO2	Design basic assembly programs and define where used.	Lecture, Group work, Discussion	Q, M, F
CLO3	Experiment with a basic microprocessor using assembly language in a group Project.	Lecture, Group work, Discussion	PR, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 3105: Computer Architecture

Course Details		
Course Code: CSE 3105	Course Title: Computer Architecture	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to introduce students to the basic concepts of computers, their design and how they work. It encompasses the definition of the machine's instruction set architecture, its use in creating a program, and its implementation in hardware. The course addresses the bridge between gate logic and executable software, and includes programming both in assembly language (representing software) and HDL (representing hardware).		
Course Content		
Fundamentals of Computer Organization and Architecture: Fundamentals of computer Design, Processor Design, Computer Evolution and Performance, Processor Design; Computer Arithmetic, Computer performance factors, Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters; Machine Instruction: Characteristics, Types of Operands, Types of Operations; Processor Structure and Function; Processor design: datapaths – single-cycle and multi-cycle implementations; Control Unit design: hardwired and micro-programmed; Hazards; Exceptions; Reduced Instruction Set Computers; RISC Processor; Pipeline: pipelined datapath, control and hazards, superscalar and dynamic pipelining; Cache Memory: Computer Memory System Overview, Cache Memory Principles, Elements of Cache Design, Pentium 4 Cache Organization, ARM Cache Organization; Internal Memory : Memory organization, ARM Cache Organization, cache, Error Correction, virtual memory, channels; Concepts of DMA and Interrupts, Advanced DRAM Organization; External Memory: Magnetic Disk, RAID, Solid State Drives, Optical Memory, Magnetic Tape; Input/ Output: External Devices, I/O Modules, Programmed I/O, Interrupt Driven I/O, Direct Memory Access, I/O Channels and Processors, Thunderbolt and Infini Band**.**		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the architectural concept of digital computers.	Y											
CLO2	Understand the development and design issues of an instruction set architecture and subsystems of central processing unit.			Y									
CLO3	Understand the Computer and Processor Design, Hazards; Exceptions; External and Internal memory and peripherals.		Y										
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.				Y							Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand the architectural concept of digital computers.	Lecture, Class Participation	CT, MT, F
CLO2	Understand the development and design issues of an instruction set architecture and subsystems of central processing unit.	Lecture, Group work, Discussion	MT, F
CLO3	Understand the Computer and Processor Design, Hazards; Exceptions; External and Internal memory and peripherals.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.	Lecture, Group work, Discussion	ASG, Pr, R

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 3107: Data Communication

Course Details		
Course Code: CSE 3107	Course Title: Data Communication	Credits: 3.00 Contact Hours: 3.00

Rationale

The main course is to understand the working knowledge of data flow techniques, analog and digital transmission techniques and also is to understand the bandwidth utilization techniques.

Course Content

Fundamentals: Communication Engineering Fundamentals, Waveforms Spectra, Periodic waveforms and its properties, Fourier series, Noise and its different types. Amplitude Modulation: Amplitude modulation, Amplitude modulation index, Frequency spectrum for sinusoidal AM, AM broadcast Transmitter. Frequency Modulation: Frequency Modulation, Sinusoidal FM, Frequency spectrum for Sinusoidal FM, FM transmitter. FM receiver, Phase Modulation. Pulse Modulation, Pulse Codes Modulation (PCM), Quantization, Compression, PCM Receiver, Differential PCM, Delta Modulation, Sigma-Delta A/D conversion, Pulse Frequency Modulation (PFM), Pulse Time Modulation (PTM), Pulse Position Modulation (PPM). Digital Communication: Digital Communication, Basic Digital Communication System, Synchronization, Asynchronous Transmission, Probability of Bit Error in Base band Transmission, Matched Filter, Eye Diagrams, Digital Carrier Systems, Amplitude Shift keying, Frequency Shift Keying, Phase Shift Keying, Carrier Recovery Circuits, Differential Phase Shift Keying, Error Control Coding, Block Control, Repetition Encoding, Parity Encoding, Convolution Encoding. Propagation: Radio Wave Propagation, Mode of Propagation, Microwave Systems, Tropospheric Propagation, VHF/UHF Radio Systems. Satellite Communication: Satellite Communication, Kepler's First and Second Law, Orbits, Geostationary Orbits, Power System. Fiber Optic Communication: Fiber Optic Communication, Propagation within a Fiber, Modes of Propagation, Losses in Fibers, Light sources for Fiber optics, Photo detectors.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain the components of a data communication system and physical topology.	Y											

CLO2	Demonstrate the representations of data and signals and analyze the encoding mechanism of signal and data.		Y										
CLO3	Understand bandwidth utilization techniques and analyze the characteristics of switched network.			Y									
CLO4	Develop the communication skill by presenting topics on data communication.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Explain the components of a data communication system and physical topology.	Lecture, Class Participation	CT, MT, F
CLO2	Demonstrate the representations of data and signals and analyze the encoding mechanism of signal and data.	Lecture, Group work, Discussion	MT, F
CLO3	Understand bandwidth utilization techniques and analyze the characteristics of switched network.	Lecture, Group work, Discussion	F
CLO4	Develop the communication skill by presenting topics on data communication.	Group work, Discussion	ASG, R

(CT – Class Test; ASG – Assignment; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 3109: Compiler

Course Details		
Course Code: CSE 3109	Course Title: Compiler	Credits: 3.00 Contact Hours: 3.00
Rationale		
This is designed to provide a knowledge how a compiler functions. To teach the students the basic techniques that underlies the practice of various phases of Compiler construction.		
Course Content		
Introduction: Introduction to compiling; Basic issues; Lexical analysis and Scanning; Syntax analysis; Syntax directed translation; Attribute Grammars and Semantic Analysis; Type-checking; Issues with run-time environments – source language issues; Issues in the design of code generation, Intermediate code generation; Error management; Storage organization-storage allocation strategies, target machine runtime storage management; Code optimization: The principle sources of optimization, Peephole optimization, Optimization of basic blocks-Loops in flow graphs; Introduction to global data-flow analysis, Code improving transformations.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the role of compilers in programming languages.	Y											
CLO2	Analyze the translation from one phase to another in compilation process.		Y										
CLO3	Apply the mechanisms of separating lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation and specify such structures of advanced language features.			Y									
CLO4	Apply the design procedure of scanners and parsers using tools and build abstract syntax trees in connection with this.			Y									
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand the role of compilers in programming languages.	Lecture, Class Participation	CT
CLO2	Analyze the translation from one phase to another in compilation process.	Lecture, Group work, Discussion	CT, MT
CLO3	Apply the mechanisms of separating lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation and specify such structures of advanced language features.	Lecture, Group work, Discussion	CT, F
CLO4	Apply the design procedure of scanners and parsers using tools and build abstract syntax trees in connection with this.	Lecture, Group work, Discussion	ASG, MT, F
(CT – Class Test; ASG – Assignment; F – Final Exam, MT- Mid Term Exam)			

CSE 3110: Compiler Sessional

Course Details		
Course Code: CSE 3110	Course Title: Compiler Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course is designed to implement debugger, tokenizer, arithmetic calculator and solve different problems of compiler related topics with any programming language.		
Objective		
1. To implement the tasks associated with different phases of a compiler. 2. To implement the different types of parsing techniques 3. To use new tools and technologies for designing a compiler.		

Course Content
Introduction to compiling; Basic issues; Lexical analysis and Scanning; Syntax analysis; Syntax directed translation; Attribute Grammars and Semantic Analysis; Type-checking; Issues with run-time environments – source language issues; Issues in the design of code generation,

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the techniques of compiler construction and use the tools to perform syntax-directed translation of a high-level programming language into an executable code.					Y							
CLO2	Understand the working mechanisms of C and C++ compiler for debugging of programs.									Y			
CLO3	Adapt the new tools and technologies used for designing a compiler.					Y				Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Apply the techniques of compiler construction and use the tools to perform syntax-directed translation of a high-level programming language into an executable code.	Lecture, Lab Participation, Lab work	M, F
CLO2	Understand the working mechanisms of C and C++ compiler for debugging of programs.	Lecture, Group work, Discussion, Lab work	Q, M, F
CLO3	Adapt the new tools and technologies used for designing a compiler.	Lecture, Group work, Discussion, Lab work	PR, R

PR – Project; Q – Quiz; R - Report; F – Final Exam, M- Mid Term Exam)

ME 3181: Basic Mechanical Engineering

Course Details		
Course Code: ME 3181	Course Title: Basic Mechanical Engineering	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course provides a prologue to the different concepts of Mechanical Engineering. The focus is to introduce the students to different branches of mechanical engineering and their relation to various disciplines of natural science like physics, mathematics etc. as well as will be able identify their practical uses. The learning approach is to build the basic of Mechanical Engineering.		
Course Content		
Energy: Sources, conventional and renewable energy, energy situation in Bangladesh, prospect of different energy sources in Bangladesh. Introduction to Steam Generation: Working principle of few common and modern boilers, difference between the fire tube and water tube boilers, description of boilers e.g. stationary fire tube boiler, Babcock and Willcox boiler, Stirling boiler, major boiler mountings and accessories, equivalent evaporation and boiler efficiency. Internal Combustion Engines: Introduction of petrol and diesel engines, main parts, working principle of both 4 stroke and 2 stroke engines, IHP, BHP and mechanical efficiency calculations, air standard Otto cycle, Diesel cycle efficiency, p-v & T-s diagrams of cycles, brief description of carburetion, injection, ignition system, lubrication and cooling systems of IC engine. Pumps, Blowers and Compressors: Introduction of pumps, blowers and compressors, classification and working principles. Turbine: Working principle and application of different types of turbines. Refrigeration and Air-conditioning Systems: Psychrometry, Fundamentals of refrigeration and air-conditioning system. Robotics: Introduction, purpose, laws of robotics, degree of freedom, manipulator-actuator and other components.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Demonstrate the core areas of mechanical engineering.	Y											
CLO2	Demonstrate introductory knowledge of various engines and processes like internal combustion engines, turbines, pumps, psychrometry etc. as well as advanced areas like automobile technology, robotics, MEMS etc.						Y						
CLO3	Understand the engineering concepts solutions in societal and environmental concepts.							Y					
CLO4	Understand the ethics of engineering.								Y				

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Demonstrate the core areas of mechanical engineering	Lecture, Class Participation	Q, F
CLO2	Demonstrate introductory knowledge of various engines and processes like internal combustion engines, turbines, pumps, psychrometry etc. as well as advanced areas like automobile technology, robotics, MEMS etc.	Lecture, Group work, Discussion	Q, ASG
CLO3	Understand the engineering concepts solutions in societal and environmental concepts.	Lecture, Group work, Discussion	Q, R, ASG
CLO4	Understand the ethics of engineering.	Lecture, Group work, Discussion	R, ASG

(CCT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

LEVEL-3, TERM-II

CSE 3200: Web Engineering Project

Course Details

Course Code: CSE 3200	Course Title: Web Engineering Project	Credits: 1.50 Contact Hours: 3.00

Rationale

The Web Engineering Project course provides a practical experience on developing innovative web solutions for real life problems by applying web engineering fundamentals which involve client-server model employing client-side design, server-side programing language and database. Student will work in groups or individually to develop a web-based application with proper documentation that they have to present within this semester.

Course Content

Internet, history of the TCT/IP protocol, worldwide web; web servers: case of Apache, other web servers; webpage design: HTML, JavaScript; XML Schemas, their validation and transformation; dynamic Web Pages with CGI, PHP or JSP and database access; Web services: SOAP, WSDL (Web Service Description Language), XML-RPC protocol; configuration, maintenance, monitoring and security.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.			Y									
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structure.	Y											

CLO4	Able to develop industry level web-based applications individually.									Y			
CLO5	Resolve different social, health, safety related problems through appropriate software project.						Y						
CLO6	Able to practice ethical issues in software development.								Y				
CLO7	Team collaboration, team work, report writing and presentation of the project in right approach.										Y		
CLO8	Ability of project planning involves resource and time planning through good management skill.											Y	
CLO9	Thinking independently to solve a problem through software solution.												Y

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.	Lecture, Tutorials, Group work, Discussion,	PR, R
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.	Lecture, Tutorials, Group work, Discussion,	PR, R
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structure.	Lecture, Tutorials, Group work, Discussion,	PR, R

CLO4	Able to develop industry level web-based applications individually.	Lecture, Tutorials, Group work, Discussion	PR, R, MT
CLO5	Resolve different social, health, safety related problems through appropriate software project.	Lecture, Tutorials, Group work, Discussion	PR, R, MT
CLO6	Able to practice ethical issues in software development.	Lecture, Tutorials, Group work	PR, R, MT
CLO7	Team collaboration, team work, report writing and presentation of the project in right approach.	Lecture, Tutorials, Group work, Discussion	PR, R, Pr
CLO8	Ability of project planning involves resource and time planning through good management skill.	Lecture, Tutorials, Group work, Discussion	PR, R, Pr
CLO9	Thinking independently to solve a problem through software solution.	Lecture, Tutorials, Group work, Discussion	PR, R, Pr
(CCT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3201: Artificial Intelligence

Course Details		
Course Code: CSE 3201	Course Title: Artificial Intelligence	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course explores the fundamental principles, methodologies, techniques, tools, and current research topics of Artificial Intelligence. The topics may include: The background and future of AI, various types of intelligent agents; Knowledge Representation and Reasoning: Propositional and first order predicate logic, inconsistencies, and uncertainties (Belief Networks); Knowledge Organization and Manipulation: different kinds of graph traversing algorithms, constraint satisfaction problems, adversarial search		

problems, planning and decision making; Perception and Communication: Natural Language Processing and image/speech understanding.
Objective
1. To learn various type of intelligent agents and their working environments. 2. To understand knowledge representation strategies for both consistent and inconsistent environments and implement them to solve complex real-world problems. 3. To understand different learning strategies to acquire knowledge, formulate information to generate inherit patterns and make decision accordingly. 4. To understand different techniques to percept information from the real-world scenarios and apply them to exchange information.
Course Content
Overview of AI, Knowledge representation, LISP and other Al programming languages; Review of Un-Informed Search Strategies and game playing; Informed search Strategies: A*, Heuristic functions, Memory Bounded Search (IDA*, SMA*); Iterative improvement Search (Hill Climbing, Simulated Annealing), constraint satisfaction problems. Review of Propositional logic, first order Logic, Introduction to Planning, Partial Order Planning. Bayesian Rule and its use in probabilistic reasoning; Belief Networks and Decision Networks; Learning Decision Trees; Learning General Logical Descriptions-Hypothesis, Examples, Current Best Hypothesis Search, Least Commitment Search; Learning Neural and Belief Networks ANN, Perceptions, MFFN (Back propagation, Applications of Neural Networks, Bayesian Methods for learning Belief Networks, Generic Algorithm, Reinforced learning. Introduction to Natural Language Processing.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the notions of rational behavior and intelligent agents.	Y											
CLO2	Develop a general appreciation of goals, subareas, achievements and difficulties of AI.			Y									
CLO3	Have knowledge of methods of blind as well as informed search and ability to		Y	Y									

	practically apply corresponding techniques.												
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.				Y						Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the notions of rational behavior and intelligent agents.	Lecture, Class Participation	T1, M, F
CLO2	Develop a general appreciation of goals, subareas, achievements and difficulties of AI.	Lecture, Group work, Discussion	T2, T3, F
CLO3	Have knowledge of methods of blind as well as informed search and ability to practically apply corresponding techniques.	Lecture, Group work, Discussion	M, F
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.	Paper Reading, Discussion, Group work, Presentation	ASG Pr, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 3202: Artificial Intelligence Sessional

Course Details		
Course Code: CSE 3202	Course Title: Artificial Intelligence Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

The Artificial Intelligence Sessional course is structured to implement different kind of graph traversing algorithm, shortest path algorithm, Iterative improvement Search, Propositional Logic, Planning, Partial Order Planning. Bayesian Rule; Decision Networks; Learning Decision Trees; Learning General Logical Descriptions-Hypothesis, ANN, Perceptions, MFFN, Bayesian Methods for learning Belief Networks, Generic Algorithm, Reinforced learning. Introduction to Natural Language Processing. This course also helps to learn to develop various kind robot and probable measures to mitigate the issues.

Course Content

Laboratory works based on CSE 3201.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To use the appropriate algorithms in appropriate situations.	Y				Y							
CLO2	To choose the appropriate algorithm or approach based one scenario and constrains.			Y									
CLO3	To implement the appropriate path finding algorithm to build a robot.		Y	Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	To use the appropriate algorithms in appropriate situations.	Lecture, Class Participation	T

CLO2	To choose the appropriate algorithm or approach based one scenario and constrains.	Lecture, Group work, Discussion	MT
CLO3	To implement the appropriate path finding algorithm to build a robot.	Lecture, Group work, Discussion	F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3203: Operating System

Course Details		
Course Code: CSE 3203	Course Title: Operating System	Credits: 3.00 Contact Hours: 3.00
Rationale		
This Operating System course focuses on the fundamental concepts of operating system related to computer science. This course begins with operating system structure, operating system goals, services, computer hardware, process, thread, synchronization, deadlock, memory management, disk structure, file system, protection, security, virtualization, cloud system and various relevant important topics.		
Course Content		
OS introduction: Introduction of Operating System, Types of OS; Process: Process managements, process states, job and process scheduling, threads, process coordination, critical section problems, semaphores, Inter-Process Communication (IPC), classical IPC problems, multiprocessing and time sharing CPU scheduling algorithms; Deadlock: resource allocation, detection, prevention, avoidance and recovery; Memory management: swapping, memory allocation schemes, Paging and segmentation, virtual memory, page replacement strategies, working sets, demand paging; Input/output: hardware/software, disk structure, disk scheduling algorithms, Secondary storage management, RAID structure ; File management; I/O systems; System Protection; System Security; Virtualization : Types and techniques for efficient virtualization, memory and i/o virtualizations, virtual appliances; Cloud: clouds as a service, virtual machine; Multiple Processor Systems: Multiprocessor, Multicomputer, Distributed Systems, Case Studies.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Define, classify and analyze modern operating systems; concept for virtualization, cloud and multiple processor systems.	Y											
CLO2	Explain process, thread, semaphore and file management systems.		Y										
CLO3	Analyze and perform cpu scheduling, deadlock and memory management algorithms.		Y										
CLO4	Develop the communication skill by presenting topics on operating systems.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Define, classify and analyze modern operating systems; concept for virtualization, cloud and multiple processor systems.	Lecture, Class Participation	CT, MT
CLO2	Explain process, thread, semaphore and file management systems.	Lecture, Discussion	CT, MT, F
CLO3	Analyze and perform cpu scheduling, deadlock and memory management algorithms.	Lecture, Discussion	CT, MT, F
CLO4	Develop the communication skill by presenting topics on operating systems.	Lecture, Group work, Discussion	ASG/Pr

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 3204: Operating System Sessional

Course Details		
Course Code: CSE 3204	Course Title: Operating System Sessional	Credits: 1.50 Contact Hours: 3.00

Rationale

The Operating System (OS) Sessional course is designed to understand fundamental components of Operating System. The lab begins with the development of operating systems like UNIX and WINDOWS. The course deals with virtualization and different key components of Operating System e.g., kernel compilation, process and thread scheduling, deadlocks, memory management, deadlock, disk scheduling, synchronization and system calls etc.

Course Content

Introduction: Development of Linux Operating System, Installation of Linux in various modes, Installation of windows application programs on Linux, Basic Linux Command; Linux Kernels and Office Environments: Compilation; Shell Programing: variables, statements, loop, array, functions etc; Inter process communication and Process scheduling: preemptive and non- preemptive algorithms and implementation; Memory management: algorithms and implementation, page replacement algorithms and implementation; Mutual exclusion and deadlock: algorithms and implementation; Disk Scheduling: algorithms and implementation.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and respond to major operating systems like Windows, Linux etc.					Y							
CLO2	Apply and modify algorithms for process, thread and memory management through group project work.									Y			
CLO3	Develop the communication skill by presenting topics on operating systems.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)**	**Teaching-Learning Strategy**	**Assessment Strategy**

	(Upon completion of the course, the students will be able to)		
CLO1	Understand and respond to major operating systems like Windows, Linux etc.	Lecture, Class Participation	T
CLO2	Apply and modify algorithms for process, thread and memory management through group project work	Lecture, Group work, Discussion	MT
CLO3	Develop the communication skill by presenting topics on operating systems	Lecture, Group work, Discussion	F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3205: Computer Networks

Course Details		
Course Code: CSE 3205	Course Title: Computer Networks	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks. Resource sharing, high Reliability, increase in system performance, and security in network are the main objectives.		
Course Content		
Introduction: Computer Networks and Applications, OSI reference model, TCP/IP model and terminology, Connectionless and Connection Oriented services, Service primitives, The ARPANET, Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing Algorithm. Physical Layer: Circuit switching and Packet switching, X-25 protocol, Frame relay and Cell relay, ATM reference model. Medium Access Sub layer: Pure and slotted ALOHA, Persistent and Non persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet.		

Data Link Layer: Types of errors, framing, error detection & correction methods; Flow control, Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC.

Network Layer: Internet address, classfull address, subnetting, static vs. dynamic routing, shortest path algorithm, flooding, distance vector routing, link state routing, ARP, RARP, IP, ICMP.

Transport Layer: UDP, TCP, Connection management, Addressing, Establishing and Releasing Connection, Congestion control algorithm, Flow control and Buffering, Multiplexing.

Presentation Layer: Data Compression techniques, Frequency Dependent Coding, Context Dependent Encoding.

Application Layer: Internet and intranets, Internet services and goals, DNS, SMTP, FTP, Telnet, HTTP, World Wide Web (WWW), DHCP and BOOTP.

Domain Name System: Name servers; Email and Its privacy; SNMP; HTTP; World Wide Web; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures, Principles of Reliable Data Transfer FTP.

Networking in Practice: Designing LAN, Cabling, Establishing Client- Server network, Configuring: Directory Server, Proxy server, FTP server, E-mail server, web server, DB server, Firewall, Network troubleshooting, network maintenance, network monitoring, Network programming.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Describe the major computer networks components and How Internet works.	Y											
CLO2	Illustrate TCP/IP protocol (Application, Transport, Network, Link and Physical) used in internetworking to develop network application		Y										
CLO3	Design and implement network routing for IP networks selecting different routing protocol.			Y									
CLO4	Develop the communication skill by presenting topics on Computer networking.										Y		

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Describe the major computer networks components and How Internet works.	Lecture, Class Participation	CT, MT
CLO2	Illustrate TCP/IP protocol (Application, Transport, Network, Link and Physical) used in inter networking to develop network application	Lecture, Group work, Discussion	MT, F
CLO3	Design and implement network routing for IP networks selecting different routing protocol.	Lecture, Group work, Discussion	F
CLO4	Develop the communication skill by presenting topics on Computer networking.	Lecture, Group work, Discussion	ASG/R
CT= Class Test, MT= Mid Term, F= Final, ASG=Assignment, R=Report			

CSE 3206: Computer Networks Sessional

Course Details		
Course Code: CSE 3206	Course Title: Computer Networks Sessional	Credits: 1.50 Contact Hours: 3.00
Rationale		
Understand and analyse different network infrastructures, applications of different types of computer networks to facilitate communication and resource-sharing among a wide range of users.		
Objective		
1. To understand the limitations and fundamental concepts of different networks and algorithms. 2. To apply the concepts to the example systems and algorithms.		
Course Content		
IP Addressing, Basic Configuration of Cisco Packet Tracer, Socket Programming, Basic Network Configuration (Static Routing), Variable Length Subnet Mask (VLSM), RIP, EIGRP, Dynamic Host Configuration Protocol (DHCP), Open Shortest Path First (OSPF), Physical Network Interface		

Connection/ Router & Switch Configuration, Access Control List (ACL), VLAN, InterVLAN, VTP, Information Gathering using Wire shark, Introduction to NS2.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and analyse different types of computer networks and create server client communication.	Y											
CLO2	Design and simulate present contemporary and new protocols of computer networks in Cisco Packet Tracer.			Y									
CLO3	Applying and analysing different routing protocols of computer networks in physical devices.		Y										
CLO4	Capturing and analysing real-time packets to detect vulnerability of network using Wire Shark.					Y							

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand and analyze different types of computer networks and create server client communication.	Lecture, Class Participation	Lab Work, Report
CLO2	Design and simulate present contemporary and new protocols of computer networks in Cisco Packet Tracer.	Lecture, Group work, Discussion	Lab Work, Report

CLO3	Applying and analyzing different routing protocols of computer networks in physical devices.	Lecture, Group work, Discussion	Lab Work, Report
CLO4	Capturing and analyzing real-time packets to detect vulnerability of network using Wire Shark.	Lecture, Group work, Discussion	Lab Work, Report
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 3207: Mathematical Analysis for Computer Science

Course Details		
Course Code: CSE 3207	Course Title: Mathematical Analysis for Computer Science	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is aimed to gain introductory knowledge on probability, computation of probability with its practical and theoretical application in studying computer science.		
Course Content		
Probability: Probability Models, Sample Space, Events, Algebra of Events, Probability Axioms, Conditional Probability, Multiplication Rule, Total Probability, Bayes" rule. Random Variables: Discrete, Continuous and Mixed Random Variables, Probability Mass, Distribution and Cumulative Distribution Functions. Probability Distributions: Discrete probability distributions -Binomial, Poisson, Negative Binominal Distributions and Their Properties Continuous probability distributions -Uniform, Normal, Exponential Distributions and their Properties. Stochastic process; Markov chains (discrete parameter, continuous parameter, birth-death process), Hidden Markov Model; Queuing models (birth-death model, Monrovian model), open and closed queuing network; Application of queuing models		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Illustrate the basic of static and dynamic equation and relevant conventional algorithms.	Y											
CLO2	Solve complex engineering problem with no obvious solution using wide ranging or conflicting problems.	Y											
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.		Y										
CLO4	Identify and reveal error in the analytical problem then diagnose needed basic operations.		Y										
CLO5	Develop the communication skill by presenting topics on Mathematical Analysis.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Illustrate the basic of static and dynamic equation and relevant conventional algorithms.	Lecture, Class Participation	CT
CLO2	Solve complex engineering problem with no obvious solution using wide ranging or conflicting problems.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Identify and reveal error in the analytical problem then diagnose needed basic operations.	Lecture, Group work, Discussion	CT, F

CLO5	Develop the communication skill by presenting topics on Mathematical Analysis.	Discussion, Group work	ASG/PR, Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3209: Information System Design

Course Details		
Course Code: CSE 3209	Course Title: Information System Design	Credits: 3.00 Contact Hours: 3.00
Rationale		
The Information System Design and Development course motivates to perceive information systems planning, analysis, design and implementation; project management, project scheduling and communication skills; as well as the fundamentals of security, disaster/recovery planning and ethics in system development to solve various real-life problems.		
Course Content		
System analysis fundamentals: systems, roles, and development methodologies; Understanding and modeling organizational system; Project management; Information requirements analysis: Interactive methods; Information gathering: Unobtrusive methods; agile modeling and prototyping; The analysis process: Using data flow diagrams; Analyzing systems using data dictionaries; Process specifications and structured decisions; Object oriented systems analysis and design using UML; The essentials of design: Designing effective output, Designing effective input; Designing databases; Human-computer interaction; Quality assurance and implementation: Designing accurate data entry procedures; Quality assurance and implementation.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Understand fundamental concepts of information system, information system environment and primary responsibilities of a system analyst.	Y											
CLO2	Apply the practical approaches of structured and cost-benefit analysis for developing information systems for industries/ business organizations.			Y									
CLO3	Analyse and organize a system using project management techniques.								Y				
CLO4	Develop awareness regarding ethics and security of a system.											Y	
CLO5	Develop the communication skill by presenting topics on information system design and development.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand fundamental concepts of information system, information system environment and primary responsibilities of a system analyst	Lecture, Class Participation	T, MT, F
CLO2	Apply the practical approaches of structured and cost-benefit analysis for developing information systems for industries/ business organizations	Lecture, Group work, Discussion	T, MT, F
CLO3	Analyse and organize a system using project management techniques.	Lecture, Group work, Discussion	T, MT, F
CLO4	Develop awareness regarding ethics and security of a system.	Lecture, Group work, Discussion	ASG/PR, Pr, R

CLO5	Develop the communication skill by presenting topics on information system design and development.	Discussion, Group work	ASG/PR, Pr, R
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 3210: Information System Design Sessional

Course Details		
Course Code: CSE 3210	Course Title: Information System Design Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course has been designed for the students to have real life experiences to help them prepare for their career.		
Course Content		
As designed by the respective industry and Course Teacher of Course Code: CSE 3209; Course Title: Information System Design.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements and design the system model.			Y									
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes.				Y								
CLO4	Test cases to evaluate the prototypes software.					Y							
CLO5	Develop the communication skill by presenting topics on software engineering sessional.											Y	
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the essentials of software development process.	Lecture, Practical, Class Participation	PR, Pr, R, Q, Viva
CLO2	Analyze the user requirements and design the system model.	Lecture, Practical, Tutorial Discussion	PR, Pr, R, Q, Viva
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes.	Lecture, Practical, Tutorial Discussion	PR, Pr, R, Q, Viva
CLO4	Test cases to evaluate the prototypes software.	Lecture, Practical, Tutorial Discussion	PR, Pr, R, Q, Viva
CLO5	Develop the communication skill by presenting topics on software engineering sessional.	Presentation	Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

LEVEL-4, TERM-I

CSE 4000: Project / Thesis*

Course Details		
Course Code: CSE 4000	Course Title: Project / Thesis*	Credits: 3.00 Contact Hours: 6.00

Rationale
Culminating demonstration of skills and knowledge achieved to date to apply and solve real life problems solvable through computer technology.

Objective
To apply technical knowledge and skills for further research and design of computer system at professional engineering scale.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify, formulate, study literature, and evaluate difficult engineering problems utilizing fundamental principles of mathematics, natural sciences, and engineering sciences to obtain justified findings.		Y										
CLO2	Design complicated technical solutions and system components or processes that satisfy the required needs while taking into account public health and safety, as well as cultural, socioeconomic, and environmental considerations.			Y									
CLO3	Investigate difficult issues utilizing research-based knowledge and research methodologies such as experiment design, data analysis and interpretation, and						Y						

	information synthesis to reach accurate results.												
CLO4	Develop, choose, and apply suitable methodologies, resources, and current engineering and IT technologies to complex engineering processes, including prediction and modelling, while keeping in mind their constraints.							Y					
CLO5	Analyse societal, health, safety, legal, and cultural issues, as well as the obligations that come with them, in relation to professional engineering practice and solutions to difficult engineering challenges, using reasoning informed by contextual knowledge.								Y				
CLO6	Understand and assess the long-term viability and effect of professional engineering work in solving complex engineering problems in social and environmental contexts.									Y			
CLO7	Apply ethical concepts and conform to professional ethics, duties, and engineering practice norms.										Y		
CLO8	Individually and as a member or leader of various teams and in interdisciplinary situations, you must be able to function effectively.											Y	
CLO9	Effectively communicate with the engineering community and society at large on complicated engineering operations, such as being able to read and create good reports and design documentation, give and receive clear directions.												Y

CLO10	Demonstrate knowledge and comprehension of engineering management concepts and economic decision-making, and apply them to one's own work, as a team member and leader, to manage projects, and in interdisciplinary settings.						Y						
CLO11	Recognize the necessity for autonomous and life-long learning in the broader context of technological change, and have the preparedness and capacity.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Identify, formulate, study literature, and evaluate difficult engineering problems utilizing fundamental principles of mathematics, natural sciences, and engineering sciences to obtain justified findings.	Previous course knowledge, Literature review	R
CLO2	Design complicated technical solutions and system components or processes that satisfy the required needs while taking into account public health and safety, as well as cultural, socioeconomic, and environmental considerations.	Self-learning, Interdisciplinary cooperation	R
CLO3	Investigate difficult issues utilizing research-based knowledge and research methodologies such as experiment design, data analysis and interpretation, and information synthesis to reach accurate results.	Literature review, Self-learning	R

CLO4	Develop, choose, and apply suitable methodologies, resources, and current engineering and IT technologies to complex engineering processes, including prediction and modeling, while keeping in mind their constraints.	Literature review, Self-learning, Interdisciplinary cooperation	R
CLO5	Analyse societal, health, safety, legal, and cultural issues, as well as the obligations that come with them, in relation to professional engineering practice and solutions to difficult engineering challenges, using reasoning informed by contextual knowledge.	Literature review, Self-learning, Interdisciplinary cooperation	R, Viva
CLO6	Understand and assess the long-term viability and effect of professional engineering work in solving complex engineering problems in social and environmental contexts.	Literature review, Self-learning, Interdisciplinary cooperation	Viva
CLO7	Apply ethical concepts and conform to professional ethics, duties, and engineering practice norms.	Literature review, Self-learning	Viva
CLO8	Individually and as a member or leader of various teams and in interdisciplinary situations, you must be able to function effectively.	Self-learning	PE
CLO9	Effectively communicate with the engineering community and society at large on complicated engineering operations, such as being able to read and create good reports and design documentation, give and receive clear directions.	Self-learning, Interdisciplinary cooperation	Viva, R
CLO10	Demonstrate knowledge and comprehension of engineering management concepts and economic decision-making, and apply them to one's own work, as a team member and leader,	Literature review, Self-learning, Interdisciplinary cooperation	R, PR

	to manage projects, and in interdisciplinary settings.		
CLO11	Recognize the necessity for autonomous and life-long learning in the broader context of technological change, and have the preparedness and capacity to do so.	Self-learning, Interdisciplinary cooperation	Viva
(Pr-Project, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4100: Industrial Training

Course Details		
Course Code: CSE 4100	Course Title: Industrial Training	Credits: 1.00 Contact Hours: 2.00
Rationale		
Industrial training course is designed for the students to have real life experiences to help them prepare for their career.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn how to use modern tools and technology to solve real-world complex engineering problem.					Y							
CLO2	Communicate with the engineering community.										Y		
CLO3	Able to learn professionalism and ethical values.								Y				
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy
CLO1	Learn how to use modern tools and technology to solve real-world complex engineering problem.	Training	PR
CLO2	Communicate with the engineering community.	Co-operative and Collaborative Method	R, Pr
CLO3	Able to learn professionalism and ethical values.	Discussion, Training	Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4101: Computer Security

Course Details		
Course Code: CSE 4101	Course Title: Computer Security	Credits: 3.00 Contact Hours: 3.00
Rationale		
The Computer Security course is designed to provide a comprehensive understanding to the modern security system in computer science. The course begins with description of basic computer security ideas followed by various security models, cryptography, security attacks and the fundamental security objectives. This course also motivates to understand various security threats and probable measures to mitigate the issues.		
Course Content		
Fundamental concepts: confidentiality, integrity and availability, assurance, authenticity and anonymity; threats and attacks, security principles; Cryptographic concepts: encryption, digital signatures, simple attacks on cryptosystems, cryptographic hash functions, digital certificates; Cryptography: symmetric cryptography, public-key cryptography, cryptographic hash functions, digital signatures, details of AES and RSA cryptography; Security: Operating systems concepts, process security, memory and file system security, physical security, application program security, network security concepts, browser security,		

physical security, applications security, Security Attacks: buffer overflow and other vulnerabilities due to insecure programming, foot printing, social engineering , Trojans and backdoors, sniffing, denial of service, session hijacking, threats on components like webservers, web Applications, mobile platforms, wireless networks, Security Measures: Firewall, Intrusion detection and prevention.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the modern security system in computer science.	Y											
CLO2	Determine and analyze the security objectives, attacks, and recognize the security requirements in real-life cases.		Y										
CLO3	Able to develop applications keeping data security at its core.				Y								
CLO4	Develop the communication skill by constructing security critical scenario in application, creating and presenting solutions regarding Security and Cryptography.												Y

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understand the modern security system in computer science.	Lecture, Class Participation	CT
CLO2	Determine and analyze the security objectives, attacks, and recognize the security requirements in real-life cases.	Lecture, Group work, Discussion	MT, F
CLO3	Able to develop applications keeping data security at its core.	Lecture, Group work, Discussion	MT, F

CLO4	Develop the communication skill by constructing security critical scenario in application, creating and presenting solutions regarding Security and Cryptography.	Lecture, Group work, Discussion	ASG, R
CT= Class Test, MT= Mid Term, F= Final, ASG=Assignment, R=Report			

CSE 4102: Computer Security Sessional

Course Details		
Course Code: CSE 4102	Course Title: Computer Security Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
The Computer Security Sessional course is designed to provide a comprehensive understanding and usage of to the modern security system in computer science. This course also helps to learn various security threats and probable measures to mitigate the issues.		
Objective		
1. To use the appropriate algorithms in appropriate situations. 2. To choose the appropriate algorithm or approach based one scenario and constrains 3. To able to use cryptography to solve real world problems		
Course Content		
Laboratory works based on CSE 4101.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Using the appropriate algorithms in appropriate situations.		Y										
CLO2	Choosing the appropriate algorithm or approach based one scenario and constrains.			Y									

CLO3	Develop the ability to use cryptography to solve real world problems.					Y							

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs.	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Using the appropriate algorithms in appropriate situations.	Lecture, Lab Participation	M, F
CLO2	Choosing the appropriate algorithm or approach based one scenario and constrains	Lecture, Group work, Discussion	Q, M, F
CLO3	Develop the ability to use cryptography to solve real world problems	Lecture, Group work, Discussion	PR, R
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4103: Computer Graphics

Course Details		
Course Code: CSE 4103	CSE 4103: Computer Graphics	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course deals with the fundamentals of computer graphics. This will emphasize the most basic algorithms and concepts in computer graphics that form the foundation for most modern graphics systems. It also deals with interactive 3D computer graphics, 2D algorithms, rendering, clipping, modelling, transformation, projection and so many graphics sectors.		
Objective		
1. Understand the basic concepts of computer graphics, different graphics systems and applications. 2. Learning the mathematical foundation of the concepts of computer graphics and apply those concepts in different geometric objects.		

3. Analyze different algorithms and techniques of computer graphics and apply those in graphical model. 4. Develop the communication skill by presenting topics on computer graphics.
Course Content
Standard graphics primitives; Graphics hardware; Graphics pipeline; Coordinate convention; Scan conversion; Clipping; Modelling transformation; Viewing transformation; Projection transformation; Polygons and polygon meshes; Curves and surfaces; Hidden lines and surface removal; Fractals; Ray tracing; Light models; Colour models; Graphics programming.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic concepts of computer graphics, different graphics systems and applications.	Y											
CLO2	Learning the mathematical foundation of the concepts of computer graphics and apply those concepts in different geometric objects.	Y											
CLO3	Analyze different algorithms and techniques of computer graphics and apply those in graphical model.		Y										
CLO4	Develop the communication skill by presenting topics on computer graphics.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic concepts of computer graphics, different graphics systems and applications.	Lecture, Class Participation	CT, M

CLO2	Learning the mathematical foundation of the concepts of computer graphics and apply those concepts in different geometric objects.	Lecture, Group work, Discussion	M, F, ASG
CLO3	Analyze different algorithms and techniques of computer graphics and apply those in graphical model.	Lecture, Group work, Discussion	ASG, CT, F
CLO4	Develop the communication skill by presenting topics on computer graphics.	Lecture, Group work, Discussion	ASG, CT, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4104: Computer Graphics Sessional

Course Details		
Course Code: CSE 4104	Course Title: Computer Graphics Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course motivates to develop and modify 2D and 3D visualization and transformation of any geometric object by using graphics library as well as create 3D games and animation using different modern graphics tools and software.		
Objective		
1. Apply graphics programming techniques to solve graphics problem related to modelling transformation, rendering, texture mapping etc. 2. Develop 2D and 3D graphical geometric objects. 3. Create animation or real time applications using open-source software.		
Course Content		
Laboratory works based on CSE 4103.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		
CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply graphics programming techniques to solve graphics problem related to modelling transformation, rendering, texture mapping etc.		Y										
CLO2	Develop 2D and 3D graphical geometric objects			Y									
CLO3	Create animation or real time applications using open-source software.					Y							
Y=Yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Apply graphics programming techniques to solve graphics problem related to modelling transformation, rendering, texture mapping etc.	Lecture, Lab Participation	M, F
CLO2	Develop 2D and 3D graphical geometric objects	Lecture, Group work, Discussion	Q, M, F
CLO3	Create animation or real time applications using open-source software.	Lecture, Group work, Discussion	PR, R
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

HUM 4123: Engineering Economics

Course Details		
Course Code: HUM 4123	Course Title: Engineering Economics	Credits: 2.00 Contact Hours: 2.00

Rationale

This course is designed to teach about fundamental concepts and practice of Economics, practices and fundamental application in real life.

Course Content

Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticities; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting; depreciation; circular flow of income and expenditure; cost-benefit analysis; payback period, net present value (NPV), internal rate of return (IRR), inflation; economic feasibility of engineering undertakings; Development Economics: Theories of developments; Banking system of Bangladesh, National Budget, Development partners(World Bank, Asian Development Bank, World Trade Organization, International Monetary Fund)

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	Understand the basic economic principle and their applications.							Y					
CO2	Generate important insights into individual and aggregate behaviour and relationships, and help in society efforts to use scarce resources in a more efficient manner.				Y								
CO3	Explain time-value of money concepts and the criteria for making economic-based decisions.												Y

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs.	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic economic principle and their applications.	Lecture, Class Participation	T, F, Q

CLO2	Generate important insights into individual and aggregate behaviour and relationships, and help in society efforts to use scarce resources in a more efficient manner.	Lecture, Group work, Discussion	T, MT, Pr
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.	Lecture, Group work, Discussion	F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

OPTIONAL I AND II

CSE 4121: Digital Signal Processing

Course Details:		
Course Code: CSE 4121	Course Title: Digital Signal Processing	Credits: 3.00 Contact Hours: 3.00
Rationale		
Digital Signal Processing (DSP) is a specialty-related elective/optional course for Engineering students. To understand the knowledge of DSP, it is classified by Signals and Systems, Signal Processing, Signal Analysis, and implementation in Engineering fields such as signal processing, detection, object tracking, computer engineering related fields, robotics, automation, financial market analysis, biomedical engineering, etc. This course is important for the students to learn the integration of signal processing with interfacing to understand engineering knowledge and applications where the students will able to learn digital signals, sampling, quantization, responses, Correlations, LTI systems, DTFT, DFT, FFT, wavelet transform, Z-transform, Inverse Z-transform, H-transform, calculation of spectrum & statistical features of discrete-time signals, filter algorithms & design, Fourier series and Fourier Transform; Perceval's theorem; Equivalent noise definition of bandwidth; Convolution, Correlation and method of numerical integration; Computation of the DFT: Gentzel FFT, Chirp Z-transform algorithms; Biomedical signal Processing (EEG, ECG, ECoG, EMG, EOG, MEEG, respiratory and hear sounds, etc.).		
Course Content		
Introduction to speech, image & data processing; Discrete time signals, sequences; Linear Constant Coefficient difference equation; Sampling continuous time signals; Two dimensional sequences and systems; Z-transform, Inverse Z-transform, H-transform; Frequency domain representation, discrete time systems and signals; Fourier series and Fourier Transform; Perceval's theorem; Equivalent noise definition of bandwidth; Convolution, Correlation and method of numerical integration; Computation of the DFT: Gentzel FFT, Chirp Z-transform algorithms; Biomedical signal Processing (EEG, ECG, ECoG, EMG, EOG, MEEG, respiratory and hear sounds, etc.).		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Understanding the key theoretical principles of DSP, in a design procedure through design examples and case studies	Y											
CLO2	Analyze to determine the architecture of DSP and programming issues in fixed-point DSP processor in real-time implementation.		Y										
CLO3	Evaluate the mathematical expression and graphical representation for understanding of DSP theory, and problems, applications.				Y								
CLO4	Apply and analyze time domain, F-domain to z-domain, time domain to frequency domain using acquired knowledge.				Y		Y						
CLO5	Create and design DSP algorithms.					Y	Y						

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understanding key theoretical principles of DSP, in a design procedure through design examples and case studies.	Lecture, Class Participation, Tutorials	CT, HW
CLO2	Analyze to determine the architecture of a DSP and some programming issues of DSP processor in real-time implementation.	Lecture, Group work, Discussion, Tutorials	ASG/PR, MT, F
CLO3	Evaluate the mathematical expression and graphical representation for understanding of DSP theory, and problems, applications.	Lecture, Group work, Discussion, Tutorials	CT, HW, MT, F
CLO4	Apply and analyze time domain, F-domain to z-domain, time domain to frequency domain using acquired knowledge.	Lecture, Group work, Discussion, Tutorials	CT, ASG, F
CLO5	Create and design signal processing algorithms.	Discussion, Group work	ASG/PR, Pr

CSE 4122: Digital Signal Processing Sessional

Course Details:

Course Code: CSE 4122	Course Title: Digital Signal Processing Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale of the Course

The Digital Signal Processing Sessional course is structured to implement different kinds of elementary signal functions (like Unit Step, Ramp, Exponential, Sine and Cosine sequences), Convolution of two sequences, Autocorrelation of sequences, LPF, FIR filters, IIR filters, System functions, DFT, DWT, etc.

Course Content

Developing program to implement different kinds of elementary signal functions (like Unit Step, Ramp, Exponential, Sine, and Cosine sequences); to find the convolution of two sequences, autocorrelation of sequences; to design Lowpass filter, FIR filters, IIR filters, System functions, DFT, DWT, etc.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To use the appropriate algorithms in appropriate situations	Y				Y							
CLO2	To choose the appropriate algorithm or approach based one scenario and constrains			Y									
CLO3	To implement the appropriate path finding algorithm to build a robot.		Y	Y									
CLO4	Understanding of machine learning algorithm to solve real world problem		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	To use the appropriate algorithms in appropriate situations	Lecture, Discussions and Practice	CE, MT, Q

CLO2	To choose the appropriate algorithm or approach based on scenario and constrains.	Lecture, Tutorials, Discussions	PR
CLO3	To implement the appropriate path finding algorithm to build a robot.	Lecture, Discussions, Practice	CE, MT, Q, F
CLO4	Understanding of machine learning algorithm to solve real world problem	Co-operative, Collaborative Method	PR
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4123: Data Science and Analytics

Course Details		
Course Code: CSE 4123	Course Title: Data Science and Analytics	Credits: 3.00 Contact Hours: 3.00
Rationale		
Data Science and Analytics course is intended deal with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions. Data science uses complex machine learning algorithms to build predictive models.		
Course Objectives:		
1. To learn the concepts, tools, techniques and the basic algorithms for modern data science. 2. To learn how to apply data mining algorithms to discover interesting knowledge and make good decisions in real-world applications 3. To summarize the past history of the data and predict the future trends of the data. 4. To prepare for the potential research career in data mining, machine learning, and other data science areas.		
Course Content		
Introduction to data science, Structured and unstructured data, Attributes and attributes types, Data Acquisition, Data Entry, Data Extraction etc.) Data Warehousing, Data Cleansing, Data Staging, Data Processing, Data Architecture, Data Mining, Clustering/Classification, Data Modeling, Data Summarization and Visualization. Analyze: Exploratory/Confirmatory, Predictive Analysis, Regression, Text Mining, Qualitative Analysis. Data Reporting, Data Visualization, Business Intelligence, Decision Making.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of the Data Science	Y											
CLO2	Discover and measure interesting patterns from different kinds of dataset.				Y								
CLO3	Apply the techniques of, regression, clustering, classification, association finding, feature selection and visualization to real world data.			Y									
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/ algorithms with respect to their accuracy		Y										
Y=Yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Comprehend the basic concepts of the Data Science	Lecture, Class Participation	CT, MT
CLO2	Discover and measure interesting patterns from different kinds of dataset.	Lecture, Group work, Discussion	MT, F
CLO3	Apply the techniques of, regression, clustering, classification, association finding, feature selection and visualization to real world data.	Lecture, Group work, Discussion	ASG, CT, MT, F
CLO4	Decide/Identify problems that can be addressed via data mining methods	Lecture, Group work, Discussion	ASG/PR, F

	and evaluate models/ algorithms with respect to their accuracy		
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4124: Data Science and Analytics Sessional

Course Details		
Course Code: CSE 4124	Course Title: Data Science and Analytics	Credits: 0.75 Contact Hours: 1.50
Rationale		
Introduction To Data Science Sessional course is intended deal with vast volumes of data using modern tools and techniques to find unseen patterns, derive meaningful information, and make business decisions through data pre-processing, data analysis and visualization. Data science uses complex machine learning algorithms to build predictive models.		
Course Objectives:		
1. To gain a working knowledge of the strengths and limitations of modern data science methods (algorithms) 2. To learn to identify problems that can profitably be addressed via data mining methods. 3. To learn how to set up data for data science experiments.		
Course Content		
Introduction to data science, Structured and unstructured data, Attributes and attributes types, Data Acquisition, Data Entry, Data Extraction etc.) Data Warehousing, Data Cleansing, Data Staging, Data Processing, Data Architecture, Data Mining, Clustering/Classification, Data Modeling, Data Summarization and Visualization. Analyze: Exploratory/Confirmatory, Predictive Analysis, Regression, Text Mining, Qualitative Analysis. Data Reporting, Data Visualization, Business Intelligence, Decision Making. Additionally, the course will provide limited exercises and practical experience with data mining related research.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)**	Program Learning Outcomes (PLOs)

	(Upon completion of the course, the students will be able to)	1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Gain a working knowledge of the strengths and limitations of modern data science methods (algorithms).	Y											
CLO2	Learn to identify problems that can profitably be addressed via data science methods.		Y										
CLO3	Learn how to set up data for data science experiments.			Y									

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Gain a working knowledge of the strengths and limitations of modern data science methods (algorithms).	Lecture, Class Participation	FT, Q
CLO2	Learn to identify problems that can profitably be addressed via data science methods.	Lecture, Group work, Discussion	ASG/PR
CLO3	Learn how to set up data for data science experiments.	Lecture, Group work, Discussion	PR

CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; MT-Mid Term, FT – Final Test

CSE 4129: Advanced Algorithms

Course Details		
Course Code: CSE 4129	Course Title: Advanced Algorithms	Credits: 3.00 Credit Hours: 3.00

Rationale

This course motivates to implement advanced methods of algorithmic design, analysis, and implementation. techniques that include amortization, randomization, word-level parallelism, bit scaling, dynamic programming, network flow, linear programming, fixed-parameter algorithms, approximation algorithms etc. to identify which algorithm will provide efficient result for a specific problem or context.

Course Content

Randomized Algorithms: Las Vegas and Monte Carlo Algorithms; Randomized Data Structures: Skip Lists; Amortized Analysis: Different methods, Applications in Fibonacci Heaps; Lower Bounds: Decision Trees, Information Theoretic Lower Bounds, Adversary Arguments; Approximation Algorithms: Approximation Schemes, Hardness of Approximation; Fixed Parameter Tractability: Parameterized Complexity, Techniques of designing Fixed Parameter Algorithms, Examples; Online Algorithms: Competitive Analysis, Online Paging Problem, k-server Problem; External Memory Algorithms; Advanced Data Structures: Linear and Non-linear Methods.

Mapping of Course Learing Outcomes (CLOs) with the Program Learing Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learing Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Select and explain a variety of algorithms with practical applications and the resource requirements of each.		Y								Y		
CLO2	Determine the most suitable algorithm for any given task and then apply it to the problem.				Y								
CLO3	Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable.	Y											

CLO4	Develop the communication skill by presenting topics on advanced algorithms.										Y		

Y=yes

Mapping of Course Learing Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Select and explain a variety of algorithms with practical applications and the resource requirements of each.	Lecture, Class Participation	CT
CLO2	Determine the most suitable algorithm for any given task and then apply it to the problem.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Develop the communication skill by presenting topics on advanced algorithms.	Lecture, Group work, Discussion	CT, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4130: Advanced Algorithms Sessional

Course Details		
Course Code: CSE 4130	Course Title: Advanced Algorithms Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course motivates to implement advanced methods of algorithmic design, analysis, and implementation. techniques that include amortization, randomization, word-level parallelism, bit scaling,		

dynamic programming, network flow, linear programming, fixed-parameter algorithms, approximation algorithms etc. to identify which algorithm will provide efficient result for a specific problem or context.

Course Content

Randomized Algorithms: Las Vegas and Monte Carlo Algorithms; Randomized Data Structures: Skip Lists; Amortized Analysis: Different methods, Applications in Fibonacci Heaps; Lower Bounds: Decision Trees, Information Theoretic Lower Bounds, Adversary Arguments; Approximation Algorithms: Approximation Schemes, Hardness of Approximation; Fixed Parameter Tractability: Parameterized Complexity, Techniques of designing Fixed Parameter Algorithms, Examples; Online Algorithms: Competitive Analysis, Online Paging Problem, k-server Problem; External Memory Algorithms; Advanced Data Structures: Linear and Non-linear Methods.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Select and explain a variety of algorithms with practical applications and the resource requirements of each.		Y								Y		
CLO2	Determine the most suitable algorithm for any given task and then apply it to the problem.				Y								
CLO3	Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable.	Y											
CLO4	Develop the communication skill by presenting topics on advanced algorithms.										Y		

Y=yes

Mapping of Course Learing Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Select and explain a variety of algorithms with practical applications and the resource requirements of each.	Lecture, Lab work	FT, ASG

CLO2	Determine the most suitable algorithm for any given task and then apply it to the problem.	Discussion, Lab work	FT, ASG
CLO3	Demonstrate adequate comprehension of the theory of intractability and prove when certain kinds of problems are intractable.	Lecture, Group work, Lab work	ASG
CLO4	Develop the communication skill by presenting topics on advanced algorithms.	Discussion, Group work	Q
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4131: Artificial Neural Networks and Fuzzy Systems

Course Details		
Course Code: CSE 4131	Course Title: Artificial Neural Networks and Fuzzy Systems	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to study the developing the skills to gain a basic understanding of neural network theory and fuzzy logic theory. It includes topics to develop and implement a basic trainable neural network and fuzzy logic system for a typical control, computing application or biomedical application.		
Course Content		
Introduction: Biological nervous system: the brain and neurons, Introduction to artificial neural network, Theory and application of Artificial neural networks and fuzzy logic. Learning Process: Error-Correction Learning, Memory Based Learning, Hebbian Learning, Boltzmann Learning, Statistical Learning Theory. Neuron Model and Network Architectures: Neuron Model, Network Architectures, Data Structures, Training Styles. Perceptron: Perceptron Convergence Theorem, Relation Between the Perceptron and Bayes Classifier for a Gaussian Environment, Perceptron Architecture, Creating a Perceptron, Learning Rules, Multilayer Perceptron, Batch Learning and On-Line Learning, Back-Propagation Algorithm, XOR		

Problem, Decision Rule, Differentiation, Hessian Matrix, Computer Experiment: Pattern Classification, Hessian and Its Role in On-Line Learning, Optimal Annealing and Adaptive Control of Learning Rate, Generalization, Approximations of Functions, Cross-Validation, Complexity Regularization and Network Pruning, Virtues and Limitations of Back-Propagation Learning, Convolutional Networks, Nonlinear Filtering.

Linear Filters: Mean Square Error, Linear System Design, Linear Networks with Delays, LMS Algorithm, Linear Classification, The Wiener Filter, Markov Model Portraying the Deviation of the LMS Algorithm from the Wiener Filter, The Langevin Equation: Characterization of Brownian Motion, Kushner's Direct-Averaging Method, Statistical LMS Learning Theory for Small Learning-Rate Parameter.

Backpropagation: Fundamentals, Faster Training, Back propagation algorithm, Variable Learning Rate, Resilient Backpropagation, Conjugate Gradient Algorithms, Line Search Routines, Quasi-Newton Algorithms, Levenberg-Marquardt, Reduced Memory Levenberg-Marquardt, Speed and Memory Comparison, Improving Generalization, Preprocessing and Postprocessing.

Control Systems: NN Predictive Control, NARMA-L2 (Feedback Linearization) Control, Model Reference Control.

Kernel Methods and Radial Basis Networks: Cover's Theorem on the Separability of Patterns, Radial Basis Functions, Radial basis network, K-Means Clustering, Recursive Least-Squares Estimation of the Weight Vector, Hybrid Learning Procedure for RBF Networks, Generalized Regression Networks, Probabilistic Neural Networks.

Support Vector Machines: Optimal Hyperplane for Linearly Separable Patterns, Optimal Hyperplane for Non-separable Patterns, Support Vector Machine Viewed as a Kernel Machine, Design of Support Vector Machines, XOR Problem.

Regularization Theory: Hadamard's Conditions for Well-Posedness, Tikhonov's Regularization Theory, Regularization Networks, Generalized Radial-Basis-Function Networks, Generalized Regularization Theory, Spectral Graph Theory, Laplacian Regularized Least-Squares Algorithm.

Principal-Components Analysis (PCA): Principles of Self-Organization, Self-Organized Feature Analysis, Principal-Components Analysis: Perturbation Theory, Hebbian-Based Maximum Eigenfilter, Hebbian-Based Principal-Components Analysis, Kernel Principal-Components Analysis, Kernel Hebbian Algorithm.

Self-Organizing and Learning Vector Quantization (LVQ) Nets: Self-organization map, Contextual Maps, Hierarchical Vector Quantization, Kernel Self-Organizing Map, Competitive Learning, Learning Vector Quantization Networks.

Stochastic Methods Rooted in Statistical Mechanics: Statistical Mechanics, Markov Chains, Metropolis Algorithm, Simulated Annealing, Gibbs Sampling, Boltzmann Machine, Logistic Belief Nets, Deep Belief Nets, Deterministic Annealing, Markov Decision Process, Q-Learning. Neurodynamics: Neurodynamic Models, Manipulation of Attractors as a Recurrent Network Paradigm, Hopfield Model, Cohen–Grossberg Theorem, Brain-State-In-A-Box Model, Strange Attractors and Chaos, Dynamic Reconstruction of a Chaotic Process. Recurrent Networks: Recurrent Network Architectures, Learning Algorithms, Learning Algorithms, Back Propagation Through Time, Real-Time Recurrent Learning, Elman Networks, Hopfield Network. Adaptive Filters and Adaptive Training: Linear Neuron Model, Adaptive Linear Network Architecture, Mean Square Error, LMS Algorithm, Adaptive Filtering, Failing Adaptive Linear (ADALINE) and Multiple Adaptive Linear (MADALINE) networks, Generating internal representation, Cascade correlation and counter propagation networks, Higher order and bi-directional associated memory, Lyapunov energy function, attraction basin, Probabilistic updates: simulated annealing, Boltzmann machine, Adaptive Resonance Theory (ART) network. ARTI. ART2. Fuzzy ART mapping (ARTMAF) networks. Kohonen feature. Learning Vector Quantization (LVQ) networks, State-Space Models, Kalman Filters, Kalman Filtering in Modeling of Brain Functions. Fuzzy System: Fuzzy set theory, Fuzzy relations, Fuzzy Logic controllers, Applications of fuzzy systems, Fuzzy neural networks, Fuzzy Applications: Fuzzy pattern recognition, fuzzy control systems. Applications of fuzzy neural systems; Fuzzy Inference, Fuzzy Non-linear Simulation: Fuzzy non-linear simulation, fuzzy decision making, cluster analysis, fuzzy c-means. Genetic algorithm and evolution compacting, Applications to control; Pattern recognition; Nonlinear system modeling, Speech and image processing.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understanding Neuron Model and Network Architectures, Perceptron.	Y											
CLO2	Evaluate Backpropagation, Linear Filters, Kernel Methods and Radial Basis Networks, Neurodynamic, Recurrent Networks, Fuzzy System.		Y										

CLO3	Apply ANN in Control Systems, PCA, Stochastic Methods Rooted in Statistical Mechanics, Convolution networks.				Y								

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy
CLO1	Understanding Neuron Model and Network Architectures, Perceptron.	Lecture, Tutorials, Discussions	CT, PR, ASG, F
CLO2	Evaluate Backpropagation, Linear Filters, Kernel Methods and Radial Basis Networks, Neurodynamic, Recurrent Networks, Fuzzy System.	Lecture, Tutorials, Discussions	MT, PR, ASG, F
CLO3	Apply ANN in Control Systems, PCA, Stochastic Methods Rooted in Statistical Mechanics, Convolution networks.	Lecture, Tutorials, Discussions	CT, PR, ASG, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4132: Artificial Neural Networks and Fuzzy Systems Sessional

Course Details:

Course Code: CSE 4132	Course Title: Artificial Neural Networks and Fuzzy Systems Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale:

This course is designed to study the developing the skills to gain a basic understanding of neural network theory and fuzzy logic theory. It includes topics to develop and implement a basic trainable neural network and fuzzy logic system for a typical control, computing application or biomedical application.

Course Content:

This course consists of two parts. In the first part, students will perform experiments to verify practically the theories and concepts learned in CSE 4131. In the second part, students will design simple systems using the principles learned in CSE 4131.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understanding Neuron Model and Network Architectures, Perceptron.	Y											
CLO2	Design Artificial Neural Network to solve complex engineering problems.		Y		Y								
CLO3	Evaluate the theoretical concepts implemented in practical systems.				Y								

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Understanding Neuron Model and Network Architectures, Perceptron.	Practical Experiments	Q, R, Pr
CLO2	Design Artificial Neural Network to solve complex engineering problems.	Practical Experiments	Q, R, Pr
CLO3	Evaluate the theoretical concepts implemented in practical systems.	Practical Experiments	Q, R, Pr

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4133: Fault Tolerant System

Course Details:

Course Code: CSE 4133	Course Title: Fault Tolerant System	Credits: 3.00 Credit Hours: 3.00

Rationale

This course motivates to implement a feature on a system that enables a system to continue with its operations even when there is a failure on one part of the system and helps in fault isolation through various failure detection mechanisms.

Objective

1. To detect and isolate faults on a system and design accordingly to achieve a fault tolerant system using different fault tolerance design techniques.
2. To test and analyses the faults in order to create a reliable and high-performance system.

Course Content

Introduction: Introduction of Fault Tolerant Systems and architectures; Goal and Application of Fault Tolerant computing, Fundamental Definitions, Design techniques to achieve fault Tolerance; Reliability Modelling Using Probability Theory; Detection: Fault detection and location in combinational and sequential circuits; Test: Fault test generation for combinational and sequential circuits; Fault modelling: Faults in memory, memory test pattern and reliability; Performance monitoring: self-checking circuits, burst error correction and triple modular redundancy, Defect: defect avoidance, defect circumvention, shield and hardening, yields enhancement, degradation Allowance;

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain underlying notions of fault tolerance and various aspect of typical design process.		Y										
CLO2	Analyze reliability of different types of systems.		Y										
CLO3	Recognize defect avoidance and circumvention.		Y										
CLO4	Identify methodologies of hardening systems.		Y										

CLO5	Develop the communication skill by presenting topics on Fault Tolerance.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Explain underlying notions of fault tolerance and various aspect of typical design process.	Lecture, Class Participation,	ASG
CLO2	Analyze reliability of different types of systems.	Lecture, Group work, Discussion	MT
CLO3	Recognize defect avoidance and circumvention.	Lecture, Group work, Discussion	F
CLO4	Identify methodologies of hardening systems.	Discussion, Group work	PR, Pr
CLO5	Develop the communication skill by presenting topics on Fault Tolerance.	Lecture, Group work, Discussion	PR

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4134: Fault Tolerant System Sessional

Course Details		
Course Code: CSE 4134	Course Title: Fault Tolerant System Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course motivates to practically implement a feature on a system that enables a system to continue with its operations even when there is a failure on one part of the system and helps in fault isolation through various failure detection mechanisms.		
Objective		

1. To detect and isolate faults on a system and design accordingly to achieve a fault tolerant system using different fault tolerance design techniques.
2. To test and analyses the faults in order to create a reliable and high-performance system.

Course Content

Introduction: Introduction of Fault Tolerant Systems and architectures; Goal and Application of Fault Tolerant computing, Fundamental Definitions, Design techniques to achieve fault Tolerance; Reliability Modelling Using Probability Theory; Detection: Fault detection and location in combinational and sequential circuits; Test: Fault test generation for combinational and sequential circuits; Fault modelling: Faults in memory, memory test pattern and reliability; Performance monitoring: self-checking circuits, burst error correction and triple modular redundancy, Defect: defect avoidance, defect circumvention, shield and hardening, yields enhancement, degradation Allowance.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain underlying notions of fault tolerance and various aspect of typical design process.		Y										
CLO2	Analyze reliability of different types of systems and apply defect avoidance strategy			Y									
CLO3	Implement hardening systems.		Y										

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Explain underlying notions of fault tolerance and various aspect of typical design process.	Lecture, Lab Participation	M, V
CLO2	Analyze reliability of different types of systems and apply defect avoidance strategy	Lecture, Group work, Discussion	Q, M, V
CLO3	Implement hardening systems.	Lecture, Group work, Discussion	PR, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; V – Viva, M- Mid Term Exam)

CSE 4135: Basic Multimedia Theory

<table>
<tr><td colspan="3">Course Details:</td></tr>
<tr><td>Course Code: CSE 4135</td><td>Course Title: Basic Multimedia Theory</td><td>Credits: 3.00
Contact Hours: 3.00</td></tr>
<tr><td colspan="3">Rationale</td></tr>
<tr><td colspan="3">This course motivates to study the architecture, different standards of compressing and coding a multimedia document; database, network and operating system issues, traffic and service issues, security issues and hence apply this knowledge to implement different multimedia applications.</td></tr>
<tr><td colspan="3">Objectives</td></tr>
<tr><td colspan="3">1. To apply different techniques and methods for developing secured and high-quality multimediaapplications for different context.
2. To recognize and analyse different issues - storing, indexing, resource management, scheduling, security etc. of multimedia applications.</td></tr>
<tr><td colspan="3">Course Content</td></tr>
<tr><td colspan="3">Multimedia systems: Introduction, Coding and compression standards, Architecture issues in multimedia; Operating systems issues in multimedia: real-time OS issues, synchronization, interrupt handling; Database issues in multimedia: indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia: Quality-of-service guarantees, resource reservation, traffic specification, shaping, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia: digital water making, partial encryption schemes for video streams; Multimedia applications: audio and video conferencing, video on demand, voice over IP.</td></tr>
</table>

<table>
<tr><td colspan="14">Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):</td></tr>
<tr><td rowspan="2">CLOs</td><td rowspan="2">Course Learning Outcomes (CLOs)
(Upon completion of the course, the students will be able to)</td><td colspan="12">Program Learning Outcomes (PLOs)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
</table>

CLO1	Understand the fundamental concepts like indexing and storing multimedia data for multimedia document.	Y											
CLO2	Analyse different techniques and problems for multimedia document.		Y										
CLO3	Discover and apply the knowledge acquired in developing multimedia applications – audio and video conferencing, video on demand, and voice over IP.			Y									
CLO4	Develop the communication skill by presenting topics on computer graphics.											Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the fundamental concepts like indexing and storing multimedia data for multimedia document.	Lecture	M, F
CLO2	Analyse different techniques and problems for multimedia document.	Lecture, Group work, Discussion	Q, M, F
CLO3	Discover and apply the knowledge acquired in developing multimedia applications – audio and video conferencing, video on demand, and voice over IP.	Lecture, Group work, Lab participation	PR, R
CLO4	Develop the communication skill by presenting topics on computer graphics.	Lecture, Group work, Discussion	Q, M, F

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4136: Basic Multimedia Theory Sessional

Course Details:

Course Code: CSE 4136	Course Title: Basic Multimedia Theory Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

This course motivates to study the architecture, different standards of compressing and coding a multimedia document; database, network and operating system issues, traffic and service issues, security issues and hence apply this knowledge to implement different multimedia applications.

Objectives

1. To apply different techniques and methods for developing secured and high-quality multimedia applications for different context.
2. To recognize and analyse different issues - storing, indexing, resource management, scheduling, security etc. of multimedia applications.

Course Content

Multimedia systems: Introduction, Coding and compression standards, Architecture issues in multimedia; Operating systems issues in multimedia: real-time OS issues, synchronization, interrupt handling; Database issues in multimedia: indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document; Networking issues in multimedia: Quality-of-service guarantees, resource reservation, traffic specification, shaping, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia: digital water making, partial encryption schemes for video streams; Multimedia applications: audio and video conferencing, video on demand, voice over IP.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the fundamental concepts like indexing and storing multimedia data for multimedia document.	Y											
CLO2	Analyse different techniques and problems for multimedia document.		Y										
CLO3	Discover and apply the knowledge acquired in developing multimedia applications –			Y									

	audio and video conferencing, video on demand, and voice over IP.												
CLO4	Develop the communication skill by presenting topics on computer graphics.											Y	
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the fundamental concepts like indexing and storing multimedia data for multimedia document.	Lecture	M, F
CLO2	Analyse different techniques and problems for multimedia document.	Lecture, Group work, Discussion	Q, M, F
CLO3	Discover and apply the knowledge acquired in developing multimedia applications – audio and video conferencing, video on demand, and voice over IP.	Lecture, Group work, Lab participation	PR, R
CLO4	Develop the communication skill bypresenting topics on computer graphics.	Lecture, Group work, Discussion	Q, M, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4137: Data and Network Security

Course Details		
Course Code: CSE 4137	Course Title: Data and Network Security	Credits: 3.00 Credit Hours: 3.00
Rationale		
The course covers principles and practice of cryptography and network security. The first half of the course focuses on cryptography (symmetric and public-key cryptographic protocols, key distribution, authentication, digital signature schemes). The second half focuses on network security (access control		

services and mechanisms for authentication, network security protocols, application layer security and secure network management).

Course Content

Data Security: Cryptography Overview and Terminologies.

Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, TransPLOsition Techniques, Steganography, Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles, Evaluation Criteria for AES, The AES Cipher, Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher, Placement of Encryption Function, Traffic Confidentiality, Key Distribution.

Number theory: Fields, algebraic closures, Integers - divisibility, primes, testing primes, factorization, Euclidean algorithm. Public-Key Encryption: Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management. Network Security. Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Authentication Protocols.

Network Security Practice: Kerberos, Pretty Good Privacy, S/Mime, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Web Security Considerations, Secure Socket Layer and Transport Layer Security. System Security: Intruders, Intrusion Detection, Password Management, Viruses and Related Threats, Virus Countermeasures, Firewalls.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify and describe cryptographic algorithms, compare their use and the issues of strength.	Y											
CLO2	Describe security threats and their countermeasures in software, computer systems, networks		Y										
CLO3	Apply the security fundamentals to management aspects of information and computer security.			Y									
CLO4	Develop the ability to compare and criticize computer security techniques										Y		

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	Delivery Methods and Activities	Assessment Methods
CLO1	Identify and describe cryptographic algorithms, compare their use and the issues of strength.	Lecture, Class Participation	CT, F, MT
CLO2	Describe security threats and their countermeasures in software, computer systems, networks	Lecture, Discussion, Group Work	CT, MT
CLO3	Apply the security fundamentals to management aspects of information and computer security.	Lecture, Discussion, Group Work	ASG
CLO4	Develop the ability to compare and criticize computer security techniques	Discussion, Group work	Pr/ASG
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Midterm Exam)			

CSE 4138: Data and Network Security Sessional

Course Details		
Course Code: CSE 4138	Course Title: Data and Network Security Sessional	Credits: 0.75 Credit Hours: 1.50
Rationale		
This course is designed to give practical knowledge on data security and network security to the students.		
Objective		
1. Understand vulnerability in a computer system. 2. Explain useful and common tools used by the attacker 3. Understand how to protect security of information.		
Course Content		
Laboratory works based on CSE 4137		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand basic concept of how to protect and design private network.			Y									
CLO2	Analyse a simulated organization's security needs based on known security threats and select appropriate security hardware, software, policies and configurations based on that analysis.	Y			Y								
CLO3	Use theoretical and practical knowledge in securing data transfer and authentication.			Y						Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Understand basic concept of how to protect and design private network.	Lecture, Lab Participation	M, F
CLO2	Analyse a simulated organization's security needs based on known security threats and select appropriate security hardware, software, policies and configurations based on that analysis.	Lecture, Group work, Discussion	Q, M, F
CLO3	Use theoretical and practical knowledge in securing data transfer and authentication.	Lecture, Group work, Discussion	PR, R

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4139: Machine Learning

Course Details		
Course Code: CSE 4139	Course Title: Machine Learning	Credits: 3.00 Contact Hours: 3.00

Rationale

The Machine Learning course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/ nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Course Content

Introduction to machine learning, Supervised, unsupervised and reinforcement learning, Unsupervised learning algorithms, Concept Learning, Decision Tree Learning, Attribute based and relational supervised learning algorithms, Artificial Neural network-based learning algorithms, Bayesian Learning, Evaluating Hypothesis, Genetic algorithm and genetic programming, Reinforcement learning algorithms, Computational learning theory.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Develop an appreciation for what is involved in learning models from data.	Y											
CLO2	Understand a wide variety of learning algorithms.	Y											
CLO3	Understand how to evaluate models generated from data and enhance the learning parameters to achieve maximum performance.		Y										
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and												Y

	report on the expected accuracy that can be achieved by applying the models.												

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Develop an appreciation for what is involved in learning models from data.	Lecture, Class Participation	CT
CLO2	Understand a wide variety of learning algorithms.	Lecture, Group work, Discussion	CT, MT, F
CLO3	Understand how to evaluate models generated from data and enhance the learning parameters to achieve maximum performance.	Lecture, Discussion	CT, MT, F
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.	Lecture, Group work, Discussion	ASG/PR, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4140: Machine Learning Sessional

Course Details

Course Code: CSE 4140	Course Title: Machine Learning Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

The Machine Learning course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Course Content

At the end of this sessional, students will have knowledge and skills on the following topics: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Develop an appreciation for what is involved in learning models from data.	Y											
CLO2	Understand a wide variety of learning algorithms.	Y											
CLO3	Understand how to evaluate models generated from data and enhance the learning parameters to achieve maximum performance.		Y										
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.												

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Develop an appreciation for what is involved in learning models from data.	Lecture, Tutorials, Group work, Discussion,	PR, R, Q
CLO2	Understand a wide variety of learning algorithms.	Lecture, Tutorials, Group work, Discussion,	PR, R, Q
CLO3	Understand how to evaluate models generated from data and enhance the learning parameters to achieve maximum performance.	Lecture, Tutorials, Group work, Discussion,	PR, R, Q
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.	Lecture, Tutorials, Group work, Discussion	T, PR, R, MT
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4141: Object Oriented Software Engineering

Course Details		
Course Code: CSE 4141	Course Title: Object Oriented Software Engineering	Credits: 3.00 Contact Hours: 3.00
Rationale		
The course is structured to cover fundamental and important topics in Object Oriented software engineering, such as information system analysis and design, modular software development approach, necessity of modular software development for handling real world projects, use of different UML (Unified Modeling Language) diagrams, software project management, emotional intelligence, importance of being team player, application of different software development model, software design pattern, code refactoring, object oriented software engineering, software quality assurance, software testing, apply the different standards and principles of Object Oriented software engineering in a real world project.		
Objective		

1. To understand the process of designing, building, and maintaining Object Oriented software systems.
2. To acquire the skill of applying different software development coding principles in an Object-Oriented software project.
3. To be able to manage a enterprise level Object Oriented software project and understand Object Oriented software evolution, testing approaches, quality assurance to ensure high standard/professional Object Oriented software

Course Content

Information System, Object Oriented Software Development Life Cycle, Information Gathering , Object Oriented Software requirement analysis, Modular Object Oriented software development approach, Object Oriented Programing (OOP) approach/philosophy, Class diagram and other different types UML diagram, Design Pattern, SOLID principles, Code refactoring, Agile Object Oriented software development approach, SCRUM: an agile framework , Project planning: time estimation/scheduling, Object Oriented Software testing strategies, Measures, Metrics and Indicators, Knowledge Discovery in Databases, Expert System, Business Intelligence System, Enterprise Resource Planning (ERP) system.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of Object-Oriented software development process.	Y											
CLO2	Analyze the user requirements, and designing different kind of system and architectural models for building Object Oriented software systems.			Y									
CLO3	Develop testing mechanisms for assuring Object Oriented software quality including the dependability and availability.		Y										
CLO4	Develop the communication skill by presenting topics on Object Oriented software engineering.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the essentials of Object-Oriented software development process.	Lecture, Tutorials, Group Work	T
CLO2	Analyze the user requirements, and designing different kind of system and architectural models for building Object Oriented software systems.	Lecture, Group work, Discussion	ASG, PR, F
CLO3	Develop testing mechanisms for assuring Object Oriented software quality including the dependability and availability.	Lecture, Group work, Discussion	ASG, PR, MT
CLO4	Develop the communication skill by presenting topics on Object Oriented software engineering.	Lecture, Group work, Discussion	ASG, PR, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4142: Object Oriented Software Engineering Sessional

Course Details		
Course Code: CSE 4142	Course Title: Object Oriented Software Engineering Sessional	Credits: 0.75 Contact Hours: 1.5
Rationale		
The Software Engineering Sessional course provides a practical experience on developing innovative enterprise solutions for real life problems by applying software engineering fundamentals which involve understanding the applicability of different software process models for different context, employing different software development standards like; design pattern, code refactoring etc., performing requirement analysis, designing system architecture as well as system models using unified modelling language, developing prototypes using prototyping tools and evaluating the prototype using test cases.		
Objectives		

1. To understand the process of designing, building, and maintaining Object Oriented software systems through a practical approach by having experience on developing Object Oriented software systems for solving real-life problems innovatively.
2. To acquire the skill of applying different Object-Oriented software development coding principles practically in an OOP software project along with project management and testing strategies.
3. To get familiar with documenting Object Oriented software process model, requirement analysis, system architecture, system models formally for a software system of programmable logic controllers.

Course Contents

Information System Design: Information and System; System Analysis and Systems Analyst; Information gathering techniques; Structured analysis of systems Feasibility Study: Concepts (abstraction, refinement, modularity and hierarchy) and classification, Introduction to modeling language (Use case diagram, Sequence diagram and Activity diagram), CLOst benefit analysis; Project scheduling; System design techniques; User interface design Software Engineering: Introduction to system engineering and software engineering; Software requirements analysis, modeling and specification; Software Designing: principals, models, design patterns and specification Software Testing: Objectives and principles, testability, testing design and implementation models and documentations, verification, validation and debugging; Quality factors and metrics for different software engineering phases; Software project management issues.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements and design the system model.		Y										
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes.			Y									
CLO4	Develop communication skill by presenting topics on software engineering.										Y		

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with the Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the essentials of software development process.	Lecture, Class Participation	T
CLO2	Analyze the user requirements and design the system model.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes	Lecture, Group work, Discussion	T, MT, F
CLO4	Develop the communication skill by presenting topics on software engineering.	Lecture, Group work, Discussion	T, MT, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4143: Basic Graph Theory

Course Details		
Course Code: CSE 4143	Course Title: Basic Graph Theory	Credits: 3.00 Credit Hours: 3.00
Rationale		
This corse is designed to provide a framework to model a large set of problems in CS for better mathematical structures and pairwise relations between objects		
Course Content		
Introduction: Graphs and their applications, Basic graph terminologies, Basic operations on graphs, Graph representations, Degree sequence and graphic sequence; Paths and Cycles: Paths, cycles and connectivity, Network flow, Euler tours, Hamiltonian cycles Ear decomposition; Trees: Trees and counting of trees, Distance in graphs and trees, graceful labelling, Matching and covering, Planar graphs, Digraphs, Graph coloring, Special classes of graphs.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn the standard uses of graphs as models and the fundamental theory about graphs with a sense of some of its modern applications	Y											
CLO2	Explain and discuss mathematical proofs, including an appreciation of why this is important.				Y								
CLO3	Formulate algorithms to solve problems with graph theories			Y									
CLO4	Develop the communication skill by presenting topics on operating systems.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy
CLO1	Learn the standard uses of graphs as models and the fundamental theory about graphs with a sense of some of its modern applications	Lecture, Class Participation	CT
CLO2	Explain and discuss mathematical proofs, including an appreciation of why this is important.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Formulate algorithms to solve problems with graph theories	Lecture, Group work, Discussion	CT, MT, F
CLO4	Develop the communication skill by presenting topics on operating systems.	Lecture, Group work, Discussion	CT, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4144: Basic Graph Theory Sessional

Course Details		
Course Code: CSE 4144	Course Title: Basic Graph Theory Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

This course is designed to provide a framework to model a large set of problems in CS for better mathematical structures and pairwise relations between objects.

Course Content

Introduction: Graphs and their applications, Basic graph terminologies, Basic operations on graphs, Graph representations, Degree sequence and graphic sequence; Paths and Cycles: Paths, cycles and connectivity, Network flow, Euler tours, Hamiltonian cycles Ear decomPLOsition; Trees: Trees and counting of trees, Distance in graphs and trees, graceful labelling, Matching and covering, Planar graphs, Digraphs, Graph coloring, Special classes of graphs.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn the standard uses of graphs as models and the fundamental theory about graphs with a sense of some of its modern applications	Y											
CLO2	Explain and discuss mathematical proofs, including an appreciation of why this is important.					Y							
CLO3	Formulate algorithms to solve problems with graph theories				Y								
CLO4	Develop the communication skill by presenting topics on operating systems.											Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**

CLO1	Learn the standard uses of graphs as models and the fundamental theory about graphs with a sense of some of its modern applications	Lecture, Lab work	FT, ASG
CLO2	Explain and discuss mathematical proofs, including an appreciation of why this is important.	Discussion, Lab work	FT, ASG
CLO3	Formulate algorithms to solve problems with graph theories	Lecture, Group work, Lab work	ASG
CLO4	Develop the communication skill by presenting topics on operating systems.	Discussion, Group work	Q
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4145: Bioinformatics

Course Details		
Course Code: CSE 4145	Course Title: Bioinformatics	Credits: 3.00 Contact Hours: 3.00
Rationale		
The field of computer science called bioinformatics is used to analyze whole-genome sequencing data. This involves algorithm, pipeline and software development, and analysis, transfer and storage/database development of genomics data.		
Course Content		
Introduction; Molecular biology basics: DNA, RNA, genes, and proteins; Graph algorithms: DNA sequencing, DNA fragment assembly, Spectrum graphs; Sequence similarity; Suffix Tree and variants with applications; Genome Alignment: maximum unique match, LCS, mutation sensitive alignments; Database search: Smith-Waterman algorithm, FASTA, BLAST and its variations; Locality sensitive hashing; Multiple sequence alignment; Phylogeny reconstruction; Phylogeny comparison: similarity and dissimilarity measurements, consensus tree problem; Genome rearrangement: types of genome		

rearrangements, sorting by reversal and other operations; Motif finding; RNA secondary structure prediction; Peptide sequencing; Population genetics; Recent Trends in Bioinformatics.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Exploring the knowledge of DNA & RNA creation.	Y											
CLO2	Implementation of different graph algorithms and DNA sequencing.	Y	Y										
CLO3	Analyzing the Genome matching.	Y											
CLO4	Applying different methods on population genetics.		Y	Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching- Learning Strategy	Assessment Strategy
CLO1	Exploring the knowledge of DNA & RNA creation.	Lecture, Class Participation	CT, MT
CLO2	Implementation of different graph algorithms and DNA sequencing.	Lecture, Discussion	CT, MT, F
CLO3	Analyzing the Genome matching.	Lecture, Discussion	CT, MT, F
CLO4	Applying different methods on population genetics.	Lecture, Group work, Discussion	ASG/Pr

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4146: Bioinformatics Sessional

Course Details		
Course Code: CSE 4146	Course Title: Bioinformatics Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale
The field of computer science called bioinformatics is used to analyze whole-genome sequencing data. This involves algorithm, pipeline and software development, and analysis, transfer and storage/database development of genomics data.

Course Content
Introduction; Molecular biology basics: DNA, RNA, genes, and proteins; Graph algorithms: DNA sequencing, DNA fragment assembly, Spectrum graphs; Sequence similarity; Suffix Tree and variants with applications; Genome Alignment: maximum unique match, LCS, mutation sensitive alignments; Database search: Smith-Waterman algorithm, FASTA, BLAST and its variations; Locality sensitive hashing; Multiple sequence alignment; Phylogeny reconstruction; Phylogeny comparison: similarity and dissimilarity measurements, consensus tree problem; Genome rearrangement: types of genome rearrangements, sorting by reversal and other operations; Motif finding; RNA secondary structure prediction; Peptide sequencing; Population genetics; Recent Trends in Bioinformatics.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Applying LCS and mutation sensitive alignments.	Y	Y										
CLO2	Analysing Smith-Waterman algorithm, FASTA, BLAST on genome database search.		Y	Y									
CLO3	Measure the similarity and dissimilarity of genome using Phylogeny comparison.	Y	Y										
CLO4	Prediction of RNA secondary genome sequence.		Y	Y									

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy
CLO1	Applying LCS and mutation sensitive alignments.	Lecture	Q, R, MT
CLO2	Analysing Smith-Waterman algorithm, FASTA, BLAST on genome database search.	Lecture, Discussion	Q, R, Pr, F
CLO3	Measure the similarity and dissimilarity of genome using Phylogeny comparison	Lecture, Discussion	Q, R, Pr, R, MT, F
CLO4	Prediction of RNA secondary genome sequence.	Lecture, Class Participation	Q, R, MT
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4147: Robotics

Course Details		
Course Code: CSE 4147	Course Title: Robotics	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course introduces the fundamentals of robotics design and development, the principles of robot kinematics, dynamics, motion planning, trajectory generation and control as well as plan and research complete robots for various industrial applications.		
Objective		
1. To explain the basics of robotic systems, robot design, development process and their vast applications. 2. To specify and analyse the simulation, modelling and drawbacks of a robotic system for an interactive complex environment. 3. To develop problem-solving skills.		
Course Content		
Introduction to robotics: overview of robot mechanisms, dynamics, and intelligent controls, planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-		

rigid body dynamics, 3D graphic simulation; Control design: actuators, and sensors; wireless networking, task modelling; Human-machine interface: embedded software mechanical design, rigid body velocity, Jacobean, inverse kinematics, redundant and parallel robots, trajectory control, face control and haptics, Micro and Nano-robotics: mobile robots. Human-robot interaction, Multi agents, fault diagnosis.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain with the concept development and key components of robotics technologies.	Y											
CLO2	Solve problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.			Y									
CLO3	Design and implement a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, software programming, simulation and modelling, control and obstacle avoidance in a complex and interactive environment.									Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Explain with the concept development and key components of robotics technologies.	Lecture, Tutorials, Group Work	CT

CLO2	Solve problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.	Lecture, Group work, Discussion	ASG, PR, MT
CLO3	Design and implement a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, software programming, simulation and modelling, control and obstacle avoidance in a complex and interactive environment.	Lecture, Group work, Discussion	F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4148: Robotics Sessional

Course Details		
Course Code: CSE 4148	Course Title: Robotics Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course introduces the fundamentals of robotics design and development, the principles of robot kinematics, dynamics, motion planning, trajectory generation and control as well as plan and research complete robots for various industrial applications.		
Objective		
1. To explain the basics of robotic systems, robot design, development process and their vast applications. 2. To specify and analyse the simulation, modelling and drawbacks of a robotic system for an interactive complex environment.		
Course Content		

Introduction to robotics: overview of robot mechanisms, dynamics, and intelligent controls, planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid body dynamics, 3D graphic simulation; Control design: actuators, and sensors; wireless networking, task modelling; Human-machine interface: embedded software mechanical design, rigid body velocity, Jacobean, inverse kinematics, redundant and parallel robots, trajectory control, face control and haptics, Micro and Nano-robotics: mobile robots. Human-robot interaction, Multi agents, fault diagnosis.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain with the concept development and key components of robotics technologies.	Y											
CLO2	Solve problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.			Y									
CLO3	Design and implement a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, software programming, simulation and modelling, control and obstacle avoidance in a complex and interactive environment.									Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Explain with the concept development and key components of robotics technologies.	Lecture, Lab Participation	M, F
CLO2	Solve problems in spatial coordinate representation and spatial transformation,	Lecture, Group work, Discussion	Q, M, F

	robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning.		
CLO3	Design and implement a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, software programming, simulation and modelling, control and obstacle avoidance in a complex and interactive environment.	Lecture, Group work, Discussion	PR, R
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4151: Mobile Computing and Applications

Course Details		
Course Code: CSE 4151	Course Title: Mobile Computing and Applications	Credits: 3.00 Contact Hours: 3.00
Rationale		
To introduces the design and implementation of mobile applications for mobile devices. Learn the basics of mobile application development using Android as the platform and Java and Kotlin as the programming language.		
Objective		
1. To know basic ideas of mobile computing. 2. To design and implementation of mobile applications for mobile devices 3. To develop problem solving skills.		
Course Content		
Installation and Configuration of application development tools: Java Software Development Kit (JDK), Android Software Development Kit (SDK), Android Studio, Android Virtual Device Manager, Genymobile, Android Debug Bridge, Android Device Drivers, Design and develop User Interfaces for the Android platform: Android Applications, Activities and Widgets, ActionBar Activities, Customizing		

Styles and Themes, Displaying images, Playing video and audio, UI Fragments and the Fragment Manage, Creating custom SurfaceViews and simple animation, Responding to touch events, Supporting different devices, localizations, orientations, API levels, and resolutions, XML resources, Launching Activities and passing information between Activities, Saving state information across important operating system events: The Activity Lifecycle, Saving data to external and internal storage, Shared preferences, Connecting to databases and sending SQL queries, Storing information in encrypted format Java/Kotlin programming concepts to Android app development: Extending classes, Overriding class methods, Adding new properties and methods to classes, Creating and implementing interfaces, Creating event listeners and responding to events, Tying Android XML resources to Java code, Creating Threads and Runnables for asynchronous event processing, Publishing & Security: Creating a Google Play Store account and preparing apps for the Play Store, Android manifests and permissions, APK contents, The Android security model.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To Install and configure Android application development tools.	Y				Y							
CLO2	To Design and develop user Interfaces for the Android platform.			Y		Y							
CLO3	To save state information across important operating system events competent with the characterization and architecture of mobile applications.	Y		Y									
CLO4	To apply Java and Kotlin programming concepts to Android application development.			Y		Y							
CLO5	Design/Develop real world project using Android platform.					Y				Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	To Install and configure Android application development tools.	Lecture, Lab Participation	M, F
CLO2	To Design and develop user Interfaces for the Android platform.	Lecture, Group work, Discussion	Q, M, F
CLO3	To save state information across important operating system events competent with the characterization and architecture of mobile applications.	Lecture, Group work, Discussion	PR, R
CLO4	To apply Java and Kotlin programming concepts to Android application development.	Lecture, Group work, Discussion	Q, M, F
CLO5	Design/Develop real world project using Android platform.	Lecture, Group work, Discussion	PR, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4152: Mobile Computing and Applications Sessional

Course Details		
Course Code: CSE 4152	Course Title: Mobile Computing and Applications Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
To introduces the design and implementation of mobile applications for mobile devices. Learn the basics of mobile application development using Android as the platform and Java and Kotlin as the programming language.		
Objective		

1. To know basic ideas of mobile computing.
2. To design and implementation of mobile applications for mobile devices
3. To develop problem solving skills.

Course Content

Installation and Configuration of application development tools: Java Software Development Kit (JDK), Android Software Development Kit (SDK), Android Studio, Android Virtual Device Manager, Genymobile, Android Debug Bridge, Android Device Drivers, Design and develop User Interfaces for the Android platform: Android Applications, Activities and Widgets, ActionBar Activities, Customizing Styles and Themes, Displaying images, Playing video and audio, UI Fragments and the Fragment Manage, Creating custom SurfaceViews and simple animation, Responding to touch events, Supporting different devices, localizations, orientations, API levels, and resolutions, XML resources, Launching Activities and passing information between Activities, Saving state information across important operating system events: The Activity Lifecycle, Saving data to external and internal storage, Shared preferences, Connecting to databases and sending SQL queries, Storing information in encrypted format Java/Kotlin programming concepts to Android app development: Extending classes, Overriding class methods, Adding new properties and methods to classes, Creating and implementing interfaces, Creating event listeners and responding to events, Tying Android XML resources to Java code, Creating Threads and Runnables for asynchronous event processing, Publishing & Security: Creating a Google Play Store account and preparing apps for the Play Store, Android manifests and permissions, APK contents, The Android security model.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To Install and configure Android application development tools.	Y				Y							
CLO2	To Design and develop user Interfaces for the Android platform.			Y		Y							
CLO3	To save state information across important operating system events competent with the characterization and architecture of mobile applications.	Y		Y									

CLO4	To apply Java and Kotlin programming concepts to Android application development.			Y		Y							
CLO5	Design/Develop real world project using Android platform.					Y				Y			

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	To Install and configure Android application development tools.	Lecture, Lab Participation	PR, R
CLO2	To Design and develop user Interfaces for the Android platform.	Lecture, Group work, Discussion	Q, M, F
CLO3	To save state information across important operating system events competent with the characterization and architecture of mobile applications.	Lecture, Group work, Discussion	PR, R
CLO4	To apply Java and Kotlin programming concepts to Android application development.	Lecture, Group work, Discussion	Q, F
CLO5	Design/Develop real world project using Android platform.	Lecture, Group work, Discussion	PR, F, R

CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4153: Digital System Design

Course Details

Course Code: CSE 4153	Course Title: Digital System Design	Credits: 3.00 Contact Hours: 3.00

Rationale

Digital System Design course deals with design of different components of basic computer and applying knowledge in the initial interfacing of basic computer.

Objectives

1. To provide a basic idea of the structure and interface of different components of Digital Computer Systems.
2. To understand and design microprocessor of basic computer.

Course Contents

Design using MSI and LSI components; Combinational and sequential circuit design with PLA's, Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: Accumulator design, Shifter design, ALU, memory and control unit – hardwired and micro-programmed, Microprocessor based designs; Design using special purPLOse controllers. Introduction to Simple as Possible (Microprocessor)- Architecture, Instruction Set, Design, Microprogramming, SAP-1, SAP-2; Introduction to Embedded Systems.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Design different components of a microcomputer like Accumulator, Shifter, ALU, RAM, Scratchpad, Memory,2 port-memory.	Y											
CLO2	Design a fully customized microprocessor with special features.				Y								
CLO3	Understand and describe how to design a digital system using various methods.		Y										
CLO4	Develop the communication skill by presenting topics on digital system design.								Y	Y			

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Design different components of a microcomputer like Accumulator, Shifter, ALU, RAM, Scratchpad, Memory,2 port-memory.	Lecture, Class Participation	CT
CLO2	Design a fully customized microprocessor with special features.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Understand and describe how to design a digital system using various methods.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Develop the communication skill by presenting topics on digital system design.	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4154: Digital System Design Sessional

Course Details		
Course Code: CSE 4154	Course Title: Digital System Design Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
Digital System Design course deals with design of different components of basic computer and applying knowledge in the initial interfacing of basic computer.		
Objectives		
1. To provide a basic idea of the structure and interface of different components of Digital Computer Systems. 2. To understand and design microprocessor of basic computer.		
Course Contents		

Design using MSI and LSI components; Combinational and sequential circuit design with PLA’s, Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: Accumulator design, Shifter design, ALU, memory and control unit – hardwired and micro-programmed, Microprocessor based designs; Design using special purPLOse controllers. Introduction to Simple as Possible (Microprocessor)- Architecture, Instruction Set, Design, Microprogramming, SAP-1, SAP-2; Introduction to Embedded Systems.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Design different components of a microcomputer like Accumulator, Shifter, ALU, RAM, Scratchpad, Memory,2 port-memory.	Y											
CLO2	Design a fully customized microprocessor with special features.				Y								
CLO3	Understand and describe how to design a digital system using various methods.		Y										
CLO4	Develop the communication skill by presenting topics on digital system design.								Y	Y			

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Design different components of a microcomputer like Accumulator, Shifter, ALU, RAM, Scratchpad, Memory,2 port-memory.	Lecture, Class Participation	CT
CLO2	Design a fully customized microprocessor with special features.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Understand and describe how to design a digital system using various methods.	Lecture, Group work, Discussion	CT, MT, F

CLO4	Develop the communication skill by presenting topics on digital system design.	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4155: Peripherals, Interfacing and Embedded Systems

Course Details:		
Course Code: CSE 4155	Course Title: Peripherals, Interfacing and Embedded Systems	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course introduces basic concepts and techniques used in interfacing a processor to other external devices and components. Its aim is to give sufficient knowledge of computer hardware components, its design and working principle and apply this knowledge in the real-world applications.		
Objectives		
1. To enable the students familiar to interface external components (peripherals, sensors, PPIs, PICs etc.) with computer systems. 2. To enhance the knowledge on basic working principle and different applications of basic microcomputer and microcontroller. 3. To enable the students capable of designing and constructing simple control system incorporating input/output to and from external devices. 4. To investigate in depth the microprocessor-based systems and understand usage of programmable logic controllers.		
Course Content		
Serial and parallel communication interface: I/O devices, Interfacing with different peripheral devices (Keyboard, Alphanumeric Display, LED), Interfacing Microcomputers: ports to high power devices, Interfacing to AC power devices, Interfacing microcomputer to motor, Embedded Systems, Different types Sensors and Transducers and its applications, Interface to A/D and D/A converters, Microcomputer based industrial process control system, DMA controller, Printer Interface, Disk and Tape Storage, Barcode Reader, USB interface, Sound Card.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Classify, identify and analyze that how the interface different types of external components work and communicate (Peripherals, sensors, PPIs, PICs etc.) with computer system.	Y											
CLO2	Apply and implement the external components in real life application and improve the results based on statistical analysis.			Y									
CLO3	Design programs to interface microprocessor to external devices and design 8051 microcontroller-based system.	Y											
CLO4	Develop communication skill by presenting topic on Peripherals, Interfacing and Embedded Systems.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Classify, identify and analyze that how the interface different types of external components work and communicate (Peripherals, sensors, PPIs, PICs etc.) with computer system.	Lecture	M, F
CLO2	Apply and implement the external components in real life application and improve the results based on statistical analysis.	Lecture, Group work, Discussion	Q, M, F

CLO3	Design programs to interface microprocessor to external devices and design 8051 microcontroller-based system.	Lecture, Group work, Lab participation	PR, R
CLO4	Develop communication skill by presenting topic on Peripherals, Interfacing and Embedded Systems.	Lecture, Group work, Discussion	Q, M, F
(CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4156: Peripherals, Interfacing and Embedded Systems Sessional

Course Details

Course Code: CSE 4156	Course Title: Peripherals, Interfacing and Embedded Systems Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

This course introduces basic concepts and techniques used in interfacing a processor to other external devices and components. Its aim is to give sufficient knowledge of computer hardware components, its design and working principle and apply this knowledge in the real-world applications.

Objectives

1. To enable the students familiar to interface external components (peripherals, sensors, PPIs, PICs etc.) with computer systems.
2. To enhance the knowledge on basic working principle and different applications of basic microcomputer and microcontroller.
3. To enable the students capable of designing and constructing simple control system incorporating input/output to and from external devices.
4. To investigate in depth the microprocessor-based systems and understand usage of programmable logic controllers.

Course Content

Sessional based on CSE 4155.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs)	Program Learning Outcomes (PLOs)

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Classify, identify and analyze that how the interface different types of external components work and communicate (Peripherals, sensors, PPIs, PICs etc.) with computer system.	Y											
CLO2	Apply and implement the external components in real life application and improve the results based on statistical analysis.			Y									
CLO3	Design programs to interface microprocessor to external devices and design 8051 microcontroller-based system.	Y											
CLO4	Develop communication skill by presenting topic on Peripherals, Interfacing and Embedded Systems.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Classify, identify and analyze that how the interface different types of external components work and communicate (Peripherals, sensors, PPIs, PICs etc.) with computer system.	Lecture	M, F
CLO2	Apply and implement the external components in real life application and improve the results based on statistical analysis.	Lecture, Group work, Discussion	Q, M, F

CLO3	Design programs to interface microprocessor to external devices and design 8051 microcontroller-based system.	Lecture, Group work, Lab participation	PR, R
CLO4	Develop communication skill by presenting topic on Peripherals, Interfacing and Embedded Systems.	Lecture, Group work, Discussion	Q, M, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4159: Web Architecture

Course Details:		
Course Code: CSE 4159	Course Title: Web Architecture	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course introduces basic concepts and techniques to understand the concepts, principles, strategies, and methodologies of web applications and development. Its aim is to give sufficient knowledge to familiarize with Web technologies and Web business models. After completion of the course, you are also able to understand and apply Web development processes.		
Objectives		
1. To understand the concepts, principles, strategies, and methodologies of web applications and development. 2. To familiarize with Web technologies and Web business models. 3. To able to understand and apply Web development processes.		
Course Content		
Introduction to Web Architecture: Web Applications, Characteristics of Web Applications Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Web Engineering Concepts, Evolution of web engineering. Web Application Architectures: Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures. Design and Software Design, Problems and Restrictions in Integrated Web Design, Presentation Design, Interaction Design, Navigation Design, designing a Link Representation, Designing Link Internals, Navigation and		

Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design. Testing Web Applications: Testing terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Approaches: Conventional Approaches, Agile Approaches, Test Scheme, Test Dimensions, Applying the Scheme to Web Applications Web Project Management: Understanding Scope, Refining Framework Activities, building a Web E-Team, Managing Risk, developing a Schedule, Managing Quality, Managing Change, Tracking the Project.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify the wider engineering issues that form the background to developing complex and evolving web application systems.		Y										
CLO2	Identify, document and analyze requirements for web application.		Y								Y		
CLO3	Develop a web application using server-side programming languages and components.			Y		Y							
CLO4	Apply the web engineering methodologies for web application development.					Y							
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Identify the wider engineering issues that form the background to developing complex and evolving web application systems.	Lecture	M, F
CLO2	Identify, document and analyze requirements for web application.	Lecture, Group work, Discussion	Q, M, F

CLO3	Develop a web application using server-side programming languages and components.	Lecture, Group work, Lab participation	Pr, R
CLO4	Apply the web engineering methodologies for web application development.	Lecture, Group work, Discussion	Q, M, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4160: Web Architecture Sessional

Course Details:		
Course Code: CSE 4160	Course Title: Web Architecture Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course introduces basic concepts and techniques to understand the concepts, principles, strategies, and methodologies of web applications and development. Its aim is to give sufficient knowledge to familiarize with Web technologies and Web business models. After completion of the course, you are also able to understand and apply Web development processes.		
Objectives		
1. To understand the concepts, principles, strategies, and methodologies of web applications and development. 2. To familiarize with Web technologies and Web business models. 3. To able to understand and apply Web development processes.		
Course Content		
Sessional based on CSE 4159.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Identify the wider engineering issues that form the background to developing complex and evolving web application systems.		Y										
CLO2	Identify, document and analyze requirements for web application.		Y								Y		
CLO3	Develop a web application using server-side programming languages and components.			Y		Y							
CLO4	Apply the web engineering methodologies for web application development.					Y							

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Identify the wider engineering issues that form the background to developing complex and evolving web application systems.	Lecture	M, F
CLO2	Identify, document and analyze requirements for web application.	Lecture, Group work, Discussion	Q, M, F
CLO3	Develop a web application using server-side programming languages and components.	Lecture, Group work, Lab participation	PR, R
CLO4	Apply the web engineering methodologies for web application development.	Lecture, Group work, Discussion	Q, M, F

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4161: Parallel Processing and Distributed System

Course Details		
Course Code: CSE 4161	Course Title: Parallel Processing and Distributed System	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course covers general introductory concepts in the design and implementation of parallel and distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing. The specific topics that this course will cover are: asynchronous/synchronous computation/communication, concurrency control, fault tolerance, GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI), MIMD/SIMD, multithreaded programming, parallel algorithms & architectures, parallel I/O, performance analysis and tuning, power, programming models (data parallel, task parallel, process-centric, shared/distributed memory), scalability and performance studies, scheduling, storage systems, and synchronization. Some of these topics are covered in more depth in the graduate courses focusing on specific sub-domains of distributed systems. This course involves lectures, programming assignments, and exams.		
Objective		
1. To know about parallel and distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing. 2. To know about asynchronous/synchronous computation/communication, concurrency control, fault tolerance, GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI), MIMD/SIMD, multithreaded programming, parallel algorithms & architectures, parallel I/O, performance analysis and tuning, power, programming models (data parallel, task parallel, process-centric, shared/distributed memory), scalability and performance studies, scheduling, storage systems, and synchronization. 3. To develop problem-solving skills.		
Course Content		
Distributed Systems, Linux, Parallel Processing, Detail discussion on parallel processing, Distributed System Models, Enabling Technologies, Jarvis & CUDA, Reevaluating Amdahl's Law in the Multicore Era, Multi/Many-Core Computing, Memory System Parallelism for Data –Intensive and Data-Driven Applications, Concurrent Average Memory Access Time, Pattern-Direct and Layout-Aware Replication		

Scheme for Parallel I/O Systems, Multi/Many-Core Computing, System Architectures, Parallel Programming, MapReduce, Cloud Computing.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	To know about parallel and distributed systems, covering all the major branches	Y		Y									
CLO2	Analyze Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.	Y	Y										
CLO3	Develop GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI).		Y										
CLO4	Develop the communication skill by presenting topics on Parallel programming language.										Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	To know about parallel and distributed systems, covering all the major branches	Lecture, Tutorials, Group Work	T
CLO2	Analyze Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.	Lecture, Group work, Discussion	ASG, PR, F

CLO3	Develop GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI).	Lecture, Group work, Discussion	ASG, PR, MT
CLO4	Develop the communication skill by presenting topics on Parallel programming language.	Lecture, Group work, Discussion	ASG, PR, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4162: **Parallel Processing and Distributed System Sessional**

Course Details		
Course Code: CSE 4162	Course Title: Parallel Processing and Distributed System Sessional	Credits: 0.75 Contact Hours: 1.5
Rationale		
This course covers general introductory concepts in the design and implementation of parallel and distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing. The specific topics that this course will cover are: asynchronous/synchronous computation/communication, concurrency control, fault tolerance, GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI), MIMD/SIMD, multithreaded programming, parallel algorithms & architectures, parallel I/O, performance analysis and tuning, power, programming models (data parallel, task parallel, process-centric, shared/distributed memory), scalability and performance studies, scheduling, storage systems, and synchronization. Some of these topics are covered in more depth in the graduate courses focusing on specific sub-domains of distributed systems. This course involves lectures, programming assignments, and exams.		
Objectives		

1. To know about parallel and distributed systems, covering all the major branches such as Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.
2. To know about asynchronous/synchronous computation/communication, concurrency control, fault tolerance, GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI), MIMD/SIMD, multithreaded programming, parallel algorithms & architectures, parallel I/O, performance analysis and tuning, power, programming models (data parallel, task parallel, process-centric, shared/distributed memory), scalability and performance studies, scheduling, storage systems, and synchronization.
3. To develop problem-solving skills.

Course Contents

Distributed Systems, Linux, Parallel Processing, Detail discussion on parallel processing, Distributed System Models, Enabling Technologies, Jarvis & CUDA, Reevaluating Amdahl's Law in the Multicore Era, Multi/Many-Core Computing, Memory System Parallelism for Data –Intensive and Data-Driven Applications, Concurrent Average Memory Access Time, Pattern-Direct and Layout-Aware Replication Scheme for Parallel I/O Systems, Multi/Many-Core Computing, System Architectures, Parallel Programming, MapReduce, Cloud Computing.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Analyze Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.					Y							
CLO2	Develop GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI).									Y			

CLO3	Develop the communication skill by presenting topics on Parallel programming language.										Y		

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Analyze Cloud Computing, Grid Computing, Cluster Computing, Supercomputing, and Many-core Computing.	Lecture, Class Participation	T
CLO2	Develop GPU architecture and programming, heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies, Message passing interface (MPI).	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Develop the communication skill by presenting topics on Parallel programming language.	Lecture, Group work, Discussion	T, MT, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4165: Computational Geometry

Course Details		
Course Code: CSE 4165	Course Title: Computational Geometry	Credits: 3.00 Contact Hours: 3.00
Rationale		
Computational Geometry introduces students to the essentials of Computational Geometry and presents an in-depth study of the fundamental geometric structures and techniques used in this field. Topics to be		

covered include geometric searching, convex hulls, proximity computations, intersections, arrangement and duality, visibility graph, and other special topics. Applications to problems from other fields such as Wireless and Mobile Computing, Computer Graphics, Computer Vision, Databases, Robotics, and VLSI design will also be discussed.

Objectives

1. To grasp the fundamental structures and techniques in computational geometry.
2. To strengthen students' ability of algorithms design and analysis.
3. To understand how to model problems in a geometric fashion.
4. To train students how to use geometric structures and techniques to solve simple or moderately difficult problems.

Course Content

Searching and geometric data structures, balanced binary search trees, priority-search trees, range searching, interval trees, segment trees, algorithms and complexity of fundamental geometric objects: polygon triangulation and art gallery theorem, polygon partitioning, convex-hulls in 2-and 3- dimension, dynamic convex-hulls, geometric intersection, line segment intersection and the plane sweep algorithm, intersection of polygons, proximity, Voronoi diagrams, Delunay triangulations, closest and furthest pair, visualization, hidden surface removal and binary space partition (BSP) trees, graph drawings, drawings of rooted trees (layering, radial drawing, HV-drawings, recursive winding), drawings of planar graphs (straight-line drawings, orthogonal drawing, visibility drawings), survey of recent developments in computational geometry.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate a knowledge of a broad range of fundamental structures and techniques in computational geometry.	Y											
CLO2	Identify, Demonstrate and apply their knowledge by analyzing problems in a geometric fashion for recognizing and employing (or proposing) effective solutions.		Y										

CLO3	Strengthen ability of algorithms design and analysis.			Y	Y								
CLO4	Training to use geometric structures and techniques to solve simple or moderately difficult problems.					Y							

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Demonstrate a knowledge of a broad range of fundamental structures and techniques in computational geometry.	Lecture, Class Participation, Tutorials	CT, ASG
CLO2	Identify, Demonstrate and apply their knowledge by analyzing problems in a geometric fashion for recognizing and employing (or proposing) effective solutions.	Lecture, Group work, Discussion, Tutorials	CT, ASG, MT, F
CLO3	Strengthen ability of algorithms design and analysis.	Lecture, Group work, Discussion, Tutorials	MT, F
CLO4	Training to use geometric structures and techniques to solve simple or moderately difficult problems.	Lecture, Group work, Discussion, Tutorials	PR, ASG, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; HW– Homework; Pr – Presentation; R – Report; MT- Mid Term Exam; F – Final Exam)

CSE 4166: Computational Geometry Sessional

Course Details		
Course Code: CSE 4166	Course Title: Computational Geometry Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

Computational Geometry introduces students to the essentials of Computational Geometry and presents an in-depth study of the fundamental geometric structures and techniques used in this field. Topics to be covered include geometric searching, convex hulls, proximity computations, intersections, arrangement and duality, visibility graph, and other special topics. Applications to problems from other fields such as Wireless and Mobile Computing, Computer Graphics, Computer Vision, Databases, Robotics, and VLSI design will also be discussed.

Objectives

1. To grasp the fundamental structures and techniques in computational geometry.
2. To strengthen students' ability of algorithms design and analysis.
3. To understand how to model problems in a geometric fashion.
4. To train students how to use geometric structures and techniques to solve simple or moderately difficult problems.

Course Content

Sessional based on CSE 4165.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate a knowledge of a broad range of fundamental structures and techniques in computational geometry.	Y		Y		Y							
CLO2	Identify, Demonstrate and apply their knowledge by analyzing problems in a geometric fashion for recognizing and employing (or proposing) effective solutions.	Y		Y									
CLO3	Prepare article, presentation and present on the topics of computer.	Y		Y									

Mapping of Course Learning Outcomes (CLOs) with Teaching-Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Demonstrate a knowledge of a broad range of fundamental structures and techniques in computational geometry	Lecture, Lab Participation	M, F
CLO2	Identify, Demonstrate and apply their knowledge by analyzing problems in a geometric fashion for recognizing and employing (or proposing) effective solutions.	Lecture, Group work, Lab Participation, Discussion	Q, M, F
CLO3	Prepare article, presentation and present on the topics of computational geometry.	Lecture, Group work, Discussion	PR, R
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; HW– Homework; Pr – Presentation; R – Report; M- Mid Term Exam; F – Final Exam)			

CSE 4171: Distributed Algorithms

Course Details		
Course Code: CSE 4171	Course Title: Distributed Algorithms	Credits: 3.00 Contact Hours: 3.00
Rationale		
The Distributed Algorithms course is designed to study of basic techniques in the design and development of Distributed Systems and understanding solutions of the fundamental problems in distributed systems. The course begins with different models of distributed computing and then covers essential concepts of distributed algorithms.		
Objective		
1. To understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency. 2. To apply the concepts to the example systems and algorithms.		

Course Content

Models of distributed computing: Synchrony communication, Failure concerns, Synchronous message passing; Distributed systems: Algorithms in systems with no failures-Leader Election, Breadth-First Search algorithms; The atomic commit problem: Consensus problems-the Byzantine Generals Problem; Asynchronous message-passing of distributed systems: Failure detectors I, Failure detectors II, Logical time Vector clocks: Routing algorithm.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency.	Y											
CLO2	Apply the concepts to the example systems and algorithms.		Y										
CLO3	Adapt and design algorithms for execution in parallel and distributed settings.		Y										
CLO4	Analyze the algorithms for correctness, reliability, security and performance.			Y									
CLO5	Be able to develop communication skill by presenting topics on distributed algorithms.							Y					

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency.	Lecture, Tutorials, Group Work	T
CLO2	Apply the concepts to the example systems and algorithms.	Lecture, Group work, Discussion	ASG, PR, F
CLO3	Adapt and design algorithms for execution in parallel and distributed settings.	Lecture, Group work, Discussion	ASG, PR, MT

CLO4	Analyze the algorithms for correctness, reliability, security and performance.	Lecture, Group work, Discussion	ASG, PR, F
CLO5	Be able to develop communication skill by presenting topics on distributed algorithms.	Lecture, Group work, Discussion	ASG, PR
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4172: Distributed Algorithms Sessional

Course Details		
Course Code: CSE 4172	Course Title: Distributed Algorithms Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

The Distributed Algorithms course is designed to study of basic techniques in the design and development of Distributed Systems and understanding solutions of the fundamental problems in distributed systems. The course begins with different models of distributed computing and then covers essential concepts of distributed algorithms.

Objective

1. To understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency.
2. To apply the concepts to the example systems and algorithms.

Course Content

Models of distributed computing: Synchrony communication, Failure concerns, Synchronous message passing; Distributed systems: Algorithms in systems with no failures-Leader Election, Breadth-First Search algorithms; The atomic commit problem: Consensus problems-the Byzantine Generals Problem; Asynchronous message-passing of distributed systems: Failure detectors I, Failure detectors II, Logical time Vector clocks: Routing algorithm.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency.	Y											
CLO2	Apply the concepts to the example systems and algorithms.		Y										
CLO3	Adapt and design algorithms for execution in parallel and distributed settings.		Y										
CLO4	Analyze the algorithms for correctness, reliability, security and performance.			Y									
CLO5	Be able to develop communication skill by presenting topics on distributed algorithms.							Y					

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the limitations and fundamental concepts in the area of message passing and shared memory concurrency.	Lecture, Tutorials, Lab Work	M, F
CLO2	Apply the concepts to the example systems and algorithms.	Lecture, Group work, Discussion	Q, M, F
CLO3	Adapt and design algorithms for execution in parallel and distributed settings.	Lecture, Group work, Discussion	Q, M, F
CLO4	Analyze the algorithms for correctness, reliability, security and performance.	Lecture, Group work, Discussion	Q, M, F
CLO5	Be able to develop communication skill by presenting topics on distributed algorithms.	Lecture, Group work, Discussion	PR, R

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

LEVEL-4, TERM-II

CSE 4000: Project / Thesis*

Course Details

Course Code: CSE 4000	Course Title: Project / Thesis*	Credits: 3.00 Contact Hours: 6.00

Rationale

Culminating demonstration of skills and knowledge achieved to date to apply and solve real life problems solvable through computer technology.

Objective

To apply technical knowledge and skills for further research and design of computer system at professional engineering scale.

Course Content

This course is a continuation of the course CSE 4000 from the previous semester. A student has to complete the defense project proposal, submit it by the end of the semester and make an oral defense of the project or thesis.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Select, analyze, classify a particular field to do research.	Y	Y										
CLO2	Solve real life complex problems.			Y			Y			Y			
CLO3	Explain and describe the time-cost estimation and ethical values.				Y	Y	Y						

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**

CLO1	Select, analyze, classify a particular field to do research	Consulting with Supervisor	Defense, Publication
CLO2	Solve real life complex problems	Consulting with Supervisor	Project
CLO3	Explain and describe the time-cost estimation and ethical values.	Consulting with Supervisor	Project
PE-Project Engagement, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4215: Professional Issues and Ethics for Computer Science

Course Details		
Course Code: CSE 4215	CSE 4215: Professional Issues and Ethics for Computer Science	Credits: 2.00 Contact Hours: 2.00
Rationale		
The Professional Issues and Ethics in Computer Science course introduces the fundamental Professional Ethics, various legal system issues and Dispute Resolutions. It helps to develop baseline knowledge to professional ethics to solve real world problems. This Course begins with introductory concepts of Professional issues and then covers other important topics such as Professional Ethics, Legal System, privacy, Free speech, Feminism, Green Computing etc.		
Objective		
1. To know about Professional issues and technical ethics in various real-world Scenarios. 2. To know about various legal issues in Information System. 3. To develop knowledge about Internet Governance and Dispute Resolutions		
Course Content		
An introduction to professionalism: Profession and vocation, Prestigious position for professionals An introduction to ethics: Philosophy, ethics, and applied ethics Theories in ethics: Golden rule, utilitarian principle, Kant’s categorical imperative, Descartes’ rule of change, Risk aversion principle, avoid hard An introduction to computer ethics: Common computer ethics fallacies: Computer game fallacy, law		

abiding citizen fallacy, shatterproof fallacy, candy-from-a–baby fallacy An introduction to legal systems: Law, moral, norms, and ethics Judiciary, legislature, executive, and separation of power Common law and civil law Criminal law and civil law An introduction to legal issues in information systems: Intellectual property: Trademarks, patents, copy rights, Passing off, masquerading Software licensing issues: Creative commons, Open source free software movements, Discussion on recent cases Computer evidence Privacy: Personal information, Data protection principles, Knowledge and consent in the Internet Free speech: Internet governance, Anonymity, Public disclosure, Defamation, Un-solicitation Dispute resolutions: Contracts- Memorandum of Understanding (MoU), Non-Disclosure Agreement (NDA), User agreements, Liabilities, Vicarious liability, Warranty and maintenance , Global warming, Green computing, Rights of employees, Feminism.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs.	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Recognize social and legal context of various Engineering applications.						Y						
CLO2	Apply various ethical principles to carry out real life professional Responsibilities.								Y				
CLO3	Develop the communication skill by writing effective reports and presenting topics on various Engineering activities										Y		
CLO4	Recognize the broadest context of technological change in life-long learning.												Y

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**

CLO1	Recognize social and legal context of various Engineering applications.	Lecture, Class Participation	CT, M
CLO2	Apply various ethical principles to carry out real life professional Responsibilities.	Lecture, Group work, Discussion	M, F, ASG
CLO3	Develop the communication skill by writing effective reports and presenting topics on various Engineering activities	Lecture, Group work, Discussion, Paper reading	ASG, CT, F
CLO4	Recognize the broadest context of technological change in life-long learning.	Paper Reading, Discussion, Group work, Presentation	ASG, CT, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

HUM 4273: Financial, Cost and Managerial Accounting

Course Details		
Course Code: HUM 4273	Course Title: Financial, Cost and Managerial Accounting	Credits: 2.00 Contact Hours: 2.00
Rationale		
This course is designed to teach about fundamental concepts and practice of Financial, Cost and Managerial Accounting.		
Course Content		
Financial Accounting: Basic Accounting Concepts; Accounting as an Information System; Computerized Accounting System; Conceptual Framework of Accounting; Double Entry Mechanism; Accounting Equation; Introduction to Journal Accounting; Posting to Ledger Accounts; Preparing Trial Balance; Adjusting Entries, preparing an Adjusted Trial Balance; Preparing Financial Statements; Financial Statements Analysis & Interpretation. Cost and Management Accounting: Cost Concepts, Cost		

Classifications & Cost Functions; Job Order Costing & Preparing Job Cost Sheet; Cost Allocation; Cost Volume Pro-t Analysis; Variable Costing Vs. Absorption Costing; Short Term Investment Decision: Relevant & Differential Cost Analysis; Long-term Investment Decision: Capital Budgeting; Working Capital Management; Linear Programming for Management Decision.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic economic principle and their applications.												Y
CLO2	Generate important insights into individual and aggregate behaviour and relationships, and help in society efforts to use scarce resources in a more efficient manner.				Y								
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.												Y
CLO4	Discuss, describe and interpret a financial accounting, managerial accounting and understand how the related reporting might be affected by a particular (Creative) business.											Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic economic principle and their applications.	Lecture, Class Participation	T, MT, F
CLO2	Generate important insights into individual and aggregate behavior and relationships, and help in society efforts to	Lecture, Group work, Discussion	T, MT, F, ASG

	use scarce resources in a more efficient manner.		
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.	Lecture, Group work, Discussion	T, MT, F
CLO4	Discuss, describe and interpret a financial accounting, managerial accounting and understand how the related reporting might be affected by a particular (Creative) business	Lecture, Group work, Discussion	T, MT, F, ASG
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

IPE 4297: Industrial Management

Course Details		
Course Code: IPE 4297	Course Title: Industrial Management	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course provides different concepts of management through integration of financial aspects, quality, innovation, technology as well as marketing strategies. The focus is to illustrate practical engineering applications in industries. Students will obtain an in-depth knowledge in management, quality, decision making, and technologies related to an organization. Upon completion of this course, students will understand the role of an industrial engineer in an industry. The learning approach is to apply theoretical knowledge in the practical field and analyze existing problems to provide appropriate solutions. Students will achieve knowledge of quality control and ways of improving production with the use of different tools and techniques.		
Course Content		

Management Principles: Principles of Management; Financial Principles; Management of Innovation; Technology Strategy; Best Management Practices.

Marketing Management: Sales and Marketing; Ratio Analysis; Prelude Lobster; Designing and Building Yachts; Commoditization vs. Differentiation.

Quality Management: Total Quality Management.

Entrepreneurship and Business: Entrepreneurship; Strategic Planning and Management of Technology; Teradyne Business Plan.

Management information System: MIS; Introduction, Decision Support Systems, MIS in decision making, Development of communication skills.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic economic principle and their applications.												Y
CLO2	Generate important insights into individual and aggregate behavior and relationships, and help in society efforts to use scarce resources in a more efficient manner.				Y								
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.												Y
CLO4	Discuss, describe and interpret a financial accounting, managerial accounting and understand how the related reporting might be affected by a particular (Creative) business											Y	

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Understand the basic economic principle and their applications.	Lecture, Class Participation	Q, F
CLO2	Generate important insights into individual and aggregate behavior and relationships, and help in society efforts to use scarce resources in a more efficient manner.	Lecture, Group work, Discussion	Q, ASG, F
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.	Lecture, Group work, Discussion	Q, F
CLO4	Discuss, describe and interpret a financial accounting, managerial accounting and understand how the related reporting might be affected by a particular (Creative) business	Lecture, Group work, Discussion	Q, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

OPTIONAL III AND IV

CSE 4221: Applied Statistics and Queuing Theory

Course Details		
Course Code: CSE 4221	Course Title: Applied Statistics and Queuing Theory	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course will provide students with in-depth knowledge, skills and understanding in the areas of Applied Statistics and Queuing Theory and a range of techniques, conceptual models and tools to develop into professionals in the areas of 'Data, Information and Knowledge Management', This course also covers the fundamental theories of statistics and applies them on different practical applications in the field of information technology, data sets, and analyses their effects. In addition to the implementation of queuing models in a computer science context will also be discussed.		
Course Content		
Introduction: Statistics and its Importance, Population and Sample, Variable and Constants, Statistical Data, Data Collection and Presentation, Construction of Frequency Distribution and Graphical Presentation. Measures of Central Tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Weighted Mean. Measures of Dispersion: Range, Standard Deviation, Variance, Moments, Skewness and Kurtosis. Correlation Theory: Linear Correlation and its Measures and Significance, Rank Correlation. Regression Analysis: Linear and Non-Linear Regression, Least-Square Method of Curve Fittings. Probability: Elementary Concepts, Laws of Probability – Additive and Multiplicative Law, Conditional Probability and Bayes Theorem, Random Variables, Mathematical Expectation. Probability Distributions: Binomial Distribution, Poisson Distribution and Normal Distribution. Queuing Theory: Stochastic Processes, Discrete Time Markov Chain and Continuous Time Markov Chain. Birth-Death Process in Queuing. Queuing Models: M/M/1, M/M/C, M/G/1, M/D/1, G/M/1 Solution of Network of Queue-Closed Queuing Models and Approximate Models. Application of Queuing Models in Computer Science.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Understand the basic theories of applied statistics.	Y											
CLO2	Classify, interpret, infer, and test applied statistics theories and problems with no particular solution.	Y											
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology.		Y										
CLO4	Decide/Identify problems that can be addressed via queuing theory and evaluate models with respect to their accuracy apply and apply in real-life applications for information technology.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand the basic theories of applied statistics.	Lecture, Class Participation	CT
CLO2	Classify, interpret, infer, and test applied statistics theories and problems with no particular solution.	Lecture, Group work, Discussion	CT, MT, F
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology	Lecture, Group work, Discussion	ASG, CT, MT, F
CLO4	Decide/Identify problems that can be addressed via queuing theory and evaluate models with respect to their accuracy apply and apply in real-life applications for information technology.	Lecture, Group work, Discussion	ASG/Pr, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4222: Applied Statistics and Queuing Theory Sessional

Course Details		
Course Code: CSE 4222	Course Title: Applied Statistics and Queuing Theory Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
Applied Statistics and Queuing Theory Sessional is intended to covers the fundamental theories of statistics and queuing models and applies them on different practical applications in the field of information technology, data sets, and analyses their effects.		
Course Content		
Laboratory works based on CSE 4221.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic theories of applied statistics.	Y											
CLO2	Classify, interpret, infer, and test applied statistics theories and problems with no particular solution.	Y											
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology.		Y										
CLO4	Decide/Identify problems that can be addressed via queuing theory and evaluate models with respect to their accuracy apply and apply in real-life applications for information technology.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)**	**Teaching- Learning Strategy**	**Assessment Strategy**

	(Upon completion of the course, the students will be able to)		
CLO1	Understand the basic theories of applied statistics.	Lecture, Class Participation	Q
CLO2	Classify, interpret, infer, and test applied statistics theories and problems with no particular solution.	Lecture, Group work, Discussion	Q, MT, F
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology.	Lecture, Group work, Discussion	ASG, MT, F
CLO4	Decide/Identify problems that can be addressed via queuing theory and evaluate models with respect to their accuracy apply and apply in real-life applications for information technology.	Lecture, Group work, Discussion	ASG/PR, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4223: Cyber Security and Blockchain

Course Details		
Course Code: CSE 4223	Course Title: Cyber Security and Blockchain	Credits: 3.00 Contact Hours: 3.00
Rationale		
To teach students the basics of security issues relating to various aspect of cyber security systems those considered critical infrastructure systems and apply appropriate security technologies and methods to ensure the overall security of the system. The course will also introduce Blockchain technology and its application to Computer Science. The Basic Cryptographic primitives used in Blockchain and then covers, Basic Distributed System concepts, Basic Blockchain (Blockchain 1.0), Blockchain 2.0, Blockchain 3.0, Beyond Crypto currency, Limitations of blockchain as a technology.		
Objective		
1. To examine the architecture of a complex cyber security system and Blockchain technology. 2. To identify significant vulnerabilities and threats, and apply appropriate security technologies and methods to ensure the overall security of the system. 3. To study advanced cyber security principles and best practices are applied to develop a comprehensive cyber defense program for an enterprise against cyber threats. 4. To introduce the application of Blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms.		
Course Content		
Cyber Security : Fundamental concepts of computer security, Well-known attack types and vulnerabilities, Social engineering attacks, Cryptography and classical cryptosystems, Authentication protocols and Public Key Infrastructure, IPSec, VPNs, E-commerce issues, Attack classification and vulnerability analysis, Security models and policy issues, Security evaluation and auditing of networked systems, Intrusion Detection, Prevention, Response, Containment (Digital forensic evidence) and Disaster Recovery, Network defense tools: Firewalls, VPNs, Intrusion Detection, and filters. Blockchain : Need for Distributed Record Keeping, Modelling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Technologies Borrowed in Blockchain, Basic Distributed Computing, Basic Crypto primitives, Blockchain 1.0: Bitcoin blockchain, Blockchain 2.0: Ethereum and Smart Contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts; Blockchain 3.0: Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain; Privacy, Security issues in Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchain .		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Interpret the basic concepts related to computer security, cryptography and blockchain technology, and identify security vulnerabilities of networked systems.	Y											
CLO2	Analyse the requirements of a comprehensive security plan for an organization and apply cybersecurity principles and methods to defend an information system against cyber threats.		Y										
CLO3	Design and customize a comprehensive security plan by integrating network defense tools and measures.			Y									
CLO4	Develop the communication skills by presenting different topics on blockchain.										Y		
Y=Yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Interpret the basic concepts related to computer security, cryptography and blockchain technology, and identify security vulnerabilities of networked systems.	Lecture, Lab Participation	M, F
CLO2	Analyse the requirements of a comprehensive security plan for an organization and apply cybersecurity principles and methods to defend an information system against cyber threats.	Lecture, Group work, Discussion	Q, M, F

CLO3	Design and customize a comprehensive security plan by integrating network defense tools and measures.	Lecture, Group work, Discussion	ASG, PR, R
CLO4	Develop the communication skills by presenting different topics on blockchain.	Lecture, Group work, Discussion	ASG, PR, R
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4224: Cyber Security and Blockchain Sessional

Course Details		
Course Code: CSE 4224	Course Title: Cyber Security and Blockchain Sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

To teach students the practical aspects of security issues and solutions relating to various cyber space those considered critical infrastructure systems as well as cryptography and blockchain technology which includes various crypto currency like Bitcoin, Ethereum.

Objective

1. To practice examining the architecture of a complex cyber security system and cryptographic primitives used in Blockchain.
2. To use methods to identify significant vulnerabilities and threats in physical systems.
3. To apply advanced cybersecurity principles to develop a comprehensive cyber defense program.
4. To develop the communication skills by presenting different topics on blockchain.

Course Content

Concepts and Principles of Cyber and Physical security; Security Breaches and Defenses in CPS; Types of attack and attacker, range of systems; Security of payment gateways: Card security, EMV payment systems, GSM and SIM cards; Wired and WiFi network security; Examples of weak cryptosystems: GSM, WEP; Infrastructure attacks: smart grids; Hardware Trojans and Trustworthy IC design. Blockchain technology and its application to Computer Science, Cryptographic primitives used in Blockchain and then covers, Basic Distributed System concepts, Basic Blockchain (Blockchain 1.0), Blockchain 2.0, Blockchain 3.0, Beyond Cryptocurrency.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**
CLO1	Demonstrate knowledge and understanding of the range of cyber physical and software systems which present potential security hazards.	Y										
CLO2	Understand and recognize instances of the principal attacks on such systems.				Y							
CLO3	Take appropriate measures to protect systems from security breaches.							Y				
CLO4	Develop the communication skills by presenting different topics on blockchain.										Y	

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Demonstrate knowledge and understanding of the range of cyber physical and software systems which present potential security hazards.	Lecture, Class Participation	MT, FT, Q
CLO2	Understand and recognize instances of the principal attacks on such systems.	Lecture, Group work, Discussion	MT, FT, Q
CLO3	Take appropriate measures to protect systems from security breaches.	Lecture, Group work, Discussion	ASG/PR
CLO4	Develop the communication skills by presenting different topics on blockchain.	Lecture, Class Participation	ASG, PR, R

CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; MT-Mid Term, FT – Final Test

CSE 4227: Pattern Recognition

Course Details		
Course Code: CSE 4227	Course Title: Pattern Recognition	Credits: 3.00 Contact Hours: 3.00

Rationale

This course motivates to recognize patterns, regularities and also irregularities in data by using various pattern recognition algorithms and techniques to find useful information for science, business and organizational decisions as well as contributing to the field of machine learning, data mining and artificialintelligence.

Objectives

1. To provide a comprehensive introduction to pattern recognition techniques leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. To specify sectors and context where the application of pattern recognition can provide a fruitful solution.

Course Contents

Introduction to pattern recognition: Statistical and Neural Pattern Recognition, Bayesian decision theory; Classifiers: Linear classifiers, Nonlinear classifiers; Estimation Techniques: Parametric estimation techniques; non-parametric estimation techniques; Methods and Models: Template matching, Dynamic programming methods, correlation methods, Hidden Markov model, Support vector machine, Syntactic pattern recognition, Clustering algorithms, Principle component analysis.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify areas where pattern recognition techniques can offer a solution.	Y											
CLO2	Analyze the strength and limitations of some techniques used in pattern recognition for classification, regression and density estimation problems.		Y										
CLO3	Solve problems in regression and classification.		Y										

CLO4	Develop communication skill by presenting topics on pattern recognition.									Y			

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with the Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching Learning Strategy	Assessment Strategy
CLO1	Identify areas where pattern recognition techniques can offer a solution.	Lecture, Class Participation	CT
CLO2	Analyze the strength and limitations of some techniques used in pattern recognition for classification, regression and density estimation problems.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Solve problems in regression and classification.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Develop communication skill by presenting topics on pattern recognition.	Lecture, Group work, Discussion	ASG/PR, Pr, F

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4228: Pattern Recognition Sessional

Course Details		
Course Code: CSE 4228	Course Title: Pattern Recognition Sessional	Credits: 0.75 Contact Hours: 1.5

Rationale

This course motivates to recognize patterns, regularities and also irregularities in data by using various pattern recognition algorithms and techniques to find useful information for science, business and organizational decisions as well as contributing to the field of machine learning, data mining and artificial intelligence.

Objectives

1. To provide a comprehensive introduction to pattern recognition techniques leading to the ability to understand contemporary terminology, progress, issues, and trends.
2. To specify sectors and context where the application of pattern recognition can provide a fruitful solution.

Course Contents

Introduction to pattern recognition: Statistical and Neural Pattern Recognition, Bayesian decision theory; Classifiers: Linear classifiers, Nonlinear classifiers; Estimation Techniques: Parametric estimation techniques; non-parametric estimation techniques; Methods and Models: Template matching, Dynamic programming methods, correlation methods, Hidden Markov model, Support vector machine, Syntactic pattern recognition, Clustering algorithms, Principal component analysis.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify areas where pattern recognition techniques can offer a solution.	Y											
CLO2	Analyze the strength and limitations of some techniques used in pattern recognition for classification, regression and density estimation problems.		Y										
CLO3	Solve problems in regression and classification.		Y										
CLO4	Develop communication skill by presenting topics on pattern recognition.									Y			

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching Learning Strategy**	**Assessment Strategy**
CLO1	Identify areas where pattern recognition techniques can offer a solution.	Lecture, Class Participation	CT

CLO2	Analyze the strength and limitations of some techniques used in pattern recognition for classification, regression and density estimation problems.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Solve problems in regression and classification.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Develop communication skill by presenting topics on pattern recognition.	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4229: Telecommunication Engineering

Course Details		
Course Code: CSE 4229	Course Title: Telecommunication Engineering	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course is designed to make the students understand the fundamentals of switching and networking principles used in telecommunication systems. They will understand the working principle and design of early automatic switching systems such as Strowger and crossbar switching as well as the concepts of telephone networks. They will also be able to learn the basic operations of electronic switching systems and resource sharing by multiplexing, to understand the computer-controlled switching systems, and to know the concepts of traffic engineering such as GoS, QoS and performance analysis based on queuing theory.		
Course Content		
Introduction: Simple telephone communication, Basic switching system, Transmission bridge, Subscriber line circuit, CB cord circuit, Junction working. Strowger Switching Systems: Relay dial telephone, signaling tones, Strowger switching component, Step-by-step switching, Design parameters, 100-line switching system, 1000- line blocking exchange, 10,000-line exchange. Crossbar Switching: Principle of common control, Touch tone dial telephone, Principles of		

crossbar switching, Crossbar switching configuration, Cross point terminology, Crossbar exchange organization. Telephone.

Networks: Subscriber loop systems, switching hierarchy and routing, Transmission plan, Transmission systems, numbering plan, charging plan, signaling techniques, In-channel signaling, Common channel signaling.

Electronic Space Division Switching: Stored program control, Centralized SPC, Distributed SPC, Software architecture, Application software, Two-stage network, Three-stage network.

Electronic Time Division Switching: Concept of TDM, Basic time division space switching, Basic time division time switching, Time multiplexed space switching.

Computer Controlled Switching System: Introduction, Call processing, Basic steps to process a call, State transition diagram, Switching system organization, Popular digital switching systems.

Traffic Engineering: Network traffic load and parameters, Grade of services and blocking probability, Modeling switching systems, Incoming traffic and service time characterization, Blocking models and loss estimates.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify the fundamentals of switching and networking principles used in telecommunication systems.	Y											
CLO2	Explain the working principle of automatic switching systems as Strowger and crossbar switching.	Y											
CLO3	Analyze the traffic requirements and design the switching system accordingly.		Y	Y									
CLO4	Explain and design multistage networks.	Y	Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**

CLO1	Identify the fundamentals of switching and networking principles used in telecommunication systems.	Lecture, Class Participation	CT, MT
CLO2	Explain the working principle of automatic switching systems as Strowger and crossbar switching.	Lecture, Discussion	CT, MT, F
CLO3	Analyze the traffic requirements and design the switching system accordingly.	Lecture, Discussion	CT, MT, F
CLO4	Explain and design multistage networks.	Lecture, Group work, Discussion	ASG/Pr
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4230: Telecommunication Engineering Sessional

Course Details		
Course Code: CSE 4230	Course Title: Telecommunication Engineering Sessional	Credits: 0.75 Contact Hours: 3.00
Rationale		
This course is designed to apply the theoretical knowledge of Strowger Switching Systems, Networks, Electronic Space Division Switching, Electronic Time Division Switching, Computer Controlled Switching System.		
Course Content		
Lab work based on CSE 4229.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Develop concepts of various aspects of telephone networks such as switching hierarchy & routing, transmission, numbering & changing plans and signaling techniques.	Y											

CLO2	Analyze and evaluate fundamental telecommunication traffic models.	Y	Y										
CLO3	Apply the principles of queuing theory in evaluating the performance of telecommunication networks.				Y	Y							
Y=yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Develop concepts of various aspects of telephone networks such as switching hierarchy & routing, transmission, numbering & changing plans and signaling techniques.	Lecture, Class Participation	Q, R, MT
CLO2	Analyze and evaluate fundamental telecommunication traffic models.	Lecture, Discussion	Q, R, Pr, F
CLO3	Apply the principles of queuing theory in evaluating the performance of telecommunication networks.	Lecture, Discussion	Q, R, Pr, R, MT, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4249: Simulation and Modeling

Course Details		
Course Code: CSE 4249	Course Title: Simulation and Modeling	Credits: 3.00 Credit Hours: 3.00
Rationale		
The course is designed to develop knowledge about fundamental systems, models and simulation. It enhances the knowledge of various kinds of simulation models such as discreet-event simulation models, continuous simulation models, combined discreet-continuous models. It also represents the concept of		

Monte Carlo simulation, Simulation of queuing systems, building valid and credible simulation models: validation principles and techniques, statistical procedures.

Course Content

Simulation modeling basics: systems, models and simulation; Classification of simulation model; Steps in a simulation study; Concepts in discreet-event simulation: event scheduling vs. process interaction approaches, Time-advance mechanism, organization of a discreet-event simulation model; continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures (or comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random variants; Output analysis. Simulation languages; Analysis and modeling of some practical systems, Random Number Generator, Random Variables, Probability Distribution.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of Simulation modeling.	Y											
CLO2	Identify and analyze complex engineering problems by using the concepts of the different simulation models.		Y										
CLO3	Design solutions for complex engineering problems using the concept of Simulation and modeling.			Y									

Y=yes

Mapping of Course Learning Outcomes (COs) with the Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Comprehend the basic concepts of Simulation modeling.	Lecture, Tutorials, Discussions	CT, ASG, MT, F

CLO2	Identify and analyze complex engineering problems by using the concepts of the different simulation models.	Lecture, Tutorials, Discussions	CT, ASG, MT, F
CLO3	Design solutions for complex engineering problems using the concept of Simulation and modeling.	Lecture, Tutorials, Discussions	CT, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4250: Simulation and Modeling Sessional

Course Details		
Course Code: CSE 4250	Course Title: Simulation and Modeling Sessional	Credit: 0.75 Contact Hours: 1.50
Rationale		
This course covers the fundamentals of Simulation modeling, such as fundamental systems, models and simulation. It also focuses on analyzing and solving complex engineering problems using Simulation languages.		
Course Content		
Observing Fundamental systems, models and simulation, discreet-event simulation model; continuous simulation models; Combined discreet-continuous models, Monte Carlo simulation; Simulation of queuing systems, Output analysis, analyze and modeling of some practical systems.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the basic concepts of a various Simulation modeling.	Y											
CLO2	Design solutions for complex engineering problems using the concept of Simulation modeling.			Y									

CLO3	Use modern tools to analyze the output of some real-world complex engineering problems.					Y							
CLO4	Develop the communication skill through report writing and presentation as a member and leader of a team.										Y		

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Understand and apply the basic concepts of a various Simulation modeling.	Lecture, Discussions and Practice	CE, MT, Q
CLO2	Design solutions for complex engineering problems using the concept of Simulation modeling.	Lecture, Tutorials, Discussions	PR
CLO3	Use modern tools to analyze the output of some real-world complex engineering problems.	Lecture, Discussions, Practice	CE, MT, Q, F
CLO4	Develop the communication skill through report writing and presentation as a member and leader of a team.	Problem Based Method, Co-operative and Collaborative Method	PR, R, V

(Class Evaluation – CE; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

CSE 4235: Network Programming

Course Details		
Course Code: CSE 4235	Course Title: Network Programming	Credits: 3.00 Contact Hours: 3.00

Rationale

This course will cover the practical aspects of computer network programming, with emphasis on the Internet. The goal of this course is to introduce the students to the basics of computer networks and Internet programming. We will introduce the students to the TCP/IP protocol stack and some of its important protocols. Students will also be introduced to multi-tier application development and RPC technologies including: RMI, CLORBA, EJB, and Web Services. We will also look at industry trends and discuss some innovative ideas that have recently been developed. Some of the course material will be drawn from the web, industry white papers and Internet RFCs.

Course Content

Overview of multi-tier enterprise applications, review of web technologies (HTML, XHTML, CSS, JavaScript, HTML DOC), NetBeans IDE, J2SE, J2ME, and Design Patterns, Review of Computer Networks, OSI Model, TCP/IP protocol suite, User Datagram Protocol, Internet Control Protocol, UDP Programming in Java, Transmission Control Protocol, Multithreading & TCP Sockets Programming in Java, Security Overview, Java Cryptography Extension (JCE), and Java Secure Socket Extension (JSSE), Email (JavaMail): SMTP, POP, IMAP, HTTP, Cookies & HTTP Proxies, URL Programming, Asynchronous JavaScript and XML (AJAX), Common Gateway Interface (CGI), Introduction to Server-Side Programming using Java Servlets, Creating Servlet Based Web Applications, Servlet Session Management, Java Naming and Directory Interface (JNDI), Introduction to Enterprise Java Beans (EJB), Session Beans, Entity Beans, Java Server Pages (JSP), JSP vs. Servlets, Handling HTML Forms using JavaBeans, MVC pattern, Java Server Faces (JSF), Input Validation, Site Navigation, Database, Connectivity, WebServices (Clients and Servers), SOAP, UDDI, JAXRPC, Remote Method Invocation (RMI), Common Object Broker Architecture (CLORBA).

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Ability to understand the basics of computer networks, the OSI reference model and the TCP/IP protocol suite.	Y											

CLO2	Ability to experiment with protocol analyzers (packet sniffers) to understand and analyze the operation of the different TCP/IP protocols.		Y										
CLO3	Ability to experiment with network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.			Y									
CLO4	Able to design and implement network applications through semester-long projects.										Y		

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Ability to understand the basics of computer networks, the OSI reference model and the TCP/IP protocol suite.	Lecture, Class Participation	CT, F, MT
CLO2	Ability to experiment with protocol analyzers (packet sniffers) to understand and analyze the operation of the different TCP/IP protocols.	Lecture, Discussion, Group Work	CT, MT
CLO3	Ability to experiment with network routing (static and dynamic) and understand the process of implementing simple routed inter-networks.	Lecture, Discussion, Group Work	ASG
CLO4	Able to design and implement network applications through semester-long projects.	Discussion, Group work	Pr/ASG

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Midterm Exam)

CSE 4236: Network Programming Sessional

Course Details		
Course Code: CSE 4236	Course Title: Network Programming Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
This course is designed to extend students' knowledge and practice in analysis and design of computer networks by focusing on computer network programming. It includes introduction, Internet Address, URLs and URis, HTTP, URLConnections, Socket Programming, IP Multicast and RMI. The JAVA programming language will be used throughout the course. It does not entirely focus on theoretical concept but also strongly focuses on practical skill-based knowledge.		
Objective		
1. Students will be able to write web applications using a combination of client-side (JavaScript, HTML, XML, WML) and server-side technologies (JSP, JSF, SERVLETS). 2. Students will be able to write network applications using state-of-the-art RPC technologies including: RMI, CLORBA, EJB, and Web Services (SOAP and UDDI). 3. Students will be able to understand e-mail programming (JavaMail, SMTP, POP, IMAP). 4. Students will be able to design and implement network applications through semester-long projects.		
Course Content		
Laboratory works based on CSE 4253.		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Able to write web applications using a combination of client-side and server-side technologies.	Y											
CLO2	Able to write network applications using state-of-the-art RPC technologies and Web Services.	Y											
CLO3	Able to design and implement network applications through semester-long projects.			Y							Y		

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Able to write web applications using a combination of client-side and server-side technologies.	Lecture, Lab Participation	M, F
CLO2	Able to write network applications using state-of-the-art RPC technologies and Web Services.	Lecture, Group work, Discussion	Q, M, F
CLO3	Able to design and implement network applications through semester-long projects.	Lecture, Group work, Discussion	PR, R
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4237: Cloud Computing

Course Details		
Course Code: CSE 4237	Course Title: Cloud Computing	Credits: 3.00 Contact Hours: 3.00
Rationale		
To know basic concepts of cloud computing and its applications.		
Objective		
1. Identify the architecture and infrastructure of cloud computing. 2. Develop new ideas and innovations. 3. Analyze various cloud computing solutions.		
Course Content		
Introduction to Cloud Computing: Definition and applications including benefits, challenges, and risks, Enabling Technologies and System Models for Cloud Computing. Cloud Computing Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a		

Service (SaaS) and emerging XaaS. Types of Cloud Computing: Public cloud, private cloud and hybrid clouds, Cloud OSs and platforms. Cloud Architectures: Architectural design of Cloud computing, Interaction among infrastructure provider, business providers and the customers, roles of cloud broker, Tradeoffs between costs and customer satisfactions, Federated Clouds. VM Resource Provisioning: Static and dynamic resource provisioning approaches, HARMONY architecture, Capacity provisioning approaches. Scalability and Fault Tolerant Issues: Scalable computing, energy optimization vs. fault tolerant service platforms, Performance, QoS, Power management in Cloud Computing data centers. Principles of Virtualization platforms: VMWare ESX Memory Management, Security and Privacy issues in the Cloud, Introduction to Mobile Cloud Computing: Architecture and applications of MCC, Code partitioning, Code offloading and VM migration techniques.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Identify the architecture and infrastructure of cloud computing.	Y											
CLO2	Develop new ideas and innovations.			Y									
CLO3	Analyze various cloud computing solutions.		Y										

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Identify the architecture and infrastructure of cloud computing.	Lecture, Class Participation	CT, M
CLO2	Develop new ideas and innovations.	Lecture, Group work, Discussion	M, F, ASG
CLO3	Analyze various cloud computing solutions.	Lecture, Group work,	ASG, CT2, F

		Discussion, Paper reading	
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4238: Cloud Computing Sessional

Course Details		
Course Code: CSE 4238	Course Title: Cloud Computing Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
To know basic concepts of cloud computing and its applications.		
Objective		
1. Identify the architecture and infrastructure of cloud computing. 2. Develop new ideas and innovations. 3. Analyze various cloud computing solutions.		
Course Content		
Cloud Computing Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and emerging XaaS. Types of Cloud Computing: Public cloud, private cloud and hybrid clouds, Cloud OSs and platforms. Cloud Architectures: Architectural design of Cloud computing, Federated Clouds. VM Resource Provisioning: Static and dynamic resource provisioning approaches, HARMONY architecture, Capacity provisioning approaches. Scalability and Fault Tolerant Issues: Scalable computing, energy optimization vs. fault tolerant service platforms, Performance, QoS, Power management in Cloud Computing data centres. Principles of Virtualization platforms: Security and Privacy issues in the Cloud, Introduction to Mobile Cloud Computing: Code partitioning, Code offloading and VM migration techniques.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Identify the architecture and infrastructure of cloud computing.	Y											
CLO2	Develop new ideas and innovations.			Y									
CLO3	Analyze various cloud computing solutions.		Y										

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Identify the architecture and infrastructure of cloud computing.	Lecture, Group Work	Q
CLO2	Develop new ideas and innovations.	Lecture, Group work, Discussion	R, M
CLO3	Analyze various cloud computing solutions.	Lecture, Group work, Discussion	R, F

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4239: High Performance Computing

Course Details

Course Code: CSE 4239	Course Title: High Performance Computing	Credits: 3.00 Contact Hours: 3.00

Rationale

This course offers to introduce the key ideas of High-Performance Computing (HPC). It will show how the historical developments in HPC have come about, how these impact on current technologies, how best to utilize these technologies for numerically intensive calculations, and what future developments are likely.

Objectives

1. To understand the motivation and opportunities of high-performance computing, and to have sufficient understanding of topics in order to use HPC facilities.
2. To appreciate challenges of obtaining peak performance and how to tackle such challenges.

Course Content

Parallel Processing Concepts (Quick Overview): Levels of parallelism (instruction, transaction, task, thread, memory, function), Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc), Architectures: N-wide superscalar architectures, multi-core, multi-threaded.

Parallel Programming with CUDA: Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture), Memory hierarchy and transaction specific memory design, Thread Organization.

Fundamental Design Issues in Parallel Computing: Synchronization, Scheduling, Job Allocation, Job Partitioning, Dependency Analysis, Mapping Parallel Algorithms onto Parallel Architectures, Performance Analysis of Parallel Algorithms.

Fundamental Limitations Facing Parallel Computing: Bandwidth Limitations, Latency Limitations, Latency Hiding/Tolerating Techniques and their limitations.

Power-Aware Computing and Communication: Power-aware Processing Techniques, Power-aware Memory Design, Power-aware Interconnect Design, Software Power Management.

Advanced Topics: Petascale Computing, Optics in Parallel Computing, Quantum Computers, Recent developments in Nanotechnology and its impact on HPC.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12

	(Upon completion of the course, the students will be able to)												
CLO1	Describe the different types of HPC hardware and make informed decisions as to what will be best in any particular situation.	Y											
CLO2	Use simple profiling tools to identify hotspots in a code and develop strategies for overcoming the hotspots.		Y										
CLO3	Design efficient coding solutions to a variety of numerical problems.			Y									
CLO4	Create a parallel program for an MP machine using message-passing techniques.					Y							

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Describe the different types of HPC hardware and make informed decisions as to what will be best in any particular situation.	Lecture, Discussion	M, F
CLO2	Use simple profiling tools to identify hotspots in a code and develop strategies for overcoming the hotspots.	Lecture, Group work, Discussion	Q, M, F
CLO3	Design efficient coding solutions to a variety of numerical problems.	Lecture, Group work, Lab participation	PR, R
CLO4	Create a parallel program for an MP machine using message-passing techniques.	Lecture, Group work, Discussion	Q, M, F

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)

CSE 4240: High Performance Computing Sessional

Course Details:		
Course Code: CSE 4240	Course Title: High Performance Computing sessional	Credits: 0.75 Contact Hours: 1.50

Rationale

This course offers to introduce the key ideas of High-Performance Computing (HPC). It will show how the historical developments in HPC have come about, how these impact on current technologies, how best to utilize these technologies for numerically intensive calculations, and what future developments are likely.

Objectives

1. To understand the motivation and opportunities of high-performance computing, and to have sufficient understanding of topics in order to use HPC facilities.
2. To appreciate challenges of obtaining peak performance and how to tackle such challenges.

Course Content

Parallel Processing Concepts (Quick Overview): Levels of parallelism (instruction, transaction, task, thread, memory, function), Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc), Architectures: N-wide superscalar architectures, multi-core, multi-threaded.

Parallel Programming with CUDA: Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture), Memory hierarchy and transaction specific memory design, Thread Organization.

Fundamental Design Issues in Parallel Computing: Synchronization, Scheduling, Job Allocation, Job Partitioning, Dependency Analysis, Mapping Parallel Algorithms onto Parallel Architectures, Performance Analysis of Parallel Algorithms.

Fundamental Limitations Facing Parallel Computing: Bandwidth Limitations, Latency Limitations, Latency Hiding/Tolerating Techniques and their limitations.

Power-Aware Computing and Communication: Power-aware Processing Techniques, Power-aware Memory Design, Power-aware Interconnect Design, Software Power Management.

Advanced Topics: Petascale Computing, Optics in Parallel Computing, Quantum Computers, Recent developments in Nanotechnology and its impact on HPC.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Describe the different types of HPC hardware and make informed decisions as to what will be best in any particular situation.	Y											
CLO2	Use simple profiling tools to identify hotspots in a code and develop strategies for overcoming the hotspots.		Y										
CLO3	Design efficient coding solutions to a variety of numerical problems.			Y									
CLO4	Create a parallel program for an MP machine using message-passing techniques.					Y							

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Describe the different types of HPC hardware and make informed decisions as to what will be best in any particular situation.	Lecture, Discussion	M, F
CLO2	Use simple profiling tools to identify hotspots in a code and develop strategies for overcoming the hotspots.	Lecture, Group work, Discussion	Q, M, F
CLO3	Design efficient coding solutions to a variety of numerical problems.	Lecture, Group work, Lab participation	PR, R

CLO4	Create a parallel program for an MP machine using message-passing techniques.	Lecture, Group work, Discussion	Q, M, F
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q –Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4245: Digital Image Processing

Course Details		
Course Code: CSE 4245	Course Title: Digital Image Processing	Credits: 3.00 Contact Hours: 3.00
Rationale		
Digital Image Processing (DIP) is a specialty-related elective/optional course for the Engineering students. This course introduces digital image processing. It focuses on the theory and algorithms underlying a range of tasks including image acquisition and formation, enhancement, restoration, compression, segmentation and object recognition, etc.		
Objective		
1. To know basic knowledge of digital image processing. 2. To know theory and algorithms to underlying a range of tasks including image acquisition and formation, enhancement, restoration, compression, segmentation and object recognition.		
Course Content		
Digital image fundamentals: visual perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic relationships between pixels, Linear and Nonlinear operations; image transforms: First Fourier Transform (FFT), Discrete Cosine Transform (DCT), Karhunen and Loeve Transform (KLT), Wavelet transform and sub-band decomposition; image enhancement in the frequency domain and image restoration techniques, image compression techniques, Image Compression S: JPEG,MPEG, H.261, and H.263, Image Segmentation; pattern recognition; image processing algorithms and object detection, tracking, neural network, deep learning.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Demonstrate a knowledge of a broad range of fundamental image processing and image analysis techniques and concepts.	Y											
CLO2	Identify, Demonstrate and apply their knowledge by analyzing image processing problems and recognizing and employing (or proposing) effective solutions.		Y										
CLO3	Evaluate image processing algorithms and object detection, tracking, Neural network, deep learning.		Y	Y									
CLO4	Analyze the requirements for picture sampling and quantization, as well as their repercussions.		Y										
CLO5	Design and create practical solutions to a range of common image processing problems and to critically assess the results of their solutions, including shortcomings.			Y									

Y=Yes

Mapping of Course Learning Outcomes (CLOs) with the Teaching- Learning & Assessment Strategy

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching and Learning Strategy	Assessment Strategy
CLO1	Demonstrate a knowledge of a broad range of fundamental image processing and image analysis techniques and concepts.	Lecture, Participation	CT, HW
CLO2	Identify, Demonstrate and apply their knowledge by analyzing image processing problems and recognizing and employing (or proposing) effective solutions.	Lecture, Group work, Discussion	ASG/PR, MT, F

CLO3	Evaluate image processing algorithms and object detection, tracking, Neural network, deep learning.	Lecture, Group work, Discussion	CT, HW, MT, F
CLO4	Analyze the requirements for picture sampling and quantization, as well as their repercussions.	Lecture, Group work, Discussion	CT, ASG, F
CLO5	Design and create practical solutions to a range of common image processing problems and to critically assess the results of their solutions, including shortcomings.	Lecture, Group work, Discussion	ASG/PR, Pr
(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4246: Digital Image Processing Sessional

Course Details		
Course Code: CSE 4246	Course Title: Digital Image Processing Sessional	Credits: 0.75 Contact Hours: 1.50
Rationale		
Digital Image Processing Sessional course is designed to implement various image processing mechanisms to process image pixel in spatial and frequency domain.		
Objective		
1. To obtain practical experience using image processing techniques on real time image. 2. To able to enhance image for real time application. 3. To able to apply segmentation techniques to partition image into meaningful regions with respect to a particular application.		
Course Content		
Digital image fundamentals: visual perception, Light and Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic relationships between pixels, Linear and Nonlinear operations; image transforms: First Fourier Transform (FFT), Discrete Cosine Transform (DCT), Karhunen and Loeve Transform (KLT), Wavelet transform and sub-band decomposition; image		

enhancement in the frequency domain and image restoration techniques, image compression techniques, Image Compression S: JPEG,MPEG, H.261, and H.263, Image Segmentation; pattern recognition; image processing algorithms and object detection, tracking, neural network, deep learning.													
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the fundamentals of image processing and enable to work with pixels in an image.	Y											
CLO2	Choosing the appropriate approach to enhance image for a particular application		Y			Y							
CLO3	Implement various Image Processing algorithms to solve real-world applications.			Y		Y							
Y=Yes													

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:			
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching and Learning Strategy**	**Assessment Strategy**
CLO1	Understand the fundamentals of image processing and enable to work with pixels in an image.	Lecture, Participation	R, Q
CLO2	Choosing the appropriate approach to enhance image for a particular application.	Lecture, Group work, Discussion	ASG, L
CLO3	Implement various Image Processing algorithms to solve real-world applications.	Lecture, Group work, Discussion	T, Q, L
CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, M- Mid Term Exam)			

CSE 4249: VLSI Design

Course Details		
Course Code: CSE 4249	Course Title: VLSI Design	Credits: 3.00 Contact Hours: 3.00

Rationale
This course is designed to enhance student understanding of the theory and fundamentals of silicon fabrication, the design principles and logical considerations of designing silicon chips, and finally, to develop an understanding of design considerations and the overall process of VLSI systems and their fabrication. This course is also intended to enable students to contribute to VLSI system designing and to have a better understanding of the different characteristics of such circuits

Objectives
1. To study and analyze different properties, behavior, and performance metrics of different integrated digital electronic circuits. 2. To understand the various stages involved in designing a silicon chip, ranging from the initial system and logical considerations to designing each layer of silicon and finally, overall fabrication process.

Course Contents
VLSI design methodology: Top-down Design Approach, Technology Trends and Design Automation Algorithms; Introduction to CMOS Inverters and Basic Gates; MOS devices and Basic Circuits (various inverters, pass gates and buffer circuits), CMOS Fabrication Process and Layout; CMOS Circuit Characteristics and Performance Estimation; Buffer Circuit Design; Introduction to BiCMOS Circuits; Complex CMOS Gates; CMOS layout design rules, CMOS Building Blocks - Adder, Comparator, Multiplier, Counter, and Shifter; Data Path and Memory structures. Design Methodology and Tools; Geometric and stick diagrams, PLA, FPGA, cell-based and full custom design methods, System-on chip design, Hardware modeling - Hardware Modeling Languages, Logic Networks, State Diagrams, Data flow and Sequencing Graphs, Behavioral Optimization; Floor Planning and Architecture Design.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Describe mathematical methods and circuit analysis models in the analysis of CMOS	Y											

	digital electronics circuits, including logic components and their interconnections.												
CLO2	Understand and analyze models of moderately sized CMOS circuits to implement specified digital functions.		Y										
CLO3	Understand and apply the basic theory of MOS devices and basic circuits, the overall process of designing MOS circuits, and the VLSI fabrication process on an industrial scale.		Y										
CLO4	Design MOS circuits to achieve various basic to moderately complex digital functions using VLSI design rules and geometric or stick diagrams.									Y			

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with the Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO1	Describe mathematical methods and circuit analysis models in the analysis of CMOS digital electronics circuits, including logic components and their interconnections.	Lecture, Class Participation	CT
CLO2	Understand and analyze models of moderately sized CMOS circuits to implement specified digital functions.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Understand and apply the basic theory of MOS devices and basic circuits, the overall process of designing MOS circuits, and the VLSI fabrication process on an industrial scale.	Lecture, Group work, Discussion	CT, MT, F

CLO4	Design MOS circuits to achieve various basic to moderately complex digital functions using VLSI design rules and geometric or stick diagrams.	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4250: VLSI Design Sessional

Course Details		
Course Code: CSE 4250	Course Title: VLSI Design Sessional	Credits: 0.75 Contact Hours: 1.5
Rationale		
This course is designed to enhance student understanding of the theory and fundamentals of silicon fabrication, the design principles and logical considerations of designing silicon chips, and finally, to develop an understanding of design considerations and the overall process of VLSI systems and their fabrication. This course is also intended to enable students to contribute to VLSI system designing and to have a better understanding of the different characteristics of such circuits.		
Objectives		
1. To study and analyze different properties, behavior, and performance metrics of different integrated digital electronic circuits. 2. To study and analyze different properties, behavior, and performance metrics of different integrated digital electronic circuits. 3. To understand the various stages involved in designing a silicon chip, ranging from the initial system andlogical considerations to designing each layer of silicon and finally, overall fabrication process.		
Course Contents		

VLSI design methodology: Top-down Design Approach, Technology Trends and Design Automation Algorithms; Introduction to CMOS Inverters and Basic Gates; MOS devices and Basic Circuits (various inverters, pass gates and buffer circuits), CMOS Fabrication Process and Layout; CMOS CircuitCharacteristics and Performance Estimation; Buffer Circuit Design; Introduction to BiCMOS Circuits; Complex CMOS Gates; CMOS layout design rules, CMOS Building Blocks - Adder, Comparator, Multiplier, Counter, and Shifter; Data Path and Memory structures. Design Methodology and Tools; Geometric and stick diagrams, PLA, FPGA, cell-based and full custom design methods, System-on chip design, Hardware modeling - Hardware Modeling Languages, Logic Networks, State Diagrams, Data flow and Sequencing Graphs, Behavioral Optimization; Floor Planning and Architecture Design.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Describe mathematical methods and circuit analysis models in the analysis of CMOS digital electronics circuits, including logic components and their interconnections.	Y											
CLO2	Understand and analyze models of moderately sized CMOS circuits to implement specified digital functions.		Y										
CLO3	Understand and apply the basic theory of MOS devices and basic circuits, the overall process of designing MOS circuits, and the VLSI fabrication process on an industrial scale.		Y										
CLO4	Design MOS circuits to achieve various basic to moderately complex digital functions using VLSI design rules and geometric or stick diagrams.									Y			

Y=yes

Mapping of Course Learnings Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Teaching-Learning Strategy	Assessment Strategy
CLO1	Describe mathematical methods and circuitanalysis models in the analysis of CMOS digital electronics circuits, including logic components and their interconnections.	Lecture, Class Participation	CT
CLO2	Understand and analyze models of moderatelysized CMOS circuits to implement specified digital functions.	Lecture, Group work, Discussion	ASG/PR, MT, F
CLO3	Understand and apply the basic theory of MOS devices and basic circuits, the overall process ofdesigning MOS circuits, and the VLSIfabrication process on an industrial scale.	Lecture, Group work, Discussion	CT, MT, F
CLO4	Design MOS circuits to achieve various basic tomoderately complex digital functions using VLSIdesign rules and geometric or stick diagrams.	Lecture, Group work, Discussion	ASG/PR, Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4251: Data Warehousing and Data Mining

Course Details		
Course Code: CSE 4251	Course Title: Data Warehousing and Data Mining	Credits: 3.00 Contact Hours: 3.00
Rationale		
This course will provide students with in-depth knowledge, skills and understanding in the areas of Data Mining and Data Warehousing and a range of techniques, conceptual models and tools to develop into		

professionals in the areas of ‘Data, Information and Knowledge Management’, data mining approaches such as clustering, classification, regression etc. and its applicability in a wide range of application areas. It will also enable students with independent exploratory and research skills, linked with abilities to synthesize, integrate and critically analyses and compare features of the Knowledge Discovery/Data mining/Business Intelligence/Data Warehousing area.

Course Content

Introduction; Data warehousing and OLAP technology for data mining; Data preprocessing; Data mining primitives, languages and systems; Descriptive data mining: characterization and comparison; Association analysis; Classification and prediction; Cluster analysis; Outlier detection; Mining complex types of data; Applications and trends in data mining. Additionally, the course will provide limited exercises and practical experience with data mining related research.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of the Data Warehousing and Data Mining.	Y											
CLO2	Discover and measure interesting patterns from different kinds of dataset.				Y								
CLO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.			Y									
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/ algorithms with respect to their accuracy.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**

CLO1	Comprehend the basic concepts of the Data Warehousing and Data Mining.	Lecture, Class Participation	CT
CLO2	Discover and measure interesting patterns from different kinds of dataset.	Lecture, Group work, Discussion	CT, MT, F
CLO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.	Lecture, Group work, Discussion	ASG, CT, MT, F
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/ algorithms with respect to their accuracy.	Lecture, Group work, Discussion	ASG/Pr, F
(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)			

CSE 4252: Data Warehousing and Data Mining Sessional

Course Details		
Course Code: CSE 4252	Course Title: Data Warehousing and Data Mining Sessional	Credits: 0.75 Contact Hours: 1.5
Rationale		
Data Warehousing and Data Mining Sessional course is intended to implement data preprocessing, data analysis methods, visualization and decision-making concepts of data warehousing and data mining.		
Course Content		
Laboratory works based on CSE 4251		

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of the Data Warehousing and Data Mining.	Y											

CLO2	Discover and measure interesting patterns from different kinds of dataset.		Y										
CLO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.			Y									
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/ algorithms with respect to their accuracy.		Y										

Y=yes

Mapping of Course Learning Outcomes (CLOs) with Teaching- Learning & Assessment Strategy:

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Teaching- Learning Strategy**	**Assessment Strategy**
CLO1	Comprehend the basic concepts of the Data Warehousing and Data Mining.	Lecture, Class Participation	FT, Q
CLO2	Discover and measure interesting patterns from different kinds of dataset.	Lecture, Group work, Discussion	ASG/PR
CLO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.	Lecture, Group work, Discussion	PR
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/ algorithms with respect to their accuracy.	Lecture, Group work, Discussion	FT/PR

(CP- Complex Problems, CA-Complex Activities, KP-Knowledge Profile, CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; FT – Final Test)

Part D:

20.Grading/Evaluation

1) Grading Scale

The total performance of a student in a given course is based on a scheme of continuous assessment, for theory courses this continuous assessment is made through a set of class tests, assignments, class performance, a midterm assessment and a term final examination. The assessment in sessional courses is made by evaluating performance of the student at work during the class, conduct of lab tests, report writing, a midterm evaluation, a final evaluation, final quiz and viva-voce. Each course has a certain number of credits (0.75/1.00/1.50), which describes its corresponding weightages. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. A student 's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress.

Total credits specified in syllabus of each department have to be acquired in order to qualify for the respective degree. Letter grades and corresponding grade points shall be awarded according to the provisions shown below:

2. The Letter Grades

Grade	Grade Points	Numerical Markings
A+	4.00	80% and above
A	3.75	75% to below 80%
A-	3.50	70% to below 75%
B+	3.25	65% to below 70%
B	3.00	60% to below 65%
B-	2.75	55% to below 60%
C+	2.50	50% to below 55%
C	2.25	45% to below 50%
D	2.00	40% to below 45%
F*	0.00	Below 40%
I	-	Incomplete
W	-	Withdrawal
X	-	Continuation (For Project/ Thesis)

* Subject(s) in which a student gets 'F' grade shall not be counted towards the credit hours' requirements and for the calculation of Grade Point Average (GPA).

3. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses in a term having credits of C1, C2, …, Cn and his grade points in these courses are G1, G2, …, Gn respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of TC1, TC2, …, TCn and his GPA in these terms are GPA1, GPA2, GPAn respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i GPA_i}{\sum_{i=1}^{n} TC_i}$$

Suppose a student has completed eight courses in a term and obtained the following grades:

Course	Credits, Ci	Grade	Grade, Gi	Points, Ci*Gi
EEE 1101	3.00	A-	3.50	10.50
EEE 1102	1.50	A+	4.00	6.00
PHY 1111	3.00	B-	2.75	8.25
CHEM 1101	3.00	D	2.00	6.00
CHEM 1102	1.50	A-	3.50	5.25
MATH 1111	3.00	A+	4.00	12.00
ME 1152	1.50	B	3.00	4.50
HUM1135	3.00	A	3.75	11.25
Total	**19.50**			**63.75**

GPA = 63.75/19.50 = 3.27

Suppose a student has completed four terms and obtained the following GPA.

Level	Term	Credit Earned, TCI	Hours GPA Earned, GPAi	GPAi*TCi
1	I	21.00	3.73	78.330
1	II	20.50	3.93	80.565
2	I	19.75	3.96	78.210
2	II	20.25	4.00	81.000
Total		**81.50**		**318.105**

CGPA = 318.105/81.50 = 3.90

4) Withdrawal from a Term

If a student is unable to complete the Term Final Examination due to illness, accident or any other valid reason, he/ she may apply in prescribed form to the Registrar through his/ her Head of the Department for total withdrawal from the Term within 7 (seven) working days after the end of the Term final examination. However, he/ she may choose not to withdraw any laboratory/ sessional/ design course if the grade obtained in such a course is ‘D’ or better and that he/ she has to indicate clearly in his/ her withdrawal application. In case of illness the withdrawal application must be supported by a medical certificate from CMH/Medical Officer of BAUST. The Academic Council shall take the final decision about such an application.

5) Incomplete (I) courses

If a student fails to attend 60% of the classes of any registered course in a Term whatever be the reasons, the registration shall be cancelled for that course and the course will be treated as Incomplete (I) course.

6) Promotion to the Next Higher Term/ Level

i. In each term there shall be 4/5/6 theory courses. A student has to pass at least 2 out of 4, 3 out of 5 and 4 out of 6 theory courses in the final examination for promotion to next higher Term/ Level with a maximum of 2 (two) failed theory courses.

ii. In addition to theory courses there shall be some sessional courses in each term for engineering programs and there may be some sessional courses in some terms for non-engineering programs. For promotion to next higher Term/ Level a student has to pass in all the sessional courses of the term. A student failed in only one sessional course in the Final Exam shall get a chance to retake the sessional course. But the course has to be cleared within the immediate next Referred Examination.

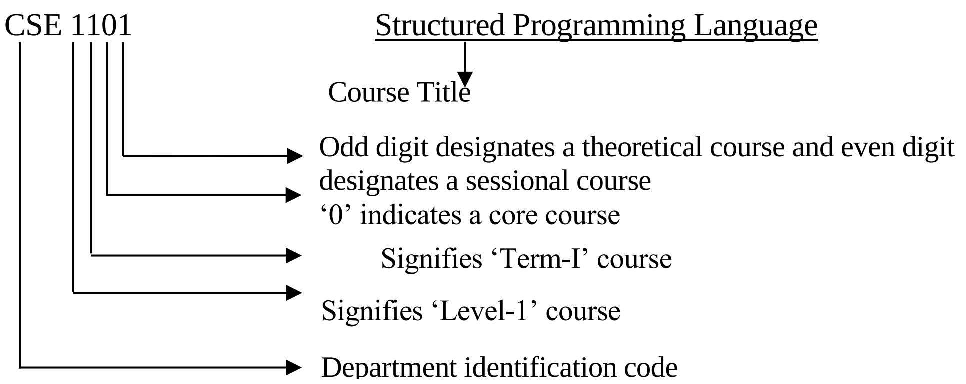
iii. A student failing in one sessional course, must retake the sessional course in any suitable time as decided by the concerned department before the schedule of the Referred Exam and appear the sessional exam during the Referred Exam schedule. The student has to register the sessional course by depositing a prescribed fee. If any student fails in two sessional courses in the final exam or in the sessional retake course in the Referred Exam in a term, he/she fails in the term and has to repeat the term.

21.Course Pattern and Credit Structure

The undergraduate programs are covered by a set of theoretical courses. For engineering programs there is also a set of sessional courses to support the theoretical courses. For other program there may be some sessional courses in some terms.

The course designation system for the Program is illustrated as follows:

Engineering



Non-Engineering

HUM 4123 Engineering Economics

Course Title
Course No.
Term
Level
Program Name/ Major

MGT 42 01 Corporate Management

Course Title
Course No.
Term
Level
Major in Management

a) Assignment of Credits

The assignment of credits to theoretical course is different from that of sessional course, which are as follows:

- For theoretical courses one lecture per week per term is equivalent to one credit.
- For sessional/laboratory courses two class hours per week per term is equivalent to one credit.
- Credits are also assigned to Project/Thesis work taken by the students. The total credit assigned to Project/ Thesis work is 4.00 to 6.00 (2.00/3.00 for Level-4 Term-I and 2.00/3.00 for Level-4 Term-II) for all engineering programs.
- Credits are also assigned to Internship and Organizational Attachment and Comprehensive Viva-Voce to other non-engineering departments where ever applicable. The number of assigned credits varies from one program to another.

b) Distribution of Marks

i. Theory Courses

Forty percent (40%) of marks of a theoretical course shall be allotted for continuous assessment, i.e., class tests/assignments/presentations, class evaluation, class participation and midterm evaluation. The rest sixty percent (60%) marks shall be allotted to the three-hour duration term final examination. Distribution of marks for a given theory course is as follows:

Class performance	5%
Class Tests/ Assignments/ Presentations	20%
Mid-Term Assessment (Exam [1 hour duration] / Project)	15%
Final Examination (3 hours duration)	60%
Total	**100%**

The number of class tests/assignments/presentations of a course shall be 'n', where 'n' is the number of credits of the course. Evaluation of performance in class tests/assignments/presentations shall be on the basis of the best '(n-1)' class tests/assignments/presentations. The scheme of continuous assessment that a particular teacher wishes to follow for a course shall be announced within the first week of each term.

Note:

a. Course teacher of a particular course has to inform the department whether he/she wants to assess mid-term through exam or project within first two weeks of beginning of a term. The duration of mid-term examination should not be more than 60 minutes. If mid-term assessment is done through project, then there should be project report and presentation.
b. The weightage of class performance can be assessed through class attendance, effective class participation and discipline.

Irrespective of the result of the continuous assessment (class performance, class test, mid- term examination), a student has to appear in the final examination (where applicable) for qualifying/ passing the concern course/ subject.

ii. Sessional/ Practical Courses

Sessional courses are designed and conducted by the concerned departments. Examination on sessional/practical subjects shall be conducted by the respective department before the end of the term. The date of practical examination shall be fixed by the respective department. Students shall be evaluated in the sessional courses on the basis of the followings:

Lab based Sessional

Attendance in experiments and effective participation	25%
Report writing/Assignment	15%
Mid-Term Evaluation (Exam/Project/Assignment)	20%
Final Evaluation (Lab tests and quiz)	30%
Viva-Voce	10%
Total	**100%**

Programming/ Project Based Sessional

Attendance in experiments and effective participation	25%
Report writing/Assignment/ Programming	15%
Mid-Term Evaluation (Exam/Project/Assignment)	20%
Final Evaluation (Lab tests and quiz)	30%
Viva-Voce/ Presentation	10%
Total	**100%**

c) Attendance

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly. One is required to attend at least 75% of all classes held in any course. Student having attendance from 60% up to 75% shall have to pay a certain fine to attend the final examination. Students having attendance less than 60% shall not be allowed to attend the final examination.

22. Conduct of Examinations

Class tests, Mid-term exam and Term final exam will be conducted for theory courses and sessional exams will be conducted for sessional/practical courses. Referred/ Improvement/ Backlog examination will be conducted for theory courses.

i. Class Tests/Assignments/Presentations

These are to be conducted by the course teacher(s) in class room for the theory courses. Concerned department will arrange and monitor these tests. Class tests will carry a weightage in the final assessment.

ii. Mid Term Examination

Mid-term assessment (Examination/Project) for the theory courses will be conducted by the concerned department around the middle of a term. Duration of the mid- term exam will be of 01 hour. The mid-term exam will carry a weightage in the final assessment.

iii. Term Final Examination

The students will get a 02 weeks preparatory leave for the term final exam ordinarily after 14 weeks of classes. The term final examination will be conducted for all the theory courses over a period of 03 weeks by the Office of the Controller of Examinations. The duration of term final examinations will be of 03 hours irrespective of the credit hours of the theory courses. The term final examination will carry a weightage in the final assessment.

iv. Sessional/Practical Examination

Sessional/Practical examinations for concerned program (both mid-term evaluation and final evaluation including viva-voce and quiz etc.) will be conducted by the concerned course teacher(s) and will be arranged and monitored by the concerned department. Both mid-term assessment and final assessment will carry weightage.

v. Referred Examination

The failed theory course(s) of the term final examination will be treated as referred course(s). Only for Level-1, Term-I, a student failed in a maximum of 3 (three) theory courses in the final examination will get a chance to appear in the next consequent referred examination because such a student will have no backlog course(s). But the student will not be promoted to the next higher level and Term if he/she cannot clear at least one fail theory course out of the 3 (three) fail courses in the referred examination. Students having referred course (maximum three for L-1, T- I and maximum two for all other Levels and Terms) will have to appear in the next consequent referred examination, which will be held combined with the Improvement and Backlog examinations at the end of each semester or at the beginning of the next semester at any convenient time as decided by the authority. The maximum grade obtainable in Referred examinations shall be ‘B’.

vi. Improvement Examination

A student may also appear in the next consequent Improvement examination for the passed theory course(s) with letter grades less than 'B+’ in the final examination. The maximum letter grade obtainable in the improvement examination shall be ‘B+’ and if he/she cannot improve, the obtained grade of the final examination shall prevail.

vii. Backlog Examination

From Level-1 Term-II and higher a student may have a maximum of 3 cumulative Backlog courses. Backlog course(s) are those theory course(s) which a student registered in a Term but even after the Final and Referred Examination he/she obtained ‘F’ grade in that course(s). The maximum obtainable grade in the Backlog examination shall be ‘B’. A student will get a maximum of 04 (four) chances to clear the Backlog course(s).

viii. Number of Courses Allowable for Referred/Improvement/Backlog Examinations

A Students will be allowed to appear for a maximum of 3 (three) courses in the Referred and /or Improvement and /or Backlog Examination in a term.

ix. Conducting and other Rules of Referred/Improvement/Backlog Examinations

Referred/Improvement/Backlog examinations will also be conducted by the Office of the Controller of Examinations. The Referred, Improvement and Backlog Examinations shall be held once in each term. Referred, Improvement and Backlog courses in each level-term shall be treated as self-study (i.e., retaining the already obtained marks of class tests and class attendance with class performance). The Referred, Improvement and Backlog Examinations will be held combined at any convenient time as decided by the authority. A student will be allowed to appear in a maximum of three courses from among his/her Referred and Backlog courses.

x. Special Backlog Examination

A Special Backlog Examination on only Backlog courses may be conducted for the students who have participated in their 4-year degree course (up to level-4 term-II) and have a shortage of maximum 12 (twelve) credits to obtain the Bachelor degree. The special backlog examination shall be arranged in a convenient time after 30 (thirty) days of publication of the final results of the level-4 term-II examination. The evaluation system shall be same as backlog with self-study. The students willing to appear at the special backlog examination have to apply to the Head of the Department and with his permission must register within 7 (seven) working days of publication of Level-4 Term-II Final and Backlog examination results. A student who will fail in the special backlog examination shall have to register the failed course(s) in the next regular term.

xi. Exemption from Taking Courses for Level Repeat Students

If a student fails to get him/herself promoted to the next higher level/term on poor academic performance, he/she has to take readmission in the same level and term in which he/she failed as a repeater student**.** In such case he/she shall be exempted from repeating the passed theory and sessional courses. A Repeater student will have to repeat only those theory and sessional courses in which he/she has failed even after the final and referred examinations.

xii. Level/Term Repeat for Student under Punishment

No waiver shall be given to a student if a student repeats the Level/Term due to punishment; he/she must have to repeat all the courses of the repeating Level/Term.

xiii. Code of Conduct for Examination

a) Conduct of the Examinees

i. An examinee must not write his/ her name or any indication mark anywhere in the answer script. If he/ she does so, the answer script will not be examined.

ii. No examine will be allowed to leave the examination hall until an hour has passed from the time when the question paper is given nor will an examinee be allowed to sit for the examination 30 minutes after the starting of an examination. An examinee also will not be allowed to leave the examination hall during the last fifteen minutes of the examination unless he/ she submit the answer script.

iii. An examinee must not bring any loose papers, books, notes, instruments etc to the examination hall unless instructed.

iv. An examinee shall not create any situation that may cause disturbance to other examinees and/ or breach of discipline.
v. An examinee must not communicate or attempt to communicate with other examinee/examinees nor shall he/ she copy or attempt to copy or take help or attempt to take help from any incriminating document.
vi. The university campus including the rooms, toilets and circulation space is in examination premises.
vii. In any matter not specifically mentioned in the regulations or on the cover page of the answer script, an examinee shall abide by the decision of the invigilator in the examination hall.

b) Description of Major Unfair means activities

The following activities are treated as unfair means activities in the examinations:

i. Possession of any incriminating document related to the course of examination.
ii. Copying/ attempt to copy/ taking help from any incriminating document.
iii. Insertion of any page in the answer script written outside of the examination hall.
iv. Writing anything on any part of body/ clothes of the student concerned/ chair, table, desk, bench, wall etc.
v. Having the answers written on the answer script by other.
vi. Exchanging of the answer scripts or any part of it or additional answer sheet with other examinee(s).
vii. Carrying a cell phone/ non-essential electronic device(s).
viii. Misbehaving with invigilator(s) and/ or other examinees.

c) Penalty for Committing Offences Related to the Examination

Penalty will be imposed for the offences during examinations are to be classified as the following types in order of severity:

i. Attempt to communicate with other examinee or examinees: Issuing warning and/or changing of seats and or deduction of marks or expulsion from the examination hall.
ii. Possession of unauthorized document(s), and/or any unauthorized device(s): cancellation of the answer script of that particular examination and he/she will get 'F' grade in that examination.
iii. Possession of unauthorized document(s), and/or any unauthorized device(s), and being caught while attempting to use them: He/she will be expelled from that examination and will get 'F' grade in that examination. He /she will not be allowed to appear in the

examination of the remaining courses. Accordingly, he/she will get ‘F’ grade in the results of the remaining courses. But in case of Referred/ Improvement/ Backlog Examinations, he/she will be expelled from that particular course and will get ‘F’ in the course.

iv. Possession of unauthorized document(s), and/or any unauthorized devices, and being caught with proof that those have been already used: He/ She will be expelled from the entire examination of that term. Accordingly, he/ she will get ‘F’ grade in the result of all the courses.

v. Attempt to get possession of question paper(s) or answer script(s) before the examination: Expulsion from the University for the semester in which the offence is committed.

vi. Use of violent language and holding out threats to the invigilators, question paper setters, examiners and scrutinizers: Cancellation of the enter examination of the student for that semester and expulsion for the university for good.

vii. Impersonating or causing to impersonate in the examination hall: Cancellation of the entire examination of the student concerned for that semester and expulsion from the University for Good.

viii. Any other activities (which are not mentioned here) deemed to be unfair means in the examination: Chief Invigilator and Chairman CECC will take the decision in consultation with the Vice-Chancellor.

COURSE OUTLINES

LEVEL-1, TERM-I

CSE 1100: Introduction to Computer System Sessional

Course Details
Course Code: CSE 1100 Course Title: Introduction to Computer System Sessional Course Type: Laboratory Course Level: 1-I Academic Session: Summer-2022 Course Teacher: Taher Muhammad Mahdee Pre-requisite: NA Credit Value: 1.50 Contact Hours: 3.00 Total Marks: 100%
Rationale
The structured programming language Sessional course is designed to introduce the fundamental concepts and mechanisms computer hardware and software. It helps to identify which hardware are used and which software are commonly used. This sessional course begins with practicing introductory concepts of computer and then covers other important topics such as Microsoft Word, Microsoft Excel, Microsoft Powerpoint, Paint and Basic web technologies.
Objective
1. To know basic ideas of computer hardware and software. 2. To learn how to use software to complete any project. 3. To develop problem solving skills.
Course Content
Introducing major components of a computer; Hardware: processor, memory, I/O devices; Operating system, application softwares: Word processor, Spreadsheet, Slideshow maker.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Understand the basic working principle of computer components, their organization inside a working computer.	Y											
CLO2	Using knowledge of computer components to identify and solve computer issues.			Y									
CLO3	Prepare article, presentation and present on the topics of computer.									Y			

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	Lab 1	Computer Organization	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Presentation, Mid Term	CLO1, CLO2
2	Lab 2	Processor, types and how it works			
3	Lab 3	Ram and how it holds program for processor to use.			
4	Lab 4	Motherboard, PSU			
5	Lab 5	Display devices and I/O devices			
6	Lab 6	Other peripherals and System Integration			
7	Lab 7	Microsoft Word			
Mid Term					CLO1-CLO3
8	Lab 8	Advanced Word Processing	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Presentation, Final	CLO2, CLO3
9	Lab 9	Powerpoint basics, Powerpoint animation			
10	Lab 10	Microsoft Excel			
11	Lab 11	Excel functions and programming			
12	Lab 12	Web Basics			
13	Lab 13	Preparation and presentation of learned topics			
14	Lab 14	Preparation and presentation of learned topics (continued)			
Final Term					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy		
Components		**Grading**
Performance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%
Final Exam		20%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodology

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books:

Introduction to Computer System, 2nd Edition, Harold L. Rogler.

Reference Site:

https://www.hackerrank.com/domains/c [for practical coding challenge site]

https://www.tutorialspoint.com/ Introduction to Computer System /index.htm

https://www.geeksforgeeks.org/ Introduction to Computer System /

CSE 1101: Structured Programming Language

Course Details

Course Code: CSE 1101

Course Title: Structured Programming Language

Course Type: Core Course

Level-Term: 1-I

Academic Session: Summer-2022

Course Teacher: Debashis Gupta

Pre-requisite: None

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

The structured programming language course introduces the fundamental concepts and mechanisms of computer programming skills. It helps to develop baseline programming knowledge to design and develop algorithms to solve real-world problems. This course begins with introductory concepts of structured programming language and then covers other important topics such as Control Statements, Loop, Array, String, Function, Pointer, Structure, File, Storage Classes, Error Handling, and Command-Line Parameters.

Course Objectives:

1. To know about flowcharts and algorithms with Implementation using Computers.
2. To know about various syntax, the semantics of structured programming languages.
3. To develop problem-solving skills.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Illustrate flow chart and describe algorithm to solve problems using computers.	Y											
CLO2	Analyze the fundamental principles, usual characteristics and appropriate mechanisms of a structured programming language.		Y										
CLO3	Develop fundamental programming skills of program design and development.			Y									

CLO4	Develop the communication skill by presenting topics on Structured programming language.										Y		

(Y-Yes)

Course Outline/ Lecture plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Programming Concepts, Program Development Stages	Lecture, Tutorials, Discussion	CT 1	CLO1
	2	Flow Charts, Algorithms, Structured Programming Language Concept	Lecture, Tutorials, Discussion		
	3	ASCII Value/code, Data types	Lecture, Tutorials, Discussion		
2	4	Basic Input/ Output	Lecture, Tutorials, Discussion		
	5	Operators, Expressions	Lecture, Tutorials, Discussion		
	6	Operators, Expressions(cont.), Type Casting	Lecture, Tutorials, Discussion		
3	7	Control Structure: if-else	Lecture, Tutorials, Discussion		
	8	Control Structure: nest if-else, else-if ladder	Lecture, Tutorials, Discussion		

	9	Switch	Lecture, Tutorials, Discussion		
4	10	Loop: for loop	Lecture, Tutorials, Discussion	ASG	CLO3-CLO4
	11	Loop: while, do while	Lecture, Tutorials, Discussion		
	12	break, continue, Nested Loop	Lecture, Tutorials, Discussion		
5	13	Nested Loop(cont.)	Lecture, Tutorials, Discussion		
	14	Nested Loop(cont.)	Lecture, Tutorials, Discussion		
	15	Nested Loop(cont.), Array Introduction	Lecture, Tutorials, Group Work		
6	16	1-D array	Lecture, Tutorials, Discussion		
	17	Multidimensional array: 2-D, 3-D etc.	Lecture, Tutorials, Group Work		
	18	Memory Allocation of arrays	Lecture, Tutorials, Group Work		
7	19	Character array/ String	Lecture, Tutorials, Group Work		

	20	String: various input/ output methods, iterative approach	Lecture, Tutorials, Group Work		
	21	String handling functions	Lecture, Tutorials, Group Work		
Mid Term					CLO1-CLO2
8	22	Function: Introduction, function declaration, definition	Lecture, Discussion	CT 2	CLO2
	23	Function: Parameter, argument, function call	Lecture, Discussion		
	24	Function: various types with example	Lecture, Discussion		
9	25	Recursion	Lecture, Discussion		
	26	Recursion (cont.)	Lecture, Discussion		
	27	Pointer: Introduction	Lecture, Discussion		
10	28	Pointer: Indirections , Pointer Arithmetic	Lecture, Discussion		
	29	Pointer: restrictions, Call by value, Call by reference	Lecture, Tutorials, Group Work		
	30	Dynamic Memory Allocation: malloc(), calloc(), realloc(), free()	Lecture, Tutorials, Group Work		
11	31	User defined data type: Structure	Lecture, Tutorials, Group Work	CT 3	CLO1-CLO2
	32	Union, Enumeration	Lecture, Tutorials, Group Work		

	33	File: Basics, Input/output, Various modes of opening file	Lecture, Tutorials, Group Work		
12	34	Header files, preprocessor	Lecture, Tutorials, Group Work		
	35	Storage Classes: auto, register, static	Lecture, Tutorials, Group Work		
	36	Variable arguments, Command line arguments	Lecture, Tutorials, Group Work		
13	37	Error handling	Lecture, Tutorials, Group Work		
	38	Linking, Library Functions	Lecture, Tutorials, Group Work		
	39	Library function: Graphics	Lecture, Tutorials, Group Work		
14	40	Review Class			
	41	Review Class			
	42	Review Class			
Final Exam					CLO1, CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books C: The Complete Reference (4th Edition) by Herbert Schildt Head First C: A Brain-Friendly Guide Programming in Ansi C (6th Edition) by E Balagurusamy **Reference Site** https://www.hackerrank.com/domains/c [for practical coding challenge site] https://www.tutorialspoint.com/cprogramming/index.htm https://www.geeksforgeeks.org/c-programming-language/ https://www.javatpoint.com/c-programming-language-tutorial

CSE 1102: Structured Programming Language Sessional

Course Details
Course Code: CSE 1102 Course Title: Structured Programming Language Sessional Course Type: Laboratory Course Level: 1-I Academic Session: Summer-2022 Course Teacher: Debashis Gupta Pre-requisite: N/A Credit Value: 1.50 Contact Hours: 3.00 Total Marks: 100%

Rationale

The structured programming language Sessional course is designed to introduce the fundamental concepts and mechanisms of computer programming skills. It helps to develop baseline programming knowledge to design and develop algorithms to solve real-world problems practically. This sessional course begins with practicing introductory concepts of structured programming and then covers other important topics such as Control Statements, Loop, Array, String, Function, Pointer, Structure, File, Storage Classes, Error Handling and Command-Line Parameters.

Objective

1. To know basic ideas of programming languages with Implementation using Computer.
2. To learn how to program with C to solve real-world problems.
3. To develop problem-solving skills.

Course Content

Laboratory works based on CSE 1101.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Design flow charts, describe algorithms and solve problems using computers.			Y									
CLO2	Analyze the fundamental principles, usual characteristics and appropriate mechanisms of a structured programming language practically.	Y			Y								
CLO3	Apply knowledge to think about the problems, their solutions and translating it to programming language practically.			Y						Y			

Y=Yes

Course Plan:

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab 1	Programming Concept, Basic Input/Output, Mathematical problems	Lecture and Discussion, Co-operative and	MT, F	

2	Lab 2	Operators (unary, binary, ternary), Expression, Type Conversion	Collaborative Method, Problem Based Method		
3	Lab 3	Control Structure: if-else, nested if-else			
4	Lab 4	Control Structure: else-if ladder, switch			
5	Lab 5	Loop: for, while, do while			
6	Lab 6	Loop: nested loops			
Mid Term Exam					**CLO1-CLO2**
7	Lab 7	Array: 1-D array,2-D Array	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	MT, F	
8	Lab 8	2-D array (Cont.), Character array/ String			
9	Lab 9	Function: Introduction, function declaration, definition, various types of functions			
10	Lab 10	Recursion			
11	Lab 11	Pointer			
12	Lab 12	User defined data type: Structure, Union, enumeration			
13	Lab 13	File I/O			
14	Lab 14	Dynamic memory Allocation: malloc(), calloc(), free(), realloc()			
Final Term					**CLO1, CLO3**

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Performance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%

Final Exam	20%
Total Marks	100%
Make-up Procedures	
Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.	
Learning Materials	
Teaching Methodology Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method. **Delivery Methods and Activities** Lecture, White Board Writing, Power Point Presentation **Reference books:** C: The Complete Reference (4th Edition) by Herbert Schildt Head First C: A Brain-Friendly Guide Programming in Ansi C (6th Edition) by E Balagurusamy **Reference Site:** https://www.hackerrank.com/domains/c [for practical coding challenge site] https://www.tutorialspoint.com/cprogramming/index.htm https://www.geeksforgeeks.org/c-programming-language/ https://www.javatpoint.com/c-programming-language-tutorial	

EEE 1163: Introduction to Electrical Engineering

Course Details
Course Code: EEE 1163 Course Title: Introduction to Electrical Engineering Course Type: GED Course Level-Term: 1-I Academic Session: Summer-2022 Course Teacher: Pre-requisite: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course is designed to teach about fundamental concepts, solution techniques and different practical applications of DC and AC circuits.
Course Objectives
1. To acquaint students with the basic concepts and properties of electrical circuits and networks. 2. Calculate current through different branches and voltages differences across different pairs of nodes using several methods. 3. To understand the basic terms and related issues in electrical systems. 4. To make students familiar with the terminology associated with AC electrical circuits like sinusoidal signal, frequency, power factor, sinusoidal voltage, current, power and other related terminologies.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply knowledge of mathematics, science, and engineering to the analysis of electrical circuits.	Y		Y									
CLO2	Analyze different theorem in electrical circuits.		Y										

CLO3	Design different circuits with various circuit elements and realizing their appropriate rating to get desired outputs.			Y	Y								

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
	1	DC Circuits: Fundamental electrical concepts and measuring units,	Lecture, Tutorials, Discussions		
1	2	D.C. voltage, current, resistance and power.	Lecture, Tutorials, Discussions		
	3	Introduction to circuit theory and Ohm's law.	Lecture and Discussion, Co-operative and Collaborative Method		
	4	Kirchhoff's current law and their application	Lecture and Discussion, Co-operative and Collaborative Method	CT1	CLO1-CLO2
2	5	Kirchhoff's voltage laws and their application	Lecture and Discussion, Co-operative and Collaborative Method		
	6	Simple resistive circuits: Series and parallel circuits,	Lecture and Discussion, Co-operative and Collaborative Method		
3	7	voltage and current division,	Lecture and Discussion, Co-operative and Collaborative	ASG	CLO3

			Method, Problem Based Learning (PBL)		
	8	Wye-Delta transformation.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	9	Various techniques for solving circuit problems:	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
4	10	Mesh Analysis and related problem	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	11	Mesh Analysis including supermesh	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	12	Nodal Analysis application	Lecture and Discussion, Co-operative and		

			Collaborative Method, Problem Based Learning (PBL)		
5	13	Nodal including supernode	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	14	Superposition theorem and related problem	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	15	Source transformation and related problem	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
6	16	The venin's theorem and applications	Lecture and Discussion, Co-operative and Collaborative Method		
	17	The venin's theorem and related problem	Lecture and Discussion, Co-operative and Collaborative Method		

	18	The venin's and related problem having dependent sources in circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
7	19	Norton's theorems and applications.	Lecture and Discussion, Co-operative and Collaborative Method		
	20	Maximum power transfer condition	Lecture and Discussion, Co-operative and Collaborative Method		
	21	Energy storage elements: Inductors and capacitors and their characteristics.	Lecture and Discussion, Co-operative and Collaborative Method		
Mid Term					CLO1-CLO2
8	22	Fundamental concepts of AC electrical circuit.	Lecture and Discussion, Co-operative and Collaborative Method	CT2	CLO1, CLO2
	23	Sinusoidal signal, mathematical representation of sinusoidal signal.	Lecture and Discussion, Co-operative and Collaborative Method		
	24	Phasor and complex quantities.	Lecture and Discussion, Co-operative and Collaborative Method		
9	25	Impedance, Admittance, Impedance Combination.	Lecture and Discussion, Co-operative and Collaborative Method		

	26	Analysis of single-phase ac circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
	27	Series and parallel circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
10	28	AC power analysis.	Lecture and Discussion, Co-operative and Collaborative Method		
	29	Instantaneous and average power.	Lecture and Discussion, Co-operative and Collaborative Method		
	30	RMS value, related mathematics.	Lecture and Discussion, Co-operative and Collaborative Method		
11	31	Complex power, power factor	Lecture and Discussion, Co-operative and Collaborative Method	CT3	CLO1-CLO2
	32	Analysis of three phase circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
	33	Three phase supply, balanced circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
12	34	Three phase unbalanced circuits.	Lecture and Discussion, Co-		

			operative and Collaborative Method		
	35	Three phase unbalanced circuit analysis.	Lecture and Discussion, Co-operative and Collaborative Method		
	36	Power calculation, related mathematics.	Lecture and Discussion, Co-operative and Collaborative Method		
13	37	Power calculation, related mathematics.	Lecture and Discussion, Co-operative and Collaborative Method		
	38	Introduction to magnetic circuit, Comparison between electrical and magnetic circuits.	Lecture and Discussion, Co-operative and Collaborative Method		
	39	Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density.	Lecture and Discussion, Co-operative and Collaborative Method		
14	40	Laws of magnetic circuits	Lecture and Discussion, Co-operative and Collaborative Method		
	41	Review of the overall courses.			
	42	Review of the overall courses.			
Final Exam					CLO1-CLO2
Assessment and Evaluation					

<table>
<tr><td colspan="3">Assessment Strategy</td></tr>
<tr><th colspan="2">Components</th><th>Grading</th></tr>
<tr><td rowspan="4">Continuous Assessment
(40%)</td><td>Class Test (1-3)</td><td>15%</td></tr>
<tr><td>Assignment</td><td>05%</td></tr>
<tr><td>Class Participation</td><td>05%</td></tr>
<tr><td>Mid Term</td><td>15%</td></tr>
<tr><td colspan="2">Final Exam</td><td>60%</td></tr>
<tr><td colspan="2">Total Marks</td><td>100%</td></tr>
</table>

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

Fundamentals of Electrical Circuits by Alexander and Sadiku

Introductory Circuit Analysis by Robert L. Boylestad

Alternating-Current Circuits- Russell M Kerchner and George F Corcoran

EEE 1164: Introduction to Electrical Engineering Sessional

Course Details

Course Code: EEE 1164

Course Title: Introduction to Electrical Engineering Sessional

Course Type: GED Course

Level-Term: 1-I

Academic Session: Summer-2022

Course Teacher: ……………

Pre-requisite: Course Code: EEE 1163, Course Title: Introduction to Electrical Engineering

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course is designed to teach about practical experiments on fundamental concepts, theorems, and different circuit problems.

Course Objectives

1. Analyze resistive circuits by using different network theorems (e.g. Mesh analysis, Nodal analysis Superposition theorem, Thevenin theorem, Norton theorem etc.).
2. Learn the self-learning mechanism to gather knowledge about different type of present developments in electrical technology worldwide.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Familiarization with electrical circuits and apply the knowledge of basic electrical components and networks practically.	Y		Y									
CLO2	Analyze the differences between theoretical knowledge with the practical observations.		Y										
CLO3	Verify basic electrical laws and circuit theorems.		Y										
CLO4	Design different elementary circuit related projects based on practical problems using			Y		Y				Y			

	circuit theorems and electrical components.												

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Construction and Operation of Simple Electrical Circuits.	Lectures, Experiments		
2	2	Study on equivalent Resistance of Series-Parallel Network & Δ-Y Circuit.	Lectures, Experiments		
3	3	To verify the V-I characteristics of series circuit using ohms law.	Lectures, Experiments	R, Q, T	CLO1-CLO4
4	4	Verification of KVL & Voltage Divider Rule.	Lectures, Experiments		
5	5	Verification of KCL & Current Divider Rule.	Lectures, Experiments		
6	6	Verification of Superposition Principle Theorem.	Lectures, Experiments		
7	7	Lab Test-1			
Mid Term					
8	8	Verification of Thevenin's Theorem and Maximum Power Transfer.	Lectures, Experiments	R, Q, T	CLO1-CLO4
9	9	Verification of Maximum Power Transfer.	Lectures, Experiments		

10	10	Measurement of power using Two-wattmeter method.	Lectures, Experiments		
11	11	Familiarization with alternating current (AC) waves.	Lectures, Experiments		
12	12	Study of Transient Behavior of RC and RL Circuits.	Lectures, Experiments		
13	13	Lab Test – II			
14	14	Project Submission and Quiz			

Assessment and Evaluation

Assessment Strategy

Components	Grading
Conduct of Lab Test /Class Performance	25%
Report Writing/ Programming	15%
Mid-Term Evaluation (Exam/Project/assignment)	20%
Final Evaluation (Exam/Project/assignment)	30%
Viva Voce / Presentation	10%
Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Fundamentals of Electrical Circuits by Alexander and Sadiku
2. Introductory Circuit Analysis by Robert L. Boylestad

MATH 1141: Differential Calculus, Integral Calculus and Coordinate Geometry

Course Details

Course Code: MATH 1141

Course Title: Differential Calculus, Integral Calculus and Coordinate Geometry

Course Type: GED Course

Level-Term: 1-I

Academic Session: Summer-2022

Course Teacher: ……………

Pre-requisite: Nill

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

This is a Required/Core Course. This course is designs to introduce the students with the basic concepts of differential calculus, integral calculus and coordinate geometry. Upon the successfully completion of this course students will be able to find the limits of functions, derivatives of functions and integration of functions and can solve associated problems arising in engineering. Also, students will be able to solve coordinate geometry related problems.

Course Objectives

1. To familiarize students with the concepts of differential calculus.
2. To make students acquainted with the application of differential calculus.
3. To familiarize students with the integral calculus.
4. Be able to solve integration related problem.
5. To make students able to solve geometry related problem.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Ability to ascertain the basic terminology and theorems associated with differentiation, integration, and coordinate geometry.	Y											
CLO2	Ability to learning the concepts of differentiation, and integration to solve	Y											

	problems arising in engineering sectors.												
CLO3	Ability to make procurement of real-life application-based works according to differential calculus, integral calculus and analytical geometry.	Y											

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Function, Limit	Lecture, Discussion, Class Participation	CT1	CLO1, CLO 2
	2	Continuity	Lecture, Discussion, Class Participation		
	3	Differentiability	Lecture, Discussion, Class Participation		
2	4	Successive differentiation of various types of functions	Lecture, Discussion, Class Participation		
	5	Successive differentiation of various types of functions	Lecture, Discussion, Class Participation		
	6	Leibnitz’s theorem	Lecture, Discussion,		

			Class Participation		
3	7	Rolle's theorem	Lecture, Discussion, Class Participation		
	8	Mean Value theorem	Lecture, Discussion, Class Participation		
	9	Expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder	Lecture, Discussion, Class Participation		
4	10	Expansions of functions differentiation and integration	Lecture, Discussion, Class Participation	ASG	CLO4
	11	Indeterminate form, Cartesian differentiation	Lecture, Discussion, Class Participation		
	12	Euler's theorem,	Lecture, Discussion, Class Participation		
5	13	Tangent and normal	Lecture, Discussion, Class Participation		
	14	Sub tangent and subnormal in Cartesian form	Lecture, Discussion, Class Participation		

	15	Sub tangent and subnormal in polar form	Lecture, Discussion, Class Participation		
6	16	Maxima and minima of functions of single variables	Lecture, Discussion, Class Participation		
	17	Curvature	Lecture, Discussion, Class Participation		
	18	Asymptotes	Lecture, Discussion, Class Participation		
7	19	Definition of integrations	Lecture, Discussion, Class Participation		
	20	Integration by the method of substitution	Lecture, Discussion, Class Participation		
	21	Integration by parts	Lecture, Discussion, Class Participation		
Mid Term					CLO1-CLO2
8	22	Standard integrals	Lecture, Discussion, Class Participation		

	23	Integration by the method of successive reduction	Lecture, Discussion, Class Participation	CT2	CLO1, CLO2
	24	Integration by the method of successive reduction	Lecture, Discussion, Class Participation		
9	25	Definite integrals and its use in summing series	Lecture, Discussion, Class Participation		
	26	Walli's formula	Lecture, Discussion, Class Participation		
	27	Improper integrals	Lecture, Discussion, Class Participation		
10	28	Beta function and gamma function	Lecture, Discussion, Class Participation		
	29	Beta function and gamma function	Lecture, Discussion, Class Participation		
	30	Beta function and gamma function	Lecture, Discussion, Class Participation		
11	31	Multiple integral and its application, area, volume of	Lecture, Discussion,	CT3	CLO1-CLO2

		solid revolution, area under a plain curve in Cartesian and polar coordinates	Class Participation		
	32	Area of the region enclosed by two curves in Cartesian and polar coordinates	Lecture, Discussion, Class Participation		
	33	Arc lengths of curves in Cartesian and polar coordinates.	Lecture, Discussion, Class Participation		
12	34	Transformation of co-ordinates, equation of conics, its reduction to standard forms, pair of straight lines	Lecture, Discussion, Class Participation		
	35	Homogeneous equations of second degree, angle between straight lines	Lecture, Discussion, Class Participation		
	36	Pair of lines joining the origin to the point of intersection of two given curves,	Lecture, Discussion, Class Participation		
13	37	Circles and system of circles, orthogonal circles	Lecture, Discussion, Class Participation		
	38	Radical axis and its properties, radical centers, coaxial circles and limiting points	Lecture, Discussion, Class Participation		
	39	Equations of parabola, ellipse in Cartesian and polar coordinates	Lecture, Discussion,		

			Class Participation		
14	40	System of coordinates, projection, direction cosines	Lecture, Discussion, Class Participation		
	41	Equations of planes and lines, angle between lines and planes, distance from a point to a plane, co-planner lines	Lecture, Discussion, Class Participation		
	42	Shortest distance between two given straight lines, standard equation of coincides, sphere and ellipsoid	Lecture, Discussion, Class Participation		
Final Exam					CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books 1. Calculus – Howard Anton 2. A text Book of Differential Calculus – Rahman and Bhattachrjee. 3. Differential Calculus – Shanti Narayan. 4. Differential Calculus – Dr. B. D. Sharma. 5. Differential Calculus – Das and Mukhajee.

PHY 1103: Physics

Course Details
Course Code: PHY 1103 Course Title: Physics Course Type: GED Course Level-Term: 1-I Academic Session: Summer-2022 Course Teacher: …………… Pre-requisite: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100
Rationale
This course is designed to teach about basic physics in the field of waves-oscillations and wave mechanics, optics and laser, and structure of matter and electricity-magnetism. The course will be emphasized the fundamental concepts, theories and solve quantitative problems which can be applicable in a wide spectrum of engineering disciplines.
Course Objectives
1. To familiarize students with waves and oscillations, wave mechanics, optics and laser, structure of matter, electricity and magnetism.

2. To educate students about various theories and laws related to waves and oscillations, wave mechanics, optics and laser, structure of matter, electricity and magnetism.
3. To solve (analytical and numerical) problems.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Knowing about different basic parameters in the field of waves and oscillations, wave mechanics, optics and laser, structure of matter and electricity and magnetism.	Y											
CLO2	Explain different theories and formulas for waves-oscillations, wave mechanics, optics and laser, structure of matter, electricity and magnetism such as various wave equations, energy of waves, wave functions, Schrodinger equation, Brewster's law, Malus law, laser, Miller indices, packing factor, Coulomb's law, Gauss's law, Ampere's law, Faraday's laws of electromagnetic induction etc.		Y										
CLO3	Solving quantitative problems in the field of waves and oscillations, wave mechanics, optics and laser, structure of matter and electricity and magnetism.			Y									

Y=yes

Course Plan

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Brief discussion on total syllabus, basic	Lecture and Discussion, Co-operative		

		requirements of the course, assessment of the course	and Collaborative Method, Problem Based Learning (PBL)	CT1	CLO1-CLO3
	2	Definition and characteristics of simple harmonic motion (SHM), Differential equation of SHM	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	3	Solution of differential equation of SHM, Velocity and acceleration	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
2	4	Time period, frequency, Mathematical problems of SHM	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	5	Total energy of a particle executing SHM	Lecture and Discussion, Co-operative and Collaborative		

			Method, Problem Based Learning (PBL)		
	6	Average energy of a particle executing SHM	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
3	7	Composition of SHM-1	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	8	Composition of SHM-2	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	9	Damped vibration, differential equation and solution of damped vibration, forced vibration and resonance	Lecture and Discussion, Co-operative and Collaborative Method,		

			Problem Based Learning (PBL)		
4	10	Wave motion, characteristics of wave motion, types of wave motion	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	ASG	CLO2-CLO3
	11	Equation of progressive wave, relationship between path difference and phase difference	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	12	Energy of progressive wave	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
5	13	Stationary wave, phase velocity and group velocity	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		

	14	Electric charge, properties of electric charge, Coulomb's law	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	15	Electric field	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
6	16	Electric potential	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	17	Gauss's law and its application	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	18	Electric current, drift velocity of electron	Lecture and Discussion,		

			Co-operative and Collaborative Method, Problem Based Learning (PBL)		
7	19	Magnetic properties of materials, magnetic effects on current, magnetic field	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	20	Biot-Savart's law and its application	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	21	Ampere's law, calculation of magnetic field	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
Mid Term					CLO1-CLO3
8	22	Electromagnetic induction, Faraday's laws of electromagnetic induction	Lecture and Discussion, Co-operative		

			and Collaborative Method, Problem Based Learning (PBL)	CT 2	CLO1-CLO3
	23	Self-inductance, mutual inductance	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	24	Solid and its classification, some definition	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
9	25	Unit cell, lattice symbol, crystal system	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	26	Miller indices, plane, direction	Lecture and Discussion, Co-operative and Collaborative		

			Method, Problem Based Learning (PBL)		
	27	Atomic radius, packing factor	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
10	28	Interplanar spacing, mathematical problems	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	29	Interference of light, conditions for interference, Young's double slit experiment	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	30	Calculation of band width, Mathematical problems	Lecture and Discussion, Co-operative and Collaborative Method,		

			Problem Based Learning (PBL)		
11	31	Interference in thin films	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)	CT3	CLO1-CLO3
	32	Newton's rings experiment, mathematical problems	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	33	Diffraction, types of diffraction, difference between interference and diffraction	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
12	34	Fraunhofer diffraction by a single slit, mathematical problems	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		

	35	Polarization of light, Brewster's law, double refraction, mathematical problems	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	36	Malus law, Nicol prism, optical activity, specific rotation	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
13	37	LASER	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	38	Wave functions and its significance, postulates of quantum mechanics	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	39	Schrodinger equation	Lecture and Discussion,		

			Co-operative and Collaborative Method, Problem Based Learning (PBL)		
14	40	Operators, Heisenberg uncertainty principle	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	41	Calculation of energy of a particle in a box	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
	42	Review of the overall courses.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL)		
Final Exam					CLO1-CLO3

Assessment and Evaluation	
Assessment Strategy	
Components	**Grading**

<table>
<tr><td rowspan="4">Continuous Assessment (40%)</td><td>Class Test (1-3)</td><td>15%</td></tr>
<tr><td>Assignment</td><td>05%</td></tr>
<tr><td>Class Participation</td><td>05%</td></tr>
<tr><td>Mid Term</td><td>15%</td></tr>
<tr><td colspan="2">Final Exam</td><td>60%</td></tr>
<tr><td colspan="2">Total Marks</td><td>100%</td></tr>
</table>

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Waves and oscillations by Brijlal and Subramannayam
2. A text of optics by Brijlal and Subramannayam
3. Electricity and magnetism by K. K. Tewari
4. Concepts of electricity and magnetism by Haq, Rafiqullah, Roy
5. Modern physics by B. L. Theraja
6. Concept of modern physics by Aurther Beiser
7. Introduction to Solid State Physics by C. Kittle

PHY 1132: Physics Sessional

Course Details

Course Code: PHY 1132

Course Title: Physics Sessional

Course Type: GED Course

Level-Term: 1-I

Academic Session: Summer-2022

Course Teacher: ……………

Pre-requisite: Nill

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

This is a laboratory based sessional course for the basic physics in the field of oscillations, mechanics, optics and electricity. The course will emphasize the fundamental experiments on different fields of physics which can be applicable in a wide spectrum of engineering disciplines. This laboratory course will enable students to understand basic physics practically as well as do work with team or individual.

Course Objectives

1. To develop basic physics knowledge practically.
2. To practice the use of basic scientific instrument.
3. To understand oscillation, various properties of light and electricity.
4. To understand the characteristics of some rigid materials.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Acquaint with different parameters concerning oscillations, mechanics, optics and electricity.	Y											
CLO2	Able to describe the different phenomena about oscillations, mechanics, optics and electricity.		Y										
CLO3	Be skilled to apply theoretical knowledge to perform experiments			Y						Y			

	by an individual or by a group to determine acceleration due to gravity, wavelength of light, resistance of a galvanometer, spring constant, the rigidity modulus etc.												
CLO4	Be able to prepare a report for an experimental work.										Y		

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introductory class: brief discussion on total syllabus, basic requirements of the course, evaluation system of the course, grouping, visit different section of the laboratory, introduction to different basic equipment's	Lectures, Experiments	R, Q, T	CLO1 -CLO4
2	2	Determination of the spring constant and the effective mass of a loaded spring and hence to calculate the rigidity modulus of the material of the spring	Lectures, Experiments		
3	3	Determination of acceleration due to gravity 'g' by means of a compound pendulum	Lectures, Experiments		
4	4	Determination of the wavelength of a	Lectures, Experiments		

		monochromatic light by spectrometer using a plane diffraction grating. Hence to calculate the dispersive power of the grating			
5	5	Determination of the resistance of a galvanometer by half-deflection method	Lectures, Experiments		
6	6	Lab Test	Lectures, Experiments		
7	7	Viva and Quiz			

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (30%)	Class performance	20%
	Report Writing/ Assignment	10%
Final Exam (70%)	Lab test	30%
	Viva	20%
	Quiz	20%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Practical Physics - Dr. Gias Uddin Ahmad and Md. Shahabuddin

ENG 1127: English

Course Details
Course Code: ENG 1127 Course Title: English Course Type: GED Course Level-Term: 1-I Academic Session: Summer-2022 Course Teacher: …………… Pre-requisite: Nill Credit Value: Credit Hours: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The course will develop students' writing skills necessary for their academic and professional success. It will also help the students to learn and follow the conventions of standard written English in sentence structure, punctuation, grammar usage and spelling. This course will also provide fundamental aspects of reading, writing, listening and speaking skills. The course will help students to develop their language and communication skills through interactive participation in the class. Students will practice brainstorming, freewriting, paragraph and argumentative essay writing. In addition, they will practice listening and speaking activities. By attending this course student can build up communicative skills which they can utilize in their academic as well as professional life.
Course Objectives
1. To help students learn rudiments of English, write grammatically correct sentences and use them in their real-life situations. 2. To enable the students to develop their reading ability through practicing a substantial number of reading materials in the classroom. 3. To enable the students to develop their writing ability through practicing a substantial number of writing tasks in the classroom.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Acquire their knowledge of fundamental grammatical structures and functions	Y											

CLO2	Read and write grammatically correct sentences. Utilize the strategies of free hand writing in other courses	Y											
CLO3	Use the language for their daily life communication with the native speakers and nonnative speakers more efficiently			Y							Y		**Y**
CLO4	Write paragraph, easy, report, summary, précis writing, cover letter and cv writing												Y

Y=yes

Course Plan:

Week	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1 - 4	Different Uses of Tense, Types of questions, ways of asking an answering question, Definition of Phrase, Types of Phrases Identify Phrases, Definition of Clause, types of Clauses, Identify Clause - Noun clause, adjective clause. Adverbial clause and conditional clause. Function and paraphrase of the Modals Basic sentence structures, Different Rules of Transformation	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study.	CT 1	CLO1-CLO2
5 - 7	Difference between phonetics and phonology, IPA symbols, Phonemic transcription and rules of pronunciation; Notions and Functions: formal and informal situations, asking for information, making request, greeting someone, congratulating; Practicing dialogue: role play, guided conversation, questioning and	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop	CT2	CLO1-CLO2

	answering;	quiz, Case study.		
8 - 9	Reading: different reading strategies (Scanning and Skinning, guessing, contextualization), Practice reading using authentic materials and giving feedback	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study.	MT	CLO1-CLO3
10 - 12	Writing: how to write an application Different type of application (job application, cover letter etc.), CV writing; Report writing	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study.	MT	CLO1-CLO3
13	Summary and précis writing; Paragraph writing: Strategies of writing a paragraph, different parts of a paragraph; Types of paragraph - Listing paragraph, Example paragraph, Comparison paragraph, Contrast paragraph	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop	CT 3	CLO1-CLO3

		quiz, Case study.		
14	Essay writing: how to write an essay, Different parts of an essay, Types of essays - Descriptive essay, Narrative essay, Argumentative essay	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Learning (PBL), Pop quiz, Case study.	CT 4	CLO1-CLO3
Final Exam				CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books
1. High school English Grammar by Wren & Martin 2. A Practical English Grammar by Thomson & Martinet 3. English Phonetics and Phonology by Peter Roach 4. Language & Communication by Miller, G.A.

LEVEL-1, TERM-II

CSE 1201: Discrete Mathematics

Course Details
Course Code: CSE 1201 Course Title: Discrete Mathematics Course Type: Core Course Level: 1-II Academic Session: Summer-2022 Course Teacher: Md Sydur Rahman Pre-requisite: N/A Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The course is designed to develop logical thinking and its application to computer science (to emphasize the importance of proving statements correctly and de-emphasize the hand-waving approach towards correctness of an argument). The subject enhances one’s ability to reason and ability to present a coherent and mathematically accurate argument.
Objective
• To introduce Discrete Mathematics and its applications. • To introduce some of the problems of Discrete Mathematics. • To develop knowledge of a variety of mathematical tools applicable in computer science.
Course Content
Mathematical Logic: propositional calculus and predicate calculus; Set theory: sets, relations, partial ordered sets, functions; Mathematical reasoning and proof techniques; Counting: permutations,

combinations, principles of inclusion and exclusion; Discrete Probability; Recurrence relations and recursive algorithms; Growth of functions; Graph theory: graphs, paths, trees, cycles; Algebraic structures: groups, rings and filed.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Define an argument using logical notationand determine the validity of the argument.	Y											
CLO2	Construct simple mathematical proofs and possess the ability to verify them.		Y										
CLO3	Demonstrate the understanding of sets, relations and functions and modeling problems using graphs and trees.			Y									
CLO4	Develop the communication skills by presenting different topics on graphs and trees.									Y	Y		

Y=Yes

Course Plan:

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Introduction and course overview, Propositional Logic	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT1, M	CLO1
	2	Logical Operators, Precedence of Operators			
	3	Propositional Equivalences			
2	4	Predicates and Quantifier, Applications of Propositional Logic			

	5	Nested Quantifier	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	M, F, ASG	CLO3, CLO4
	6	Proof Techniques: Direct			
3	7	Proof Techniques: Indirect			
	8	Sets Theory			
	9	Set Operations			
4	10	Functions			
	11	Algorithms and Algorithmic notations			
	12	Complexity of algorithms			
5	13	Relations and their Properties			
	14	Closures of Relations			
	15	Equivalence Relations, Partial Order Relations			
6	16	Mathematical Reasoning: Inductions and Recursion			
	17	Recursive Definition and Structural Induction			
	18	Sequences and Sums			
7	19	Counting Methods: The Pigeonhole Principle and applications			
	20	Permutations and Combinations			
	21	Binomial Coefficients and Identities			
		Mid Term			**CLO1, CLO3**
8	22	Probability Theory, Discrete Probability	Lecture, Discussion, Presentation, Co-operative and Collaborative Method,	ASG, CT2, F	CLO2, CLO4
	23	Bayes' Theorem			
	24	Expected value and variance			
9	25	Advance Counting Techniques: Recurrence Relations			

	26	Divide and Conquer Algorithm	Problem Based Method		
	27	Inclusion-Exclusion			
10	28	Boolean Algebra , Boolean Functions			
	29	Logic Gates			
	30	Minimization of Circuits			
11	31	Graphs Terminology and Special Types of Graphs	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO2, CLO4
	32	Graph Connectivity: Euler and Hamilton Paths			
	33	Graph Coloring			
12	34	Trees and its applications			
	35	Spanning Tree			
	36	Minimum Spanning Tree			
13	37	Number theory and Cryptography, Divisibility and Modular Arithmetic			
	38	Primes, Greatest Common Divisors, Least Common Multiplier			
	39	Solving Congruence			
14	40	Algebraic structures: Groups			
	41	Algebraic structures: Ring, Field		F	CLO1-CLO4
	42	Review Class			
Final Term					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test 1-3	15%
	Assignment	05%

	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodology:

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books:

1. Discrete Mathematics and its Applications, 7th Edition by K. Rosen, McGraw Hill.
2. Discrete Mathematics with Applications -Thomas Koshy, Elsevier, 2003
3. Discrete Mathematics with Applications, 3rd Edition by Susanna S. Epp Gagne

Reference Site:

https://www.tutorialspoint.com/discrete_mathematics/index.htm.

https://mathworld.wolfram.com/DiscreteMathematics.html

https://www.javatpoint.com/discrete-mathematics-tutorial

CSE 1203: Object Oriented Programming Language I

Course Details

Course Code: CSE 1203

Course Title: Object Oriented Programming Language I

Course Type: Core Course

Level-Term: 1-II

Academic Session: Summer-2022

Course Teacher: Urmi Saha

Pre-requisite: Course Code: CSE 1101; Course Title: Structured Programming Language

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

The course is structured to cover fundamental and important topics in object oriented programming, such as philosophy of object oriented programing, necessity of object oriented programing for handling real world projects, introduction to class and objects, formation of class and object to handle different activity, object oriented programing principles, encapsulation, inheritance, polymorphism, abstraction, generic and template, exception handling, standard template library, applying object oriented approach in a sample project.

Course Objectives

1. To learn the object-oriented programing approach
2. To know different features and principles of object-oriented programing based on a high-level language like; C++, Java etc.
3. To able to design object-oriented architecture for a project and apply the object-oriented programing to solve real world projects

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn and utilize the fundamental features of anobject-oriented programming language**.**	Y											
CLO2	Realize the advantages of object-oriented design and learn when it is an appropriate methodology to use.		Y										
CLO3	Apply object-oriented approach for smallproblems having multiple objects.			Y									

CLO4	Demonstrate standard programming style and identifythe impact of style on developing and maintaining programs.				Y								
CLO5	Improve the knowledge presentation skill by presentingtopics on Object Oriented Programming**.**									Y			

Y=Yes

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Overview of functional programing	Lecture, Tutorials, Discussions	CT1	CLO1, CLO2
	2	Introduction to object-oriented programing	Lecture, Tutorials, Discussions		
	3	Comparative study of functional programing and object-oriented programing	Lecture, Tutorials, Discussion		
2	4	Brief Review–Variable, Data types, Expression, Statements	Lecture, Tutorials, Discussion		
	5	Brief Review–Arrays, Strings, Function	Lecture, Tutorials, Discussion		
	6	Structures & Union	Lecture, Tutorials, Discussion		
3	7	OOP Philosophy	Lecture, Tutorials, Discussion		

	8	Overview of OOP features: Encapsulation, polymorphism, Inheritance and Abstraction	Lecture, Tutorials, Discussion		
	9	Introduction of Class and Object	Lecture, Tutorials, Discussion		
4	10	More about class, Namespace usage	Lecture, Tutorials, Discussion	CT2	CLO2, CLO3
	11	Comparative study of structure, union and class	Lecture, Tutorials, Discussion		
	12	Inline function, constructor and destructor	Lecture, Tutorials, Discussion		
5	13	Different type of access modifier	Lecture, Tutorials, Discussion		
	14	Significance of access types in class members	Lecture, Tutorials, Discussion		
	15	Introduction to class diagram and its application	Lecture, Tutorials, Discussion		
6	16	Assigning object, passing object to function, returning object from function	Lecture, Tutorials, Discussion		
	17	Introduction to friend function	Lecture, Tutorials, Discussion		

	18	Different appliance of friend function	Lecture, Tutorials, Discussion		
7	19	Arrays of object, Pointer of object, this pointer	Lecture, Discussion		
	20	Generic pointer, new and delete	Lecture, Discussion		
	21	Static class member and its significance	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Arrays of object, Pointer of object, this pointer	Lecture, Discussion	CT3/ASG	CLO3, CLO4
	23	Generic pointer, new and delete	Lecture, Discussion		
	24	Static class member and its significance	Lecture, Discussion		
9	25	OOP principle: Polymorphism	Lecture, Group work, Discussion		
	26	Polymorphism: Function Overloading	Lecture, Group work, Discussion		
	27	Polymorphism: Function Overloading with default argument	Lecture, Group work, Discussion		
10	28	Polymorphism: Ambiguity in function overloading	Lecture, Group work, Discussion		
	29	Polymorphism: Operator Overloading	Lecture, Group work, Discussion		
	30	Polymorphism: Operator Overloading	Lecture, Group work, Discussion		

		(continuation), copy constructor			
11	31	OOP principle: Inheritance	Lecture, Group work, Discussion	CT3, ASG	CLO3-CLO4
	32	Inheritance: Constructor, Destructor in inheritance	Lecture, Presentation, Discussion		
	33	Inheritance: different examples of inheritance	Lecture, Presentation, Discussion		
12	34	Inheritance: Multiple Inheritance	Lecture, Group work, Discussion		
	35	Inheritance: Diamond problem	Lecture, Group work, Discussion		
	36	Inheritance: Base class access control, virtual keyword	Lecture, Group work, Discussion		
13	37	Abstract Class, Virtual function	Lecture, Group work, Discussion		
	38	Virtual function in polymorphism	Discussion, Group work		
	39	Interface and Abstraction	Discussion, Presentation, Group work		
14	40	Early binding and late binding	Discussion, Presentation, Group work		
	41	Generic and Template			
	42	Review Class			
Final Exam					CLO3-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Teach Yourself C++ - Herbert Schildt
2. Turbo C/C++ Complete Reference - Herbert Schildt
3. C++ – How to Program – Deitel&Deitel

Reference Sites

https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm

https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/

https://www.javatpoint.com/cpp-oops-concepts

https://www.w3schools.com/cpp/cpp_oop.asp

CSE 1204: Object Oriented Programming Language I Sessional

Course Details

Course Code: CSE 1204

Course Title: Object Oriented Programming Language I Sessional

Course Type: Laborartory Course

Level: 1-II

Academic Session: Summer-2022

Course Teacher: Urmi Saha

Pre-requisite: Course Code: CSE 1101; Course Title: Structured Programming Language

Credit Value: 1.5

Contact Hours: 3.00

Total Marks: 100%

Rationale

Object Oriented Programming Language I Sessional course is designed to cover the practical knowledge of fundamental and important topics in object oriented programming, such as philosophy of object oriented programing, necessity of object oriented programing for handling real world projects, introduction to class and objects, formation of class and object to handle different activity, object oriented programing principles, encapsulation, inheritance, polymorphism, abstraction, generic and template, exception handling, standard template library, applying object oriented approach in a sample project.

Objective

1. To learn the object-oriented programing philosophy.
2. To know different features and principles of object-oriented programing based on a high-level language like; C++, Java etc.
3. To learn coding in an object-oriented programming language and apply the object-oriented programing to solve real world projects.

Course Content

Laboratory works based on CSE 1203

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Learn and use the basic features of an object-oriented programming language**.**	Y											
CLO2	Habituate with the use of object-oriented design and learn when it is an appropriate methodology to use.	Y											

CLO3	Able at apply object-oriented approach for smallproblems having multiple objects.					Y							
CLO4	Illustrate good programming style and identify the impact of style on developing and maintaining programs**.**			Y									
CLO5	Improve the knowledge presentation skill by presentingtopics on Object-oriented Programming**.**								Y	Y			

Y=Yes

Course Plan:

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding COs**
1	1	Introduction to object-oriented programing (OOP) approach and practice first OOP program	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method		
2	2	Comparative practice of union, structure and class			
3	3	Use of namespace, constructor and destructor			
4	4	More about class with member attributes and methods having different access modifiers			
5	5	Example code with different type of access modifier			
6	6	Member function, inline function and friend function			
7	7	OOP principle: Polymorphism (function overloading)			
		Mid Term			
8	8	OOP principle: Polymorphism (operator overloading)			

<table>
<tr><td>9</td><td>9</td><td>OOP principle: Inheritance</td><td rowspan="5">Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method</td><td rowspan="5"></td><td rowspan="5"></td></tr>
<tr><td>10</td><td>10</td><td>Inheritance: Multiple Inheritance</td></tr>
<tr><td>11</td><td>11</td><td>Abstract class, Virtual function</td></tr>
<tr><td>12</td><td>12</td><td>Generic and Template</td></tr>
<tr><td>13</td><td>13</td><td>Exception Handling, Standard Template Library (STL)</td></tr>
<tr><td>14</td><td>14</td><td>Review</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Final Term</td><td></td></tr>
<tr><td colspan="6">Assessment and Evaluation</td></tr>
<tr><td colspan="6">Assessment Strategy</td></tr>
</table>

<table>
<tr><td colspan="2">Components</td><td>Grading</td></tr>
<tr><td rowspan="4">Attendance
(25%)</td><td>Report</td><td>15%</td></tr>
<tr><td>Viva</td><td>10%</td></tr>
<tr><td>Quiz</td><td>10%</td></tr>
<tr><td>Mid Term</td><td>20%</td></tr>
<tr><td colspan="2">Final Exam</td><td>20%</td></tr>
<tr><td colspan="2">Total Marks</td><td>100%</td></tr>
</table>

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodlogy

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books:

1. Teach Yourself C++ - Herbert Schildt
2. Turbo C/C++ Complete Reference - Herbert Schildt
3. C++ – How to Program – Deitel&Deitel

Reference Site:

https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm

https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/

https://www.javatpoint.com/cpp-oops-concepts

https://www.w3schools.com/cpp/cpp_oop.asp

CSE 1208: Numerical Methods Sessional

Course Details

Course Code: CSE 1208

Course Title: Numerical Methods Sessional

Course Type: Core Course

Level-Term: 1-II

Academic Session: Summer-2021

Course Teacher: Md. Muktar Hossain

Pre-requisite: N/A,

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course aims to provide students with knowledge of problem solving with the basics of MATLAB/Python software by using it in the numerical technique problems.

Course Objectives

1. To learn basic theorems and techniques of numerical analysis.
2. To be introduced with Engineering Tools like MATLAB, Python Software.
3. To learn to use Engineering Tools in solving numerical problems.
4. To solve complex numerical problems using Software Engineering Tools.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the knowledge of basic numerical techniques practically.	Y											
CLO2	Analyze the necessity and utilize engineering tools like MATLAB/Python for solving numerical problems.					Y							
CLO3	Design different complex problems and solve them with MATLAB.								Y				
CLO4	To be skilled in using engineering tools like MATLAB at the end of the course.										Y		

Y=Yes

Course Plan:

Week	**Lab**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Introduction to engineering tools like MATLAB/Python	Lecture, White Board Writing, Power Point Presentation		
2	2	Solutions to Non-linear Equations: Bisection and False Position Method	Lecture, White Board Writing, Power Point Presentation		
3	3	Solutions to Non-linear Equations: Newton Raphson and Ramanujan's Method	Lecture, White Board Writing, PowerPoint Presentation		
4	4	Numerical Integration	Lecture, White Board Writing, PowerPoint Presentation		

5	5	Interpolation (Lagrange's Polynomial)	Lecture, White Board Writing, PowerPoint Presentation	F, Q, R, LT	CLO1 -CLO4
6	6	Interpolation (Newton's Polynomial)	Lecture, White Board Writing, PowerPoint Presentation		
7	7	Lab Test – 01 and Viva	Lecture, White Board Writing, PowerPoint Presentation		
8	8	Solution of Simultaneous Linear Algebraic Equations: Gauss Jordan and Gauss Seidal	Lecture, White Board Writing, PowerPoint Presentation		
9	9	Solution of Simultaneous Linear Algebraic Equations: LU decomposition Method	Lecture, White Board Writing, PowerPoint Presentation		
10	10	Curve Fitting.	Lecture, White Board Writing, PowerPoint Presentation		
11	11	Solution of Numerical Integration formulae	Lecture, White Board Writing, PowerPoint Presentation		
12	12	Review Practice Lab	Lecture, White Board Writing, PowerPoint Presentation		
13	13	Quiz test	Lecture, White Board Writing, PowerPoint Presentation		
14	14	Lab Test-02 and Viva	Lecture, White Board Writing, PowerPoint Presentation		

Assessment and Evaluation	
Assessment Strategy	
Components	**Grading**
Class Performance	10%
Attendance	10%
Report/Assignment	10%
Lab Test/Project	30%
Viva/Presentation	20
Quiz	20%
Total Marks	100%

- Missed Reports, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses reports or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Lab Test and Quiz: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Numerical Methods – E Balagurusamy
2. Numerical methods - Robert W. Hornbeck; Quantum Publishers
3. Introductory Methods of Numerical Analysis – S. S. Sastry

EEE 1269: Electronic Circuits

Course Details
Course Code: EEE 1269 Course Title: Electronic Circuits Course Type: GED Course Level-Term: 1-II Academic Session: Summer-2022 Course Teacher: Pre-requisite: N/A Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET etc. Students equipped with the knowledge provided in the course will be able to participate in design, development and operation in the different area of electronics system.
Course Objectives
1. To give the idea about fundamental properties of semiconductors. 2. To understand the basics of electronic devices like diode, Transistor, MOSFET etc. and its applications. 3. To prepare students to perform the analysis of any Analog electronics circuits, 4. To empower students to understand the design and working of BJT and FET amplifiers. 5. To prepare the students for advanced courses related to electronics.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Arise a clear understanding of the basic operation and characteristics of semiconductor devices like diodes, BJTs and FETs.	Y											

CLO2	Analyze and compare the characteristics of different types of diodes and transistors.		Y										
CLO3	Design rectifier, multiplier, amplifier circuit etc. with electronics equipment to solve realworld problems			Y									

Y=Yes

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Basic idea about Electronics. Examples of electronic devices and comparison with electrical equipment. Introduction to semiconductor devices and its classifications.	Lecture, Tutorials, Discussions	CT1	CLO1, CLO2
	2		Lecture, Tutorials, Discussions		
	3		Lecture, Tutorials, Discussion		
2	4	P-type and N-type materials and doping. Semiconductor diode and its band diagram. Biasing of semiconductor diodes	Lecture, Tutorials, Discussion		
	5		Lecture, Tutorials, Discussion		
	6		Lecture, Tutorials, Discussion		
3	7	I-V characteristics of diode and equivalent circuit of diodes	Lecture, Tutorials, Discussion		

	8	Shockley's equation and related mathematical problems Zener diode and related problems of Zener diode	Lecture, Tutorials, Discussion		
	9		Lecture, Tutorials, Discussion		
4	10	Static and Dynamic resistance Applications of diode HWR and FWR using diode	Lecture, Tutorials, Discussion	ASG	CLO3
	11		Lecture, Tutorials, Discussion		
	12		Lecture, Tutorials, Discussion		
5	13	Diode bridge rectifier and Centre tapped transformer rectifier. Ripple factor and related mathematical problems Clipper circuit and related problems	Lecture, Tutorials, Discussion		
	14		Lecture, Tutorials, Discussion		
	15		Lecture, Tutorials, Discussion		
6	16	Clamper circuit and related problems Diodes in voltage multiplier circuit Voltage doubler, tripler and quadrupler circuit	Lecture, Tutorials, Discussion		
	17		Lecture, Tutorials, Discussion		
	18		Lecture, Tutorials, Discussion		

7	19	Introduction to BJT and construction Principle and operation of BJT Operating regions of BJT and its different configurations	Lecture, Discussion		
	20		Lecture, Discussion		
	21		Lecture, Discussion		
Mid Term Exam					CLO2
8	22	CB and CE configurations and characteristics curves. Mathematical problems related to CB and CC configurations. BJT as an amplifier, biasing the BJT for discrete circuits	Lecture, Discussion	CT2	CLO1, CLO2
	23		Lecture, Discussion		
	24		Lecture, Discussion		
9	25	Mathematical problems related to different configurations using BJT. Small signal equivalent circuit models, BJT as a switch. Voltage and current gain, input and output impedance of a common base, common emitter and common collector amplifier circuits.	Lecture, Group work, Discussion		
	26		Lecture, Group work, Discussion		
	27		Lecture, Group work, Discussion		
10	28	Introduction to FET and comparative studies between BJT and FET. Construction and operation of JFET Drain characteristics and Transfer characteristics	Lecture, Group work, Discussion		
	29		Lecture, Group work, Discussion		

	30		Lecture, Group work, Discussion		
11	31	Pinch off and pinch off voltage. Mathematical problems related to JFET. Mathematical problems related to JFET.	Lecture, Group work, Discussion	CT3	CLO1, CLO2
	32		Lecture, Presentation, Discussion		
	33		Lecture, Presentation, Discussion		
12	34	Introduction to MOSFET Construction and operating principle of MOSFET Types of MOSFET	Lecture, Group work, Discussion		
	35		Lecture, Group work, Discussion		
	36		Lecture, Group work, Discussion		
13	37	Construction and operating principle of depletion type and enhancement type MOSFET. Biasing of MOSFET and related problems. Characteristics curve of MOSFET	Lecture, Group work, Discussion		
	38		Discussion, Group work		
	39		Discussion, Presentation		

			, Group work		
14	40	Threshold voltage, Body effect, current- voltage characteristics of an enhancement MOSFET single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter	Discussion, Presentation , Group work		
	41		Discussion, Presentation , Group work		
	42		Discussion, Presentation , Group work		
Final Exam					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books
1. Microelectronics circuit by Sedra Smith. 2. Electronic Device and Circuit Theory by Robert L. Boylestad. 3. Principles of Electronics by V. K. Mehta.

EEE 1270: Electronic Circuits Sessional

Course Details
Course Code: EEE 1270 Course Title: Electronic Circuits Sessional Course Type: GED Course Level-Term: 1-II Academic Session: Summer-2022 Course Teacher: …………… Pre-requisite: N/A Credit Value: 1.50 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course provides the student with the fundamental skills to identify and utilize various electronic components and devices with their specifications to implement and verify the outputs of hardware circuits.
Course Objectives
1. Identify, Specify and Test different active, passive electronic components and instruments. 2. Verify the theoretical concepts through laboratory experiments. 3. Understand DC & AC models of semi-conductor devices. 4. Evaluate the performance characteristics of BJT and FET. 5. Design Different Electronic Circuits and check their functionality.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.	Y											
CLO2	Analyze the characteristics of Junction Diode, Zener Diode, BJT& FET and different types of Rectifier and amplifier Circuits.		Y										
CLO3	Design different elementary circuit related projects based on practical problems using electronic components.			Y									

Y=Yes

Course Plan

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Verification of Diode Characteristics curve.	Lectures, Experiments	R, Q, T	CLO1-CLO3
2	2	Verification of Diode Clipper circuit	Lectures, Experiments		
3	3	Verification of Diode clamper circuit.	Lectures, Experiments		
4	4	Verification of Zener diode characteristics curve.	Lectures, Experiments		
5	5	Verification of Zener diode as voltage stabilizer.	Lectures, Experiments		
6	6	Verification of BJT as a switch.	Lectures, Experiments		
7	7	Lab Test-1			
Mid Term					
8	8	Verification of Common Emitter amplifier.	Lectures, Experiments	R, Q, T	CLO1-CLO3

9	9	Verification of Common Base amplifier.	Lectures, Experiments		
10	10	Verification of JFET as an amplifier	Lectures, Experiments		
11	11	Verification of MOSFET as an amplifier.	Lectures, Experiments		
12	12	Practice Class.	Lectures, Experiments		
13	13	Lab Test – II			
14	14	Project Submission and Quiz			

Assessment and Evaluation

Assessment Strategy

Components	Grading
Conduct of Lab Test /Class Performance	25%
Report Writing/ Programming	15%
Mid-Term Evaluation (Exam/Project/assignment)	20%
Final Evaluation (Exam/Project/assignment)	30%
Viva Voce / Presentation	10%
Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books
1. Microelectronics circuit by Sedra Smith. 2. Electronic Device and Circuit Theory by Robert L. Boylestad. 3. Principles of Electronics by V. K. Mehta.

ENG 1228: Developing English Skill Sessional

Course Details
Course Code: ENG 1228 Course Title: Developing English Skill Sessional Course Type: GED Course Level-Term: 1-II Academic Session: Summer-2022 Course Teacher: …………… Pre-requisite: N/A Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
This sessional course has been designed to enhance our English skill.
Course Objectives:
1. To get a clear idea about how to speak understand and speak English quickly and smartly. 2. To find out the main points of any long article within a very limited time. 3. To recognize the techniques of any effective writing.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Determine and get a clear idea about how to speak understand and speak English quickly and smartly.	Y				Y					Y		

CLO2	Organize them within the shortest possible time to present their ideas and opinions.	Y									Y		
CLO3	Find out the main points of any long article within a very limited time.		Y										
CLO4	Recognize the techniques of any effective writing.		Y							Y			
CLO5	Overcome language barrier.									Y	Y		
Y=Yes													

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Application Writings, Profession CV Writing with smart English	Lecture, White Board Writing	Class Participation / Observation, Presentation, Assignment	CLO1-CLO5
2	2		Lecture, White Board Writing		
3	3		Lecture, White Board Writing		
4	4		Lecture, White Board Writing		
5	5		Lecture, White Board Writing		
6	6		Lecture, White Board Writing		
7	7				
Mid Term					
8	8	Communication Skill Developing Toos	Lecture, White Board Writing	Class Participation / Observation, Presenta	CLO1-CLO5
9	9		Lecture, White Board Writing		
10	10		Lecture, White Board Writing		

11	11		Lecture, White Board Writing	tion, Assignment	
12	12		Lecture, White Board Writing		
13	13				
14	14				

Assessment and Evaluation	
Assessment Strategy	
Components	Grading
Conduct of Lab Test /Class Performance	25%
Report Writing/ Programming	15%
Mid-Term Evaluation (Exam/Project/assignment)	20%
Final Evaluation (Exam/Project/assignment)	30%
Viva Voce / Presentation	10%
Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

MATH 1243: Ordinary Differential Equations and Partial Differential Equations

Course Details
Course Code: MATH 1243 Course Title: Ordinary Differential Equations and Partial Differential Equations Course Type: GED Course Level-Term: 1-II Academic Session: Summer-2022 Course Teacher: Pre-requisite: Course Code: MATH 1141, Course Title: Differential Calculus, Integral Calculus and Coordinate Geometry Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
Background of arising Differential Equations and Introduction, Differential Equation of first order and first degree, Solution of exact and linear Differential Equations of first order and first degree, Differential Equation of first order but higher degree, Solution of higher order, Differential Equation, Introduction to PDE, Linear and Non-linear Partial Differential Equations, Application of Differential Equations.
Course Objectives
1. To Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equations. 2. To teach students to evaluate first order differential equations including separable, homogeneous, exact, and linear. 3. Introduce students to how to solve second order and higher order linear differential equations. 4. Introduce students to partial differential equations. 5. Introduce students to how to solve linear and non-linear Partial Differential with different methods. 6. Introduce students to some physical problems in Engineering that results in partial differential equations.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

CLO1	Explain the concept and classes of differential equation and classifies the differential equations with respect to their order and linearity.	Y	Y										
CLO2	Understanding how to solve higher-order and homogeneous linear differential equations with constant coefficients.	Y	Y										
CLO3	Evaluate solution of differential equation of higher order when dependent and independent variables are absent and the method of forming partial differential equations and implementation.	Y	Y										
CLO4	Find solution of non-linear partial differential equation by different methods.	Y	Y										

Y=yes

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Background of Arising Differential Equations and Introduction What is Differential equation and why we need it? Differential equation in various field. Types of Differential equation.	Lecture, White Board Writing, PowerPoint Presentation	CT1	CLO1, CLO3, CLO4
	2	Degree and Order of ordinary differential equation. General solution and particular Solution.	Lecture, White Board Writing, PowerPoint Presentation		

	3	Formulation of Differential Equation. Solutions of Differential Equation.	Lecture, White Board Writing, PowerPoint Presentation		
2	4	Differential Equation of first order and first degree**.** Standard forms	Lecture, White Board Writing, PowerPoint Presentation		
	5	Solvable by separating variable	Lecture, White Board Writing, PowerPoint Presentation		
	6	Transformation of some equations in the form in which variables are separable	Lecture, White Board Writing, PowerPoint Presentation		
3	7	Homogeneous. Differential Equation and Equation reducible to homogenous form	Lecture, White Board Writing, PowerPoint Presentation		
	8	Linear differential equation	Lecture, White Board Writing, PowerPoint Presentation		
	9	Bernoulli differential equation	Lecture, White Board Writing, PowerPoint Presentation		
4	10	Solution of exact and linear Differential Equations of first order and first degreeExact differential equation Integrating factor	Lecture, White Board Writing, PowerPoint Presentation	ASG	CLO1, CLO2

		Linear equations of first order			
	11	Equation reducible to the Exact form	Lecture, White Board Writing, PowerPoint Presentation		
	12	Equation reducible to linear form (Brenoulli Equation)	Lecture, White Board Writing, PowerPoint Presentation		
5	13	Linear Differential Equation with constant coefficients (Real and distinct roots)	Lecture, White Board Writing, PowerPoint Presentation		
	14	Real and Equal roots	Lecture, White Board Writing, PowerPoint Presentation		
	15	Complex roots	Lecture, White Board Writing, PowerPoint Presentation		
6	16	Differential Equation of 1st order but higher degree. Equation solvable for p	Lecture, White Board Writing, PowerPoint Presentation		
	17	Equation solvable for x	Lecture, White Board Writing, PowerPoint Presentation		
	18	Equation solvable for y and Clairaut's Equation	Lecture, White Board Writing,		

			PowerPoint Presentation		
7	19	Homogeneous Linear Differential Equation and its application	Lecture, White Board Writing, PowerPoint Presentation		
	20	Solution of Differential Equation of Higher Order when Dependent Variable Absent	Lecture, White Board Writing, PowerPoint Presentation		
	21	Solution of Differential Equation of Higher Order when Independent Variable Absent	Lecture, White Board Writing, PowerPoint Presentation		
Mid Term					CLO1, CLO2
8	22	Introduction to PDE Definition and Examples	Lecture, White Board Writing, PowerPoint Presentation	CT2	CLO1, CLO3, CLO4
	23	Method of forming Partial Differential Equations	Lecture, White Board Writing, PowerPoint Presentation		
	24	Elimination of arbitrary function	Lecture, White Board Writing, PowerPoint Presentation		
9	25	Linear Partial Differential Equations Lagrange's equation	Lecture, White Board Writing, PowerPoint Presentation		
	26	Method of Multipliers	Lecture, White Board Writing,		

			PowerPoint Presentation		
	27	Method of Multipliers	Lecture, White Board Writing, PowerPoint Presentation		
10	28	Non-linear Partial Differential Equations Partial Differential Equation non-linear in p and q	Lecture, White Board Writing, PowerPoint Presentation		
	29	Charpit's Method	Lecture, White Board Writing, PowerPoint Presentation		
	30	Charpit's Method	Lecture, White Board Writing, PowerPoint Presentation		
11	31	Monge's Methods	Lecture, White Board Writing, PowerPoint Presentation	CT3	CLO1, CLO3, CLO4
	32	Monge's Methods	Lecture, White Board Writing, PowerPoint Presentation		
	33	Second order linear Partial Differential Equation: its nomenclature and classification to standard forms:	Lecture, White Board Writing, PowerPoint Presentation		
12	34	Parabolic	Lecture, White Board Writing,		

			PowerPoint Presentation		
	35	Elliptic	Lecture, White Board Writing, PowerPoint Presentation		
	36	Hyperbolic	Lecture, White Board Writing, PowerPoint Presentation		
13	37	Second order linear Partial Differential Equation By Separation of Variables	Lecture, White Board Writing, PowerPoint Presentation		
	38	Higher order linear Partial Differential Equation with constant coefficients	Lecture, White Board Writing, PowerPoint Presentation		
	39	Higher order linear Partial Differential Equation with constant coefficients	Lecture, White Board Writing, PowerPoint Presentation		
14	40	Review Class			
	41	Review Class			
	42	Review Class			
Final Exam					CLO2, CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%

Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Introduction to Ordinary Differential Equations- Shepley L. Ross
2. Ordinary and Partial Differential Equations- M.D. Raisinghania
3. Advanced Engineering Mathematics- H.K. Das
4. Differential Equations – Dr.B.D. Sharma.

Reference Sites

https://www.tutorialspoint.com/cprogramming/index.htm

https://www.geeksforgeeks.org/c-programming-language/

CE 1250: Engineering Drawing and CAD Sessional

Course Details

Course Code: CE 1250

Course Title: Engineering Drawing and CAD Sessional

Course Type: GED Course

Level-Term: 1-II

Academic Session: Summer-2022

Course Teacher: ……………

Pre-requisite: Course Code: Nil, Course Title: Nil

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

This sessional course has been designed to know about pros and cons of AUTO CAD Drawing.

Course Objectives

1. To gather knowledge and iformation about the tools AUTOCAD
2. To communicate all needed information from the engineer to workers or manufacturer who constructs any kind of structural element.
3. To design solutions for complex structural engineering problems for different environmental context.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Explain the Engineering drawing which helps to communicate ideas and information.	Y									Y		
CLO2	Communicate all needed information from the engineer to workers or manufacturer who constructs any kind of structural element.	Y								Y	Y		

CLO3	Design solutions for complex structural engineering problems for different environmental context.	Y				Y	Y						

Y=Yes

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Paper Drawing	Lectures, Experiments	Class Participation / Observation, Class Attendance, Homework, Assignment and quizzes, Final Examination (Written)	CLO1-CLO3
2	2	Paper Drawing	Lectures, Experiments		
3	3	Paper Drawing	Lectures, Experiments		
4	4	Paper Drawing	Lectures, Experiments		
5	5	Paper Drawing	Lectures, Experiments		
6	6	Paper Drawing	Lectures, Experiments		
7	7	Lab Test-1			
Mid Term					
8	8	AUTO CAD Design	Lectures, Experiments	Class Participation / Observation, Class Attendance, Homework, Assignment and quizzes, Final Examination (Written)	CLO1-CLO3
9	9	AUTO CAD Design	Lectures, Experiments		
10	10	AUTO CAD Design	Lectures, Experiments		
11	11	AUTO CAD Design	Lectures, Experiments		
12	12	AUTO CAD Design	Lectures, Experiments		
13	13	AUTO CAD Design			
14	14	Lab Final			

Assessment and Evaluation

Assessment Strategy

Components	Grading
Conduct of Lab Test /Class Performance	25%
Report Writing/ Programming	15%
Mid-Term Evaluation (Exam/Project/assignment)	20%
Final Evaluation (Exam/Project/assignment)	30%
Viva Voce / Presentation	10%
Total Marks	**100%**

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

HUM 1221: Bengali Language and Literature

Course Details:

Course Code: HUM 1221

Course Title: Bengali Language and Literature

Course Type: GED Course

Level-Term: 1-II

Academic Session: Summer-2022

Course Teacher:

Pre-requisite: 1. Course Code: প্রযোজ্য নয়; Course Title: প্রযোজ্য নয়

Credit Value: 2.00

Contact Hours: 2.00

Total Marks: 100

সার–সংক্ষেপ (Synopsis):

বাংলা ভাষা ও সাহিত্য সম্পর্কে মৌলিক ধারণা প্রদান করার উদ্দেশ্যে কোর্সটি সিলেবাসের অন্তর্ভুক্ত হয়। প্রাচীনকাল থেকে আধুনিককাল পর্যন্ত নানা বিবর্তন ও পরিবর্তনের মাধ্যমে বাংলা ভাষা আজকের সমৃদ্ধি লাভ করেছে। তথ্য –প্রযুক্তির বিকাশের সাথে সাথে যোগাযোগের মাধ্যম হিসেবে ভাষার ব্যবহার এবং বোধ জাগ্রত করার মূল হাতিয়ার হিসেবে মাতৃভাষার গুরুত্ব সম্পর্কে তুলে ধরার একটি ক্ষেত্র হিসেবে বাংলা ভাষা ও সাহিত্য নামক কোর্সটি অত্যন্ত গুরুত্বপূর্ণ ভূমিকা পালন করবে; সেইসাথে আন্তর্জাতিক অঙ্গনে বাংলা ভাষা ও সাহিত্যকে প্রতিষ্ঠাকরণ এবং আধুনিক যোগাযোগের মাধ্যম হিসেবে বাংলা ভাষার মাধুর্যকে তুলে ধরবে। আদর্শ ও দেশপ্রেমিক জাতি গঠনে সহায়ক ভূমিকা পালন করবে।

Course Objectives:

১. যোগাযোগের মাধ্যম হিসেবে বাংলা ভাষার গুরুত্বকে উপলব্ধি করা এবং সেইসাথে জ্ঞানকান্ডের বিভিনড়ব শাখার সাথে সংযোগ তৈরির উপায় হিসেবে ভাষা সম্পর্কিত জ্ঞান লাভ করা।

২. সাহিত্য ব্যক্তির কল্পনা ও অনুভূতি নিয়ে কাজ করে ফলে আদর্শ মানুষ হয়ে গড়ে ওঠার পেছনে সাহিত্য গুরুত্বপূর্ণ ভূমিকা পালন করে।

৩. সাহিত্য পাঠের মাধ্যমে বোধ জাগ্রত হয় ফলে অন্যের প্রতি সহানুভূতিশীল এবং মানবিক বোধসম্পনড়ব চিন্তা– চেতনা গড়ে ওঠে।

৪. যুক্তিবোধ তৈরি করে এবং সৃষ্টিশীল পৃথিবী গড়তে সহায়ক ভূমিকা পালন করে।

৫. তথ্য– প্রযুক্তির উৎকর্ষ ও জ্ঞান–বিজ্ঞানের বিভিনড়ব শাখার সাথে আন্তঃসম্পর্ক গঠনে গুরুত্বপূর্ণ ভূমিকা পালন করে।

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	শুদ্ধভাবে ভাষা বিষয়ক জ্ঞান অর্জন করা, নিজের শেকড়ের অনুসন্ধানে চেতনাকে প্রবাহিত করা।	Y								Y			
CLO2	ভাষা বিষয়ক জ্ঞান অর্জন, বোধের বিকাশ এবং তা বাস্তব জীবনে প্রয়েগে উৎসাহিত করা।	Y							Y				

CLO3	সাহিত্য ও সংস্কৃতির অনুশীলনের মাধ্যমে নিজ দেশ ও জাতিকে জানা। জাতির ইতিহাস ও ঐতিহ্য অনুসন্ধানের পাশাপাশি ধারাবাহিক চর্চায় অনুপ্রাণিত করা এবং বাস্তব জীবনে প্রয়োগ করা।	Y											**Y**

Course Plan

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	পরিচিতি ক্লাস, সিলেবাস সম্পর্কে প্রাথমিক ধারণা প্রদান	Lecture, Tutorials, Discussions	CT1	
	2	ভাষার উৎপত্তি, ধ্বনি ও বর্ণ, স্বরধ্বনি ও ব্যঞ্জনধ্বনি	Lecture, Tutorials, Discussions		
2	3	বাংলা বানানের নিয়ম, যতিচিহ্ন	Lecture, Tutorials, Discussion		
	4	ণ-ত্ব বিধান ও ষ-ত্ব বিধান, বঙ্গানুবাদ	Lecture, Tutorials, Discussion		
3	5	প্রতিবেদন, সংলাপ, গল্প লিখন, পত্রলিখন	Lecture, Tutorials, Discussion		
	6	ব্যবহারিক বাংলা ও সংক্ষিপ্ত আলোচনা (একুশে ফেব্রুয়ারি, মুক্তিযুদ্ধ, বাংলা নববর্ষ, বাংলা উৎসব, ষড়ঋতু	Lecture, Tutorials, Discussion		
4	7	বাংলা ভাষা, লোকসংস্কৃতি, মানবতা ও নৈতিকতা, বিশ্বায়ন, তথ্য-প্রযুক্তি ইত্যাদি।	Lecture, Tutorials, Discussion	ASG	
	8	কবিতার সংজ্ঞা, ধারা, বঙ্গবাণী, বঙ্গভাষা	Lecture, Tutorials, Discussion		
5	9	খাঁচার ভিতর অচিন পাখি, নির্ঝরের স্বপ্নভঙ্গ	Lecture, Tutorials, Discussion		
	10	আজ সৃষ্টি সুখের উল্লাসে, বাংলার মুখ আমি	Lecture, Tutorials, Discussion		
6	11	অমর একুশে, স্মৃতিস্তম্ভ	Lecture, Tutorials, Discussion		
	12	তোমাকে পাওয়ার জন্য হে স্বাধীনতা, আমার পরিচয়	Lecture, Tutorials, Discussion		
7	13	ছোটগল্পের সংজ্ঞা, ইতিহাস, পোস্টমাস্টার	Lecture, Discussion		

	14	বায়ুযানে পঞ্চাশ মাইল, পুঁইমাচা	Lecture, Discussion		
8	15	নয়নচারা, খাঁচা, মৌন নয়	Lecture, Discussion	CT2	
	16	একাত্তরের দিনগুলি, অপঘাত ইত্যাদি	Lecture, Discussion		
9	17	প্রবন্ধের সংজ্ঞা, প্রকারভেদ	Lecture, Group work, Discussion		
	18	সভ্যতার সংকট, তৈল	Lecture, Group work, Discussion		
10	19	যৌবনে দাও রাজটিকা	Lecture, Group work, Discussion		
	20	বর্তমান বিশ্বসাহিত্য	Lecture, Group work, Discussion		
11	21	আমাদের বাংলা উচ্চারণ, আমাদের আত্মপরিচয়	Lecture, Group work, Discussion	CT3	
	22	নাটকের সংজ্ঞা, প্রকারভেদ, ইতিহাস	Lecture, Presentation, Discussion		
12	23	কবর নাটক	Lecture, Group work, Discussion		
	24	কবর নাটক	Lecture, Group work, Discussion		
13	25	কবর নাটক	Lecture, Group work, Discussion		
	26	ব্যাকরণ ও নির্মিতি অংশ রিভিশন	Discussion, Group work		
14	27	বাংলা সাহিত্য অংশ রিভিশন	Discussion, Presentation, Group work		
	28	প্রবলেম সলভিং ক্লাস			
Final Exam					

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%

	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

১. বাঙ্গালা ভাষার ইতিবৃত্ত– ড. মুহম্মদ শহীদুল্লাহ

২. বাঙ্গালা সাহিত্যের ইতিহাস– সুকুমার সেন

৩. বাংলা সাহিত্যের সমগ্র ইতিহাস– ক্ষেত্র গুপ্ত

৪. বাংলা সাহিত্যের ইতিবৃত্ত– অসিতকুমার বন্দ্যোপাধ্যায়

৫. বাংলা সাহিত্যের ইতিহাস (১ম ও ২য় খন্ড)– বাংলা একাডেমি

৬. বাংলাদেশের সাহিত্যের ইতিহাস (১৯৪৭–২০০০)– শহীদ ইকবাল

LEVEL-2, TERM-I

CSE 2100: Software Development Project I

Course Details

Course Code: CSE 2100

Course Title: Software Development Project I

Course Type: Project Course

Level-Term: 2-I

Academic Session: Summer-2022

Course Teacher: Md. Muktar Hossain

Pre-requisite: N/A, Course Title: N/A

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

The Individual Software Development Project I course is designed to make its learners able to solve advanced level industry problems and develop real time projects professionally.

Course Objectives

1. To give idea about programming related to software development.
2. To prepare students for the advanced level works of industry.
3. To design real time projects in web platform.
4. To increase practical knowledge to identify the relative merits of different project designs, programming constructs and data structures.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.			Y									
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							

CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Y											
CLO4	Able to develop industry level web-based applications individually.									Y			
Y=yes													

Course Plan:

Week	Lab	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Project Proposal and Project Selection	Lecture, White Board Writing, Power Point Presentation	PR, Q	CLO1 -CLO4
2	2	Language/ Platform Selection	Lecture, White Board Writing, Power Point Presentation		
3	3	UX and UI Design	Lecture, White Board Writing, Power Point Presentation		
4	4	Introduction to MySQL, SQL Connection	Lecture, White Board Writing, Power Point Presentation		
5	5	Front-end Development	Lecture, White Board Writing, Power Point Presentation		
6	6	Presentation on F-D as Mid Term	Lecture, White Board Writing, Power Point Presentation		
7	7	Back-end Development	Lecture, White Board Writing, Power Point Presentation		
8	8	Project Integration	Lecture, White Board Writing, Power Point Presentation		

9	9	Debugging	Lecture, White Board Writing, Power Point Presentation		
10	10	Error Handling	Lecture, White Board Writing, Power Point Presentation		
11	11	Testing	Lecture, White Board Writing, Power Point Presentation		
12	12	Correction on Testing	Lecture, White Board Writing, Power Point Presentation		
13	13	Final Presentation Preparation	Lecture, White Board Writing, Power Point Presentation		
14	14	Project Submission	Lecture, White Board Writing, Power Point Presentation		

Assessment and Evaluation

Assessment Strategy

Components	**Grading**
Class Performance & Observation	10%
Project Proposal (10%)	10%
Project update-1(20%)	20%
Final Exam (40%)	40%
Quiz	20%
Total Marks	100%

Missed Reports, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses reports or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Lab Test and Quiz: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

CSE 2101: Digital Logic Design

Course Details		
Course Code: CSE 2101 Course Title: Digital Logic Design Course Type: Core Course Level-Term: 2-I Academic Session: Summer-2022 Course Teacher: Dr. Mohammed Sowket Ali Pre-requisite: Course Code: Nil, Course Title: Nil Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%		
Rationale		
This course is designed to learn about different logic gates, to design and analysis of digital circuits, gather knowledge about different types of computer chips and learn to represent signals and sequences of a digital circuit through numbers.		
Course Objectives		
1. To understand the different boolean algebra theorems and apply them for simplifying logic functions. 2. To understand Karnaugh map and other methods to perform an algorithmic reduction of multivariable logic functions. 3. To understand the usefulness of combinational circuits: adder, sub-tractor, code converters encoders/decoders, multiplexers, de-multiplexers, ROM, RAM, PLAs. 4. To design and analysis of clocked sequential circuits, flip-flops, state diagram, state table, different latches. 5. To understand the analysis of various registers, shift-registers, counters and how more complex systems are constructed.		
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):		
CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Remember and understand the number system and Boolean algebra and basic properties of Boolean algebra to simplify simple Boolean functions	Y											
CLO2	Understanding and applying the tabulation and Karnaugh map methods for simplifying combinational circuits		Y										
CLO3	Identify the basic sequential logic components: SR Latch, Different Flip-Flops and their usage and able to analyze sequential logic circuits		Y										
CLO4	Design and develop different digital systems like shifters, counters, registers by presenting in front of the class									Y			

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Number systems and codes; Digital logic: Boolean algebra, De-Morgan`s theorems, logic gates and their truth tables.	Lecture, Tutorials, Discussions	CT1	CLO1
	2		Lecture, Tutorials, Discussions		
	3		Lecture, Tutorials, Discussion		
2	4	Canonical forms, minimization techniques.	Lecture, Tutorials, Discussion		
	5		Lecture, Tutorials, Discussion		
	6		Lecture, Tutorials, Discussion		

3	7	Arithmetic and data handling logic circuits.	Lecture, Tutorials, Discussion		
	8		Lecture, Tutorials, Discussion		
	9		Lecture, Tutorials, Discussion		
4	10	Combinational logic circuits, Sum of Products Form, Karnaugh Map Method.	Lecture, Tutorials, Discussion	ASG	CLO2-CLO4
	11		Lecture, Tutorials, Discussion		
	12		Lecture, Tutorials, Discussion		
5	13	Decoders and Encoders.	Lecture, Tutorials, Discussion		
	14		Lecture, Tutorials, Discussion		
	15		Lecture, Tutorials, Discussion		
6	16	Digital Arithmetic, Operations and Circuits, Multiplexers and de-multiplexers.	Lecture, Tutorials, Discussion		
	17		Lecture, Tutorials, Discussion		
	18		Lecture, Tutorials, Discussion		
7	19	Design of sequential circuit: State diagram; State minimizations and assignments.	Lecture, Discussion		
	20		Lecture, Discussion		
	21		Lecture, Discussion		
Mid Exam					CLO1-CLO3
8	22	Flip-flops, S-R Flip Flop, J-K Flip-flop, D Flip-flop, T- Flip Flop, Race around problems and recovering.	Lecture, Discussion	CT2	CLO3, CLO4
	23		Lecture, Discussion		
	24		Lecture, Discussion		

9	25	Synchronous and asynchronous logic design	Lecture, Group work, Discussion		
	26		Lecture, Group work, Discussion		
	27		Lecture, Group work, Discussion		
10	28	Counters; asynchronous counters, synchronous counters and their applications.	Lecture, Group work, Discussion		
	29		Lecture, Group work, Discussion		
	30		Lecture, Group work, Discussion		
11	31	Registers and Basic memory unit.	Lecture, Group work, Discussion	CT3	CLO3-CLO4
	32		Lecture, Presentation, Discussion		
	33		Lecture, Presentation, Discussion		
12	34	Pulse mode logic; Fundamental mode design.	Lecture, Group work, Discussion		
	35		Lecture, Group work, Discussion		
	36		Lecture, Group work, Discussion		
13	37	Programmable Logic Device, PLA, PAL and ROM Architecture design.	Lecture, Group work, Discussion		
	38		Discussion, Group work		
	39		Discussion, Presentation, Group work		
14	40	Review Classes	Discussion, Presentation, Group work		

	41				
	42				
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Digital Logic and Computer Design by M. Morris Mano
2. Digital Computer Electronics by Albert P. Malvino, Jerald A Brown
3. Hank Book of Modern Digital Electronics by Md. Golam Moazzam and Md. Sorif Uddin

CSE 2102 Digital Logic Design Sessional

Course Details:

Course Code: CSE 2102

Course Title: Digital Logic Design Sessional

Course Type: Core Course

Level-Term: 2-I

Academic Session: Summer-2022

Course Teacher: Dr. Mohammed Sowket Ali

Pre-requisite: Nil

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course aims to provide students with knowledge of problem solving with digital logic circuits & systems. The basic building blocks of combinational and sequential circuits are introduced to enable students to develop circuit solutions to problems and to understand the design and operation of hardware models of digital systems.

Course Objectives:

1. To gain basic knowledge on logic design and the basic building blocks used in digital systems, in particular digital computers.
2. To design different types of combinational and sequential logic circuit and their implementations

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Operate laboratory equipment by implementing and simulating simple combinational digital circuits.	Y											
CLO2	Analyze a given problem and apply the acquired knowledge to design both combinational and sequential circuits.		Y										
CLO3	Understand the relationship between abstract logic characterizations.			Y									

CLO4	Practical implementations while designing a system.										Y		
Y=yes													
Course Plan:													

Week	**Lab**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Verify Basic Logic Gates and Truth Tables of the Logic Gates	Lecture, Tutorial, Labwork	Lab Report, Lab Test	CLO1
2	Lab-2	Combinational Circuit (Light Your Lamp)	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
3	Lab-3	Experiments Based on Truth tables and Boolean functions	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
4	Lab-4	Experiments Based on Truth tables and K-maps	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
5	Lab-5	Design and implementation of the Logic Circuits using K-maps (7 Segment Display)	Lecture, Tutorial, Labwork	Lab Report, Lab Test	CLO1-CLO4
6	Lab-6	Experiments Based on Adder/Subtractor	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
7	Lab-7	Experiment based in real life examples	Lecture, Tutorial, Labwork	Quiz, Mid Term	
8	Lab-8	Experiments Based on Comparator	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
9	Lab-9	Design and implementation of Combinational circuit using Multiplexer	Lecture, Tutorial, Labwork	Lab Report, Lab Test	CLO2-CLO4

10	Lab-10	Design and Implementation of encoder and decoder	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
11	Lab-11	Design and implement Flip Flop using basic gates	Lecture, Tutorial, Labwork	Lab Test	
12	Lab-12	Design and implement counters using Flip-Flops	Lecture, Tutorial, Labwork	Lab Report, Lab Test	
13	Lab-13	Design and implement counters, registers using Flip-Flops	Lecture, Tutorial, Group work	Lab Report, Lab Test	
14	Lab-14	Experiments based on real life example		Quiz, Viva, Lab Test, Evaluation	CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Attendance	25%
	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books
Hand Book of Modern Digital Electronics by Md. Golam Moazzzam and Md. Sorif Uddin.

CSE 2103: Data Structures and Algorithm I

Course Details:
Course Code: CSE 2103 Course Title: Data Structures and Algorithm I Course Type: Core Course Level-Term: 2-I Academic Session: Summer-2022 Course Teacher: Sohel Rana Pre-requisite: Course Code: CSE 1203, Course Title: Object Oriented Programming Language I Credit Value: 1.50 Contact Hours: 3.00 Total Marks: 100%
Rationale
This Data Structures & Algorithms I course is designed to offer a flawless concept on the vital parts of the data structures and algorithms related to computer science. This course begins with the introduction of basic concepts of some commonly used data structures and algorithms and then covers complexity analysis, linked list, stack, queue, tree, graph, sorting, searching and various relevant important topics.
Course Objectives:
1. To develop a general understanding of basic data structures and algorithms 2. To achieve a basic idea on asymptotic notations for different types of algorithms 3. To choose the appropriate algorithm based one scenario and constrains 4. To develop Programming skills for basic data structures and algorithms
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Illustrate the basic of static and dynamic data structures and relevant conventional algorithms.	Y											

CLO2	Solve complex engineering problem with no obvious solution using wide ranging or conflicting algorithms and data structures.	Y											
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.		Y										
CLO4	Identify and reveal bugs in the program then diagnose needed basic operations with algorithms and data structures.		Y										
CLO5	Develop the communication skill by presenting topics on data Structures and algorithms										Y		

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction and course overview	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Complexity Theory and Algorithmic Notation	Lecture, Tutorials, Discussions		
	3	Asymptotic Notations	Lecture, Tutorials, Discussion		
2	4	Arrays	Lecture, Tutorials, Discussion		
	5	Sparse array	Lecture, Tutorials, Discussion		
	6	Array Operations	Lecture, Tutorials, Discussion		
3	7	String operations: Pattern matching	Lecture, Tutorials, Discussion		
	8	String operations: KMP algorithm	Lecture, Tutorials, Discussion		

	9	Searching: Linear Search and Binary Search	Lecture, Tutorials, Discussion		
4	10	Sorting: Bubble Sort	Lecture, Tutorials, Discussion	ASG	CLO2, CLO5
	11	Sorting: Selection Sort, Insertion Sort	Lecture, Tutorials, Discussion		
	12	Dynamic memory allocation and pointer	Lecture, Tutorials, Discussion		
5	13	Linked List: Singly linked list and its operations: Insertion, Traversing.	Lecture, Tutorials, Discussion		
	14	Linked List: Singly linked list and its operations: Deletion, Searching	Lecture, Tutorials, Discussion		
	15	Doubly link list and its operations: Insertion, Traversing.	Lecture, Tutorials, Discussion		
6	16	Doubly link list and its operations: Deletion	Lecture, Tutorials, Discussion		
	17	Circular link list and its operations: Insertion	Lecture, Tutorials, Discussion		
	18	Circular link list and its operations: Deletion	Lecture, Tutorials, Discussion		
7	19	Uses of linked list: Reversing a link list, finding middle element, cycle detection	Lecture, Discussion		
	20	Stack implementation: Array, Linked List	Lecture, Discussion		
	21	Stack operations: Push, Pop	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Uses of Stack: String reverse, Infix to postfix	Lecture, Discussion	CT2	CLO3, CLO4

	23	Uses of Stack: Postfix evaluation	Lecture, Discussion		
	24	Queue Implementation	Lecture, Discussion		
9	25	Queue operations: enqueue, dequeue	Lecture, Group work, Discussion		
	26	Circular Queue	Lecture, Group work, Discussion		
	27	Priority Queue	Lecture, Group work, Discussion		
10	28	Tree Terms and types	Lecture, Group work, Discussion		
	29	Binary tree construction and operations: traversal (Preorder)	Lecture, Group work, Discussion		
	30	Binary tree operations: traversal (Post order, In order)	Lecture, Group work, Discussion		
11	31	Binary Search Tree construction	Lecture, Group work, Discussion	CT3	CLO3-CLO4
	32	Balanced Binary Search Tree (BST)	Lecture, Presentation, Discussion		
	33	Operations of BST	Lecture, Presentation, Discussion		
12	34	Heap: Max- Heap, Min-Heap	Lecture, Group work, Discussion		
	35	Heap Operations, Heap Application: Heap-Sort	Lecture, Group work, Discussion		
	36	Graph: Terminology, Representation	Lecture, Group work, Discussion		
13	37	Hashing: Hash Function	Lecture, Group work, Discussion		
	38	Collision, Resolution, Open Addressing	Discussion, Group work		

	39	Channing, Double Hashing	Discussion, Presentation, Group work		
14	40	Skip list	Discussion, Presentation		
	41	**Review Class**			
	42	**Review Class**			
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

Data Structures – Seymour Lipschutz

Introduction to Algorithms (Third Edition), Thomas H. Cormen

Algorithm Design and Applications, Michael T. Goodrich, Roberto Tamassia

Data Structures Using C and C++ – Y. Langsam, M. J. Augenstein, A. M. Tenenbaum

CSE 2104: Data Structures and Algorithm I Sessional

Course Details:

Course Code: CSE 2104

Course Title: Data Structures and Algorithm I Sessional

Course Type: Core Course

Level-Term: 2-I

Academic Session: Summer-2022

Course Teacher: Sohel Rana

Pre-requisite: Nill

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale of the Course:

This course is designed to provide a clear concept on the implementation of the essential parts of the data structures and algorithms related to computer science. This course begins with the implementation of some commonly used data structures including Array, Linked list, Stack, and Queue and then covers various relevant important topics related to this course.

Course Objectives:

1. To develop a general understanding of basic data structures and algorithms
2. To Apply different linear and non-linear data structures to solve the problems
3. To develop programming skills for advanced data Structures and algorithms

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate advantages and disadvantages of specific algorithms and data structures.	Y											
CLO2	Select basic data structures and algorithms for autonomous realization of simple programs or program parts.	Y											
CLO3	Initiate practical knowledge to determine and demonstrate bugs in programs.		Y			Y							

CLO4	Formulate new solutions for problems or improve existing code using learned algorithms and data structures.		Y	Y									

Y=yes

Course Plan:

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Operations on Dynamic and static array	Lecture, Discussion		
2	2	String Operations: Pattern Matching	Lecture, Discussion, Group works		
3	3	Searching: Linear Search, Binary Search	Lecture, Discussion, Group works		
4	4	Sorting: Insertion, Bubble, Selection	Discussion, Group works	E, MT, Q, R, V	CLO1-CLO2
5	5	Pointer, Dynamic Memory Allocation	Lecture, Discussion		
6	6	Linked List: Single Linked List	Lecture, Discussion, Group works		
7	7	Linked List: Doubly Linked List	Lecture, Discussion, Group works		
Mid Term					CLO1, CLO2
8	8	Linked List: Circular Linked List	Lecture, Discussion		
9	9	Stack operations and uses	Lecture, Discussion, Group works		
10	10	Queue operations, Circular Queue, Priority Queue	Lecture, Discussion, Group works	E, Quiz, R, V	CLO2-CLO4
11	11	Tree Construction, Preorder, Inorder, Postorder traversal	Discussion, Group works		
12	12	Binary search tree Operations	Lecture, Discussion		

13	13	Graph Representation	Lecture, Discussion, Group works		
14	14	Review Class	Lecture, Discussion, Group works		
Final Exam					CLO2, CLO4

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Evaluation	Class Evaluation and Class Participation	25%
	Mid Term	20%
Report		15%
Presentation and Viva		10%
Final Exam and Quiz		30%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Data Structures – Seymour Lipschutz
2. Introduction to Algorithms (Third Edition), Thomas H. Cormen
3. Algorithm Design and Applications, Michael T. Goodrich, Roberto Tamassia
4. Data Structures Using C and C++ – Y. Langsam, M. J. Augenstein, A. M. Tenenbaum

Reference Sites

https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

https://www.tutorialspoint.com/data_structures_algorithms/index.htm

https://www.shafaetsplanet.com/

https://www.geeksforgeeks.org/data-structures/

CSE 2105: Applied Statistics for Computer Science

Course Details:

Course Code: CSE 2105

Course Title: Applied Statistics for Computer Science

Course Type: Core Course

Level-Term: 2-I

Academic Session: Summer-2022

Course Teacher: Sohel Rana

Pre-requisite: Nill

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course covers the fundamental theories of statistics and applies them on different practical applications in the field of information technology, data sets, and analyses their effects.

Course Objectives:

1. The aim of this course is to address the theories of applied statistics and analyze real-life problems in the area of information technology to illustrate how statistics are used in real-life situations.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic theories of applied statistics	Y											
CLO2	Classify, interpret, infer, and test applied statistics theories and problems.	Y											
CLO3	Analysis, apply and incorporate statistical theories in real-life applications for information technology		Y										

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs

1	1	Introduction to Statistics, Types of Statistics, Basic Terminologies of Statistics	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Types of Statistical Data and Variables	Lecture, Tutorials, Discussions		
	3	Summarizing data, Measures of Central Tendency	Lecture, Tutorials, Discussions		
2	4	Measures of Central Tendency	Lecture, Tutorials, Discussions		
	5	Range, Quartile, Decile, Percentile	Lecture, Tutorials, Discussions		
	6	Variance, Standard deviation and other measures of dispersion	Lecture, Tutorials, Discussions		
3	7	Moments, Skewness, Kurtosis	Lecture, Tutorials, Discussions		
	8	Tables, Graphs and Charts Representations	Lecture, Tutorials, Discussions		
	9	Introduction to probability	Lecture, Tutorials, Discussions		
4	10	Conditional Probability	Lecture, Tutorials, Discussions	CT 2	CLO 1
	11	Conditional Probability	Lecture, Tutorials, Discussions		
	12	Independence, Mutual Exclusive events	Lecture, Tutorials, Discussions		
5	13	Bayes Theorem	Lecture, Tutorials, Discussions		
	14	Bayes Theorem Exercise	Lecture, Tutorials, Discussions		
	15	Random Variables	Lecture, Tutorials, Discussions		
6	16	Discrete Probability Distributions, PMF	Lecture, Tutorials, Discussions		

	17	Binomial Distribution	Lecture, Tutorials, Discussions		
	18	Poisson Distribution	Lecture, Tutorials, Discussions		
7	19	Joint Probability Distribution	Lecture, Tutorials, Discussions		
	20	Expected value	Lecture, Tutorials, Discussions		
	21	Review Class	Lecture, Tutorials, Discussions		
Mid Term					CLO1, CLO3
8	22	Continuous Distribution	Lecture, Tutorials, Discussions	CT3	CLO1
	23	Continuous Distribution	Lecture, Tutorials, Discussions		
	24	Continuous Distribution	Lecture, Tutorials, Discussions		
9	25	Markov Model, Markov Chains	Lecture, Tutorials, Discussions		
	26	Markov Inequality, Chebyshev Inequality	Lecture, Tutorials, Discussions		
	27	Law of Large Numbers	Lecture, Tutorials, Discussions		
10	28	PageRank Algorithm	Lecture, Tutorials, Discussions		
	29	Sampling, Sample Mean	Lecture, Tutorials, Discussions		
	30	Estimation	Lecture, Tutorials, Discussions		
11	31	Central Limit Theorem	Lecture, Tutorials, Discussions	ASG	CLO2
	32	Simulation, Standard Error	Lecture, Tutorials, Discussions		

	33	Maximum Likelihood, Bayes Estimation	Lecture, Tutorials, Discussions		
12	34	Confidence Interval	Lecture, Tutorials, Discussions		
	35	Hypothesis Testing	Lecture, Tutorials, Discussions		
	36	Statistical Inferences,	Lecture, Tutorials, Discussions		
13	37	Simple Linear Regression	Lecture, Tutorials, Discussions		
	38	Multiple Linear Regression	Lecture, Tutorials, Discussions		
	39	Residual Analysis	Lecture, Tutorials, Discussions, Group Work		
14	40	Model Diagnostics	Lecture, Tutorials, Discussions, Group Work		
	41	Review Class			
	42				
Final Exam					CLO2-CLO3

Assessment and Evaluation		
Assessment Strategy		
Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence

in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books 1. STATISTICS by Robert S. Witte, John S. Witte, Eleventh Edition, Hoboken, NJ: John Wiley & Sons, Inc., 2017 2. Applied Statistics and Probability for Engineers by Douglas C. Montgomery, GEORGE C. RUNGER, Seventh edition. Hoboken, NJ: Wiley, 2018

CSE 2108: Object Oriented Programming Language II Sessional

Course Details
Course Code: CSE 2108 Course Title: Object Oriented Programming Language II Sessional Course Type: Core Course Level-Term: 2-I Academic Session: Summer-2022 Course Teacher: Sohel rana Pre-requisite: Nil Credit Value: 1.50 Contact Hours: 3.00 Total Marks: 100
Rationale
This course is designed to provide a comprehensive knowledge about Inheritance, Polymorphism, Encapsulation and other Object-Oriented methodologies to do programming in an effective manner and solve the practical life problems by building real-time projects.
Course Objectives

1. To learn the concept of OOP with a pure object-oriented programming language (Java).
2. To learn how to use advance programming features such as GUI design, exception handling and multithreading.
3. To learn how to design and develop a complete real-world software solution.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcome (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the concept of OOP with a pure object-oriented programming language (Java)	Y				Y							
CLO2	Use the advance programming features such as GUI design, exception handling and multi-threading.			Y		Y							
CLO3	Demonstrate how to design and develop a complete real-world software solution.					Y				Y			

Y=yes

Course Plan:

Week	**Lab**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Basic Concept on java, basic operation and command line	Lecture, Tutorial, Labwork	Lab Report	CLO1
2	Lab-2	Introduction to class, Methods, Constructors	Lecture, Tutorial, Labwork	Lab Report, Project	
3	Lab-3	Java Array, String and Control Statements	Lecture, Tutorial, Labwork	Lab Report, Project	
4	Lab-4	OOP principle: Polymorphism and Inheritance	Lecture, Tutorial, Labwork	Lab Report, Project	

5	Lab-5	Statics Properties of Java: Static data members, methods, blocks etc.	Lecture, Tutorial, Labwork	Lab Report, Project	CLO1, CLO3
6	Lab-6	Execution sequences of Constructor, Super, Final and DMD	Lecture, Tutorial, Labwork	Lab Report, Project	
7	Lab-7	Class abstraction, Interface, Closure	Lecture, Tutorial, Labwork	Lab Report, Project	
Mid Term					CLO1-CLO2
8	Lab-8	Packages and Access Specifiers	Lecture, Tutorial, Labwork	Lab Report	
9	Lab-9	Exception Handling, Multithreading	Lecture, Tutorial, Labwork	Lab Report	CLO2-CLO3
10	Lab-10	Java I/O (serialization) and stream, Collection Frameworks	Lecture, Tutorial, Labwork	Lab Report	
11	Lab-11	Generics classes and method, Concurrency	Lecture, Tutorial, Labwork	Lab Test	
12	Lab-12	Introduction with swings, Swing Layouts	Lecture, Tutorial, Labwork	Lab Report	
13	Lab-13	Simple GUI Project	Lecture, Tutorial, Group work	Presentation	
14	Lab-14	Quiz, Viva		Evaluation	
Lab Final					CLO1-CLO2

Assessment and Evaluation		
Assessment Strategy		
Components		**Grading**
Continuous Assessment (40%)	Attendance	25%

	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Java: The Complete Reference - Herbert Schildt
2. Head First Java- Eric Freeman & Elisabeth Robson with Kathy Sierra & Bert Bates
3. Java: How to Program – Deitel&Deitel

Reference Sites

Introduction to Programming in Java, Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-092-introduction-to programming-in-java-january-iap-2010/.

CHEM 2133: Chemistry

Course Details
Course Code: CHEM 2133 Course Title: Chemistry Course Type: GED Course Level-Term: 2-I Academic Session: Summer-2022 Course Teacher: …………… Pre-requisite: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
To learn the basic concepts of inorganic, organic & physical chemistry.
Course Objectives
1. To familiarize students with the terminology associated with organic, inorganic, & physical chemistry. 2. Teach students how to use elements in indifferent purposes using the concept of periodic table and periodic properties & identify types of chemical bonding. 3. To familiarize students with both pH and teach students how to identify the nature of substances using pH. 4. To familiarize students with chemical kinetics, chemical equilibrium, thermochemistry & various types of reaction. 5. To familiarize students with the type of solution, their properties and unit of concentration. 6. To introduce students with industrial chemistry, chemical hazards and safety & CWC, OPCW.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To remember and understand and firm grasp of the basic principles of chemistry.	Y											

CLO2	To encourage creative thinking and development of a deeper understanding and intuitive feel.		Y										
CLO3	To apply the principle & understand advanced level of relevant field of study in CSE.	Y											
Y=yes													

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1 2 3	Introductory concepts and definitions: Atom, Isotope, Isobar, Isotone, Different atom models, Quantum numbers, electronic configuration.	Lecture, Discussions	CT1	CLO1
2	4 5 6	Periodic Table: Concept of periodic table, Finding the position of the elements in the periodic table using electronic configuration, Periodic properties of elements, uses of noble gases.	Lecture, Discussions		
3	7 8 9	Chemical bond: Definition and types of chemical bond, Properties of compound containing different chemical bonds, Lewi's theory, VBT, MOT, hybridization.	Lecture, Discussions		
4	10 11 12	Reaction kinetics: Introduction, Rate of reaction, Rate laws, factors affecting the rate, Molecularity & Order of reaction, Determining the rate	Lecture, Discussions	ASG	CLO 4

		equations, Half-lives, the Arrhenius equation, and activation energies.			
5	13 14 15	Chemical equilibrium: Definition of reversible reaction and chemical equilibrium. Graphical representation of chemical equilibrium, Law of mass action and its explanation, concept of Kp and Kc, Relation between Kp and Kc, Derivation of Kp and Kc for some special reaction.	Lecture, Discussions		
6	16 17 18	Selective organic reactions: Definition, description, and mechanism of addition, substitution, oxidation- reduction, and polymerization reaction (Plastic and fiber, Rubber).	Lecture, Discussions		
7	19 20 21	Solution: Definition of solution and its classification. Unit expressing concentration of solution. Procedure of solution preparation Colligative properties of dilute solutions: Definition and name of the colligative properties. Rault's law of lowering of vapour pressure Explanation of lowering of vapour pressure.	Lecture, Discussions		
Mid Term					CLO3
8	22		Lecture, Discussions	CT2	CLO2

	23, 24	Electrical properties of solution: Electrolysis, Electrical conductance Faraday's Laws of electrolysis, electrochemical cell.			
9	25, 26, 27	Concept of acids & bases: Strength of acid & base, Ionization of water, Ionic product of water(k_w), Definition of pH, Calculation of pH for different solution, pH scale and determination of nature of solution using pH, Buffer solution.	Lecture, Discussions		
10	28, 29, 30	Thermochemistry: Enthalpy of a reaction, Exothermic and endothermic reaction, Concept of delta H, Calculation of delta H for different reaction., Laws of thermochemistry.	Lecture, Discussions		
11	31, 32, 33	Phase rule: Definition of phase, components, and degree of freedom Phase rule, Phase diagram of mono component system.	Lecture, Discussions	CT3	CLO2
12	34, 35, 36	Introduction to Basics of Chemical Hazards and Safety: Chemical safety, loss prevention, hazard, risk, occupation, and security & safety. Hazard communication, risks of	Lecture, Discussions		

		chemical exposure, Evaluation and control of chemical exposure in workplace. Major hazards control: how to prevent chemical accidents. Chemical accidents: case studies. Chemical safety standards and regulations: National/International. History of Chemical weapons, CWC and formation/function of OPCW.			
13	37 38 39	Overview of CWC, OPCW and National Authority: Formation/function of BNACWC and national legislations on CWC in Bangladesh. Classification of chemical weapons, schedule chemicals and their effects. Dual use of chemicals and chemical threat.	Lecture, Discussions		
14	40 41 42	Revisions and discussion about final exams	Lecture, Discussions		
Final Exam					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%

	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Modern Inorganic Chemistry – S. Z. Haider
2. Concise Inorganic Chemistry – J. D. Lee
3. A Textbook of Organic Chemistry – Arun Bahl and B. S. Bahl
4. Organic Chemistry – Morrison and Boyd
5. Principles of Physical Chemistry – Haque and Nawab
6. Essentials of Physical Chemistry – Bahl and Tuli

Reference Sites

https://chem.libretexts.org/

https://www.khanacademy.org/science/chemistry

MATH 2145: Vector Calculus, Linear Algebra and Complex Variable

Course Details:

Course Code: MATH 2145

Course Title: Vector Calculus, Linear Algebra and Complex Variable

Course Type: GED Course

Level-Term: 2-I

Academic Session: Summer-2022

Course Teacher: ……………

Pre-requisite: MATH 1141: Differential and Integral Calculus, MATH 1243

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course provides clear concepts of Vectors and Scalars, The Dot and Cross Product of Vectors, Vector Differentiation, Gradient, Divergence and Curl, Vector Integration, Green's , Stoke's and Gauss's Theorem. Introduction to system of linear equation, inverse of matrix, vector space, subspace, basis, dimension, rank, nullity, linear transformation, kernel, range, Eigen value, Eigen vector, inner product spaces, how to solve linear system by various method. This course is proposals to introduce the students with the basic concepts of complex variables, complex integration. Upon the effectively accomplishment of this course students will be bright to know the complex number system and can solve associated problems arising in engineering

The focus is to illustrate engineering applications of these principles comparable to vector calculus, linear algebra. The learning approach is how the students can deal the engineering problems related to linear algebra and complex variable. Students will achieve comprehension of the fundamental knowledge from this course and they will be able to apply it in the branch of engineering.

Course Objectives:

1. Introduce students to the fundamentals of vector and Matrices.
2. expose students to mathematical applications of vector and Matrices to
3. Handle diverse problems which occur in real life situations.
4. Introduce students to the fundamentals of Complex variable.
5. Teach students how to solve various problems of complex variable.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12

	(Upon completion of the course, the students will be able to)												
CLO1	Compute the derivatives and line integrals of vector function and learn their applications.	Y											
CLO2	Evaluate surface and volume integrals and learn their inter relations and applications.		Y										
CLO3	Illustrate the basic terminology of basic complex variables and functions and explain the complex differentiation and integration with the concept of various complex related theorems.	Y											
CLO4	Apply the acquired concepts of complex information to solve problems arising in engineering mathematics.		Y										
Y=yes													

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Vectors and Scalars/; Scalars and vectors, equality of vectors;	Lecture, Discussions	CT1	CLO1
	2	Addition and subtraction of vectors, Multiplication of vectors by scalars.			
	3	Scalar and vector product of two vectors			
2	4	their geometrical interpretation;	Lecture, Discussions		
	5	Triple products and multiple products			
	6	Differentiation of vectors. Differentiation of vectors.			
3	7		Lecture, Discussions		

	8	Gradient of point functions and physical significance			
	9	divergence of point functions and physical significance curl of point functions and physical significance			
4	10	integration of vectors,	Lecture, Discussions	ASG	CLO 4
	11	Definition of line, surface			
	12	And volume integration			
5	13	Green's Theorem and its application Stoke's Theorem and its application Gauss's Theorem and its application	Lecture, Discussions		
	14				
	15				
6	16	Complex number system, General function of a complex variable Limits and continuity of a function of complex variable and related theorems	Lecture, Discussions		
	17				
	18				
7	19	Complex function, differentiation the Cauchy-Rieman Equations Cauchy's form of remainder (expansion of remainder)	Lecture, Discussions		
	20				
	21				
Mid Term					CLO2
8	22	expansions of functions differentiation and integration	Lecture, Discussions	CT2	CLO3
	23	Line integral of a complex function Cauchy's Integral formula			
	24				
9	25	Liouvillie's Theorem	Lecture, Discussions		
	26	Taylor's and Laurent's Theorem			
	27	Singular Residues			

10	28	Chemical Equilibrium/ Cauchy's Residue Theorem	Lecture, Discussions		
	29	Introduction to system of linear equations Introduction to system			
	30	of linear equations			
11	31	Gaussian elimination;	Lecture, Discussions	CT3	CLO3
	32	Inverse of matrix			
	33	Eigen values and eigen vectors			
12	34	Cayley-Hamilton theorem	Lecture, Discussions		
	35	Euclidean n-space; Linear transformations from IRn to IRm, properties of linear			
	36	transformation from IRn to IRm			
13	37	Real vector spaces and subspaces	Lecture, Discussions		
	38	Basis and dimension, change of basis			
	39	Rank and nullity			
14	40	Inner product spaces; Diagonalization	Lecture, Discussions		
	41	Linear transformations; Kernel and range.			
	42	Review class			
Final Exam					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books 1. Matrices – ML. Khanna 2. Vector Analysis – Schaum's Series 3. Complex Variable- Schaum's Series 4. Advanced Engineering Mathematics- H.K. Dass

LEVEL-2, TERM-II

CSE 2201: Data Structures and Algorithm II

Course Details:
Course Code: CSE 2201 Course Title: Data Structures and Algorithm II Course Type: Core Course Level-Term: 2-II Academic Session: Summer 2022 Course Teacher: NA Pre-requisite: Data Structures and Algorithm I Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The course is structured to cover fundamental and important topics in data structures and algorithms, such as algorithm's complexity analysis, various types of trees, heaps, disjoint set, greedy algorithms, dynamic programming, sorting algorithms, flow networks, string matching algorithms, graph representation and sorting, backtracking, NP problems and approximation algorithms.
Course Objectives:
1. To use the appropriate data structure in different types of algorithms 2. To choose the appropriate algorithm based one scenario and constrains 3. To able to use algorithms and data structure to solve real world problems
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLO	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate a familiarity with major algorithms and data structures.	Y											
CLO2	Synthesize efficient algorithms and data structures in common engineering design situations.			Y									
CLO3	Illustrate important algorithmic design paradigms and method of analysis		Y										

CLO4	Write rigorous correctness proof and analyze the complexity of classic algorithms and data structure		Y										

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corres-ponding CLOs
1	1	Introduction, importance	Lecture, Tutorials, Discussions	CT1	CLO1, CLO2
	2	Order of growth and Complexity analysis,	Lecture, Tutorials, Discussions		
	3	Correctness proof and different types of Complexity	Lecture, Tutorials, Discussion		
2	4	Divide and conquer method, Merge sort	Lecture, Tutorials, Discussion		
	5	Merge sort (cont.)	Lecture, Tutorials, Discussion		
	6	Quick sort	Lecture, Tutorials, Discussion		
3	7	Recurrence, Methods for solving recurrence	Lecture, Tutorials, Discussion		
	8	Lower Bound for comparison-based sorting	Lecture, Tutorials, Discussion		
	9	Linear time sorting algorithms	Lecture, Tutorials, Discussion		
4	10	Dynamic Programming (DP) basics	Lecture, Tutorials, Discussion	ASG	CLO1, CLO2
	11	DP: Coin Choose Problem	Lecture, Tutorials, Discussion		
	12	DP: 0-1 Knapsack Problem	Lecture, Tutorials, Discussion		
5	13	DP: LCS	Lecture, Tutorials, Discussion		

	14	DP: Matrix Chain Multiplication	Lecture, Tutorials, Discussion		
	15	DP: Matrix Chain Multiplication (cont.)	Lecture, Tutorials, Discussion		
6	16	Greedy method: Elements of Greedy algorithm,	Lecture, Tutorials, Discussion		
	17	Activity Selection Problem, Fractional Knapsack,	Lecture, Tutorials, Discussion		
	18	Huffman code	Lecture, Tutorials, Discussion		
7	19	Graph representation,	Lecture, Discussion		
	20	BFS, DFS,	Lecture, Discussion		
	21	Topological sort	Lecture, Discussion		
Mid Term					CLO3
8	22	Strongly connected component	Lecture, Discussion	CT2	CLO1, CLO2
	23	MST: Kruskal	Lecture, Discussion		
	24	MST: Prims	Lecture, Discussion		
9	25	Single source shortest path algorithm,	Lecture, Group work, Discussion		
	26	Theory: Negative edge, negative cycle	Lecture, Group work, Discussion		
	27	Dijkstra algorithm	Lecture, Group work, Discussion		
10	28	Bellman-Ford algorithm	Lecture, Group work, Discussion		
	29	Dijkstra algorithm vs Bellman-Ford algorithm	Lecture, Group work, Discussion		
	30	All Pairs Shortest Paths: Floyd–Warshall	Lecture, Group work, Discussion		
11	31	P versus NP	Lecture, Group work, Discussion	CT3	CLO1, CLO2
	32	NP completeness	Lecture, Presentation, Discussion		

	33	NP-hard and NP-complete problem	Lecture, Presentation, Discussion		
12	34	Flow network, Cuts, Min cut max flow theory	Lecture, Group work, Discussion		
	35	Max Flow problem: Ford Fulkerson algorithm	Lecture, Group work, Discussion		
	36	Max Flow problem: Edmonds–Karp algorithm	Lecture, Group work, Discussion		
13	37	String Matching: KMP algorithm.	Lecture, Group work, Discussion		
	38	String Matching: Robin-Karp algorithm	Discussion, Group work		
	39	Backtracking: N-Queen, All permutation,	Discussion, Presentation, Group work		
14	40	Branch and Bound technique: 0-1 Knapsack problem	Discussion, Presentation, Group work		
	41	Approximation algorithm: Vertex cover problem			
	42	Review Class			
Final Exam					CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Introduction to Algorithms (Third Edition), Thomas H. Cormen
2. Data Structures and Algorithm Analysis in Cpp (Fourth Edition), Mark Alan Weiss
3. Algorithm Design and Applications, Michael T. Goodrich, Roberto Tamassia

Reference Sites:

1. Erik Demaine, Srini Devadas, and Nancy Lynch. 6.046J Design and Analysis of Algorithms. Spring 2015. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

2. Erik Demaine, and Srini Devadas. 6.006 Introduction to Algorithms. Fall 2011. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

CSE 2202: Data Structures and Algorithm II Sessional

Course Details:

Course Code: CSE 2202

Course Title: Data Structures and Algorithm II Sessional

Course Type: Core Course

Level-Term: 2-II

Academic Session: Summer-2022

Course Teacher: NA

Pre-requisite: Data Structures and Algorithm I Sessional

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

The Data Structure and Algorithm II sessional course is designed to provide hands on implementation of commonly used data structure and algorithms. The lab begins with the implementation of some commonly used data structures and then covers the implementation of some important algorithms with required modifications and optimizations.

Course Objectives:

1. To implement some commonly used data structures.
2. To implement some commonly used algorithms with required modifications based on requirements.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the implementation of any data structure or algorithm	Y											
CLO2	Implement any algorithm from its pseudo code and writing pseudo code from its algorithm		Y										
CLO3	Choose appropriate data structure and algorithm at the appropriate scenario.					Y							
CLO4	Apply changes and modifications in the existing data structure and algorithms to reduce the time and space complexity of any problem.			Y									

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corres-ponding CLOs**
1	1	Basic functions, Merge two sorted array, linear search	Lectures, Experiments	R, E	CLO1-CLO2

2	2	Sorting: Merge sort, Quick sort	Lectures, Experiments		
3	3	Linear time sorting: Counting sort, Radix sort	Lectures, Experiments		
4	4	DP: Coin Choose, 0-1 Knapsack	Lectures, Experiments		
5	5	DP: Matrix Chain Multiplication, LCS	Lectures, Experiments		
6	6	Greedy: activity selection, fractional knapsack	Lectures, Experiments		
7	7	Lab Test – I			
Mid Term					CLO3
8	8	Graph: BFS, DFS,	Lectures, Experiments	F, V, Q, R	CLO1-CLO4
9	9	Strongly Connected Component, topological sort	Lectures, Experiments		
10	10	MST: Prim's algorithm, Kruskal's algorithm	Lectures, Experiments		
11	11	Shortest Path: Dijkstra, Bellman-Ford Algorithm, Floyd–Warshall	Lectures, Experiments		
12	12	String matching: KMP	Lectures, Experiments		
13	13	Branch and Bound: 0-1 knapsack problem Approximation: Vertex cover	Lectures, Experiments		
14	14	Final Lab Test and Quiz			

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Evaluation	Class Evaluation and Class Participation	25%
	Mid Term	20%
Report		15%
Presentation and Viva		10%
Final Exam and Quiz		30%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books: 1. Introduction to Algorithms (Third Edition), Thomas H. Cormen 2. Data Structures and Algorithm Analysis in Cpp (Fourth Edition), Mark Alan Weiss 3. Algorithm Design and Applications, Michael T. Goodrich, Roberto Tamassia **Reference Site:** https://www.cs.usfca.edu/~galles/visualization/Algorithms.html https://www.shafaetsplanet.com/ https://forthright48.com/

CSE 2203: Theory of Computation

Course Details:
Course Code: CSE 2203 Course Title: Theory of Computation Course Type: Core Course Level-Term: 2-II Academic Session: Summer-2022 Course Teacher: Mr. Md. Sydur Rahman, Mr. Md. Toukir Ahmed Pre-requisite: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%

Rationale

The course is designed to learn how problems can be efficiently solved on a model of computation using algorithms and the elementary ways in which a computer works.

Course Objectives:

1. To understand the mathematical foundations of computation including automata theory.
2. To have a solid foundation of the theory of formal languages and grammars.
3. To analyze and design finite automata, pushdown automata, Turing machines, formal languages and languages, and grammars.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the mathematical foundations of computation including automata theory.				Y								
CLO2	Determine the foundation of theory of formal languages and grammars.					Y							
CLO3	Differentiate, correlate and design finite automata, pushdown automata, Turing machine, formal languages and grammars.				Y								
CLO4	Demonstrate mathematical proofs for computation and algorithms.											Y	

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corres-ponding CLOs**
1	1	Central concepts of Computation theory, Automata Theory, Basic concepts and definitions	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Set operations; partition of a set, Equivalence relations,	Lecture, Tutorials, Discussions		

		Properties on relation on set.			
	3	Proving Equivalences about Sets.	Lecture, Tutorials, Discussion		
2	4	Graphical Representation	Lecture, Tutorials, Discussion		
	5	Transition Table (TT)	Lecture, Tutorials, Discussion		
	6	Acceptability of DFA	Lecture, Tutorials, Discussion		
3	7	Deterministic Finite Automata (DFA) Advanced Minimization of DFA.	Lecture, Tutorials, Discussion		
	8	Moore & Mealy Machine	Lecture, Tutorials, Discussion		
	9	DFA Compliment	Lecture, Tutorials, Discussion		
4	10	Non-Deterministic Finite Automata (NDFA) Graphical Representation	Lecture, Tutorials, Discussion	ASG	CLO5
	11	Transition Table(TT) Acceptability of NDFA	Lecture, Tutorials, Discussion		
	12	NDFA to DFA conversion	Lecture, Tutorials, Discussion		
5	13	Regular Expression Definition & different operators	Lecture, Tutorials, Discussion		
	14	DFA to RE Conversion RE to DFA Conversion	Lecture, Tutorials, Discussion		
	15	Applications of RE	Lecture, Tutorials, Discussion		
6	16	RE Properties	Lecture, Tutorials, Discussion		
	17	Algebraic Laws for RE	Lecture, Tutorials, Discussion		

	18	Closure Properties of RE	Lecture, Tutorials, Discussion		
7	19	RE Advanced Checking of Language Regular or Not	Lecture, Discussion		
	20	Arden's Theorem	Lecture, Discussion		
	21	Pumping Lemma	Lecture, Discussion		
Mid Term					CLO2, CLO4
8	22	Context-Free Grammar Grammar Context-Free Grammar (CFG)	Lecture, Discussion		
	23	Derivations of Grammar Sentential Form of CFG	Lecture, Discussion		
	24	Parse Tree	Lecture, Discussion		
9	25	Context-Free Grammar Ambiguity of Grammar CFG Closure Properties	Lecture, Group work, Discussion		
	26	Minimization of CFG's CFG Simplification	Lecture, Group work, Discussion	CT2	CLO2
	27	Yield of CFG	Lecture, Group work, Discussion		
10	28	Normal Form of CFG	Lecture, Group work, Discussion		
	29	CFG to CNF	Lecture, Group work, Discussion		
	30	CFG to GNF	Lecture, Group work, Discussion		
11	31	Pushdown Automata (PDA) Definition of PDA	Lecture, Group work, Discussion		
	32	Language of PDA Equivalence of PDA & CFG	Lecture, Presentation, Discussion	CT3	CLO3
	33	DPDA	Lecture, Presentation, Discussion		

12	34	Turing Machine (TM) Definition Accepted Language & Decided Language	Lecture, Group work, Discussion		
	35	Multi-tape TM Multi-track TM	Lecture, Group work, Discussion		
	36	Relation between PDA & TM NDTM	Lecture, Group work, Discussion		
13	37	Decidability Language Decidability	Lecture, Group work, Discussion		
	38	Undecidable Language	Discussion, Group work		
	39	Rice Theorem	Discussion, Presentation, Group work		
14	40	Review Class	Discussion, Presentation, Group work		
	41	Review Class			
	42	Review Class			
Final Exam					CLO3, CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence

in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Introduction to Automata Theory, Languages, and Computation. Addison-Wesley Longman
2. Publishing Co., Inc., 3rd ed., 2006 - J. E. Hopcroft, R. Motwani, and J. D. Ullman.
3. Introduction to the Theory of Computation. CENGAGE Learning, 3rd ed., 2012 - M. Sipser.
4. Elements of the Theory of Computation. Upper Saddle River, NJ, USA: Prentice Hall PTR,2nd ed., 1997 - H. R. Lewis and C. H. Papadimitriou.

Reference Sites:

www.google.com,

www.tutorialpoints.com,

Stack overflow

CSE 2205: Database Management Systems

Course Details

Course Code: CSE 2205

Course Title: Database Management Systems

Course Type: Core Course

Level-Term: 2-II

Academic Session: Summer-2022

Course Teacher: Hasan Muhammad Kafi

Pre-requisite: N/A

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100

Rationale

This course focuses on the fundamental concepts of database management, including data models, schema normalization, relational algebra and SQL basics, query optimization, transactions, concurrency and recovery, database security, and so on.

Course Objectives

1. Understand the fundamental principles of database systems.
2. Identify, analyze and design solutions for complex engineering problems by using the concepts of the database management systems.
3. Use modern database tools to design and develop solutions for complex engineering database problems.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of the database management systems.	Y											
CLO2	Identify and analyze complex engineering problems using the concepts of the database management systems.		Y										
CLO3	Design solutions for complex engineering problems using the concept of database management systems.			Y									
CLO4	Use modern database tools to design and develop solutions for complex engineering database problems.					Y							

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corres-ponding CLOs**
1	1	Database Management System Overview	Lecture, Tutorials, Discussions	CT1	CLO1, CLO3
	2	Data Models and Integrity Constraints	Lecture, Tutorials, Discussions		

	3	Database Design Process, Architectures, Users and Administrators	Lecture, Tutorials, Discussion		
2	4	Relational Model	Lecture, Tutorials, Discussion		
	5	Functional Dependencies and Anomalies in Database	Lecture, Tutorials, Discussion		
	6	Normalization and Normal Forms	Lecture, Tutorials, Discussion		
3	7	Entity Relationship (ER) Model	Lecture, Tutorials, Discussion		
	8	ER Model Design	Lecture, Tutorials, Discussion		
	9	Reduction to Schemas and Extended ER Features	Lecture, Tutorials, Discussion		
4	10	Relational Algebra Basic	Lecture, Tutorials, Discussion	ASG	CLO3, CLO4
	11	Relational Algebra: Set Operations	Lecture, Tutorials, Discussion		
	12	Relational Algebra: Joins	Lecture, Tutorials, Discussion		
5	13	Basic SQL: Introduction, Create, Insert, Update and Delete	Lecture, Tutorials, Discussion		
	14	Select, Where and Like	Lecture, Tutorials, Discussion		
	15	SQL Joins	Lecture, Tutorials, Discussion		
6	16	Group by, Having, Subquery and Union	Lecture, Tutorials, Discussion		
	17	Stored Procedure and Functions	Lecture, Tutorials, Discussion		
	18	Trigger and View	Lecture, Tutorials, Discussion		

7	19	Physical Storage Systems	Lecture, Tutorials, Discussions		
	20	RAID Levels	Lecture, Tutorials, Discussions		
	21	Data Storage Structures	Lecture, Tutorials, Discussions		
Mid Term					CLO1, CLO3, CLO4
8	22	Indexing Basic, Ordered Index and Multi-level Index	Lecture, Tutorials, Discussions	CT2	CLO1, CLO2
	23	B+ Tree Structure, Insertion and Deletion	Lecture, Tutorials, Discussions		
	24	Static Hashing and Dynamic Hashing	Lecture, Tutorials, Discussions		
9	25	Extendable Hashing	Lecture, Tutorials, Discussions		
	26	Spatial and Temporal Indexing	Lecture, Tutorials, Discussions		
	27	Transaction Concept and Schedule	Lecture, Tutorials, Discussions		
10	28	Serializability	Lecture, Tutorials, Discussions		
	29	Concurrency Control: Lock Based Protocol and Graph Based Protocol	Lecture, Tutorials, Discussions		
	30	Deadlock, Deadlock Handling and	Lecture, Tutorials, Discussions		
11	31	Multiple Granularity	Lecture, Tutorials, Discussions	CT3	CLO1, CLO2
	32	Timestamp Based Protocol and Validation Based Protocol	Lecture, Tutorials, Discussions		

	33	Failure Classification, Stable Storage Implementation and Shadow Database and Paging	Lecture, Tutorials, Discussions		
12	34	Log Based Recovery	Lecture, Tutorials, Discussions		
	35	Recovery Algorithm	Lecture, Tutorials, Discussions		
	36	Database Security	Lecture, Tutorials, Discussions		
13	37	Cryptography	Lecture, Tutorials, Discussions		
	38	Data Analytics	Lecture, Tutorials, Discussions		
	39	Different Types of Databases	Lecture, Tutorials, Discussions		
14	40	Review Class			
	41	Review Class			
	42	Review Class			
Final Exam					CLO1-CLO4

(CT – Class Test; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence

in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the course teacher before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the course teacher within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Database System Concept - Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
2. Files and Databases-An Introduction, Peter D. Smith and G.M. Barnes, Addison Wesley

Reference Sites:

MySQL Tutorial, https://www.mysqltutorial.org/

SQL Tutorial, https://www.w3schools.com/sql/default.asp

CSE 2206: Database Management Systems Sessional

Course Details

Course Code: CSE 2206

Course Title: Database Management Systems Sessional

Course Type: Core Course

Level-Term: 2-II

Academic Session: Summer-2022

Course Teacher: Hasan Muhammad Kafi

Pre-requisite: N/A

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100

Rationale

This course covers the fundamentals of database management, such as developing skills in designing real-world databases using data models, implementing those designs using a commercial database framework (MySQL), and so on.

Course Objectives

1. Understand and apply the basic concepts of a commercial database management system.
2. Understand data models such as the relational data model and the entity-relationship data model, and be able to design databases using these models.
3. Design solutions for complex engineering problems using the concept of database management systems and modern database tools.
4. Function effectively as an individual and as a member or leader of a teams and develop the communication skill through report writing and presentation.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand and apply the basic concepts of a commercial database management system.	Y											
CLO2	Design solutions for complex engineering problems using the concept of database management systems.			Y									
CLO3	Use modern database tools to design and develop solutions for complex engineering database problems.					Y							
CLO4	Function effectively as an individual and as a member or leader of a teams to develop solutions for complex engineering database problems.									Y			
CLO5	Develop the communication skill through report writing and presentation as a member and leader of a team.										Y		

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corres-ponding CLOs
1	1	MySQL Overview and Installation.	Lecture, Discussions and Practice	CE, MT, Q	CLO1, CLO3

2	2	Project Proposal Presentation.	Problem Based Method, Co-operative and Collaborative Method	PR, Pr, V	CLO4, CLO5
3	3	Database Design and Project Build up.	Lecture, Group Discussions, Co-operative and Collaborative Method	CE	CLO1, CLO2
4	4	Create, Alter, Drop, Rename and Truncate Tables.	Lecture, Discussions and Practice	CE, MT, Q	CLO1, CLO3
5	5	Insert, Update, Delete Data Select, Order By and Limit.	Lecture, Discussions and Practice		
6	6	Aggregate Functions.	Lecture, Discussions and Practice		
7	7	Project Progress Presentation, Problem Solving and Group Discussion.	Problem Based Method, Group Discussion, Co-operative and Collaborative Method	PR, CE, Pr	CLO2-CLO5
Mid Term					CLO1, CLO3
8	8	Wildcard, Set Operations.	Lecture, Discussions and Practice	CE, Q, F	CLO1, CLO3
9	9	Join Expressions.	Lecture, Discussions and Practice		
10	10	Project Progress Presentation, Problem Solving and Group Discussion.	Problem Based Method, Group Discussion, Co-operative and Collaborative Method	PR, CE, Pr	CLO2-CLO5
11	11	Group By, Having, Indices, View, Sub Queries.	Lecture, Discussions and Practice	CE, Q, F	CLO1, CLO3
12	12	Stored Procedures, SQL Functions.	Lecture, Discussions and Practice		

13	13	Stored Functions and Triggers.	Lecture, Discussions and Practice		
14	14	Quiz, Report, Presentation.	Problem Based Method, Co-operative and Collaborative Method	PR, Pr, F	CLO1-CLO5
Final Exam					CLO1-CLO5

(Class Evaluation – CE; PR – Project; Q – Quiz; ASG – Assignment; Pr – Presentation; R - Report; F – Final Exam, MT- Mid Term Exam)

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (45%)	Class Evaluation and Class Participation	25%
	Mid Term	20%
Report		15%
Presentation and Viva		10%
Final Exam and Quiz		30%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the course teacher before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the Course teacher within three (3) days of the exam.

<u>Missed Final Term</u>: Retake exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Database System Concept - Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
2. Files and Databases-An Introduction, Peter D. Smith and G.M. Barnes, Addison Wesley

Reference Sites: MySQL_Tutorial, https://www.mysqltutorial.org/ SQL Tutorial, https://www.w3schools.com/sql/default.asp

EEE 2269: Electrical Drives and Instrumentation

Course Details
Course Code: EEE 2269 Course Title: Electrical Drives and Instrumentation Course Type: GED Course Level-Term: 2-II Academic Session: Summer-2022 Course Teacher: NA Pre-requisite: N/A Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100
Rationale
This course is designed to deliver clear concepts about electrical machines especially DC (generator, motor), AC (synchronous generator, synchronous motor) machines, induction motor and transformer: types, constructions, working principles, advantages, disadvantages, practical applications etc. This course also designed to teach about the characteristics of measurement system with functional elements, classification of instruments and measurement of electrical as well as non-electrical quantities using different types of instruments.
Course Objectives
1. To make familiar with different aspects of transformer and induction motor. 2. To introduce the students with DC machines and synchronous machines. 3. To make students familiar with the applications, functional elements of a measurement and instrumentation system. 4. To teach students the function, types and application of various transducer.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To make the students familiar with basic principle, construction, operation and testing of transformer and induction motor.	Y											
CLO2	Understand the fundamentals and basic concepts of DC machines, synchronous generator and synchronous motor.	Y											
CLO3	To understand the fundamental measurement of Electrical quantities	Y											
CLO4	To deal with the measurement and control related task effectively in the practical fields.		Y										

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corres-ponding COs**
1	1, 2, 3	Faraday's law of electromagnetic induction, induced voltage, different electrical machines	Lecture, Discussions	CT1	CO1
2	4, 5, 6	Transformer, importance, construction, classification Ideal transformer, leakage reactance, theory and operation of single-phase transformer	Lecture, Discussions	CT1	CO1
3	7, 8, 9	Losses, transformer testing, no load test, short circuit test	Lecture, Discussions	CT1	CO1
4	10, 11	Maximum efficiency, condition for maximum efficiency	Lecture, Discussions	ASG	CO 4

	12	Equivalent circuit of a transformer.			
5	13 14 15	Basic concepts of ac machine, Classification of ac machine and introduction to induction motor Construction and working principle of induction motor	Lecture, Discussions		
6	16 17 18	Developing the equivalent circuit of an induction motor and induction motor as a generalized transformer Starting torque of induction motor, Running torque of induction motor,	Lecture, Discussions		
7	19 20 21	Introduction to DC generator, Shunt and series generator characteristics, compound generator characteristics, Parallel operation of DC generator, parallel shunt generators	Lecture, Discussions		
Mid Term					CO2
8	22 23 24	Introduction to motor, classification, DC motor Principle, comparison of generator and motor action Back emf, significance, Classification of DC motor	Lecture, Discussions	CT2	CO3
9	25 26 27	Speed control of DC motor, different methods Introduction to constructional details of alternator and comparison with dc generator	Lecture, Discussions		

		Excitation systems and equivalent circuit of Alternator			
10	28	Parallel operation: Necessary conditions	Lecture, Discussions		
	29	Constructional detail of synchronous motor			
	30	methods of starting Application of Synchronous motor as synchronous condenser.			
11	31	Introduction, applications and functions of measurement system,	Lecture, Discussions		
	32	Characteristics of measurement & instrumentations system. Classification of instruments.			
	33	Measurement of electrical quantities: (Current, voltage, power and energy).			
12	34	Introduction to instrument transformer & classification	Lecture, Discussions		
	35	Current Transformer (CT), Potential Transformer (PT)			
	36	construction, working principle & classifications			
13	37	Transducer classifications: active & passive transducer, primary & secondary and others	Lecture, Discussions	CT3	CO3
	38	Transducer characteristics: Input, output & transfer characteristics			
	39	A/D and D/A converters			

14	40	Noise and source of noise, Internal noise, External noise, Thermal noise, White Noise. Recording and display devices: Types and brief description of recording and display devices	Lecture, Discussions		
	41				
	42				
Final Exam					CO1-CO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. A textbook of Electrical Technology (volume-II)- B.L Theraja, A.K Theraja
2. Electric Machinery Fundamentals- Stephen J. Chapman
3. Direct and Alternating Current Machinery– Rosenblatt, Friedman
4. A course in Electrical and Electronic Measurements and instrumentation by A.K Sawhney
5. Measurement and Instrumentation: Trends and Applications by M. K. Ghosh

EEE 2270: Electrical Drives and Instrumentation Sessional

Course Details

Course Code: EEE 2270

Course Title: Electrical Drives and Instrumentation Sessional

Course Type: GED Course

Level-Term: 2-II

Academic Session: Summer-2022

Course Teacher: NA

Pre-requisite: Nill

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

This course is designed to teach about fundamental concepts and theorems on DC generator, DC motor, synchronous generator, synchronous motor, transformer and induction motor through experimental work in the laboratory.

Course Objectives

1. To become capable of analysing the performance of different types of rotating machines.
2. To empower students to determine the parameters of AC, DC machines by performing experiments on these machines.
3. To enable, train and evaluate the ability of the students to perform the analysis of transformer and induction motor.
4. To empower students to determine the parameters of induction motor and transformers by performing experiments on these machines.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Analyze the performance criteria of DC and synchronous machines to select for an industrial application.				Y								
CLO2	Perform various tests, find efficiency and voltage regulation of electrical machines		Y										

CLO3	Analysis of the differences between theoretical knowledge with the practical observations.					Y							

Y=yes

Course Plan:

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corres-ponding COs**
1	1, 2	Study of no-load magnetizing curve of a separately excited dc generator.	Lecture, Discussion, Group works	E, Q, R, V	CO1-CO2
3	3,4	Study of load characteristics curve of a dc shunt generator.	Lecture, Discussion, Group works		
5	5, 6	Speed control of dc shunt motor by varying armature circuit and field circuit method.	Lecture, Discussion, Group works		
7	7,8	Finding the regulation of an alternator at inductive and capacitive load.	Lecture, Discussion, Group works		
Mid Term					CO3
9	9,10	To synchronize an alternator to an infinite bus by various methods.	Lecture, Discussion, Group works	E, Quiz, R, V	CO2-CO4
11	11, 12	Measurement of resistance of a transformer winding. Study of open circuit test and short circuit test of a single-phase transformer	Discussion, Group works		
13	13, 14	No load test and Blocked rotor test of an Induction motor.	Lecture, Discussion, Group works		
Final Exam					CO3

Assessment and Evaluation

Assessment Strategy

Components	**Grading**

Continuous Evaluation	Class Evaluation and Class Participation	25%
	Mid Term	20%
Report		15%
Presentation and Viva		10%
Final Exam and Quiz		30%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. A Textbook of Electrical Technology (volume-II)- B.L Theraja, A.K Theraja
2. Electric Machinery Fundamentals- Stephen J. Chapman
3. Direct and Alternating Current Machinery– Rosenblatt, Friedman

MATH 2247: Laplace Transformation and Fourier Analysis

Course Details

Course Code: MATH 2247

Course Title: Laplace Transformation and Fourier Analysis

Course Type: GED Course

Level-Term: 2-II

Academic Session: Summer-2022

Course Teacher: NA

Pre-requisite: MATH 1141, MATH 1243, MATH 2145

Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course is designed to introduce the students with the basic concepts of Fourier Transform, Fourier integral, Fourier series, Laplace transform, inverse Laplace transform, Convolution theorem. The focus is to illustrate engineering applications of these principles comparable to Fourier analysis and Laplace transformation. The learning approach is how the students can deal the engineering problems related to linear algebra. Students will achieve comprehension of the fundamental knowledge from Fourier analysis and Laplace transformation and they will be able to apply it in the branch of engineering.
Course Objectives
1. To familiarize students with the terminology associated with finding the Laplace transform and Fourier transform of a function using the definition. 2. To understand the matter where we can use the Laplace transform and the Fourier transform in engineering problems. 3. To familiarize students with the Laplace transform of derivatives, integrals and periodic functions. 4. Teach students how to use the method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients. 5. To familiarize students with fundamental mathematical properties of the Fourier transform including linearity, shift, symmetry, scaling, modulation and convolution. 6. Teach students how to derive a Fourier series of a given periodic function by evaluating Fourier coefficients. 7. To understand students with Understand the nature of the Fourier series that represent even and odd functions and how derivation of a Fourier series can be simplified in this way. 8. To familiarize students to apply Parseval's Theorem and to know about its physical significance in terms of the power of the Fourier components. 9. To interpret geometrically.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Define the basic terminology and theorems associated with Laplace and	Y	Y										

	Fourier transform, Fourier integral and Fourier series.												
CLO2	Find the Laplace transform, inverse Laplace transform, Fourier integral, Fourier transform and Fourier series of different types of functions.	Y	Y										
CLO3	Solve the differential equations and integrate the functions using the Laplace and inverse Laplace transform, and interpret the result geometrically.	Y	Y		Y								
CLO4	Apply the acquired concepts of Laplace and Fourier transform, Fourier integral and Fourier series to solve problems arising in engineering.		Y		Y								

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corres-ponding CLOs
1	1 2 3	Introductory concepts and definitions of Laplace transform Laplace transforms of some elementary functions	Lecture, Discussions	CT1	CLO1
2	4 5 6	Properties of Laplace transform Linearity property First shifting property and their related problems Second shifting property and their related problems	Lecture, Discussions		
3	7 8 9	Laplace transforms of derivatives and integrals Theorem on-Laplace transform of first derivative of a function	Lecture, Discussions		

		Laplace transform of second derivative of a function Laplace transform of third derivative of a function Laplace transform of n^{th} derivative of a function Problems based on the above theorems Laplace transform of integrals			
4	10	Some special theorem on Laplace transforms Laplace transform of a function multiplied by tn and related problem	Lecture, Discussions	ASG	CLO4
	11	Laplace transform of a function division by t and related problem Fundamentals of Inverse Laplace transform Definition and Examples Linearity property of inverse Laplace transform			
	12				
5	13	First and second translation properties and associated problems	Lecture, Discussions		
	14	Inverse Laplace transform by partial fraction method			
	15	Inverse Laplace transform by partial fraction method			
6	16	Inverse Laplace transforms of derivatives and integrals	Lecture, Discussions		
	17				

	18	Inverse Laplace transforms of derivatives Inverse Laplace transforms of integrals Convolution property and applicable problems			
7	19	Application of Laplace transform	Lecture, Discussions		
	20	Solutions of differential equations Evaluation of improper integral			
	21	Laplace transforms on circuit analysis			
Mid Term					CLO2
8	22	Introduction to Fourier Series Even function, odd function, Periodic function	Lecture, Discussions	CT2	CLO3
	23	Trigonometric series, Definition of Fourier series Coefficients of Fourier series in case of odd function			
	24				
9	25	Coefficients of Fourier series in case of even function.	Lecture, Discussions		
	26	Application of Fourier Series Determination of Fourier coefficients in case of different types of function			
	27	Application of Fourier Series Determination of Fourier coefficients in case of different types of function			
10	28		Lecture, Discussions		

	29	Expanding functions in Fourier series			
	30	Fourier Integral Drichlets's condition Theorem on Fourier integral			
11	31	Different forms of Fourier integral and related exercises Introduction to Fourier transform Definition – Fourier transform and Inverse Fourier transform	Lecture, Discussions		
	32	Fourier sine transform and Inverse Fourier sine transform Fourier cosine transform and Inverse Fourier cosine transform.			
	33				
12	34	Relation between Fourier and Laplace transform	Lecture, Discussions	CT3	CLO3
	35				
	36	The Convolution theorem of Fourier transform Parseval's identity of Fourier transform Problems on Fourier transform Exercises based on Fourier transform, Fourier sine transform			
13	37	Fourier cosine transform and their inverse	Lecture, Discussions		
	38	Solution of Boundary value problem using Fourier transform. Application on circuit analysis			

	39				
14	40	Review Class	Lecture, Discussions		
	41				
	42				
Final Exam					CLO1-CLO3

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Method of Applied Mathematics- Prof. Md. Abu Yusuf
2. Advanced Engineering Mathematics- H.K. Das

HUM 2221: History of the Emergence of Bangladesh

Course Details
Course Code: HUM 2221 Course Title: History of the Emergence of Bangladesh Course Type: GED Course Level-Term: 2-II Academic Session: Summer-2022 Course Teacher: NA Pre-requisite: NA Credit Value: 2.00 Contact Hours: 2.00 Total Marks: 100%
Rationale
This course has been designed for undergraduate engineering students to help them learn the rich history of Bangladesh, to understand present Bangladesh in the light of history and to provide them with basic knowledge of historical events which eventually led to the formation of Bangladesh and constitution of Bangladesh, current trends in economic development and thereby to enhance their understanding of present phenomena in the light of history which will make them responsible citizen.
Course Objectives:
1. To equip students with factual knowledge that will enable them to learn and critically appreciate the history, culture, and economy of Bangladesh. 2. To trace the historical roots of Bangladesh as an independent state focusing on the social, cultural and economic developments that have taken place since its independence. 3. To promote an understanding of the development of Bangladesh and its culture from ancient time. 4. To create an awareness among the students about the History, Politics and Culture of Bangladesh.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify specific stages of Bangladesh‘s political history, through the ancient, medieval, colonial and post-colonial periods .	Y											

CLO2	Critically analyze the political movements of Bangladesh before 1971.		Y					Y					
CLO3	Clear understanding of the History of Bangladesh and its impact on reforming of a nation. This eloquent history will help the students to know the actual roots of their nation.	Y							Y				Y

Y=yes

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

LEVEL-3, TERM-I

CSE 3100: Software Development Project II

Course Details:
Course Code: CSE 3100 Course Title: Software Development Project II Course Type: Core Course Level-Term: 3-I Academic Session: Summer-2022 Course Teacher: Sohel Rana Pre-requisite: Nill Credit Value: Credit Hours: 0.75 Contact Hours: 1.50 Total Marks: 100 %
Rationale
The Individual Software Development Project II course is designed to make its learners able to solve advanced level industry problems and develop real time projects professionally.
Course Objectives
1. To give idea about programming related to software development. 2. To prepare students for the advanced level works of industry. 3. To design real time projects in web platform. 4. To increase practical knowledge to identify the relative merits of different project designs, Programming constructs and data structures.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase the depth of knowledge in programming.			Y									

CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structures.	Y											
CLO4	Able to develop industry level web-based applications individually.									Y			

Y= Yes

Course Plan:

Week	Lab	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1	Project Proposal and Project Selection	Discussion, Presentation, Project, Problem Solving	Proposal	
2	2	Language/ Platform Selection	Discussion, Presentation, Project, Problem Solving		
3	3	UX and UI Design	Discussion, Presentation, Project, Problem Solving		
4	4	Intro. to MySQL, SQL Connection	Discussion, Presentation, Project, Problem Solving		CLO1-CLO4

5	5	Front-end Development	Discussion, Presentation, Project, Problem Solving	PR, Q	
6	6	Presentation on F-D as Mid Term	Discussion, Presentation, Project, Problem Solving		
7	7	Back-end Development	Discussion, Presentation, Project, Problem Solving		
8	8	Project Integration	Discussion, Presentation, Project, Problem Solving		
9	9	Debugging	Discussion, Presentation, Project, Problem Solving		
10	10	Error Handling	Discussion, Presentation, Project, Problem Solving		
11	11	Testing	Discussion, Presentation, Project,		

			Problem Solving		
12	12	Correction on Testing	Discussion, Presentation, Project, Problem Solving		
13	13	Final Presentation Preparation	Discussion, Presentation, Project, Problem Solving		
14	14	Project Submission	Evaluation	E, V	

Assessment and Evaluation	
Assessment Strategy	
Components	**Grading**
Class Performance & Observation	10%
Project Proposal(10%)	10%
Project update-1(20%)	20%
Final Submission(40%)	40%
Quiz	20%
Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

CSE 3101: Software Engineering

Course Details:
Course Code: CSE 3101 Course Title: Software Engineering Course Type: Core Course Level-3, Term: I Academic Session: Summer-2022 Course Teacher: Dr. Engr. Mohammed Sowket Ali and Mr. Md. Al-Hasan Pre-requisite: Course Code: CSE 1203, Course Title: Object Oriented Programming Language I Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100 %
Rationale
The course is structured to cover fundamental and important topics in software engineering, such as information system analysis and design, modular software development approach, necessity of modular software development for handling real world projects, use of different UML (Unified Modeling Language) diagrams, software project management, emotional intelligence, importance of being team player, application of different software development model, software design pattern, code refactoring, object-oriented software engineering, software quality assurance, software testing, apply the different standards and principles of software engineering in a real world project.
Course Objectives
1. To understand the process of designing, building, and maintaining software systems. 2. To acquire the skill of applying different software development coding principles in a software project. 3. To be able to manage a enterprise level software project and understand software evolution, testing approaches, quality assurance to ensure high standard/professional software
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements, and designing different kind of system and			Y									

	architectural models for building software systems.												
CLO3	Develop testing mechanisms for assuring software quality including the dependability and availability.		Y										
CLO4	Develop the communication skill by presenting topics on software engineering.										Y		

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding COs**
1	1	Overview of Software Engineering Course	Lecture, Tutorials, Discussions	CT1	CLO1-CLO2
	2	Introduction to Information System	Lecture, Tutorials, Discussions		
	3	Software Development Life Cycle	Lecture, Tutorials, Discussion		
2	4	Information Gathering	Lecture, Tutorials, Discussion		
	5	Software requirement analysis	Lecture, Tutorials, Discussion		
	6	Different activities of system analyst	Lecture, Tutorials, Discussion		
3	7	Modular software development approach	Lecture, Tutorials, Discussion		
	8	Modular software development: cohesion and coupling	Lecture, Tutorials, Discussion		
	9	Review of Object-oriented Programing (OOP) approach/philosophy	Lecture, Tutorials, Discussion		
4	10	Review of OOP features: Encapsulation, polymorphism, Inheritance and Abstraction	Lecture, Tutorials, Discussion	ASG	CLO3, CLO4

	11	Class diagram and other different types UML diagram	Lecture, Tutorials, Discussion		
	12	Design Pattern	Lecture, Tutorials, Discussion		
5	13	Application of different types of design patterns	Lecture, Tutorials, Discussion		
	14	Application of different types of design patterns (Cont.)	Lecture, Tutorials, Discussion		
	15	SOLID principles	Lecture, Tutorials, Discussion		
6	16	Code refactoring	Lecture, Tutorials, Discussion		
	17	Different approaches of code refactoring	Lecture, Tutorials, Discussion		
	18	Introduction to a generic software process model	Lecture, Tutorials, Discussion		
7	19	Different types of software process models	Lecture, Discussion		
	20	Detail of different software development model	Lecture, Discussion		
	21	Agile software development approach	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	SCRUM: an agile framework	Lecture, Discussion	CT2	CLO1, CLO2
	23	Software Project Management	Lecture, Discussion		
	24	Job versus Project	Lecture, Discussion		
9	25	Characteristics of projects, Project management activities	Lecture, Group work, Discussion		
	26	Project planning: work-resource distribution	Lecture, Group work, Discussion		
	27	Project planning: work breakdown structure (WBS)	Lecture, Group work, Discussion		

10	28	Project planning: time estimation/scheduling	Lecture, Group work, Discussion		
	29	Project planning: cost estimation	Lecture, Group work, Discussion		
	30	Cost Benefit Analysis (CBA)	Lecture, Group work, Discussion		
11	31	Dealing with uncertainty: Risk evaluation, Risk Matrix, Risk Management	Lecture, Group work, Discussion	CT3	CLO1-CLO2
	32	Importance of team work	Lecture, Presentation, Discussion		
	33	Emotional Intelligence	Lecture, Presentation, Discussion		
12	34	Software testing	Lecture, Group work, Discussion		
	35	Software testing strategies	Lecture, Group work, Discussion		
	36	Software Quality Assurance, Quality factors, Software quality measures	Lecture, Group work, Discussion		
13	37	Concepts of Software reliability, availability and safety	Lecture, Group work, Discussion		
	38	Measures, Metrics and Indicators	Discussion, Group work		
	39	Knowledge Discovery in Databases, Expert System.	Discussion, Presentation, Group work		
14	40	Business Intelligence System, Enterprise Resource Planning (ERP) system	Discussion, Presentation, Group work		
	41	**Review Classes**			
	42	**Review Classes**			

Final Exam	CLO2-CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

- <u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- <u>Missed Final Term</u>: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Software Engineering a Practical Approach - Rogers Pressman
2. Software Engineering – Ian Somerville
3. Software Engineering Fundamental - Ali Behforooz & Fredrick J. Hudson

Reference Sites

1. Nancy Leveson. 16.355J Software Engineering Concepts. Fall 2005. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.
2. Harold Abelson, and Philip Greenspun. 6.171 Software Engineering for Web Applications. Fall 2003. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

CSE 3102: Software Engineering Sessional

Course Details
Course Code: CSE 3102 Course Title: Software Engineering Sessional Course Type: Laboratory Course Level: 3-I Academic Session: Summer 2022 Course Teacher: …………… Pre-requisite: Course Code: CSE 1203; Course Title: Object Oriented Programming Language I Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
The Software Engineering Sessional course provides a practical experience on developing innovative enterprise solutions for real life problems by applying software engineering fundamentals which involve understanding the applicability of different software process models for different context, employing different software development standards like; design pattern, code refactoring etc., performing requirement analysis, designing system architecture as well as system models using unified modelling language, developing prototypes using prototyping tools and evaluating the prototype using test cases.
Objectives
1. To understand the process of designing, building, and maintaining software systems through a practical approach by having experience on developing software systems for solving real-life problems innovatively. 2. To acquire the skill of applying different software development coding principles practically in a software project along with project management and testing strategies. 3. To get familiar with documenting software process model, requirement analysis, system architecture, system models formally for a software system of programmable logic controllers.
Course Content
Information System Design: Information and System; System Analysis and Systems Analyst; Information gathering techniques; Structured analysis of systems Feasibility Study: Concepts (abstraction, refinement, modularity and hierarchy) and classification, Introduction to modeling language (Use case diagram, Sequence diagram and Activity diagram), Cost benefit analysis; Project

scheduling; System design techniques; User interface design Software Engineering: Introduction to system engineering and software engineering; Software requirements analysis, modeling and specification; Software Designing: principals, models, design patterns and specification Software Testing: Objectives and principles, testability, testing design and implementation models and documentations, verification, validation and debugging; Quality factors and metrics for different software engineering phases; Software project management issues.

Mapping of Course Learning Outcomes with the Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements and design the system model.		Y										
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes			Y									
CLO4	Develop the communication skill by presenting topics on software engineering sessional.										Y		

Y=Yes

Course Plan:

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Correspon ding COs**
1	Lab-1	Introduction to information systems and discussion about possible innovative project ideas	Lecture and Discussion, Co-operative and Collaborative Method,	PR, Pr, R, Q, Viva	CLO1-CLO4
2	Lab-2	Overview of SDLC			

3	Lab-3	Introduction to requirement engineering along with information gathering strategies on the assigned project	Problem Based Method		
4	Lab-4	Use different designing tools for documenting the software requirement for different context			
5	Lab-5	Designing the software architecture of assigned project			
6	Lab-6	Comparative study of different software development model for applying the best suited model on the assigned project			
7	Lab-7	Present proper reason of choosing the suitable software development model for the assigned project			
Mid Term					CLO3
8	Lab-8	Apply proper design patterns in the assigned project and present the proper reason behind the choice	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	PR, Pr, R, Q, Viva	
9	Lab-9	Apply code refactoring strategies in the assigned project and present the proper reason behind the choice			

10	Lab-10	Project planning: time estimation/scheduling and cost estimation for the assigned project			
11	Lab-11	Risk evaluation, Risk Matrix, Risk Management on the assigned project			
12	Lab-12	Developing the test cases and evaluating the prototypes			
13	Lab-13	Final documentation on assigned project			
14	Lab-14	Final presentation on assigned project			
Final Term					CLO1-CLO4

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Attendance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%
Final Exam		20%
Total Marks		100%
Make-up Procedures		

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials
Teaching Methodology: Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method. Delivery Methods and Activities Lecture, White Board Writing, Power Point Presentation **Reference books:** 1. Software Engineering A Practical Approach - Rogers Pressman 2. Software Engineering – Ian Somerville 3. Software Engineering Fundamental - Ali Behforooz & Fredrick J. Hudson **Reference Site:** Nancy Leveson. 16.355J Software Engineering Concepts. Fall 2005. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu. License: Creative Commons BY-NC-SA.

CSE 3103: Microprocessors, Microcontrollers and Embedded Systems

Course Details
Course Code: CSE 3103 Course Title: Microprocessors, Microcontrollers and Embedded Systems Course Type: Core Course Level: 3-I Academic Session: Summer 2022 Course Teacher: Taher Muhammad Mahdee and Debashis Gupta Pre-requisite: NA Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100 %
Rationale
This course is designed to teach students the concepts, principles and functioning of basic microprocessors and assembly language. This course aims to provide a fundamental foundation of assembly language, microprocessor architecture, and discusses different interfaces and design of systems based on microprocessors.

Objective
1. To provide an understanding of microprocessor and their use in instrumentation, control and communication systems. 2. To familiarize students with the architecture and operation of typical microprocessors and impart knowledge on the low-level language of microprocessor. 3. To teach the basics of programming and interfacing of common microprocessors. 4. To investigate in depth the microprocessor-based systems. 5. To provide strong foundation for being able to design real world applications using microprocessors.
Course Content
Introduction to 8-bit, 16-bit, and 32-bit microprocessors: architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Bus interface; Arithmetic co-processor; Microcontrollers; Integrating microprocessor with interfacing chips; Programmable peripheral interfacing chip with interface to A/D and D/A converters; Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; Introduction to embedded systems: overview of the design flow, Embedded systems specifications and modeling; Embedded hardware platforms and peripherals; Interfacing to the external world through sensors and actuators.
Mapping of Course Learning Outcomes with the Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Interpret microprocessor's internal architecture and their operation.	Y											
CLO2	Analyze how the high-level language structure is converted to low level languages and how a processor executes a program line by line.		Y										

CLO3	Design programs to interface microprocessor to external devices.			Y									
CLO4	Apply knowledge and programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and solve assembly language programs			Y									

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1	Introduction to 8-bit, 16-bit, and 32-bit microprocessors: architecture	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT1, M	CLO1
	2	addressing modes			
	3	instruction set			
2	4	Interrupts			
	5	multi-tasking and virtual memory; Memory interface		M, F, ASG	CLO1, CLO2
	6	Bus interface; Arithmetic co-processor			
3	7	Organization of the 8086 microprocessors.			
	8				
	9				
4	10	Integrating microprocessor with interfacing chips;			
	11				
	12				

5	13	Programmable peripheral interfacing chip			
5	14	interface to A/D converters			
5	15	interface to D/A converters			
6	16	Keyboard/display interface;			
6	17	Keyboard/display interface;			
6	18	Programmable timer			
7	19	Programmable interrupt controller			
7	20	Programmable interrupt controller			
7	21	Programmable interrupt controller			
		Mid Term			CLO1, CLO2
8	22	DMA controller	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
8	23	Introduction to embedded systems	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
8	24	Introduction to embedded systems	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
9	25	Overview of the design flow of microprocessor.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
9	26	Overview of the design flow of microprocessor.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
9	27	Overview of the design flow of microprocessor.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
10	28	Embedded systems specifications and modeling;	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
10	29	Embedded systems specifications and modeling;	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
10	30	Embedded systems specifications and modeling;	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO3, CLO4
11	31	Embedded hardware platforms and peripherals	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
11	32	Embedded hardware platforms and peripherals	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
11	33	Embedded hardware platforms and peripherals	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
12	34	Microcontroller introduction, ARDUINO and similar platforms	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
12	35	Microcontroller introduction, ARDUINO and similar platforms	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
12	36	Microcontroller introduction, ARDUINO and similar platforms	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
13	37	Interfacing to the external world through sensors and actuators.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
13	38	Interfacing to the external world through sensors and actuators.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
13	39	Interfacing to the external world through sensors and actuators.	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
14	40	Reinforced learning	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT3, F	CLO3, CLO4
14	41	Review Class	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	F	CLO1-CLO4
14	42	Review Class	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	F	CLO1-CLO4
Final Term					**CLO1-CLO4**
Assessment and Evaluation					

Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test 1-3	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodology:

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books:

1. Assembly Language Programming and Organization of the IBM PC--Ytha Yu, Charles Marut.
2. The Intel Microprocessors -Barry B Brey.
3. Microprocessors and Interfacing -Douglas V. Hall
4. Microprocessors and Microcomputer-based system design -Mohamed Rafiquzzaman.
5. 8051 Microcontroller-Internals, Instructions, Programming& Interfacing by Subrata Ghoshal.

CSE 3104: Microprocessors, Microcontrollers and Embedded Systems Sessional

Course Details

Course Code: CSE 3104

Course Title: Microprocessors, Microcontrollers and Embedded Systems Sessional

Course Type: Laboratory Course

Level: 3-I

Academic Session: Summer 2022

Course Teacher: Taher Muhammad Mahdee and Debashis Gupta

Pre-requisite: NA

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100 %

Rationale

This course introduces basics of assembly language programming, microprocessor architecture, and discusses different interfaces and design of systems based on microprocessors.

Objective

1. To achieve practical knowledge on the low-level language of microprocessor.
2. To obtain understanding of microprocessor-based systems and their use in instrumentation, control and communication systems.
3. Investigate microprocessor-based systems and produce software for this system, interface microprocessor-based systems and understand usage of programmable logic controllers.

Course Content

Basics of Assembly Language: Instruction set, Instruction types and their formats; Assembly program format; Assembly process; Interrupts and system services; Addressing methods; High level control structure formation; Use of subroutines and macros; Numeric processing and string processing. Experiments will be performed using Microprocessor and Microcontroller

Mapping of Course Learning Outcomes with the Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand how low-level languages are implemented and	Y											

	how a processor executes a program line by line.												
CLO2	Design basic assembly programs and define where used.			Y									
CLO3	Experiment with a basic microprocessor using assembly language in a group Project.										Y		

Y=Yes

Course Plan:

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding COs**
1	Lab-1	Basic of Assembly Language - Compilation, input, output, variables, basic instructions, memory model, data segment, stack segment, code segment, Input Output Instruction.	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Presentation, Mid Term	CLO1, CLO2
2	Lab-2	Flow Control Instruction - Conditional and unconditional jump instructions, If-then-else, case, for loop, while loop			
3	Lab-3	Logic, Shift and Rotate Instructions - AND, OR, XOR, complement, shift left, shift right			
4	Lab-4	Rotate left, rotate right, rotate carry left, rotate carry right, Binary, Hexa Input Output			
Mid Term					CLO3

<table>
<tr><td>5</td><td>Lab-5</td><td>Stack and Procedure - Push, Pushf, Pop, Popf</td><td rowspan="3">Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method</td><td rowspan="3">Presentation, Final</td><td rowspan="3">CLO2, CLO3</td></tr>
<tr><td>6</td><td>Lab-6</td><td>Multiplication and Division – Mul, IMul, Div, IDiv</td></tr>
<tr><td>7</td><td>Lab-7</td><td>Array and Addressing modes – 1D Array, DUP operator, Addressing-mode, register indirect mode</td></tr>
<tr><td colspan="5">Final Term</td><td>CLO1-CLO3</td></tr>
<tr><td colspan="6">Assessment and Evaluation</td></tr>
<tr><td colspan="6">Assessment Strategy</td></tr>
<tr><td colspan="3">Components</td><td colspan="3">Grading</td></tr>
<tr><td colspan="2" rowspan="4">Attendance (25%)</td><td>Report</td><td colspan="3">15%</td></tr>
<tr><td>Viva</td><td colspan="3">10%</td></tr>
<tr><td>Quiz</td><td colspan="3">10%</td></tr>
<tr><td>Mid Term</td><td colspan="3">20%</td></tr>
<tr><td colspan="3">Final Exam</td><td colspan="3">20%</td></tr>
<tr><td colspan="3">Total Marks</td><td colspan="3">100%</td></tr>
<tr><td colspan="6">Make-up Procedures</td></tr>
<tr><td colspan="6"><u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
<u>Missed Final Term</u>: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.</td></tr>
<tr><td colspan="6">Learning Materials</td></tr>
</table>

Teaching Methodology: Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method. Delivery Methods and Activities Lecture, White Board Writing, Power Point Presentation **Reference books:** 1. Assembly Language Programming and Organization of the IBM PC--Ytha Yu, Charles Marut. 2. The Intel Microprocessors - Barry B Brey. 3. Microprocessors and Interfacing - Douglas V. Hall.

CSE 3105: Computer Architecture

Course Details
Course Code: CSE 3105 Course Title: Computer Architecture Course Type: Core Course Level-Term: 3-I Academic Session: Summer-2022 Course Teacher: Mr. Md. Toukir Ahmed Pre-requisite: None Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100 %
Rationale
This course is designed to introduce students to the basic concepts of computers, their design and how they work. It encompasses the definition of the machine's instruction set architecture, its use in creating a program, and its implementation in hardware. The course addresses the bridge between gate logic and executable software, and includes programming both in assembly language (representing software) and HDL (representing hardware).
Course Objectives
1. Understand the structure, behaviour, and characteristics of computer systems. 2. Understand MIPS ISA formats, execution models and SPIM simulation environment. 3. Understand computer performance measurement techniques and major factors to determine performance.

4. Understand the design issues of the various functional units of digital computers and basic concepts of pipelining.
5. Understand the different types of memories and their building norms.
6. Understand the interfacing techniques between processor and peripherals

Mapping of Course Learning Outcomes (TOTAL MARKS: 100 %) with the Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand the architectural concept of digital computers.	Y											
CLO2	Understand the development and design issues of an instruction set architecture and subsystems of central processing unit.			Y									
CLO3	Understand the Computer and Processor Design, Hazards; Exceptions; External and Internal memory and peripherals.		Y										
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.				Y						Y		

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Fundamentals of computer Design	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Computer Architectural Evolution	Lecture, Tutorials, Discussions		
	3	Performance Measurement	Lecture, Tutorials, Discussion		

2	4	Performance Measurement	Lecture, Tutorials, Discussion		
	5	Computer Arithmetic	Lecture, Tutorials, Discussion		
	6	Computer Arithmetic	Lecture, Tutorials, Discussion		
3	7	Computer Arithmetic	Lecture, Tutorials, Discussion		
	8	MIPS ISA	Lecture, Tutorials, Discussion		
	9	MIPS ISA	Lecture, Tutorials, Discussion		
4	10	MIPS ISA	Lecture, Tutorials, Discussion	ASG	CLO4
	11	MIPS ISA	Lecture, Tutorials, Discussion		
	12	MIPS ISA	Lecture, Tutorials, Discussion		
5	13	MIPS ISA	Lecture, Tutorials, Discussion		
	14	Datapath (Functional Units)	Lecture, Tutorials, Discussion		
	15	Computer Components	Lecture, Tutorials, Discussion		
6	16	Single Cycle Datapath	Lecture, Tutorials, Discussion		
	17	Single Cycle Datapath	Lecture, Tutorials, Discussion		
	18	Single Cycle Control Unit	Lecture, Tutorials, Discussion		
7	19	Single Cycle Control Unit	Lecture, Discussion		
	20	Pipeline Datapath	Lecture, Discussion		
	21	Pipeline Control Unit	Lecture, Discussion		

Mid Term					CLO1-CLO2
8	22	Pipeline Hazards	Lecture, Discussion	CT2	CLO3
	23	Pipeline Hazards	Lecture, Discussion		
	24	Pipeline Hazards	Lecture, Discussion		
9	25	Cache Memory	Lecture, Group work, Discussion		
	26	Cache Memory	Lecture, Group work, Discussion		
	27	Cache Memory	Lecture, Group work, Discussion		
10	28	Cache Memory	Lecture, Group work, Discussion		
	29	Internal Memory	Lecture, Group work, Discussion		
	30	Internal Memory	Lecture, Group work, Discussion		
11	31	Internal Memory	Lecture, Group work, Discussion	CT3	CLO3
	32	Internal Memory	Lecture, Presentation, Discussion		
	33	External Memory	Lecture, Presentation, Discussion		
12	34	External Memory	Lecture, Group work, Discussion		
	35	External Memory	Lecture, Group work, Discussion		
	36	External Memory	Lecture, Group work, Discussion		
13	37	Input and Output	Lecture, Group work, Discussion		
	38	Input and Output	Discussion, Group work		
	39	Input and Output	Discussion, Presentation, Group work		

14	40	Review Class	Discussion, Presentation, Group work		
	41	Review Class			
	42	Review Class			
Final Exam					CLO1-CLO3

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Computer Organization and Architecture, 9th Edition – William Stalling
2. Computer Organization and Design, 4th Edition – David A Patterson
3. Structured Computer Organization, 6th Edition – Andrew S. Tanenbaum

CSE 3107: Data Communication

Course Details

Course Code: CSE 3107

Course Title: Data Coomunication

Course Type: Core Course

Level-Term: 3-I

Academic Session: Summer-2022

Course Teacher: Md. Mahbur Rahman

Pre-requisite: Nill

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100 %

Rationale

The main course is to understand the working knowledge of data flow techniques, analog and digital transmission techniques and also is to understand the bandwidth utilization techniques.

Course Objective

1. To understand the modern telecommunication systems and the architecture of different types of networks.
2. To convey knowledge on protocol layering and different types of network bandwidth optimization techniques such as multiplexing, spreading.
3. To familiarize with different techniques to meet network performance criteria.

Skill Mapping

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Explain the components of a data communication system and physical topology.	Y											
CLO2	Demonstrate the representations of data and signals and analyze the encoding mechanism of signal and data.		Y										

CLO3	Understand bandwidth utilization techniques and analyze the characteristics of switched network.			Y									
CLO4	Develop the communication skill by presenting topics on data communication.										Y		

Y=Yes

Course Outline

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy
1	Lec 1	Introduction to data communication system, Data flow techniques.		Class Test 1
	Lec 2	network criteria, Physical structure of network.	Lecture, Tutorials, Discussions	
	Lec 3	Physical topology.	Lecture, Tutorials, Discussions	
2	Lec 4	Categories of Networks.	Lecture, Tutorials, Discussions	
	Lec 5	OSI model.	Lecture, Tutorials, Discussions	
	Lec 6	TCP/IP model.	Lecture, Tutorials, Discussions	
3	Lec 7	Addressing: Physical, logical, port.	Lecture, Tutorials, Discussions	Class Test 2
	Lec 8	Data and signal representation.	Lecture, Tutorials, Discussions	
	Lec 9	Introduction to bandwidth, bitrate.	Lecture, Tutorials, Discussions	
4	Lec 10	Transmission Impirement.	Lecture, Tutorials, Discussions	
	Lec 11	Data rate: Noisy channel.	Lecture, Tutorials, Discussions	

	Lec 12	noiseless channel.	Lecture, Tutorials, Discussions	
5	Lec 13	Line Coding Schemes: Unipolar, polar, bipolar.	Lecture, Tutorials, Discussions	Mid Term
	Lec 14	Multilevel, Multitransition.	Lecture, Tutorials, Discussions	
	Lec 15	Block Coding.	Lecture, Tutorials, Discussions	
6	Lec 16	Analog to digital conversion: Pulse Code.	Lecture, Tutorials, Discussions	
	Lec 17	Modulation, Delta Modulation.	Lecture, Tutorials, Discussions	
	Lec 18	Transmission Modes: serial, Parallel.	Lecture, Tutorials, Discussions	
7	Lec 19	Digital-to-analog conversion: ASK, FSK.	Lecture, Tutorials, Discussions	
	Lec 20	PSK, QPSK.	Lecture, Tutorials, Discussions	
	Lec 21	Constellation Diagram, QAM.	Lecture, Tutorials, Discussions	
8	Lec 22	Analog-to-analog conversion: AM.	Lecture, Tutorials, Discussions	
	Lec 23	FM, PM.	Lecture, Tutorials, Discussions	
	Lec 24	Bandwidth Utilization: Multiplexing.	Lecture, Tutorials, Discussions	
9	Lec 25	Frequency-division multiplexing, Wavelength- division multiplexing.	Lecture, Tutorials, Discussions	
	Lec 26	Synchronous time-division multiplexing.	Lecture, Tutorials, Discussions	
	Lec 27	multilevel multiplexing, multiple-slot allocation, and pulse.	Lecture, Tutorials, Discussions	
10	Lec 28	Statistical Time-Division Multiplexing.	Lecture, Tutorials, Discussions	

	Lec 29	Frequency Hopping Spread Spectrum (FHSS).	Lecture, Tutorials, Discussions	
	Lec 30	Direct Sequence Spread Spectrum.	Lecture, Tutorials, Discussions	
11	Lec 31	Transmission Media: Twisted-Pair Cable, Coaxial Cable.	Lecture, Tutorials, Discussions	Class Test 3
	Lec 32	Fiber-Optic Cable.	Lecture, Tutorials, Discussions	
	Lec 33	Unguided media: Propagation methods, Wireless transmission waves.	Lecture, Tutorials, Discussions	
12	Lec 34	A circuit-switched network.		
	Lec 35	A datagram network.	Lecture, Tutorials, Discussions	
	Lec 36	virtual-circuit network.	Lecture, Tutorials, Discussions	
13	Lec 37	Structure of a switch: Crossbar switch, Multistage switch.		
	Lec 38	Types of Errors, Error Detection, Error Correction, Minimum Hamming Distance.	Lecture, Tutorials, Discussions	
	Lec 39	Cyclic Redundancy Check.	Lecture, Tutorials, Discussions	
14	Lec 40	Satellite Communication.		
	Lec 41	Fiber Optic Communication.	Lecture, Tutorials, Discussions	
	Lec 42	**Review Class**		

Assessment Strategy

Components		Grading CO Bloom Taxonomy
Continuous Assessment (40%)	Class Test 1-3	20%
	Class Participation	5%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor

before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference Book 1. Data Communication and Networking - Behrouz A Forouzan 2. Data and Computer Communication - William Stallings 3. Data Communication & Networks – R L Brewste

CSE 3109: Compiler

Course Details:
Course Code: CSE 3109 Course Title: Compiler Course Type: Core Course Level-Term: 3-I Academic Session: Summer-2022 Course Teacher: Sohel Rana Pre-requisite: Course Code: CSE 2203; Course Title: Theory of Computation Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100 %
Rationale
This is designed to provide a knowledge how a compiler functions. To teach the students the basic techniques that underlies the practice of various phases of Compiler construction.
Course Objectives
1. To introduce the major concept areas of language translation and compiler design. 2. To enrich the knowledge in various phases of compiler ant its use, code optimization techniques, machine code generation, and use of symbol table. 3. To extend the knowledge of parser by parsing LL parser and LR parser. 4. To provide practical programming skills necessary for constructing a compiler.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcome (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand the role of compilers in programming languages.	Y											
CLO2	Analyze the translation from one phase to another in compilation process.		Y										
CLO3	Apply the mechanisms of separating lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation and specify such structures of advanced language features.			Y									
CLO4	Apply the design procedure of scanners and parsers using tools and build abstract syntax trees in connection with this.			Y									

Y=Yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1	Introduction to Compiler, Classification of Compiler.	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Analysis of the source program, The phases of Compiler.	Lecture, Tutorials, Discussions		
	3	Cousins of Compiler, Grouping of phases.	Lecture, Tutorials, Discussion		
2	4	A simple one-pass Compiler, Syntax-Directed Translation.	Lecture, Tutorials, Discussion		
	5	Parsing.	Lecture, Tutorials, Discussion		

	6	Lexical analysis with symbol table management.	Lecture, Tutorials, Discussion		
3	7	Role of Lexical analyzer, Input buffering, Tokenization.	Lecture, Tutorials, Discussion		
	8	Finite Automata, RE to NFA, Transition Diagram.	Lecture, Tutorials, Discussion		
	9	Regular Definition, NFA to DFA Conversion.	Lecture, Tutorials, Discussion		
4	10	The role of the parser, Grammar, Writing a grammar Parser generator.	Lecture, Tutorials, Discussion	ASG	CLO4
	11	Top-down parsing, Bottom-up parsing.	Lecture, Tutorials, Discussion		
	12	Operator-precedence parsing, LL and LR parsers, Using ambiguous grammars	Lecture, Tutorials, Discussion		
5	13	Syntax-Directed Translation, Syntax-directed definitions, Construction of syntax trees.	Lecture, Tutorials, Discussion		
	14	Elimination of Left Recursion, Left Factoring,	Lecture, Tutorials, Discussion		
	15	Top-Down Parsing, First and Follow.	Lecture, Tutorials, Discussion		
6	16	Parsing Table, Stack Implementation of input string.	Lecture, Tutorials, Discussion		
	17	Bottom-up evaluation of S-attributed definitions, L-attributed definitions.	Lecture, Tutorials, Discussion		
	18	Top-down translation, Bottom-up evaluation of inherited attributes, Recursive Evaluators.	Lecture, Tutorials, Discussion		

7	19	Type Checking, Type systems.	Lecture, Discussion		
	20	Specification of a simple type checker, Equivalence of type expressions.	Lecture, Discussion		
	21	Type conversions, Overloading of functions and operators.	Lecture, Discussion		
Mid Term					CLO2,CLO 4
8	22	Run-Time Environment, Source language issues, Storage organization.	Lecture, Discussion	CT2	CLO2
	23	Storage-allocation strategies.	Lecture, Discussion		
	24	Access to nonlocal names, Parameter passing, Symbol tables.	Lecture, Discussion		
9	25	Language facilities for dynamic storage allocation, Dynamic storage allocation techniques.	Lecture, Group work, Discussion		
	26	Inherited and Synthesized Attribute, Applications of Syntax Directed Translation.	Lecture, Group work, Discussion		
	27	Evaluating an SDD at the Nodes of a Parse Tree, Dependency Graph.	Lecture, Group work, Discussion		
10	28	Variants of Syntax Tree, Directed Acyclic Graphs for Expressions.	Lecture, Group work, Discussion		
	29	The Value Number Method for Constructing DAG.	Lecture, Group work, Discussion		
	30	Three Address Code, Addresses and Instructions.	Lecture, Group work, Discussion		
11	31	Quadruples, Triples.	Lecture, Group work, Discussion	CT3	CLO3

	32	Direct Triples, Indirect Triples.	Lecture, Presentation, Discussion		
	33	Static Single Assignment Form, Types and Declarations.	Lecture, Presentation, Discussion		
12	34	Storage Organization, Static VS Dynamic Storage Allocation.	Lecture, Group work, Discussion		
	35	Stack Allocation of Space, Activation Trees.	Lecture, Group work, Discussion		
	36	Activation Records, Sub-division of run-time storage.	Lecture, Group work, Discussion		
13	37	Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code.	Lecture, Group work, Discussion		
	38	Static Allocation, Optimization of Basic Blocks.	Discussion, Group work		
	39	Peephole Optimization, Optimization of basic blocks, Loops in flow graphs.	Discussion, Presentation, Group work		
14	40	Introduction to global data-flow analysis, Code improving transformations.	Discussion, Presentation, Group work		
	41	Local and Global Common Sub-Expression Elimination.			
	42	Review Class.			
Final Exam					CLO3, CLO4

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%

Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

Compilers: Principles, Techniques & Tools (2nd ed)- Alfred V Aho, Monica S Lam, Ravi Sethi, and Jeffrey D Ullman, Pearson/Addison Wesley (2006).

CSE 3110: Compiler Sessional

Course Details:

Course Code: CSE 3110

Course Title: Compiler Sessional

Course Type: Core Course

Level-Term: 3-I

Academic Session: Summer-2022

Course Teacher: Sohel Rana

Pre-requisite: Nill

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100 %

Rationale

This course is designed to implement debugger, tokenizer, arithmetic calculator and solve different problems of compiler related topics with any programming language.

Course Objectives

1. To implement the tasks associated with different phases of a compiler. 2. To implement the different types of parsing techniques 3. To use new tools and technologies for designing a compiler.

Mapping of Course Learning Outcomes with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcome (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply the techniques of compiler construction and use the tools to perform syntax-directed translation of a high-level programming language into an executable code.					Y							
CLO2	Understand the working mechanisms of C and C++ compiler for debugging of programs.	Y								Y			
CLO3	Adapt the new tools and technologies used for designing a compiler.					Y				Y			

Y= Yes

Course Plan:

Week	Lab	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Debugging procedure of Compiler and application on different programs.	Lecture, Lab Works, Discussions	Lab Performance, Report	CLO1
2	2		Lecture, Lab Works, Discussions		
3	3	Programs on validation of an identifier. Comment checking programs.	Lecture, Lab Works, Discussions		
4	4		Lecture, Lab Works, Discussions		
5	5	Syntax Directed Translator design. Top-down parser design	Lecture, Lab Works, Discussions		CLO2
6	6		Lecture, Lab Works, Discussions		

7	7	Stack Implementation of an expression with different notations.	Lecture, Lab Works, Discussions		
8	8		Lecture, Lab Works, Discussions		CLO3
9	9	First() and Follow() set calculation using required algorithm.	Lecture, Lab Works, Discussions		
10	10		Lecture, Lab Works, Discussions		
11	11	IR design using different representations.	Lecture, Lab Works, Discussions		
12	12		Lecture, Lab Works, Discussions		
13	13	Programs on different code optimization techniques.	Lecture, Lab Works, Discussions		
14	14		Lecture, Lab Works, Discussions		
Lab Final Exam					CLO1, CLO3

Assessment and Evaluation

Assessment Strategy

Components	**Grading**
Class Performance & Observation	25%
Report	15%
Mid Term	20%
Quiz/Viva	10%
Lab Final/Project	30%
Total Marks	100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

<u>Missed Final Term</u>: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

ME 3181: Basic Mechanical Engineering

Course Details
Course Code: ME 3181 Course Title: Basic Mechanical Engineering Course Type: GED Course Level: 3-I Academic Session: Summer 2022 Course Teacher: -------------- Pre-requisite: NA Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100 %
Rationale
This course provides a prologue to the different concepts of Mechanical Engineering. The focus is to introduce the students to different branches of mechanical engineering and their relation to various disciplines of natural science like physics, mathematics etc. as well as will be able identify their practical uses. The learning approach is to build the basic of Mechanical Engineering.
Objective
1. Introduction to various energy sources available in the world 2. Introduction to internal combustion engines, gas turbines and their applications 3. Brief introduction to psychrometry, refrigeration and air-conditioning 4. Brief introduction to fluid machinery 5. Brief introduction to automobiles, robotics, electromechanical systems and relevant cutting-edge branches.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Demonstrate the core areas of mechanical engineering	Y											
CLO2	Demonstrate introductory knowledge of various engines and processes like internal combustion engines, turbines, pumps, psychrometry etc. as well as advanced areas like automobile technology, robotics, MEMS etc.						Y						
CLO3	Understand the engineering concepts solutions in societal and environmental concepts.							Y					
CLO4	Understand the ethics of engineering.								Y				

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1	Energy: Sources-I	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT1, M	CLO1
	2	Energy: Sources-II			
	3	Conventional and renewable energy			
2	4	Energy situation in Bangladesh			
	5	Prospect of different energy sources in Bangladesh-I		M, F, ASG	CLO1, CLO2
	6	Prospect of different energy sources in Bangladesh-II			

3	7	Introduction to Steam Generation			
	8	Working principle of few common and modern boilers			
	9	Difference between the fire tube and water tube boilers			
4	10	Description of boilers e.g. stationary fire tube boiler			
	11	Babcock and Willcox boiler			
	12	Stirling boiler			
5	13	Major boiler mountings and accessories-I			
	14	Major boiler mountings and accessories-II			
	15	Equivalent evaporation and boiler efficiency			
6	16	Internal Combustion Engines			
	17	Introduction of petrol and diesel engines, main parts			
	18	Working principle of both 4 stroke and 2 stroke engines			
7	19	IHP, BHP and mechanical efficiency calculations			
	20	Air standard Otto cycle-I			
	21	Air standard Otto cycle-II			
		Mid Term			CLO1, CLO2
8	22	Diesel cycle efficiency	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem	ASG, CT2, F	CLO3, CLO4
	23	p-v & T-s diagrams of cycles			
	24	Brief description of carburetion			
9	25	Injection system			
	26	Ignition system			
	27	Lubrication and cooling systems of IC engine			

10	28	Pumps, Blowers and Compressors	Based Method		
	29	Introduction of pumps, blowers and compressors			
	30	Classification and working principles			
11	31	Turbine		ASG, CT3, F	CLO3, CLO4
	32	Working principle and application of different types of turbine-I			
	33	Working principle and application of different types of turbine-II			
12	34	Refrigeration and Air-conditioning Systems			
	35	Psychrometry			
	36	Fundamentals of refrigeration and air-conditioning system			
13	37	Robotics			
	38	Introduction, purpose, laws of robotics			
	39	Degree of freedom, manipulator-actuator and other components			
14	40	Review class			
	41	Review class		F	CLO1-CLO4
	42	Review class			
Final Term					CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment	Class Test 1-3	15%
	Assignment	05%

(40%)	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodology:

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books:

1. Thermal Engineering- by R. S. Khurmi, 3^{rd} Edition, Nirja Publishers, India
2. Engineering Thermodynamics- by P. K. Nag, 5^{th} Edition, McGraw Hill Education Private Limited, India, ISBN: 978-1-25-906256-8
3. Heat Engines –D. A. Low ERENCE BOOKS by Subrata Ghoshal.

LEVEL-3, TERM-II

CSE 3200: Web Engineering Project

Course Details

Course Code: CSE 3200

Course Title: Web Engineering Project

Course Type: Core Course

Level-Term: 3-II

Academic Session: Summer 2022

Course Teacher: Md. Moazzem Hossain

Pre-requisite: Course Code CSE 1102

Course Title: Structured Programing Language Sessional

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

The Web Engineering Project course provides a practical experience on developing innovative web solutions for real life problems by applying web engineering fundamentals which involve client-server model employing client-side design, server-side programing language and database. Student will work in groups or individually to develop a web-based application with proper documentation that they have to present within this semester.

Course Objectives

1. To understand the process of designing a web-based project with client-server model.
2. To acquire knowledge of different front end and back-end language, tools, technologies, team-work and team management.
3. To prepare student capable for developing industry grade professional software applying different designing and coding standards with proper software documentation.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify advance programming language and technique to solve complex problems, to design real time projects and to increase			Y									

	the depth of knowledge in programming.												
CLO2	Practice good programming style and identify and adapt to the changes in style of developing and maintaining systems.					Y							
CLO3	Illustrate practical knowledge to identify the relative merits of different information architectural designs, programming constructs and data structure.	Y											
CLO4	Able to develop industry level web-based applications individually.									Y			
CLO5	Resolve different social, health, safety related problems through appropriate software project						Y						
CLO6	Able to practice ethical issues in software development								Y				
CLO7	Team collaboration, team work, report writing and presentation of the project in right approach										Y		
CLO8	Ability of project planning involves resource and time planning through good management skill											Y	
CLO9	Achieve the skill of think independently to solve a problem through software solution.												Y

Y=yes

Course Plan

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Information about architectural design of web systems, show sample projects and assigned project to the teams.	Lecture, Tutorials, Discussions	Project, Report	CLO1-CLO3

2	Lab-2	Front end development of Web based Systems using HTML & CSS.	Lecture, Tutorials, Group work, Discussion,		
3	Lab-3	Frontend development with frameworks.	Lecture, Tutorials, Group work, Discussion		
4	Lab-4	Project version control with git.	Lecture, Tutorials, Group work, Discussion	Project, Report, Mid Term	CLO4-CLO6
5	Lab-5	Dynamic web front end programming, concurrent and asynchronous Javascript programming.	Lecture, Tutorials, Group work, Discussion	Project, Report, Mid Term	CLO4-CLO6
6	Lab-6	Validation with Javascript.	Lecture, Tutorials, Group work, Discussion	Project, Report, Mid Term	CLO4-CLO6
7	Lab-7	Intro to Bootstrap, Codeigniter, Laravel.	Lecture, Tutorials, Group work, Discussion	Project, Report, Mid Term	CLO4-CLO6
8	Lab-8	Introduction to a server-side programing language like; PHP, C#.NET or Java.	Lecture, Tutorials, Group work, Discussion	Project, Report, Presentation, Team Work	CLO4-CLO7
9	Lab-9	Coding with server-side programing language and relational database.	Lecture, Tutorials, Group work, Discussion	Project, Report, Presentation, Team Work	CLO4-CLO7
10	Lab-10	A sample project for performing Create, Retrieve, Update, Delete (CRUD) operations.	Lecture, Tutorials, Group work, Discussion	Project, Report, Presentation, Team Work	CLO4-CLO7
11	Lab-11	Introduction to web security approaches.	Lecture, Tutorials, Group work, Discussion	Lab Test, PR, pr, E	CLO6-CLO9

12	Lab-12	Team-wise project update presentation from students.	Discussion, Presentation, Group work		
13	Lab-13	Final test on the course.	Discussion, Presentation, Group work		
14	Lab-14	Final team-wise project update presentation from students.	Discussion, Presentation, Group work		
Lab Test					

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Attendance	25%
	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Lab Test: Retake exam will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books 1. Learning Web App Development - Purewal, Semmy 2. Web Engineering: A practitioner's approach - Roger Pressman and David Loue 3. Web Engineering - Gerti Kappel
Reference Sites 1. https://www.w3schools.com/ 2. https://www.tutorialrepublic.com/ 3. https://www.w3.org 4. https://developer.mozilla.org

CSE 3201: Artificial Intelligence

Course Details
Course Code: CSE 3201 Course Title: Artificial Intelligence Course Type: Core Course Level-Term: 3-II Academic Session: Summer-2022 Course Teacher: Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The course explores the fundamental principles, methodologies, techniques, tools, and current research topics of Artificial Intelligence. The topics may include: The background and future of AI, various types of intelligent agents; Knowledge Representation and Reasoning: Propositional and first order predicate logic, inconsistencies, and uncertainties (Belief Networks); Knowledge Organization and Manipulation: different kinds of graph traversing algorithms, constraint satisfaction problems, adversarial search problems, planning and decision making; Perception and Communication: Natural Language Processing and image/speech understanding.
Course Objectives

1. To learn various type of intelligent agents and their working environments.
2. To understand knowledge representation strategies for both consistent and inconsistent environments and implement them to solve complex real-world problems.
3. To understand different learning strategies to acquire knowledge, formulate information to generate inherit patterns and make decision accordingly.
4. To understand different techniques to percept information from the real-world scenarios and apply them to exchange information.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the notions of rational behavior and intelligent agents.	Y											
CLO2	Develop a general appreciation of goals, subareas, achievements and difficulties of AI.			Y									
CLO3	Have knowledge of methods of blind as well as informed search and ability to practically apply corresponding techniques.		Y	Y									
CLO4	Have general understanding of major concepts and approaches in Research and Innovation and develop skills to share knowledge.				Y						Y		

Y=yes

Course Plan

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Introduction and Overview of AI	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Foundation and History of AI	Lecture, Tutorials, Discussions		

	3	Intelligent Agent	Lecture, Tutorials, Discussion		
2	4	Problem Solving Agents, Path Finding Algorithms	Lecture, Tutorials, Discussion		
	5	Uninformed Search (BFS, DFS)	Lecture, Tutorials, Discussion		
	6	Heuristic Function	Lecture, Tutorials, Discussion		
3	7	Informed Searching Strategy	Lecture, Tutorials, Discussion		
	8	A*	Lecture, Tutorials, Discussion		
	9	IDA*, SMA*	Lecture, Tutorials, Discussion		
4	10	Hill-climbing Search	Lecture, Tutorials, Discussion		
	11	Simulated Annealing	Lecture, Tutorials, Discussion		
	12	Genetic Algorithm	Lecture, Tutorials, Discussion		
5	13	Knowledge Based Agent	Lecture, Tutorials, Discussion		
	14	The Woumpus World	Lecture, Tutorials, Discussion	ASG	CLO4
	15	Propositional Logic	Lecture, Tutorials, Discussion		
6	16	Logical Inference and Proof.	Lecture, Tutorials, Discussion		
	17	Syntax and Semantics of Propositional Logic.	Lecture, Tutorials, Discussion		
	18	Using Firs Order Periodic Logic.	Lecture, Tutorials, Discussion		

7	19	Learning General Logical descriptions-Hypothesis	Lecture, Discussion		
	20	Examples, Current Best Hypothesis Search,	Lecture, Discussion		
	21	Least Commitment Search;	Lecture, Discussion		
Mid Term					CLO1, CLO3
8	22	Understanding Probability	Lecture, Discussion	CT2	CLO2
	23	Uncertainty, Conditional Probability	Lecture, Discussion		
	24	Bayesian Rule and its use	Lecture, Discussion		
9	25	Bayesian Rule Example-1	Lecture, Group work, Discussion		
	26	Bayesian Rule Example-2 Using Dataset.	Lecture, Group work, Discussion		
	27	Belief Network	Lecture, Group work, Discussion		
10	28	Understanding Decision Tree Decision Tree Example	Lecture, Group work, Discussion		
	29	ANN,	Lecture, Group work, Discussion		
	30	Back propagation,	Lecture, Group work, Discussion		
11	31	Applications of Neural Networks,	Lecture, Group work, Discussion	CT3	CLO3
	32	Understanding Genetic Algorithm	Lecture, Presentation, Discussion		
	33	Genetic Algorithm Example-1	Lecture, Presentation, Discussion		
12	34	Genetic Algorithm Example-2	Lecture, Group work, Discussion		
	35	Constraint Propagation	Lecture, Group work, Discussion		

	36	Backtracking Search for CSP.	Lecture, Group work, Discussion		
13	37	Introduction to Natural Language Processing.	Lecture, Group work, Discussion		
	38	Steps of NLP.	Discussion, Group work		
	39	Top Down, Bottom-Up Parse Tree	Discussion, Presentation, Group work		
14	40	Reinforced learning	Discussion, Presentation, Group work		
	41	Review Class			
	42	Review Class			
Final Exam					CLO1-CLO3

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

<u>Missed Final Term:</u> RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials
Reference books: 1. Artificial Intelligence: a modern approach - Stuart Jonathan Russell, Peter Norvig 2. Artificial Intelligence: a new synthesis - Nils J. Nilsson **Reference Site:** https://www.edx.org/learn/artificial-intelligence

CSE 3202: Artificial Intelligence Sessional

Course Details
Course Code: CSE 3202 Course Title: Artificial Intelligence Sessional Course Type: Core Course Level-Term: 3-II Academic Session: Summer-2022 Course Teacher: Md. Zahid Hassan Pre-requisite: Course Code: CSE 3201; Course Title: Artificial Intelligence Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
The Artificial Intelligence Sessional course is structured to implement different kind of graph traversing algorithm, shortest path algorithm, Iterative improvement Search, Propositional Logic, Planning, Partial Order Planning. Bayesian Rule; Decision Networks; Learning Decision Trees; Learning General Logical Descriptions-Hypothesis, ANN, Perceptions, MFFN, Bayesian Methods for learning Belief Networks, Generic Algorithm, Reinforced learning. Introduction to Natural Language Processing. This course also helps to learn to develop various kind robot and probable measures to mitigate the issues.
Course Objectives
1. To use the appropriate algorithms in appropriate situations. 2. To choose the appropriate algorithm or approach based one scenario and constrains 3. To implement the appropriate path finding algorithm to build a robot. 4. Understanding of machine learning algorithm to solve real world problem

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)													
CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	To use the appropriate algorithms in appropriate situations	Y				Y							
CLO2	To choose the appropriate algorithm or approach based one scenario and constrains			Y									
CLO3	To implement the appropriate path finding algorithm to build a robot.		Y	Y									
CLO4	Understanding of machine learning algorithm to solve real world problem		Y										
Y=yes													

Course Plan

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Basic AI and Installing Python, Basic python programming Exercise	Lecture, Tutorials, Discussions	Project, Report	CLO1, CLO2, CLO3
2	Lab-2	Graph Traversing Algorithm (Informed and Uninformed Search)	Lecture, Tutorials, Group work, Discussion,		
3	Lab-3	Propositional Logic, FOPL, Mid Term Examination	Lecture, Tutorials, Group work, Discussion		
4	Lab-4	Bayesian Theorem, Naive Bayesian Classifier	Lecture, Tutorials, Group work, Discussion	Project, Report, Mid Term	CLO4
5	Lab-5	Decision Tree Classifier, ANN, NLP	Lecture, Tutorials, Group work, Discussion		

6	Lab-6	Reinforcement Learning	Lecture, Tutorials, Group work, Discussion		
7	Lab-7	Genetic Algorithm	Lecture, Tutorials, Group work, Discussion		
Lab Test					

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Attendance	25%
	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Lab Test: Retake exam will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Artificial Intelligence: a modern approach - Stuart Jonathan Russell, Peter Norvig
2. Artificial Intelligence: a new synthesis - Nils J. Nilsson
3. Learning Python - Mark Lutz

Reference Sites

1. https://ai.google/
2. https://openai.com/

CSE 3203: Operating System

Course Details
Course Code: CSE 3203 Course Title: Operating System Course Type: Core Course Level-Term: 3-II Academic Session: Summer-2022 Course Teacher: Ashrafun Zannat Pre-requisite: N/A Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This Operating System course focuses on the fundamental concepts of operating system related to computer science. This course begins with operating system structure, operating system goals, services, computer hardware, process, thread, synchronization, deadlock, memory management, disk structure, file system, protection, security, virtualization, cloud system and various relevant important topics.
Course Objectives
1. To learn the fundamental and system structure of operating system. 2. To develop idea about embedded operating system from this basic knowledge. 3. To choose an appropriate algorithm to implement based on scenario given.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Define, classify and analyze modern operating systems; concept for virtualization, cloud and multiple processor systems.	Y											
CLO2	Explain process, thread, semaphore and file management systems.		Y										
CLO3	Analyze and perform cpu scheduling, deadlock and memory management algorithms		Y										

CLO4	Develop the communication skill by presenting topics on operating systems.										Y		

Y=yes

Course Plan

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Introduction and course overview	Lecture, Discussions	CT1	CLO1, CLO2
	2	Goals and components of OS, types of OS	Lecture, Discussions		
	3	OS structure, operations	Lecture, Discussion		
2	4	Operating System services	Lecture, Discussion		
	5	System Call, Types of system calls	Lecture, Discussion		
	6	Context switch	Lecture, Discussion		
3	7	Process managements, Process states and state transition,	Lecture, Discussion		
	8	Process scheduling, Process control blocks.	Lecture, Discussion		
	9	Inter-process communication, Operations on processes	Lecture, Discussion		
4	10	Thread, Multithreading model, Threading Issues	Lecture, Discussion	CT2	CLO2, CLO3
	11	Process coordination, Race condition, Synchronization	Lecture, Discussion		
	12	Critical section problems, Peterson's solution, Mutex locks, Semaphores,	Lecture, Discussion		
5	13	Program, Process, Process scheduling	Lecture, Discussion		
	14	Objective and criteria of CPU scheduling algorithms.	Lecture, Discussion		

	15	Impacts of context switch on scheduling, Multiple processor scheduling	Lecture, Discussion		
6	16	Preemptive and Non-preemptive CPU Scheduling Algorithms, First Come First Serve CPU Scheduling	Lecture, Discussion		
	17	Shortest Job First, Shortest Remaining Time First CPU Scheduling	Lecture, Discussion		
	18	Priority and Round Robin CPU Scheduling, Real Time CPU Scheduling	Lecture, Discussion		
7	19	Deadlock, Deadlock Characterization, Methods for handling deadlocks	Lecture, Discussion		
	20	Deadlock Prevention, Deadlock Avoidance	Lecture, Discussion		
	21	Deadlock detection, Recovery from deadlock	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Memory management allocation schemes	Lecture, Discussion	CT3	CLO3
	23	Paging, Dynamic Storage Memory Allocation, First Fit, Best Fit, Worst Fit	Lecture, Discussion		
	24	Fragmentation, Segmentation, virtual memory	Lecture, Discussion		
9	25	Demand Paging, Page replacement algorithms	Lecture, Discussion		
	26	FIFO, LRU and Optimal Page replacement algorithms	Lecture, Discussion		

	27	Allocation of frames, Thrashing	Lecture, Discussion		
10	28	Secondary storage management, Disk Structure	Lecture, Discussion		
	29	Disk scheduling algorithms: FCFS, SCAN, SSTF	Lecture, Discussion		
	30	Disk scheduling algorithms: C-SCAN, LOOK and C-LOOK, RAID structure	Lecture, Discussion		
11	31	File system functions, file organization logical and physical file maps	Lecture, Discussion	ASG/Pr	CLO4
	32	Access Methods, Directory and Disk Structure	Lecture, Discussion		
	33	File Sharing, Protection	Lecture, Discussion		
12	34	Operating system protection, Goals of Protection, Access Matrix	Lecture, Discussion		
	35	System security, Cryptography as a security tool, Firewall, Threats, Viruses, Worms	Lecture, Discussion		
	36	Timesharing, Types and techniques for efficient virtualization, memory and i/o virtualizations, virtual appliances	Lecture, Discussion		
13	37	Clouds as a service, virtual machine	Lecture, Group work, Discussion		
	38	Multiple Processor Systems: Multiprocessor, Multicomputer	Discussion, Group work, Presentation,		

	39	Distributed Systems, Case Studies	Discussion, Presentation, Group work		
14	40	Review Class	Discussion, Lecture		
	41	Review Class	Discussion, Lecture		
	42	Review Class	Discussion, Lecture		
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Operating System concepts - A. Silberschatz, P.B. Galvin, Greg Gagne
2. Modern Operating Systems - Andrew S. Tanenbaum; Prentice Hall
3. Operating Systems: Internals and Design Principles - William Stallings

Reference Sites

https://www.geeksforgeeks.org/operating-systems/

CSE 3204: Operating System Sessional

Course Details
Course Code: CSE 3204 Course Title: Operating System Sessional Course Type: Laboratory Course Level: 3-II Academic Session: Summer-2022 Course Teacher: Ashranfun Zannat Pre-requisite: NA Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
The Operating System (OS) Sessional course is designed to understand fundamental components of Operating System. The lab begins with the development of operating systems like UNIX and WINDOWS. The course deals with virtualization and different key components of Operating System e.g. kernel compilation, process and thread scheduling, deadlocks, memory management, deadlock, disk scheduling, synchronization and system calls etc.
Objective
1. To learn basic OS concepts and to be familiar with the design principles of Operating System 2. To learn the internal and design principles of Operating System
Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand and respond to major operating systems like Windows, Linux etc.					Y							
CLO2	Apply and modify algorithms for process, thread and memory management									Y			

CLO3	Develop the communication skill by presenting topics on operating systems										Y		

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction to Linux Operating System, Installation of Linux in various modes, Installation of windows application programs on Linux, Basic Linux Command	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Project, Report, Mid Term	CLO1
	2				
3	3	Preemptive and non- preemptive CPU Scheduling algorithms			
	4				
Mid Term					
5	5	Preemptive and non- preemptive CPU Scheduling algorithms	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Project, Report, Final	CLO2
	6				
7	7	Solution of dynamic storage allocation problem by First fit, best fit and Worst fit			
8	8				
9	9	Implementation of Deadlock avoidance algorithm	Lecture and Discussion, Co-operative and Collaborative Method, Problem	Project, Report, Final	CLO3
	10				
11	11	Page Replacement Algorithms			
	12				
13	13	Disk scheduling algorithms and implementation			

	14		Based Method		
Final Term					

Assessment and Evaluation

Assessment Strategy

Components		Grading
Attendance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%
Final Exam		20%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books:

1. Operating System concepts - A. Silberschatz, P.B. Galvin, Greg Gagne
2. Modern Operating Systems - Andrew S. Tanenbaum; Prentice Hall
3. Operating Systems: Internals and Design Principles - William Stallings

Reference Site:

https://www.linux.org/

CSE 3205: Computer Networks

Course Details
Course Code: CSE 3205 Course Title: Computer Networks Course Type: Core Course Level-Term: 3-II Academic Session: Summer-2022 Course Teacher: Md. Mahbur Rahman Pre-requisite: Course Code: CSE 3107, Course Title: Data Communication Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course is designed to understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks. Resource sharing, high Reliability, increase in system performance, and security in network are the main objectives.
Course Objectives
1. To describe the major computer networks components and How Internet works? 2. To understand how HTTP, Email, Web, and DNS work. 3. To understand the transport layer 4. To design and implement IP and routing protocol
Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Describe the major computer networks components and How Internet works.	Y											
CLO2	Illustrate TCP/IP protocol (Application, Transport, Network, Link and Physical) used in internetworking to develop network application		Y										
CLO3	Design and implement network routing for IP networks selecting different routing protocol.			Y									

CLO4	Develop the communication skill by presenting topics on Computer networking.										Y		

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction, Computer network and the Internet.	Lecture, Tutorials, Discussion	CT1	CLO1
	2	OSI reference model			
	3	TCP/IP model and terminology	Lecture, Tutorials, Discussion		
2	4	Hubs, Bridges, Repeater	Lecture, Tutorials, Discussion		
	5	Router and Switches,	Lecture, Tutorials, Discussion		
	6	Circuit switching and Packet switching	Lecture, Tutorials, Discussion		
3	7	Frame relay and Cell relay	Lecture, Tutorials, Discussion	CT2	CLO2, CLO3
	8	ATM reference model.	Lecture, Tutorials, Discussion		
	9	Internet address, classfull address	Lecture, Tutorials, Discussion		
4	10	subnetting	Lecture, Tutorials, Discussion		
	11	VLSM	Lecture, Tutorials, Discussion		
	12	ARP, RARP, IP, ICMP.	Lecture, Tutorials, Discussion	MID	CLO2, CLO3
5	13	Pure and slotted ALOHA	Lecture, Tutorials, Discussion		
	14	Persistent and Non persistent CSMA	Lecture, Tutorials, Discussion		

	15	CSMA with collision detection	Lecture, Tutorials, Discussion		
6	16	collision free protocols	Lecture, Tutorials, Discussion		
	17	IEEE standard 802.3 and Ethernet	Lecture, Tutorials, Discussion		
	18	Types of errors, framing	Lecture, Tutorials, Discussion		
7	19	error detection & correction methods Flow control, Stop & wait ARQ	Lecture, Tutorials, Discussion		
	20	Go-Back- N ARQ,	Lecture, Tutorials, Discussion		
	21	Selective repeat ARQ	Lecture, Tutorials, Discussion		
	22	UDP	Lecture, Tutorials, Discussion	CT3	
	23	TCP	Lecture, Tutorials, Discussion		
	24	Connection management, Addressing, Establishing and Releasing Connection,	Lecture, Tutorials, Discussion		CLO2, CLO3
9	25	Congestion control algorithm	Lecture, Tutorials, Discussion		
	26	Flow control and Buffering	Lecture, Tutorials, Discussion		
	27	Multiplexing	Lecture, Tutorials, Discussion		
10	28	Data Compression techniques, Frequency Dependent Coding	Lecture, Tutorials, Discussion		
	29	Context Dependent Encoding	Lecture, Tutorials, Discussion		

	30	Internet and intranets, Internet services and goals	Lecture, Tutorials, Discussion		
11	31	DNS, SMTP	Lecture, Tutorials, Discussion		CLO2, CLO3
	32	FTP, Telnet, HTTP	Lecture, Tutorials, Discussion		
	33	World Wide Web (WWW), DHCP	Lecture, Tutorials, Discussion		
12	34	shortest path algorithm, flooding	Lecture, Tutorials, Discussion		
	35	distance vector routing	Lecture, Tutorials, Discussion		
	36	link state routing	Lecture, Tutorials, Discussion		
13	37	Name servers; Email and Its privacy, Network security	Lecture, Tutorials, Discussion		
	38	Authentication; Digital signatures, Principles of Reliable Data Transfer FTP	Lecture, Tutorials, Discussion		
	39	Proxy server, FTP server, E-mail server, web server, DB server	Lecture, Tutorials, Discussion		
14	40	NAT	Lecture, Tutorials, Discussion		
	41	Firewall	Lecture, Tutorials, Discussion		
	42	Review Class	Discussion		
Final Exam					CLO1, CLO2

Assessment and Evaluation

Assessment Strategy

Components		Grading
	Class Test 1-3	20%

<table>
<tr><td rowspan="2">Continuous Assessment (40%)</td><td>Class Participation</td><td>5%</td></tr>
<tr><td>Mid Term</td><td>15%</td></tr>
<tr><td colspan="2">Final Exam</td><td>60%</td></tr>
<tr><td colspan="2">Total Marks</td><td>100%</td></tr>
<tr><td colspan="3">(CLO=Course Outcomes, C=Cognitive Domain, P=Psychomotor Domain, A=Affective Domain)</td></tr>
<tr><td colspan="3"><u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
<u>Missed Final Term</u>: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.</td></tr>
<tr><td colspan="3">Learning Materials</td></tr>
<tr><td colspan="3">Reference books
1. Computer Networking: A Top-Down Approach by James F. Kurose and Keith W. Ross. 7th /8th Edition
2. Data Communications and Networking by Behrouz A. Forouzan, 4th / 5th Edition
Reference Site
https://www.cisco.com/</td></tr>
</table>

CSE 3206: Computer Networks Sessional

Course Details
Course Code: CSE 3206 Course Title: Computer Networks Sessional Course Type: Core Course Level-Term: 3-II Academic Session: Summer-2022 Course Teacher: Md. Mahbur Rahman Pre-requisite: Nill

Credit Value: 1.50

Contact Hours: 3.00

Total Marks: 100%

Rationale

Understand and analyze different network infrastructures, applications of different types of computer networks to facilitate communication and resource-sharing among a wide range of users.

Objective

1. To learn and analyze different types of computer networks & simulate protocols of computer networks.
2. Detect vulnerability of network by capturing and analyzing real-time packets.
3. Achieve a basic idea about Cisco Packet tracer, Wire Shark, Cable connection.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and analyze different types of computer networks and create server client communication.	Y											
CLO2	Design and simulate present contemporary and new protocols of computer networks in Cisco Packet Tracer.			Y									
CLO3	Applying and analyzing different routing protocols of computer networks in physical devices.		Y										
CLO4	Capturing and analyzing real-time packets to detect vulnerability of network using Wire Shark.					Y							

Y=Yes

Course Plan

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**

1	1	IP Addressing, PC Network: installation of NIC Card & TCP/IP Configuration and testing.			CLO1
2	2	Making Straight, Rollover and Cross-Over cables, Cable & RJ-45 Jack outlet installation, Basic LAN Setup			
3	3	Introduction to Wireshark for Network Traffic analysis			
4	4	Network traffic analysis of HTTP using Wireshark			
5	5	Network traffic analysis of DNS using Wireshark			
6	6	Network traffic analysis of TCP using Wireshark	Lecture, Lab Works, Discussions	Lab Performance, Report	CLO2
7	7	Introduction to packet tracer and Simulation & Study of Simple network using Hubs and Switch			
8	8	Mid Term Exam			
9	9	Simulation & Study of Networks and Internetwork Communication using router			CLO3
10	10	Simulation & Study of Static Routing in Network using packet tracer			
11	11	Simulation & Study of Dynamic Routing open shortest path (OSPF) using packet tracer			
12	12	Simulation & Study of Access-lists using packet tracer			CLO4
13	13	VLAN, Inter-VLAN, VTP			
14	14	Quiz and Viva			

Final Term		
Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Attendance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%
Final Exam		20%
Total Marks		100%
Make-up Procedures		
Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.		
Learning Materials		
Reference books: 1. Computer Networks - Andrew S. Tanenbaum 2. Complete Networking: A Top-Down Approach Featuring the Internet – James F. Kurose, Keith W. Ross Reference Site: https://www.cisco.com/		

CSE 3207: Mathematical Analysis for Computer Science

Course Details:

Course Code: CSE 3207

Course Title: Mathematical Analysis for Computer Science

Course Type: Core Course

Level-Term: 3-II

Academic Session: Summer-2022

Course Teacher: Ashrafun Zannat

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course is aimed to gain introductory knowledge on probability, computation of probability with its practical and theoretical application in studying computer science.

Course Objectives

1. To learn mathematical models and methods to analyze problems that arise in computer science.
2. To understanding basics of probability theorem, the concept of random variable, standard distributions in discrete and continuous cases.
3. To learn the application of stochastic process and Queuing theory

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs) :

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Illustrate the basic of static and dynamic equation and relevant conventional algorithms.	Y											
CLO2	Solve complex engineering problem with no obvious solution using wide ranging or conflicting problems.	Y											
CLO3	Choose appropriate data structures and algorithms for specific programs or program parts.		Y										

CLO4	Identify and reveal error in the analytical problem then diagnose needed basic operations with		Y										
CLO5	Develop the communication skill by presenting topics on Mathematical Analysis										Y		

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1	Introduction and course overview	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Recurrence Problems: The Tower of Hanoi.	Lecture, Tutorials, Discussions		
	3	Lines in The Plane, The Josephus Problem	Lecture, Tutorials, Discussion		
2	4	Sums: Manipulation of sums, Multiple Sums,	Lecture, Tutorials, Discussion		
	5	General Methods, Finite and Infinite Calculus, Infinite Sums	Lecture, Tutorials, Discussion		
	6	Number Theory: Divisibility, Primes	Lecture, Tutorials, Discussion		
3	7	Prime Examples, Factorial Factors	Lecture, Tutorials, Discussion		
	8	Number Theory: Relative Primarily,	Lecture, Tutorials, Discussion		
	9	The Congruence Relation, Independent Residues, Additional Applications, Phi and Mu	Lecture, Tutorials, Discussion		

4	10	Special Numbers: Stirling Numbers	Lecture, Tutorials, Discussion	ASG	CLO2, CLO5
	11	Eulerian Numbers, Harmonic Numbers	Lecture, Tutorials, Discussion		
	12	Special Numbers: Harmonic Summation,	Lecture, Tutorials, Discussion		
5	13	Bernoulli Numbers, Fibonacci Numbers	Lecture, Tutorials, Discussion		
	14	Generating Functions	Lecture, Tutorials, Discussion		
	15	Introduction to Probability: Definition,	Lecture, Tutorials, Discussion		
6	16	Conditional Probability, Independent Probability,	Lecture, Tutorials, Discussion		
	17	Bayes' Formula	Lecture, Tutorials, Discussion		
	18	The Bernoulli Random Variable	Lecture, Tutorials, Discussion		
7	19	Continuous Random variables: The Uniform Random Variable	Lecture, Discussion		
	20	Exponential Random Variables	Lecture, Discussion		
	21	Gamma Random Variables, Normal Random Variables	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Stochastic Process: Definition with application Markov chains: Definition,	Lecture, Discussion	CT2	CLO3, CLO4
	23	Transforming a Process into a Markov Chain,	Lecture, Discussion		
	24	Chapman– Kolmogorov Equations	Lecture, Discussion		

9	25	Queuing models: open and closed queuing network;	Lecture, Group work, Discussion		
	26	Hidden Markov Model: Modelling	Lecture, Group work, Discussion		
	27	Application of queuing models	Lecture, Group work, Discussion		
10	28	The Binomial Random Variable.	Lecture, Group work, Discussion		
	29	The Geometric Random Variable.	Lecture, Group work, Discussion		
	30	The Poisson Random Variable	Lecture, Group work, Discussion		
11	31	Application The Poisson Random Variable	Lecture, Group work, Discussion	CT3	CLO3-CLO4
	32	The Discrete Case	Lecture, Presentation, Discussion		
	33	Application Discrete Random variables.	Lecture, Presentation, Discussion		
12	34	The Continuous Case, Variance	Lecture, Group work, Discussion		
	35	Application Continuous Case, Variance	Lecture, Group work, Discussion		
	36	**Review Class**	Lecture, Group work, Discussion		
13	37	Expectation of a Random Variable:	Lecture, Group work, Discussion		
	38		Discussion, Group work		
	39	Review Class	Discussion, Presentation, Group work		
14	40	Review Class	Discussion, Presentation, Group work		

	41	Review Class			
	42	Review Class			
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Concrete Mathematics -BY Graham, Knuth, Patashnik, 2nd Edition.
2. Introduction to Probability Models BY Sheldon M. Ross, 9th Edition.
3. Introduction to Probability BY Dimitri P. Bertsekas and John N. Tsitsiklis

CSE 3209: Information System Design

Course Details:

Course Code: CSE 3209

Course Title: Information System Design

Course Type: Core Course

Level-Term: 3-II

Academic Session: Summer-2022

Course Teacher: Dr. Engr. Mohammed Sowket Ali

Pre-requisite: None

Credit Value: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

The Information System Design and Development course motivates to perceive information systems planning, analysis, design and implementation; project management, project scheduling and communication skills; as well as the fundamentals of security, disaster/recovery planning and ethics in system development to solve various real-life problems.

Course Objectives:

1. To assist students for developing a comprehensive understanding of how information systems are developed.
2. To conduct the structured analysis and cost/benefit analysis for developing effective information systems.
3. To understand the importance of project management, security and ethics of system development.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand fundamental concepts of information system, information system environment and primary responsibilities of a system analyst	Y											
CLO2	Apply the practical approaches of structured and cost-benefit analysis for			Y									

	developing information systems for industries/ business organizations												
CLO3	Analyse and organize a system using project management techniques.								Y				
CLO4	Develop awareness regarding ethics and security of a system.											**Y**	
CLO5	Develop the communication skill by presenting topics on information system design and development.										Y		

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	System concepts	Lecture, Tutorials, Discussions	CT1	CLO1-CLO2
	2	Characteristics and elements of system	Lecture, Tutorials, Discussions		
	3	Types of systems	Lecture, Tutorials, Discussion		
2	4	Information systems environment	Lecture, Tutorials, Discussion		
	5	Categories of Information	Lecture, Tutorials, Discussion		
	6	Management Information systems	Lecture, Tutorials, Discussion		
3	7	The system development lifecycle	Lecture, Tutorials, Discussion		
	8	Impetus for system change	Lecture, Tutorials, Discussion		
	9	Prototyping	Lecture, Tutorials, Discussion		
4	10	The skills of the system analyst	Lecture, Tutorials, Discussion	ASG	CLO4, CLO5

	11	The role of the system analyst	Lecture, Tutorials, Discussion		
	12	Analyst/User Interface	Lecture, Tutorials, Discussion		
5	13	Systems planning and dimensions of planning	Lecture, Tutorials, Discussion		
	14	Strategic MIS planning	Lecture, Tutorials, Discussion		
	15	Managerial and Operational MIS Planning	Lecture, Tutorials, Discussion		
6	16	Initial investigation	Lecture, Tutorials, Discussion		
	17	Determining the Users Information Requirements	Lecture, Tutorials, Discussion		
	18	Strategies for determining information requirements	Lecture, Tutorials, Discussion		
7	19	Different types of information about organization and information sources	Lecture, Discussion		
	20	Information gathering tools (Review literature, procedures and forms, On-site observation)	Lecture, Discussion		
	21	Information gathering tools (Interviews, Questionnaires)	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Structured analysis	Lecture, Discussion	CT2	CLO2, CLO3
	23	The tools of structured analysis (DFD)	Lecture, Discussion		
	24	The tools of structured analysis (Data dictionary)	Lecture, Discussion		

9	25	The tools of structured analysis (Decision Tree and Structured English)	Lecture, Group work, Discussion		
	26	The tools of structured analysis (Decision Table)	Lecture, Group work, Discussion		
	27	Pros and cons of the tools of structured analysis	Lecture, Group work, Discussion		
10	28	Feasibility Study	Lecture, Group work, Discussion		
	29	Feasibility considerations	Lecture, Group work, Discussion		
	30	Steps in feasibility analysis	Lecture, Group work, Discussion		
11	31	Cost-benefit analysis	Lecture, Group work, Discussion	CT3	CLO2-CLO3
	32	Classification of costs and benefits	Lecture, Presentation, Discussion		
	33	Cost-benefit evaluation methods	Lecture, Presentation, Discussion		
12	34	Logical and physical design	Lecture, Group work, Discussion		
	35	Design Methodologies	Lecture, Group work, Discussion		
	36	Input and output design	Lecture, Group work, Discussion		
13	37	File Structure and file organization	Lecture, Group work, Discussion		
	38	System testing	Discussion, Group work		
	39	System implementation	Discussion, Presentation, Group work		

14	40	Post implementation	Discussion, Presentation, Group work		
	41	Software maintenance			
	42	Review Class			
Final Exam					CLO1-CLO3

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. System Analysis and Design (2nd Edition) by Elias M. Awad; Galgotia Publications Pvt. Ltd.
2. System Analysis and Design (2nd Edition) by Raja Raman; Prentice Hall
3. System Analysis and Design Methods (7th Edition) by Jeffery L. Whitten; McGraw Hill
4. System Analysis and Design (9th Edition) by Kendel & Kedel; Pearson

CSE 3210: Information System Design Sessional

Course Details
Course Code: CSE 3210 Course Title: Information System Design Sessional Course Type: Core Course Level-Term: 3-II Academic Session: Summer 2022 Course Teacher: Dr. Engr. Mohammed Sowket Ali Pre-requisite: 1. Course Code: CSE 1203; Course Title: Object Oriented Programming Language I 2. Course Code: CSE 3209; Course Title: Information System Design Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
This course has been designed for the students to have real life experiences to help them prepare for their career.
Course Objectives
1. To expose student to work responsibility and ethics in working environment. 2. To develop communication skill effectively within the working environment. 3. To apply theoretical and academic knowledge for solving the industrial problem. 4. To acquire the knowledge on preparation of training report and presentation.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand and apply the essentials of software development process.	Y											
CLO2	Analyze the user requirements and design the system model.			Y									
CLO3	Use software prototyping tool and develop system prototypes and test cases to evaluate the prototypes				Y								
CLO4	Test cases to evaluate the prototypes software					Y							

CLO5	Develop the communication skill by presenting topics on software engineering sessional.											Y	

Y=yes

Course Plan

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Introduction to information systems and discussion about possible innovative project ideas as per industrial plan.	Lecture, Tutorials, Discussions	R, Pr, R, Q, Viva	CLO1-CLO5
2	Lab-2	Overview of SDLC as per industrial plan.	Lecture, Tutorials, Group work, Discussion,		
3	Lab-3	Introduction to requirement engineering along with information gathering strategies on the assigned as per industrial project.	Lecture, Tutorials, Group work, Discussion		
4	Lab-4	Use different designing tools for documenting the software requirement for different context of the Project.	Lecture, Tutorials, Group work, Discussion	R, Pr, R, Q, Viva	CLO1-CLO5
5	Lab-5	Designing the software architecture of assigned industrial project	Lecture, Tutorials, Group work, Discussion		
6	Lab-6	Developing the test cases and evaluating the prototypes industrial project.	Lecture, Tutorials, Group work, Discussion		
7	Lab-7	Final documentation and Presentation on assigned industrial project	Lecture, Tutorials, Group work, Discussion		
Lab Test					

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Attendance	25%
	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Lab Test: Retake exam will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. System Analysis and Design (2nd Edition) by Elias M. Awad; Galgotia Publications Pvt. Ltd.
2. System Analysis and Design (2nd Edition) by Raja Raman; Prentice Hall
3. System Analysis and Design Methods (7th Edition) by Jeffery L. Whitten; McGraw Hill
4. System Analysis and Design (9th Edition) by Kendel & Kedel; Pearson

LEVEL-4, TERM-I

CSE 4000: Project / Thesis*

Course Details

Course Code: CSE 4000

Course Title: Project / Thesis*

Course Type: Project Course

Level: 4-I

Academic Session: Summer-2022

Course Teachers:

Pre-requisite: N/A

Credit Value: 3.00

Contact Hours: 6.00

Total Marks: 100%

Rationale

Culminating demonstration of skills and knowledge achieved to date to apply and solve real life problems solvable through computer technology.

Course Objectives

To apply technical knowledge and skills for further research and design of computer system at professional engineering scale.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Identify, formulate, study literature, and evaluate difficult engineering problems utilizing fundamental principles of mathematics, natural sciences, and engineering sciences to obtain justified findings.		Y										

CLO2	Design complicated technical solutions and system components or processes that satisfy the required needs while taking into account public health and safety, as well as cultural, socioeconomic, and environmental considerations.			Y									
CLO3	Investigate difficult issues utilizing research-based knowledge and research methodologies such as experiment design, data analysis and interpretation, and information synthesis to reach accurate results.						Y						
CLO4	Develop, choose, and apply suitable methodologies, resources, and current engineering and IT technologies to complex engineering processes, including prediction and modeling, while keeping in mind their constraints.							Y					
CLO5	Analyze societal, health, safety, legal, and cultural issues, as well as the obligations that come with them, in relation to professional engineering practice and solutions to difficult engineering challenges, using reasoning informed by contextual knowledge.								Y				

CLO6	Understand and assess the long-term viability and effect of professional engineering work in solving complex engineering problems in social and environmental contexts.									Y			
CLO7	Apply ethical concepts and conform to professional ethics, duties, and engineering practice norms.										Y		
CLO8	Individually and as a member or leader of various teams and in interdisciplinary situations, you must be able to function effectively.											Y	
CLO9	Effectively communicate with the engineering community and society at large on complicated engineering operations, such as being able to read and create good reports and design documentation, give and receive clear directions.												Y
CLO 10	Demonstrate knowledge and comprehension of engineering management concepts and economic decision-making, and apply them to one's own work, as a team member and leader, to manage projects, and in interdisciplinary settings.	Y											
CLO 11	Recognize the necessity for autonomous and life-long learning in the broader context		Y										

	of technological change, and have the preparedness and capacity to do so.												

Y=Yes

Course Plan:

Week	**Topics**	**Remarks**
1-2	Discussion with students, Topics Selection	6.00 hrs in every week
3-4	Analysis of the selected topics	
5-6	Review of Literature (I)	
7-8	Review of Literature (II)	
9-10	Work on methodology section	
11-12	Presentation on proposed research work	
13-14	Work on proposal: Introduction, Literature review and Methodology	

Final Term

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Project Demo	30%
	Project Engagement	30%
Project presentation		20%
		20%
Total Marks		100%

CSE 4100: Industrial Training

Course Details

Course Code: CSE 4100

Course Title: Industrial Training

Course Type: Core Course

Level-Term: 4-I

Academic Session: Summer-2022

Course Teacher: Dr. Engr. Mohammed Sowket Ali

Pre-requisite:

Credit Value: 1.00

Contact Hours: 2.0 (3 Weeks)

Total Marks: 100%

Rationale

This course has been designed for the students to have real life experiences to help them prepare for their career.

Course Objectives

1. To expose student to work responsibility and ethics in working environment.
2. To develop communication skill effectively within the working environment.
3. To apply theoretical and academic knowledge for solving the industrial problem.
4. To acquire the knowledge on preparation of training report and presentation.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Learn how to use modern tools and technology to solve real-world complex engineering problem.					Y							
CLO2	Communicate with the engineering community.										Y		
CLO3	Able to learn professionalism and ethical values.								Y				

Y=yes

<table>
<tr><td colspan="6">Course Plan:</td></tr>
<tr><th>Week</th><th>Training</th><th>Topic</th><th>Teaching-Learning Strategy</th><th>Assessment Strategy</th><th>Corresponding CLOs</th></tr>
<tr><td>1</td><td>1-5</td><td>As per industrial plan</td><td rowspan="3">N/A</td><td rowspan="3">R, Pr, R, Q, Viva</td><td rowspan="3">CLO1-CLO3</td></tr>
<tr><td>2</td><td>6-10</td><td>As per industrial plan</td></tr>
<tr><td>3</td><td>11-14</td><td>As per industrial plan</td></tr>
<tr><td colspan="5">Lab Test</td><td></td></tr>
</table>

<table>
<tr><td colspan="2">Assessment and Evaluation</td></tr>
<tr><td colspan="2">Assessment Strategy</td></tr>
<tr><td>Components</td><td>Grading</td></tr>
<tr><td>Continuous Assessment (40%)</td><td>50%</td></tr>
<tr><td>Report</td><td>25%</td></tr>
<tr><td>Presentation</td><td>25%</td></tr>
<tr><td>Total Marks</td><td>100%</td></tr>
<tr><td colspan="2">Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
Missed Final Lab Test: Retake exam will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.</td></tr>
<tr><td colspan="2">Learning Materials</td></tr>
<tr><td colspan="2">N/A</td></tr>
</table>

CSE 4101: Computer Security

Course Details
Course Code: CSE 4101 Course Title: Computer Security Course Type: Core Course Level-Term: 4-I Academic Session: Summer-2022 Course Teacher: Pre-requisite: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The Computer Security course is designed to provide a comprehensive understanding to the modern security system in computer science. The course begins with description of basic computer security ideas followed by various security models, cryptography, security attacks and the fundamental security objectives. This course also motivates to understand various security threats and probable measures to mitigate the issues.
Course Objectives
1. To understand to the modern security system in computer science. 2. To determine and analyze the security objectives, attacks, and models, so is able to recognize the security requirements in real-life cases. 3. To be able to develop applications keeping data security at its core.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the modern security system in computer science.	Y											
CLO2	Determine and analyze the security objectives, attacks, and recognize the security requirements in real-life cases.		Y										

CLO3	Able to develop applications keeping data security at its core.				Y								
CLO4	Develop the communication skill by constructing security critical scenario in application, creating and presenting solutions regarding Security and Cryptography.												Y

Course Outline

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
	1	Introduction, Importance	Lecture, Tutorials, Discussions		
1	2	Data CLOnfidentiality, Integrity	Lecture, Tutorials, Discussions		
	3	Availability, Assurance	Lecture, Tutorials, Discussions		
	4	Authenticity and Anonymity	Lecture, Tutorials, Discussions		
2	5	Threats and Attacks	Lecture, Tutorials, Discussions	Class Test 1	CLO1
	6	Security Principles	Lecture, Tutorials, Discussions		
	7	Encryption	Lecture, Tutorials, Discussions		
3	8	Various attacks on cryptosystems	Lecture, Tutorials, Discussions		
	9	CLOntinued	Lecture, Tutorials, Discussions		
4	10	Cryptographic hash functions	Lecture, Tutorials, Discussions	Class Test 2	CLO1

	11	SHA 512 algorithm	Lecture, Tutorials, Discussions		
	12	Digital signatures,	Lecture, Tutorials, Discussions		
	13	Digital certificates	Lecture, Tutorials, Discussions		
5	14	DSA algorithm	Lecture, Tutorials, Discussions		
	15	Symmetric cryptography	Lecture, Tutorials, Discussions		
	16	Details of DES	Lecture, Tutorials, Discussions		
6	17	Details of AES	Lecture, Tutorials, Discussions		
	18	Public-key cryptography	Lecture, Tutorials, Discussions		
	19	RSA Algorithm	Lecture, Tutorials, Discussions		
7	20	RSA Key generation	Lecture, Tutorials, Discussions		
	21	Security: Operating systems CLOncepts,	Lecture, Tutorials, Discussions		
	22	Process security	Lecture, Tutorials, Discussions		
8	23	Memory and file system security	Lecture, Tutorials, Discussions		
	24	Application program security	Lecture, Tutorials, Discussions	Mid Term	CLO2
	25	Physical security	Lecture, Tutorials, Discussions		
9	26	Network security concepts,	Lecture, Tutorials, Discussions		
	27	Browser security	Lecture, Tutorials, Discussions		

10	28	Buffer overflow and other vulnerabilities due to insecure programming	Lecture, Tutorials, Discussions		
	29	Foot printing	Lecture, Tutorials, Discussions		
	30	Social engineering	Lecture, Tutorials, Discussions		
11	31	Trojans and backdoors	Lecture, Tutorials, Discussions	Mini Project	CLO4
	32	Sniffing	Lecture, Tutorials, Discussions		
	33	Denial of service	Lecture, Tutorials, Discussions		
12	34	Session hijacking	Lecture, Tutorials, Discussions		
	35	Threats on components like webservers	Lecture, Tutorials, Discussions		
	36	Web Applications,	Lecture, Tutorials, Discussions		
13	37	Mobile platforms	Lecture, Tutorials, Discussions		
	38	Wireless networks	Lecture, Tutorials, Discussions		
	39	Security Measures: Firewall	Lecture, Tutorials, Discussions		
14	40	Intrusion detection	Lecture, Tutorials, Discussions		
	41	Intrusion prevention	Lecture, Tutorials, Discussions		
	42	Review Class	Discussions		
Final Exam					CLO3
Assessment and Evaluation					

<table>
<tr><td colspan="3">Assessment Strategy</td></tr>
<tr><td colspan="2">Components</td><td>Grading</td></tr>
<tr><td rowspan="3">Continuous Assessment (40%)</td><td>Class Test (1-3)</td><td>15%</td></tr>
<tr><td>Assignment</td><td>05%</td></tr>
<tr><td>Class Participation</td><td>05%</td></tr>
<tr><td></td><td>Mid Term</td><td>15%</td></tr>
<tr><td colspan="2">Final Exam</td><td>60%</td></tr>
<tr><td colspan="2">Total Marks</td><td>100%</td></tr>
<tr><td colspan="3"></td></tr>
</table>

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Cryptography and Network Security Principles and Practice - W. Stallings
2. Cryptography and Network Security - Behrouz Forouzan
3. Applied Cryptography - Bruce Schneier
4. Cryptography and Data Security - D. Denning

CSE 4102: Computer Security Sessional

Course Details

Course Code: CSE 4102

Course Title: Computer Security Sessional

Course Type: Laboratory Course

Level: 4-I

Academic Session: Summer-2022

Course Teacher:

Pre-requisite: NA

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

The Computer Security Sessional course is designed to provide a comprehensive understanding and usage of to the modern security system in computer science. This course also helps to learn various security threats and probable measures to mitigate the issues.

Objective

1. To use the appropriate algorithms in appropriate situations.
2. To choose the appropriate algorithm or approach based one scenario and constrains
3. To able to use cryptography to solve real world problems

Course Content

Laboratory works based on CSE 4101.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Using the appropriate algorithms in appropriate situations.		Y										
CLO2	Choosing the appropriate algorithm or approach based one scenario and constrains			Y									

CLO3	Develop the ability to use cryptography to solve real world problems					Y							

Y=Yes

Course Plan

Week	**Lecture**	**Topics**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	1,2	Basic Ciphers	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	M, F	CLO1, CLO2, CLO3
3	3,4	Simplified DES			
5	5,6	DES. AES			
Mid-Term					
7	7,8	SHA 512	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	R, M, F	
9	9,10	DSA			
11	11,12	RSA			
13	13,14	DDOS, Intrusion, Firewall			

Assessment Strategy

Components		Grading
Attendance (25%)	report	15%
	viva	10%
	Quiz	10%
	Mid-Term	20%
Final-Exam		20%
Total Marks		100%

Make-up Procedures

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence

in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Teaching Methodology: Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method. Delivery Methods and Activities Lecture, White Board Writing, Power Point Presentation **Reference books** 1. Cryptography and Network Security Principles and Practice - W. Stallings 2. Cryptography and Network Security - Behrouz Forouzan 3. Applied Cryptography - Bruce Schneier 4. Cryptography and Data Security - D. Denning

CSE 4103: Computer Graphics

Course Details
Course Code: CSE 4103 Course Title: Computer Graphics Course Type: Core Course Level: 4-I Academic Session: Summer-2022 Course Teacher: Taher Muhammad Mahdee Pre-requisite: N/A Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale

This course deals with the fundamentals of computer graphics. This will emphasize the most basic algorithms and concepts in computer graphics that form the foundation for most modern graphics systems. It also deals with interactive 3D computer graphics, 2D algorithms, rendering, clipping, modeling, transformation, projection and so many graphics sectors.

Objective

1. Understand the basic concepts of computer graphics, different graphics systems and applications.
2. Learning the mathematical foundation of the concepts of computer graphics and apply those concepts in different geometric objects.
3. Analyze different algorithms and techniques of computer graphics and apply those in graphical model.
4. Develop the communication skill by presenting topics on computer graphics.

Course Content

Standard graphics primitives; Graphics hardware; Graphics pipeline; Coordinate convention; Scan conversion; Clipping; Modeling transformation; Viewing transformation; Projection transformation; Polygons and polygon meshes; Curves and surfaces; Hidden lines and surface removal; Fractals; Ray tracing; Light models; Color models; Graphics programming.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic concepts of computer graphics, different graphics systems and applications.	Y											
CLO2	Learning the mathematical foundation of the concepts of computer graphics and apply those concepts in different geometric objects.	Y											
CLO3	Analyze different algorithms and techniques of computer		Y										

	graphics and apply those in graphical model.												
CLO4	Develop the communication skill by presenting topics on computer graphics.										Y		

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT1, M	CLO1
	2	Usage of Computer Graphics			
	3	Usage of Computer Graphics – continued			
2	4	Standard graphics primitives			
	5	CRT Display		M, F, ASG	CLO2
	6	LCD Display			
3	7	Other display and I/O devices			
	8	Graphics pipeline			
	9	Coordinate convention			
4	10	Scan conversion			
	11	Line Drawing DDA			
	12	Line Drawing Bresenham’s			
5	13	Circle introduction			
	14	Midpoint circle drawing			
	15	Clipping introduction, point clipping			
6	16	Line clipping			
	17	Polygon clipping			
	18	Modeling transformation 2D			
7	19	Modeling transformation 3D			
	20	Viewing transformation			

	21	Projection transformation			
Mid Term					
8	22	Polygons and polygon mesh	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	ASG, CT2, F	CLO2, CLO3
	23	Curves			
	24	Splines			
9	25	B-Splines			
	26	Surfaces			
	27	Hidden lines and surface removal			
10	28	Hidden lines and surface removal -continued			
	29	Hidden lines and surface removal –continued			
	30	Hidden lines and surface removal –continued			
11	31	Fractals		ASG, CT3, F	CLO4
	32	Dimension			
	33	Creation of Fractals			
12	34	Ray Tracing			
	35	Lighting models			
	36	Light source			
13	37	Shadows			
	38	Reflection			
	39	Transparency			
14	40	Color models			
	41	Graphics Programming		F	CLO4
	42	Review Class			
Final Term					
Assessment and Evaluation					
Assessment Strategy					

Components		Grading
Continuous Assessment	Class Test 1-3	15%
	Assignment	05%

(40%)	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Make-up Procedures

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Teaching Methodology:

Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method.

Delivery Methods and Activities

Lecture, White Board Writing, Power Point Presentation

Reference books

1. Theory and Problems of Computer Graphics (2nd) - Zhigang Xiang, Roy A. Plastock
2. Computer Graphics Principle and Practice (3rd) - James D Foley, Van Dam
3. Computer Graphics using OpenGL (2nd) by Francis S Hill, Jr.

CSE 4104: Computer Graphics Sessional

Course Details

Course Code: CSE 4104

Course Title: Computer Graphics Sessional

Course Type: Laboratory Course

Level: 4-I

Academic Session: Summer-2022

Course Teacher: Taher Muhammad Mahdee

Pre-requisite: NA

Credit Value: 0.75

Contact Hours: 1.50

Total Marks: 100%

Rationale

This course motivates to develop and modify 2D and 3D visualization and transformation of any geometric object by using graphics library as well as create 3D games and animation using different modern graphics tools and software.

Objective

1. Apply graphics programming techniques to solve graphics problem related to modeling transformation, rendering, texture mapping etc.
2. Develop 2D and 3D graphical geometric objects.
3. Create animation or real time applications using open-source software.

Course Content

Laboratory works based on CSE 4103.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Apply graphics programming techniques to solve graphics problem related to modeling transformation, rendering, texture mapping etc.		Y										
CLO2	Develop 2D and 3D graphical geometric objects			Y									
CLO3	Create animation or real time applications using open-source software.					Y							

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding COs
1	1	Introduction to 2D Graphics and Drawing	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	M, F	CLO1
	2				
3	3	Simple 2D animation and modelling			
	4				
Mid Term					
5	5	Drawing 3D geometric object	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	Q, M, F	CLO2
	6				
7	7	Introduction to blender/ unity			
	8			PR, R	CLO3
9	9	3D modelling and Lighting in blender/unit	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method		
	10				
11	11	Texturing and coloring			
	12				
13	13	Rendering, animation			
	14				
Final Term					CLO3

Assessment and Evaluation

Assessment Strategy

Components		Grading
Attendance (25%)	Report	15%
	Viva	10%
	Quiz	10%
	Mid Term	20%
Final Exam		20%
Total Marks		100%

Make-up Procedures
• Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. • Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Teaching Methodology: Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method. Delivery Methods and Activities Lecture, White Board Writing, Power Point Presentation **Reference books** 1. Theory and Problems of Computer Graphics (2nd) - Zhigang Xiang, Roy A. Plastock 2. Computer Graphics Principle and Practice (3rd) - James D Foley, Van Dam 3. Computer Graphics using OpenGL (2nd) by Francis S Hill, Jr.

HUM 4123: Engineering Economics

Course Details
Course Code: HUM 4123 Course Title: Engineering Economics Course Type: GED Course Level-Term: 4-I Academic Session: Summer-2022 Course Teacher: Pre-requisite: Credit Value: 2.00 Contact Hours: 2.00

Total Marks: 100%

Rationale

This course is designed to teach about fundamental concepts and practice of Economics, practices and fundamental application in real life.

Course Objectives

1. Preparing economic information for planning and control and for the evaluation of products, projects and divisions.
2. It is a course designed to equip students with basic principles, concepts, and techniques in doing economic analysis.
3. To help various decision-making problems in economics, business, engineering and many other areas.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic economic principle and their applications.							Y					
CLO2	Generate important insights into individual and aggregate behavior and relationships, and help in society efforts to use scarce resources in a more efficient manner.				Y								
CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.												Y

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	This lecture will cover the definition, goals.	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Distinguish between Microeconomics and macroeconomics	Lecture, Tutorials, Discussions		

	3	Why to study engineering economics.	Lecture, Tutorials, Discussion		
2	4	Demand, The Law of Demand, Demand Curve, Demand Table.	Lecture, Tutorials, Discussion		
	5	From a Demand Table to a Demand Curve.	Lecture, Tutorials, Discussion		
	6	A Sample Demand Curve vs. Quantity, Supply.	Lecture, Tutorials, Discussion		
3	7	The Law of Supply, Supply Curve.	Lecture, Tutorials, Discussion		
	8	Supply Table.	Lecture, Tutorials, Discussion		
	9	From a Supply Table to a Supply Curve.	Lecture, Tutorials, Discussion		
4	10	A Sample Supply Curve vs. Quantity,	Lecture, Tutorials, Discussion	ASG	
	11	Price Elasticity of Demand and Supply.	Lecture, Tutorials, Discussion		
	12	Price Elasticity of Demand and Supply.	Lecture, Tutorials, Discussion		
5	13	Macroeconomic Models and Analysis.	Lecture, Tutorials, Discussion		
	14	Aggregate Demand & Aggregate Supply.	Lecture, Tutorials, Discussion		
	15	Classical Analysis.	Lecture, Tutorials, Discussion		
6	16	Keynesian analysis.	Lecture, Tutorials, Discussion		
	17	Two-Sector Economy.	Lecture, Tutorials, Discussion		
	18	Some fundamental concepts of	Lecture, Tutorials, Discussion		

		Macroeconomics Consumption.			
7	19	Savings & Investment, Gross Domestic Product.	Lecture, Discussion		
	20	National Income and Product Accounts, Final Goods and Services.	Lecture, Discussion		
	21	Value Added, Calculating GDP Personal Consumption Expenditures.	Lecture, Discussion		
Mid Term					
8	22	theory of production; theory of cost and cost estimation; market structure.	Lecture, Discussion	CT2	
	23	national income accounting; depreciation; circular flow of income and expenditure.	Lecture, Discussion		
	24	cost-benefit analysis; payback period, net present value (NPV),	Lecture, Discussion		
9	25	internal rate of return (IRR), inflation; economic feasibility of engineering undertakings.	Lecture, Group work, Discussion		
	26	Development conomics.	Lecture, Group work, Discussion		
	27	Development conomics.	Lecture, Group work, Discussion		
10	28	Development partners (World Bank, ADB, WTO, IMF)	Lecture, Group work, Discussion		

	29	Development partners (World Bank, ADB, WTO, IMF)	Lecture, Group work, Discussion		
	30	WB-founder, history, function.	Lecture, Group work, Discussion		
11	31	ADB- founder, history, function.	Lecture, Group work, Discussion	CT3	
	32	WTO-founder, history, function.	Lecture, Presentation, Discussion		
	33	founder, history, function.	Lecture, Presentation, Discussion		
12	34	IMF- founder, history, function.	Lecture, Group work, Discussion		
	35	Theories of developments.	Lecture, Group work, Discussion		
	36	Banking system of Bangladesh, National Budget.	Lecture, Group work, Discussion		
13	37	Sector wise national budget, feasibility of budget.	Lecture, Group work, Discussion		
	38	Economy of Bangladesh	Discussion, Group work		
	39	Economy of Bangladesh	Discussion, Presentation, Group work		
14	40	Reviews			
	41	Reviews			
	42	Reviews			
Final Exam					CLO1-CLO3

Assessment and Evaluation

Assessment Strategy

Components		**Grading**
Continuous Assessment	Class Test (1-3)	15%
	Assignment	05%

(40%)	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Mark Lovewell**:** Understanding Economics- A Contemporary Perspective.
2. N. Gregory Mankiw: Principles of Macroeconomics.
3. Johnson: Macroeconomics.

LEVEL-4, TERM-II

CSE 4000: Project / Thesis*

Course Details

Course Code: CSE 4000

Course Title: Project / Thesis*

Course Type: Project/Thesis Course

Level: 4-II

Academic Session: Summer-2022

Course Teacher:

Pre-requisite: N/A

Credit Value: 3.00

Contact Hours: 6.00

Total Marks: 100%

Rationale

Culminating demonstration of skills and knowledge achieved to date to apply and solve real life problems solvable through computer technology.

Coiurse Objectives

To apply technical knowledge and skills for further research and design of computer system at professional engineering scale.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Select, analyze, classify a particular field to do research	Y	Y										
CLO2	Solve real life complex problems			Y			Y			Y			
CLO3	Explain and describe the time-cost estimation and ethical values.				Y	Y	Y						

Y=Yes

CSE 4215: Professional Issues and Ethics for Computer Science

Course Details
Course Code: CSE 4215 Course Title: Professional Issues and Ethics for Computer Science Course Type: Core Course Level: 4-II Academic Session: Summer-2022 Course Teacher: Taher Muhammad Mahdee Pre-requisite: N/A Credit Value: 2.00 Contact Hours: 2.00 Total Marks: 100%
Rationale
The Professional Issues and Ethics in Computer Science course introduces the fundamental Professional Ethics, various legal system issues and Dispute Resolutions. It helps to develop baseline knowledge to professional ethics to solve real world problems. This Course begins with introductory concepts of Professional issues and then covers other important topics such as Professional Ethics, Legal System, privacy, Free speech, Feminism, Green Computing etc..
Objective
1. To know about Professional issues and technical ethics in various real-world Scenarios. 2. To know about various legal issues in Information System. 3. To develop knowledge about Internet Governance and Dispute Resolutions.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Recognize social and legal context of various Engineering applications.						Y						
CLO2	Apply various ethical principles to carry out real								Y				

	life professional Responsibilities.												
CLO3	Develop the communication skill by writing effective reports and presenting topics on various Engineering activities										Y		
CLO4	Recognize the broadest context of technological change in life-long learning.												Y

Y=Yes

Course Plan:

Week	Lecture	Topics	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Profession and vocation, Recognition of professionals, their duties and responsibilities	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT1	CLO1
	2	Prestigious position for professionals, Professional bodies trade unions, and other organizations, Professional bodies in CSE/IT and related fields, Characteristics and functions of a professional body			
2	3	Philosophy, ethics, and applied ethics, Ethics in other professions			
	4	Factors affecting in making ethical decisions, Value, value systems, culture, cooperate culture, attitudes, behaviors, beliefs, norms			

3	5	Golden rule, utilitarian principle, Kant's categorical imperative, Descartes' rule of change, Risk aversion principle, avoid hard, no free lunch rule			
	6	legalism, evidentiary guidance, client/customer/patient choice, equity, competition, compassion/last chance, impartiality/objectivity, openness, confidentiality			
4	7	Common computer ethics fallacies: Computer game fallacy, law abiding citizen fallacy	Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method	CT2	CLO1, CLO2
	8	shatterproof fallacy, candy-from-a–baby fallacy, hacker's fallacy, free information fallacy, Code of conducts in IT/CS related professional bodies			
5	9	Law, moral, norms, and ethics Judiciary, legislature, executive, and separation of power			
	10	Common law and civil law, Criminal law and civil law Fundamental right and protection			
6	11	Intellectual property: Trademarks, patents, copy rights, Passing off, masquerading			
	12	Software licensing issues: Creative commons, Open-source free software movements, Discussion on recent cases			

7	13	Online transactions: Consent, jurisdictions, Software licensing issues, Creative commons, GPL, Open source			
	14	Online communities, Computer misuse and frauds			
Mid Term					CLO1, CLO2
8	15	Personal information, Data protection principles, Knowledge and consent in the Internet	Lecture, Discussion, Presentation, Co-operative and Collaborative Method, Problem Based Method	CT3	CLO3, CLO4
	16	Big brother concept, Privacy enhancing and invasive tools/methods			
9	17	Internet governance, Anonymity			
	18	Public disclosure, Defamation, Un-solicitation			
10	19	Contracts- Memorandum of Understanding (MoU), Non-Disclosure Agreement (NDA), User agreements			
	20	Liabilities, Vicarious liability, Warranty and maintenance			
11	21	Offline dispute resolution methods: Mediation			CLO3, CLO4
	22	litigation, arbitration, Issues in resolving dispute relating online transactions			
12	23	Feminism, Global warming			
	24	Green computing, Rights of employees			
13	25	Feminism			
	26	Review Class			

14	27	Review Class			
	28	Review Class			CLO1-CLO4
Final Term					CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test 1-3	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Make-up Procedures

<u>Missed Class Tests, Assignment, Class Participation and Midterm:</u> There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

<u>Missed Final Term</u>: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Reference books:

1. Gift of fire Social, Legal and Ethical Issue for computing Technology (4rd Edition) by Sara Baase

HUM 4273: Financial, Cost and Managerial Accounting

Course Details:

Course Code: HUM 4273

Course Title: Financial, Cost and Managerial Accounting

Course Type: GED Course

Level-Term: 4-II

Academic Session: Summer-2022

Course Teacher:

Pre-requisite: Course Code: Nill; Course Title: Nill

Credit Value: Credit Hours: 2.00

Contact Hours: 2.00

Total Marks: 100%

Rationale

This course is designed to teach about fundamental concepts and practice of Financial, Cost and Managerial Accounting.

Course Objectives

1. To gain basic knowledge of Financial, Cost and Managerial Accounting related terms.
2. To understand and relate the CSE related knowledge with accounting knowledge.
3. To solve various related problems.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the basic economic principle and their applications.												Y
CLO2	Generate important insights into individual and aggregate behavior and relationships, and help in society efforts to use scarce resources in a more efficient manner.				Y								

CLO3	Explain time-value of money concepts and the criteria for making economic-based decisions.												Y
CLO4	Discuss, describe and interpret a financial accounting, managerial accounting and understand how the related reporting might be affected by a particular (Creative) business											Y	
Y=yes													

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Concept of accounting and accounting cycle, basic activities of accounting, users of accounting,	Lecture, Tutorials, Discussions	CT1	CLO1
	2	transaction and event, characteristics of transaction, differences between transactions and event,	Lecture, Tutorials, Discussions		
	3	introduction to various financial statements	Lecture, Tutorials, Discussion		
2	4	Introduction to and clarification of numerous elements of variousfinancial statements. Like: assets, expense, revenue, owner’s equity and liability.	Lecture, Tutorials, Discussion		
	5	introduction to GAAP and accounting	Lecture, Tutorials, Discussion		

		assumption and measurement principles, Identification of assets, expense, revenue, owners' equity and liability			
	6	Accounting Equation, Application of Accounting Equation in mathematical form, identifying transactions and events,	Lecture, Tutorials, Discussion		
3	7	Analyzing transactions and its impact on accounting equation. Preparation of a tabular analysis.	Lecture, Tutorials, Discussion		
	8	Preparing owner's equity statement, income statement,	Lecture, Tutorials, Discussion		
	9	Balance sheet, cash flow statement.	Lecture, Tutorials, Discussion		
4	**10**	Concept regarding recording process and steps in recording process, general journal and adjusting journal.	Lecture, Tutorials, Discussion	ASG	CLO2
	11	Entering transactions into Journal after analyzing, preparing a complete general journal. (part-1)	Lecture, Tutorials, Discussion		

	12	Entering transactions into Journal after analyzing, preparing a complete general journal. (part-2)	Lecture, Tutorials, Discussion		
5	13	Clarification of concept of an account, debit and credit and ledger. Steps involves in Posting transactions from general journal to ledger,	Lecture, Tutorials, Discussion		
	14	Preparing Ledger account, balancing and closing of a ledger	Lecture, Tutorials, Discussion		
	15	Clarification of concept of trial balance, preparing trial balance.	Lecture, Tutorials, Discussion		
6	16	Depreciation: discussion on cost of the assets, sal vage value, useful life of the asset and impacts of these concepts on calculation of depreciation.	Lecture, Tutorials, Discussion		
	17	Calculation of depreciation on straight line method,	Lecture, Tutorials, Discussion		
	18	Declining balance method, Besides, impacts of the stated concept on operations of business and decision-making purposes.	Lecture, Tutorials, Discussion		

7	19	Calculation of accumulated depreciation and salvage value at the end of the useful life.	Lecture, Discussion		
	20	Impacts of the stated concept on operations of business and decision-making purposes	Lecture, Discussion		
	21	Review of previous classes	Lecture, Discussion		
Mid Term					CLO3
8	22	Cost concept and classification. Segregation of mixed costs, overhead costs.	Lecture, Discussion	CT2	
	23	Cost concept and classification. Segregation of mixed costs, overhead costs.	Lecture, Discussion		
	24	Meaning and classification, allocation of overhead cost, overhead recovery method.	Lecture, Discussion		
9	25	Meaning and classification, allocation of overhead cost, overhead recovery method.	Lecture, Group work, Discussion		
	26	Job order costing	Lecture, Group work, Discussion		
	27	Job cost sheet, related journals.	Lecture, Group work, Discussion		

10	28	Statement of cost, Cost Volume Profit (CVP), Assumptions of CVP analysis,	Lecture, Group work, Discussion		
	29	Factors of CVP analysis. Break-even point	Lecture, Group work, Discussion		
	30	Preparation of job cost sheet and quotation (Lecture-2). Linking them to decision making purposes	Lecture, Group work, Discussion		
11	31	Break-even point analysis using equation and formula method. Target profit analysis. CVP analysis changing variable cost and fixed cost.	Lecture, Group work, Discussion	CT3	
	32	Introduction to breakeven analysis, contribution margin approach, sensitivity analysis.	Lecture, Presentation, Discussion		
	33	Use of those tools and technique in calculating, anticipating and controlling cost, profit, br eakeven in relation to the desired or actual volume of produced units.	Lecture, Presentation, Discussion		
12	34	Use of those tools and technique in calculating, anticipating and controlling cost, profit, br eakeven in relation to the	Lecture, Group work, Discussion		

		desired or actual volume of produced units.			
	35	General approaches used in manufacturing companies for costing products for the purposes of valuating inventories a nd cost of goods sold	Lecture, Group work, Discussion		
	36	Complete overview of absorption and variable costing.	Lecture, Group work, Discussion		
13	37	Calculation of unit product cost and net operating income or loss both in absorption costing and variable costing approach.	Lecture, Group work, Discussion		
	38	Reconciliation of variable costing with absorption costing income and vice versa.	Discussion, Group work		
	39	Choosing a costing method between absorption and variable costing. Impact of each costing on managers' decision making. Solution of partial problems.	Discussion, Presentation, Group work		
14	40	Short term investment decision: differential cost analysis	Discussion, Presentation, Group work		
	41	Long term investment decision: Capital budgeting, techniques of	Discussion, Presentation, Group work		

		evaluation of capital investment, risk management and capital rationing.			
	42	Review classes			
Final Exam					CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Accounting principles' By- Kimmel, Kieso, Weygandt
2. Managerial Accounting' By- Garrision, Noreen, Brewer

IPE 4297: Industrial Management

Course Details:
Course Code: IPE 4297 Course Title: Industrial Management Course Type: GED Course Level-Term: 4-II Academic Session: Summer-2022 Course Teacher: Pre-requisite: Course Code: Nill; Course Title: Nill Credit Value: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course provides different concepts of management through integration of financial aspects, quality, innovation, technology as well as marketing strategies. The focus is to illustrate practical engineering applications in industries. Students will obtain an in-depth knowledge in management, quality, decision making, and technologies related to an organization. Upon completion of this course, students will understand the role of an industrial engineer in an industry. The learning approach is to apply theoretical knowledge in the practical field and analyze existing problems to provide appropriate solutions. Students will achieve knowledge of quality control and ways of improving production with the use of different tools and techniques.
Course Objectives
1. To understand the concepts and evolution of management. 2. To enlighten students about the concepts of TQM and its various tools. 3. To understand the concept of entrepreneur, entrepreneurship and enterprise. 4. To develop the strategic thinking and decision-making abilities of students. 5. To know about MIS Decision Support Systems and MIS in decision making. 6. To know the necessity and mechanism of marketing management.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

	(Upon completion of the course, the students will be able to)												
CLO1	Understanding of the basic principles of management and basics of financial aspects.	Y										Y	
CLO2	Applying different TQM tools to solve challenging real-world problems.	Y		Y		Y							
CLO3	Developing new ideas of business through entrepreneurial skills and identifying appropriate business types.	Y			Y								
CLO4	Understanding the necessity of marketing management for a business to be sustain-able.							Y					
Y=yes													

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Correspon ding CLOs
1	1	Principles of Management	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Management Functions and Evolution	Lecture, Tutorials, Discussions		
	3	Managerial Roles and Skills	Lecture, Tutorials, Discussion		
2	4	Managerial Roles and Skills	Lecture, Tutorials, Discussion		
	5	Financial Principles	Lecture, Tutorials, Discussion		
	6	Financial Principles	Lecture, Tutorials, Discussion		
3	7	Management of Innovation	Lecture, Tutorials, Discussion		

	8	Management of Innovation	Lecture, Tutorials, Discussion		
	9	Technology Management	Lecture, Tutorials, Discussion		
4	10	The S-Curve of Technological Progress	Lecture, Tutorials, Discussion	ASG	CLO2
	11	Technology life cycle	Lecture, Tutorials, Discussion		
	12	Marketing Management Concepts and Strategy	Lecture, Tutorials, Discussion		
5	13	Sales Promotion	Lecture, Tutorials, Discussion		
	14	Ratio Analysis	Lecture, Tutorials, Discussion		
	15	Prelude Lobster	Lecture, Tutorials, Discussion		
6	16	Designing and Building Yachts	Lecture, Tutorials, Discussion		
	17	Commoditization	Lecture, Tutorials, Discussion		
	18	Differentiation	Lecture, Tutorials, Discussion		
7	19	Introduction to quality; Cost of quality	Lecture, Discussion		
	20	Total quality management (TQM)	Lecture, Discussion		
	21	Seven tools of TQM	Lecture, Discussion		
Mid Term					
8	22	Statistical Process Control	Lecture, Discussion	CT2	CLO3
	23	Control Charts: Variable Control Charts	Lecture, Discussion		
	24	House of quality (HOQ)	Lecture, Discussion		

9	25	Concept of Entrepreneurship; Characteristics of Entrepreneurship	Lecture, Group work, Discussion		
	26	Relationship between entrepreneurship and management; Need for entrepreneurship	Lecture, Group work, Discussion		
	27	Functions of entrepreneurs; Role of Entrepreneurs	Lecture, Group work, Discussion		
10	28	Process of setting up a Business; Feasibility analysis	Lecture, Group work, Discussion		
	29	The process of entrepreneurship development; Business plan	Lecture, Group work, Discussion		
	30	The role of environment in entrepreneurship development; Competencies for entrepreneurship	Lecture, Group work, Discussion		
11	31	Entrepreneurial motivation; Behavioral choice for entrepreneurial success	Lecture, Group work, Discussion	CT3	CLO4
	32	Forms of business organization: Sole proprietorship: Features, merit and limitations;	Lecture, Presentation, Discussion		

		Partnership: Features, merit and limitations			
	33	Partnership: Features, merit and limitations; Co-operative organization: Features, merit and limitations; Company: Features, merit and limitations	Lecture, Presentation, Discussion		
12	34	Strategic management	Lecture, Group work, Discussion		
	35	Strategic model	Lecture, Group work, Discussion		
	36	Information and management	Lecture, Group work, Discussion		
13	37	MIS: Introduction	Lecture, Group work, Discussion		
	38	Decision Support Systems	Discussion, Group work		
	39	MIS in decision making	Discussion, Presentation, Group work		
14	40	Review Class			
	41	Review Class			
	42	Review Class			
Final Exam					CLO1-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%

Total Marks	100%

Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.

Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Quality Control and Management by Ahsan Akhter Hasin
2. Introduction to Statistical Quality Control by Douglas C. Montgomery (6th edition)
3. Organization and Management by R D Agarwal
4. Industrial Engineering and Management – O.P. Khanna
5. Analysis and design of information system by V. Rajaraman

CSE 4139: Machine Learning

Course Details

Course Code: CSE 4139

Course Title: Machine Learning

Course Type: Core Course

Level-Term: 4-I

Academic Session: Summer-2022

Course Teacher: Md. Mamun Hossain & Hasan Muhammad Kafi

Pre-requisite: Course Code: None, Course Title: None

Credit Value: Credit Hours: 3.00

Contact Hours: 3.00

Total Marks: 100%

Rationale

The Machine Learning course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Course Objectives

1. To learn paradigms in different environmental setting and apply the appropriate learning algorithm to best suit the current need.
2. To enhance the learning parameters to achieve maximum performance.
3. To familiarize with a broad cross-section of models and algorithms for machine learning, and prepare for research or industry application of machine learning techniques.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Develop an appreciation for what is involved in learning models from data.	Y											
CLO2	Understand a wide variety of learning algorithms.	Y											
CLO3	Understand how to evaluate models generated from data and enhance the learning parameters to achieve maximum performance.		Y										
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.												Y

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction to machine learning and its application	Lecture, Tutorials, Discussions	CT1	CLO1
	2	Supervised, Unsupervised, Reinforcement learning	Lecture, Tutorials, Discussions		
	3	Linear regression: uni-variate linear regression,	Lecture, Tutorials, Discussion		
2	4	Cost function: Measuring the Error	Lecture, Tutorials, Discussion		
	5	Linear regression using gradient descent algorithm,	Lecture, Tutorials, Discussion		
	6	Multivariate linear regression using gradient descent algorithm,	Lecture, Tutorials, Discussion		
3	7	Learning rate, Bias, Variance, Regularization term	Lecture, Tutorials, Discussion		
	8	Logistic regression, Decision Boundary	Lecture, Tutorials, Discussion		
	9	Cost function for logistic regression, Regularization in logistic regression	Lecture, Tutorials, Discussion		

4	10	Support vector machine (SVM), Support vectors, Gutter, Hyper plane	Lecture, Tutorials, Discussion	ASG	CLO4
	11	SVM: Mathematical explanation, Kernel trick	Lecture, Tutorials, Discussion		
	12	Naive Bayes Classifier	Lecture, Tutorials, Discussion		
5	13	Decision tree basics, ID3	Lecture, Tutorials, Discussion		
	14	ID3 practical Examples, CART	Lecture, Tutorials, Discussion		
	15	Ensemble Methods: Reason of Use, Diversity Measures	Lecture, Tutorials, Discussion		
6	16	K-fold Data Split, Bagging algorithm	Lecture, Tutorials, Discussion		
	17	Boosting algorithm, AdaBoost	Lecture, Tutorials, Discussion		
	18	Stacked Generalization, Mixture of Experts, Majority Voting, Weighted Majority Voting	Lecture, Tutorials, Discussion		

7	19	Behavior Knowledge Space, Borda Count, Combining Continuous Output	Lecture, Discussion		
	20	Model Evolution: Handling Skew data, Confusion Matrix, Accuracy, Precision and Recall, F1 Score	Lecture, Discussion		
	21	Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.	Lecture, Discussion		
Mid Term					CLO1-CLO3
8	22	Genetic Algorithm	Lecture, Discussion	CT2	CLO2, CLO3
	23	Genetic Algorithm	Lecture, Discussion		
	24	Unsupervised algorithm: k-means algorithm for clustering and classification, optimization objective,	Lecture, Discussion		
9	25	k-means algorithm: Overcoming local optimization,	Lecture, Group work, Discussion		

		choosing value for k, elbow method			
	26	Dimensionality Reduction: Principal Components Analysis (PCA)	Lecture, Group work, Discussion		
	27	Artificial Neural networks: Basic concepts, perceptron	Lecture, Group work, Discussion		
10	28	MLP, Activation Functions	Lecture, Group work, Discussion		
	29	ANN Architectures	Lecture, Group work, Discussion		
	30	Back Propagation Algorithm with Example	Lecture, Group work, Discussion		
11	31	Back Propagation Algorithm with Example	Lecture, Group work, Discussion	CT3	CLO3
	32	Deep learning and Convolutional Neural Network (CNN) Basics	Lecture, Presentation, Discussion		
	33	CNN Layers, Operations, Applications	Lecture, Presentation, Discussion		
12	34	Self-Supervised Learning: Generative and	Lecture, Group work, Discussion		

		Contrastive Learning			
	35	Recurrent Neural Networks (RNN) Basics, Back Propagation Through Time	Lecture, Group work, Discussion		
	36	LSTM, Bidirectional RNN, Gated Recurrent Unit, Transformer	Lecture, Group work, Discussion		
13	37	Reinforcement learning Basics, Markov Decision Process	Lecture, Group work, Discussion		
	38	Q Learning Algorithm with Example	Discussion, Group work		
	39	Recommendation System	Discussion, Presentation, Group work		
14	40	Recommendation System (cont.)	Discussion, Presentation, Group work		
	41	Review Class			
	42	Review Class			
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%

	Mid Term	15%
Final Exam		60%
Total Marks		100%

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Pattern Recognition and Machine Learning - Christopher M. Bishop; Springer
2. Machine Learning - Tom Mitchell, McGraw Hill (International Edition)
3. Introduction to Machine Learning, Second Edition - Ethem Alpaydin (2nd Edition)
4. Pattern Recognition –Sergios Theodoridis and Konstantinos Koutroumbas; Elsevier Inc.
5. Machine Learning: An Algorithmic Perspective - Stephen Marsland

Reference Sites

1. http://cs229.stanford.edu/
2. https://www.coursera.org/learn/machine-learning
3. https://see.stanford.edu/Course/CS229

CSE 4140: Machine Learning Sessional

Course Details

Course Code: CSE 4140

Course Title: Machine Learning Sessional

Course Type: Core Course

Level-Term: 4-I

Academic Session: Summer-2022

Course Teacher: Md. Mamun Hossain & Hasan Muhammad Kafi

Pre-requisite: Course Code: None, Course Title: None Credit Value: Credit Hours: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
The Machine Learning course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/nonparametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.
Course Objectives
1. To learn paradigms in different environmental setting and apply the appropriate learning algorithm to best suit the current need. 2. To enhance the learning parameters to achieve maximum performance. 3. To familiarize with a broad cross-section of models and algorithms for machine learning, and prepare for research or industry application of machine learning techniques.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Develop an appreciation for what is involved in learning models from data.	Y											
CLO2	Understand a wide variety of learning algorithms.	Y											
CLO3	Understand how to evaluate models generated from data and		Y										

	Enhance the learning parameters to achieve maximum performance.												
CLO4	Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.												Y

Y=yes

Course Plan:

Week	**Lab**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**
1	Lab-1	Design supervised, unsupervised and reinforcement model.	Lecture, Tutorials, Discussions	Pr, R	CLO1-CLO3
2	Lab-2	Implement Linear Regression model with cost function analysis.	Lecture, Tutorials, Group work, Discussion,		
3	Lab-3	Implement a Linear regression model using gradient descent algorithm.	Lecture, Tutorials, Group work, Discussion		
4	Lab-4	Implement a Multivariate linear regression model using gradient descent algorithm	Lecture, Tutorials, Group work, Discussion	Pr, R, MT	CLO1, CLO4

5	Lab-5	Implement logistic regression and decision tree.	Lecture, Tutorials, Group work, Discussion		
6	Lab-6	Design a SVM model for non-linear functionality	Lecture, Tutorials, Group work, Discussion		
7	Lab-7	Implement naïve bayes algorithm for classification.	Lecture, Tutorials, Group work, Discussion		
8	Lab-8	Applying a CART model on CSV dataset	Lecture, Tutorials, Group work, Discussion	Pr, R, P, TW	CLO2-CLO3
9	Lab-9	Applying k-fold validation method.	Lecture, Tutorials, Group work, Discussion		
10	Lab-10	Implementing Ensemble model with pre-trained models	Lecture, Tutorials, Group work, Discussion		
11	Lab-11	Implementing Genetic Algorithm	Lecture, Tutorials, Group work, Discussion	F, P, Pr, E	CLO1,CLO4
12	Lab-12	Unsupervised algorithm: k-means algorithm for clustering and classification,	Discussion, Presentation, Group work		

		optimization objective,			
13	Lab-13	Implementation of ANN model for classification.	Discussion, Presentation, Group work		
14	Lab-14	Implementation of LSTM and Bidirectional RNN	Discussion, Presentation, Group work		
Final					

(F-Final, P-Presentation, Pr-Project, R-Report, E-Evaluation, TW-Team Work, MT-Mid Term)

Assessment and Evaluation

Assessment Strategy

Components		Grading
Continuous Assessment (40%)	Attendance	25%
	Lab Report	15%
Mid Term		20%
Viva		10%
Quiz		10%
Lab Test		20%
Total Marks		**100%**

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Lab Test: Retake exam will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Pattern Recognition and Machine Learning - Christopher M. Bishop; Springer 2. Machine Learning - Tom Mitchell, McGraw Hill (International Edition) 3. Introduction to Machine Learning, Second Edition - Ethem Alpaydin (2nd Edition) 4. Pattern Recognition –Sergios Theodoridis and Konstantinos Koutroumbas; Elsevier Inc. 5. Machine Learning: An Algorithmic Perspective - Stephen Marsland.
Reference Sites
1. http://cs229.stanford.edu/ 2. https://www.coursera.org/learn/machine-learning 3. https://see.stanford.edu/Course/CS229

CSE 4251: Data Warehousing and Data Mining

Course Details:
Course Code: CSE 4251 Course Title: Data Warehousing and Data Mining Course Type: Core Course Level-Term: 4-II Academic Session: Summer-2022 Course Teacher: Dr. Mohammed Sowket Ali & Md. Mamun Hossain Pre-requisite: N/A Credit Hours: 3.00 Contact Hours: 3.00 Total Marks: 100%
Rationale
This course will provide students with in-depth knowledge, skills and understanding in the areas of Data Mining and Data Warehousing and a range of techniques, conceptual models and tools to develop into professionals in the areas of 'Data, Information and Knowledge Management', data mining approaches such as clustering, classification, regression etc. and its applicability in a wide range of application areas. It will also enable students with independent exploratory and research skills, linked with abilities to synthesize, integrate and critically analyses and compare features of the Knowledge Discovery/Data mining/Business Intelligence/Data Warehousing area.
Course Objectives

1. To learn the concepts and techniques of data is warehousing and the basic algorithms of data mining.
2. To learn how to apply data mining algorithms to discover interesting knowledge and make good decisions in real-world applications
3. To summarize the past history of the data and predict the future trends of the data.
4. To prepare for the potential research career in data mining, machine learning, and other data science areas.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Comprehend the basic concepts of the Data Warehousing and Data Mining	Y											
CLO2	Discover and measure interesting patterns from different kinds of dataset.				Y								
CLO3	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.			Y									
CLO4	Decide/Identify problems that can be addressed via data mining methods and evaluate models/		Y										

	algorithms with respect to their accuracy												

Y=yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction to Data Mining: What is data mining?	Lecture, Discussions	CT1	CLO1
	2	Data Mining Goals and its application	Lecture, Discussions		
	3	Stages of the Data Mining Process: The KDD Approach	Lecture, Discussions		
2	4	Data Mining Techniques, Knowledge Representation Methods and Data Mining Example.	Lecture, Discussions		
	5	Data object and attributes - Nominal, Binary, Ordinal	Lecture, Discussions		
	6	Statistical description of data, ensuring Central Tendency: Mean	Lecture, Tutorials, Discussion		

		Median and Mode, Measuring			
3	7	The Dispersion: Range, Quartile, Variance, Standard Deviation and Interquartile Range (IQR)	Lecture, Tutorials, Discussion		
	8	Proximity: Data Matrix Vs Dissimilarity Matrix, Proximity measure of Nominal, Binary and Ordinal Attributes	Lecture, Discussions		
	9	Dissimilarity of Numeric Data, Mikulski (Euclidian, Manhattan and supremum) Distances, Cosine Similarity	Lecture, Discussions		
4	10	Preprocessing overview: Data Quality	Lecture, Discussions	ASG	CLO4
	11	Data Cleaning- Missing values, Noisy data	Lecture, Tutorials, Discussion		
	12	Data Integration: Redundancy and	Lecture, Tutorials, Discussion		

		Correlation Analysis			
5	13	Data Reduction: Dimensionality Reduction – PCA	Lecture, Tutorials, Discussion		
	14	Data Transformation: normalization and Discretization: Binding	Lecture, Tutorials, Discussion		
	15	Data Warehouse Basic Concept: What is Data Warehouse? Why a separate Data Warehouse? OLTP Vs. OLAP	Lecture, Discussions		
6	16	Data Warehousing Architecture	Lecture, Tutorials, Discussion		
	17	Data Warehouse Modeling- Enterprise OLAP, Data Mart, ETL, Metadata Repository	Lecture, Tutorials, Discussion		
	18	Data Warehouse Multidimensional Data Model: Stars, Snowflakes, and Fact Constellations: Schemas	Lecture, Tutorials, Discussion		

7	19	OLAP Operations: Roll-up, Drill-down, Slice, Dice, Pivot; A Starnet Query Model	Lecture, Discussion		
	20	Mining Frequent patterns, Association and correlation: Market Basket Analysis, Frequent item set, close item set and Association Rule	Lecture, Discussion		
	21	Frequent item mining method: Apriori Algorithm	Lecture, Discussion		
Mid Term					CLO2-CLO3
8	22	Association Rule Generation: Support and Confidence. Strong Rule, Association, Correlation and Lift	Lecture, Discussion	CT2	CLO2, CLO3
	23	Patterns Evolution Measures	Lecture, Discussion		
	24	Supervised Machine Learning, Data	Lecture, Discussion		

		Classification: Classification and its Approaches			
9	25	Decision tree induction	Lecture, Group work, Discussion		
	26	Entropy, Information gain, Gain Ratio and Gini Index,	Lecture, Group work, Discussion		
	27	ID3, C4.5, CART, Rule based classification	Lecture, Group work, Discussion		
10	28	Bayes classification – The Naïve Bayes Classifier,	Lecture, Group work, Discussion		
	29	Class imbalance Problem	Lecture, Group work, Discussion		
	30	Model evaluation and selection: The Confusion matrix, Cross Benefit and ROC Curves	Lecture, Group work, Discussion		
11	31	Techniques to improve classification Accuracy: Ensemble model: Bagging, Boosting and Random Forest	Lecture, Discussion	CT3	CLO3
	32	Data Clustering: Basic Concepts and Methods	Lecture, Discussion		

	33	Cluster Analysis: Overview and Basic Concept, Basic Clustering Method, Hierarchical Methods: Agglomerative (Single, Average and Complete linkage) Vs Divisive	Lecture, Discussion		
12	34	Partitioning Methods: k-Means and k-Medoids	Lecture, Discussion		
	35	Evaluation of Clustering: Clustering Tendency, Number of Cluster and Quality of Cluster.	Lecture, Discussion		
	36	Deep Learning Techniques in Data mining.	Lecture, Group work, Discussion		
13	37	Outlier Detection: Outliers and Outlier Analysis: Types and Challenges	Lecture, Discussion		
	38	Outlier Detection Methods: Supervised, Semi-	Lecture, Discussion		

		supervised and Unsupervised Method; Statistical, Proximity and Cluster based Methods			
	39	Outlier Detection in High Dimension Data	Lecture, Discussion		
14	40	Mining Complex Data Types	Lecture, Discussion		
	41	Data Mining Applications and methodologies	Lecture, Discussion		
	42	Data Mining Trend and Research	Lecture, Discussion		
Final Exam					CLO2-CLO4

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment	05%
	Class Participation	05%
	Mid Term	15%
Final Exam		60%
Total Marks		100%
• Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for		

reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. • Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.
Learning Materials
Reference books
1. Data Mining: Concepts and Techniques, Third Edition by Han, Kamber & Pei (2013) 2. Introduction to data mining Second Edition by Tan, Steinbach & Kumar (2016) 3. Data Mining and Analysis Fundamental Concepts and Algorithms by Zaki & Meira (2014)
Reference Sites
1. http://cs229.stanford.edu/ 2. https://ocw.mit.edu/courses/sloan-school-of-management/15-062-data-mining/

CSE 4252: Data Warehousing and Data Mining Sessional

Course Details
Course Code: CSE 4252 Course Title: Data Warehousing and Data Mining Sessional Course Type: Core Course Level-Term: 4-II Academic Session: Summer-2022 Course Teacher: Md. Mamun Hossain Pre-requisite: N/A Credit Hours: 1.50 Contact Hours: 3.00 Total Marks: 100%

Rationale

Data Warehousing and Data Mining Sessional course is intended to implement data preprocessing, data analysis methods, visualization and decision-making concepts of data warehousing and data mining.

Course Objectives

1. To gain a working knowledge of the strengths and limitations of modern data mining methods (algorithms)
2. To learn to identify problems that can profitably be addressed via data mining methods.
3. To learn how to set up data for data mining experiments.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Gain a working knowledge of the strengths and limitations of modern data mining methods (algorithms).	Y											
CLO2	Learn to identify problems that can profitably be addressed via data mining methods		Y										
CLO3	Learn how to set up data for data mining experiments.		Y										

Y=yes

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**

1	1	Language: Python /R	Lecture and Lab Work		
2	2	Language: Python /R	Lecture and Lab Work	Q	
3	3	Language: Python /R	Lecture and Lab Work		
4	4	Data visualization techniques and Explanatory Data Analysis	Lecture and Lab Work		
5	5	Data Preprocessing: Data Cleaning, Filling missing Values, Normalization, Data Transformation etc.	Lecture and Lab Work	ASG/Pr	CLO1
6	6	Implementing association analysis: Association Rules Mining, Finding Correlation and Covariance.	Lecture and Lab Work		
7	7	Supervised Learning: Regression –Simple Linear Regression, Multivariate Linear Regression	Lecture and Lab Work		
8	8	Supervised Learning: Classification – SVM, Naïve Bayes, Random Forest, Logistic Regression etc.	Lecture and Lab Work	Pr, F	CLO2, CLO3

9	9	Model Evaluation – Confusion Matrix, Accuracy, Error, Sensitivity, Specificity, F1Score, ROC, AUC etc.	Lecture and Lab Work		
10	10	Unsupervised Learning: Clustering Analysis - k-means cluster, Hierarchical cluster, DB Scan,	Lecture and Lab Work		
11	11	Unsupervised Learning: PCA-Dimensionality Reduction	Lecture and Lab Work		
12	12	Deep Learning Techniques: CNN & RNN	Lab Work & Discussion	R	CLO3
13	13	Deep Learning Based Project	Lab Work & Discussion		
14	14	Lab Final & Quiz			
Final Exam					CLO2-CLO3
(F-Final, P-Presentation, Pr-Project, R-Report, E-Evaluation, TW-Team Work, MT-Mid Term, ASG-Assignment, Q-Quiz)					

Assessment and Evaluation		
Assessment Strategy		
Components		Grading
Continuous Assessment (60%)	Lab Performance	15%
	Lab Report	15%
	Class Participation	10%
	Mid Term	20%
Viva		10

Final Test + Quiz	30%
Total Marks	100%

- Missed Class Quiz, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB- Referred, Improvement and Backlog exams will be conducted according to the Examination Policy for Undergraduate Programs, BAUST.

Learning Materials

Reference books

1. Data Mining: Concepts and Techniques, Third Edition by Han, Kamber & Pei (2013)
2. Introduction to data mining Second Edition by Tan, Steinbach & Kumar (2016)
3. Data Mining and Analysis Fundamental Concepts and Algorithms by Zaki & Meira (2014)

Reference Sites

1. http://cs229.stanford.edu/
2. https://ocw.mit.edu/courses/sloan-school-of-management/15-062-data-mining/

CSE 4131: Artificial Neural Networks and Fuzzy Systems

Course Details

Course Code: CSE 4131

Course Title: Artificial Neural Networks and Fuzzy Systems

Course Type: Optional Course

Level-Term: 4-I

Academic Session: Summer-2022

Course Teacher/Instructor: Dr. Jahangir Alam

Pre-requisite: MATH-1141, PHY-1103, MATH-2145, EEE-1163, EEE-1269, MATH-2247

Credit Value: 3.0

Contact Hours: 3.00

Total Marks: 100%

Rationale

This course is designed to study the developing the skills to gain a basic understanding of neural network theory and fuzzy logic theory. It includes topics to develop and implement a basic trainable neural network and fuzzy logic system for a typical control, computing application or biomedical application.

Course Objectives

To develop the OBE learning system in engineering field, the students will able to achieve the fundamentals knowledge of Artificial Neural Networks and Fuzzy Systems as well as its applications are in the following,

1. The principal objective of this subject is to introduce students to neural networks and fuzzy theory from an engineering perspective
2. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
3. Explore the functional components of neural network classifiers or controllers, and the functional components of fuzzy logic classifiers or controllers.
4. Develop and implement a basic trainable neural network or a fuzzy logic system for a typical control, computing application or biomedical application.
5. As trainable dynamic systems, these intelligent control systems can learn from experience with numerical and linguistic sample data.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLO)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLOs)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO 1	Understanding Neuron Model and Network Architectures, Perceptron.	√											
CLO 2	Evaluate Backpropagation, Linear Filters, Kernel Methods and Radial Basis Networks, Neurodynamic, Recurrent Networks Fuzzy System.		√										

CLO 3	Apply ANN in Control Systems, PCA, Stochastic Methods Rooted in Statistical Mechanics, Convolution networks.					√							

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Biological nervous system: brain and neurons;	Lecture, Tutorials	CT1, Homework	CLO1
	2	Introduction to artificial neural network, Theory and application of ANN and Fuzzy logic;	Lecture, Discussions		
	3	Learning Process: Error-Correction Learning, Memory Based Learning;	Lecture, Discussion		
2	4	Hebbian, Boltzmann, Statistical Learning Theory.	Lecture, Discussion		
	5	Neuron Model and Network Architectures	Lecture, Discussion		
	6	Perceptron: Perceptron Convergence Theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment, Perceptron Architecture, creating a Perceptron, Learning Rules, Perceptron Learning Rule;	Lecture, Tutorials, Discussion		
3	7	Multilayer Perceptron, Batch Learning and On-Line Learning.	Lecture, Discussion		
	8	Back-Propagation Algorithm, XOR Problem, Decision Rule, Differentiation;	Lecture, Discussion		

	9	Hessian Matrix, Computer Experiment: Pattern Classification, Hessian and Its Role in On-Line Learning.	Lecture, Tutorials, Discussion		
4	10	Optimal Annealing and Adaptive Control of Learning Rate, Generalization, Approximations of Functions, Cross-Validation;	Lecture, Tutorials, Discussion	Assignment/ Homework	CLO2, CLO5
	11	Complexity Regularization and Network Pruning, Virtues and Limitations of Back-Propagation Learning.	Lecture, Tutorials, Discussion		
	12	Convolutional Networks, Nonlinear Filtering.	Lecture, Discussion		
5	13	Perceptron: Multilayer Perceptron, Back-Propagation Algorithm.	Lecture, Discussion		
	14	Perceptron: XOR Problem, Decision Rule.	Lecture, Discussion		
	15	Perceptron: Differentiation, Hessian Matrix, Generalization.	Lecture, Discussion		
6	16	Perceptron: Cross-Validation, Network Pruning Technique.	Lecture, Discussion		
	17	Perceptron: Convolutional Network.	Lecture, Discussion		
	18	Linear Filters: MSE, Linear System Design, Linear Networks with Delays, LMS Algorithm, Linear Classification, The Wiener Filter, Markov Model.	Lecture, Tutorials, Discussion		
7	19	The Langevin Equation: Characterization of Brownian Motion, Kushner's Direct-Averaging Method, Statistical LMS	Lecture, Tutorials, Discussion		

		Learning Theory for Small Learning-Rate Parameter.			
	20	Backpropagation: Fundamentals, Faster Training, Back propagation algorithm, Variable Learning Rate, Resilient Backpropagation, Conjugate Gradient Algorithms, Line Search Routines, Quasi-Newton Algorithms, Levenberg-Marquardt, Reduced Memory Levenberg-Marquardt, Speed and Memory Comparison, Improving Generalization, Preprocessing and Postprocessing.	Lecture, Tutorials, Discussion		
	21	Control Systems: NN Predictive Control, NARMA-L2 (Feedback Linearization) Control, Model Reference Control.	Lecture, Discussion		
Midterm Examination				Written Exam	CLO1-CLO3
8	22	Kernel Methods and Radial Basis Networks: Cover's Theorem on the Separability of Patterns, Radial Basis Functions, Radial basis network, K-Means Clustering, Recursive Least-Squares Estimation of the Weight Vector, Hybrid Learning Procedure for RBF Networks, Generalized Regression Networks, Probabilistic Neural Networks.	Lecture, Tutorials, Discussion	CT2	CLO3, CLO4
	23	Support Vector Machines: Optimal Hyperplane for Linearly Separable Patterns, Optimal Hyperplane for	Lecture, Tutorials, Discussion		

		Nonseparable Patterns, Support Vector Machine Viewed as a Kernel Machine, Design of Support Vector Machines, XOR Problem.			
	24	Regularization Theory: Hadamard's Conditions for Well-Posedness, Tikhonov's Regularization Theory, Regularization Networks, Generalized Radial-Basis-Function Networks, Generalized Regularization Theory, Spectral Graph Theory, Laplacian Regularized Least-Squares Algorithm.	Lecture, Discussion		
9	25	Principal-Components Analysis: Principles of Self-Organization, Self-Organized Feature Analysis, Principal-Components Analysis: Perturbation Theory, Hebbian-Based Maximum Eigenfilter, Hebbian-Based Principal-Components Analysis, Kernel Principal-Components Analysis, Kernel Hebbian Algorithm.	Lecture, Group work, Discussion		
	26	Self-Organizing and Learning Vector Quantization (LVQ) Nets: Self-organization map, Contextual Maps, Hierarchical Vector Quantization, Kernel Self-Organizing Map, Competitive Learning, Learning Vector Quantization Networks.	Lecture, Tutorials, Discussion		

	27	Stochastic Methods Rooted in Statistical Mechanics: Statistical Mechanics, Markov Chains, Metropolis Algorithm, Simulated Annealing, Gibbs Sampling, Boltzmann Machine, Logistic Belief Nets, Deep Belief Nets, Deterministic Annealing, Markov Decision Process, Q-Learning.	Lecture, Tutorials, Discussion		
10	28	Neurodynamics: Neurodynamic Models, Manipulation of Attractors as a Recurrent Network Paradigm, Hopfield Model, Cohen–Grossberg Theorem, Brain-State-In-A-Box Model, Strange Attractors and Chaos, Dynamic Reconstruction of a Chaotic Process.	Lecture, Discussion		
	29	Recurrent Networks: Recurrent Network Architectures, Learning Algorithms, Learning Algorithms, Back Propagation Through Time, Real-Time Recurrent Learning, Elman Networks, Hopfield Network	Lecture, Group work Discussion		
	30	Adaptive Filters and Adaptive Training: Linear Neuron Model, Adaptive Linear Network Architecture, Mean Square Error, LMS Algorithm, Adaptive Filtering, Failing Adaptive Linear (ADALINE) and Multiple Adaptive Linear (MADALINE) networks, Generating internal	Lecture, Group work, Discussion		

		representation, Cascade correlation and counter propagation networks.			
11	31	Higher order and bi-directional associated memory, Lyapunov energy function, attraction basin,	Lecture, Group work, Discussion	CT3, Project	CLO3-CLO4
	32	Probabilistic updates: simulated annealing, Boltzmann machine, Adaptive Resonance Theory (ART) network. ARTI. ART2. Fuzzy ART mapping (ARTMAF) networks. Kohonen feature.	Lecture, Discussion		
	33	Learning Vector Quantization (LVQ) networks, State-Space Models, Kalman Filters, Kalman Filtering in Modeling of Brain Functions.	Lecture, Discussion		
12	34	Fuzzy System: Fuzzy set theory, Fuzzy relations, Fuzzy Logic controllers, Applications of fuzzy systems, Fuzzy neural networks.	Discussion, Tutorials		
	35	Fuzzy Applications: Fuzzy pattern recognition, fuzzy control systems. Applications of fuzzy neural systems; Fuzzy Inference.	Discussion, Group work		
	36	Fuzzy Non-linear Simulation: Fuzzy non-linear simulation, fuzzy decision making, cluster analysis, fuzzy c-means.	Lecture, Tutorials, Discussion		
13	37	Genetic algorithm and evolution compacting, Applications to control;	Lecture, Discussion		
	38	Pattern recognition;	Lecture, Discussion		

	39	Nonlinear system modeling.	Lecture, Group work, Discussion		
14	40	Speech and image processing.	Lecture, Group work, Discussion		
	41	Review Class			
	42	Review Class			
Final Examination				Written Exam	CLO2-CLO4

Assessment and Evaluation:

Assessment Strategy

Continuous assessment in class room and closed book final examination system.

Marks distribution:

Assessment and Evaluation Factor		Marks
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment/Homework	05%
	Class Participation	05%
	Mid Term	15%
	Project	10%
Final Examination		60%
Total Marks		100%

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB (Referred, Improvement and Backlog) exams will be conducted according to the Examination Policy for Undergraduate Programs of BAUST.

Learning Materials:
Recommended Readings/Reference Text books 1. Neural Networks and Deep Learning: A Textbook 1st ed. 2018 Edition by Charu C. Aggarwal. 2. Neural Network, Fuzzy Logic and Genetic Algorithms by S. Rajesekaran, G. A. Vijayalakshmi 3. Introduction to Neural Networks, Fuzzy Logic & Genetic algorithms by Sudarshan K. Valluru, T. NageswaraRao 4. Neural Networks and Fuzzy Logic St ed. Edition by Naga Bhaskar (Author), G Vijay Kumar (Author) 5. Control Engineering Theory & Applications, by Jahangir Alam, et al. 6. Deep Learning with Python, Second Edition 2nd Edition, by Francois Chollet (Author) 7. Fundamental of Artificial Neural Network and Fuzzy Logic Paperback January 1, 2010 by Rajesh Kumar (Author) 8. Fuzzy logic with Engineering Applications, McGraw Hill, New york, 1996, by Timothy J. Ross.

CSE 4132: Artificial Neural Networks and Fuzzy Systems Sessional

Course Details
Course Code: CSE 4132 Course Title: Artificial Neural Networks and Fuzzy Systems Sessional Course Type: Optional Course Level-Term: 4-I Academic Session: Summer Course Teacher/Instructor: Dr. Jahangir Alam Pre-requisite: MATH-1141, PHY-1103, MATH-2145, EEE-1163, EEE-1269, MATH-2247 Credit Value: 0.75 Contact Hours: 1.50 Total Marks: 100%
Rationale
This course is designed to study the developing the skills to gain a basic understanding of neural network theory and fuzzy logic theory. It includes topics to develop and implement a basic trainable

neural network and fuzzy logic system for a typical control, computing application or biomedical application.

Course Objectives

To develop the OBE learning system in engineering field, the students will able to achieve the fundamentals knowledge of Artificial Neural Networks and Fuzzy Systems as well as its applications are in the following,

1. The principal objective of this subject is to introduce students to neural networks and fuzzy theory from an engineering perspective
2. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
3. Explore the functional components of neural network classifiers or controllers, and the functional components of fuzzy logic classifiers or controllers.
4. Develop and implement a basic trainable neural network or a fuzzy logic system for a typical control, computing application or biomedical application.
5. As trainable dynamic systems, these intelligent control systems can learn from experience with numerical and linguistic sample data.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLO)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understanding Neuron Model and Network Architectures, Perceptron.	Y											
CLO2	Design Artificial Neural Network to solve complex engineering problems.		Y		Y								
CLO3	Evaluate the theoretical concepts implemented in practical systems.				Y								

Course Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**

1	1	Neuron Model and Network Architectures	Practical Experiments	Assignment/ Homework/ Lab Report	CLO1 - CLO5
2	2	Perceptron, Linear Filters			
3	3	Backpropagation			
4	4	Control Systems			
5	5	Kernel Methods and Radial Basis Networks			
6	6	Support Vector Machines			
7	7	Midterm evaluation	Quiz/Test, Experiments		
8	8	Self-Organizing and Learning Vector Quantization (LVQ) Nets	Practical Experiments	Assignment/ Homework/ Lab Report	
9	9	Recurrent Networks			
10	10	Adaptive Filters and Adaptive Training			
11	11	Fuzzy neural networks.			
12	12	Principal-Components Analysis			
13	13	Speech and image processing.			
14	14	Lab Final Examination	Quiz/Test, Experiments		

Assessment and Evaluation:

Assessment Strategy

Continuous assessment in class room and closed book final examination system.

Marks distribution:

Assessment and Evaluation Factor		Marks
Continuous Assessment (70%)	Class Participation	25%
	Lab Report	15%
	Assignment/Homework	10%
	Mid Term	10%
	Viva	10%
Final Examination (Lab Final & Quiz)		30%
Total Marks		100%

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and

legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam. • Missed Final Term: RIB (Referred, Improvement and Backlog) exams will be conducted according to the Examination Policy for Undergraduate Programs of BAUST.
Learning Materials:
Recommended Readings/Reference Text books **1.** Neural Networks and Deep Learning: A Textbook 1st ed. 2018 Edition by Charu C. Aggarwal. **2.** Network, Fuzzy Logic and Genetic Algorithms by S. Rajesekaran, G. A. Vijayalakshmi. **3.** Introduction to Neural Networks, Fuzzy Logic & Genetic algorithmsby Sudarshan K. Valluru, T. NageswaraRao. **4.** Neural Networks and Fuzzy Logic St ed. Edition by Naga Bhaskar (Author), G Vijay Kumar (Author). **Supplementary Readings** 1. Control Engineering Theory & Applications, by Jahangir Alam, et al. 2. Deep Learning with Python, Second Edition 2nd Edition, by Francois Chollet (Author) 3. Fundamental of Artificial Neural Network and Fuzzy Logic Paperback January 1, 2010 by Rajesh Kumar (Author) **4.** Fuzzy logic with Engineering Applications, McGraw Hill, New york, 1996, by Timothy J. Ross.

CSE 4245: Digital Image Processing

Course Details
Course Code: CSE 4245 Course Title: Digital Image Processing Course Type: Optional Level-Term: 4-II Academic Session: Summer-2022 Course Teacher/Instructor: Dr. Jahangir Alam Pre-requisite: CSE 3107 Credit Value: 3.0 Contact Hours: 3.00 Total Marks: 100%
Rationale
Digital Image Processing (DIP) is a specialty-related elective/optional course for the Engineering students. This course introduces digital image processing. It focuses on the theory and algorithms underlying a range of tasks including image acquisition and formation, enhancement, restoration, compression, segmentation and object recognition, etc.
Course Objectives
To develop the OBE learning system in engineering field, the students will able to achieve the fundamentals knowledge of Digital Image Processing as well as its applications are in the following, Teaching Objectives 1. Understanding theory and applications of Digital Image Processing; 2. Integration and interfacing with modern engineering integration; Student Outcomes After learning DIP & its applications, the students will achieve, 1. The high-level technology applications in applied fields of computer vision, machine vision, automation systems, robotics, mechatronics, computing system, etc. which can be acquired the knowledge by the students. 2. The students can apply the knowledge in the different perspective engineering fields. 3. Integrate concepts of various image processing algorithms. 4. be conversant with the mathematical description of image processing techniques and algorithms 5. Interpret image storage, sampling, and frequency domain processing operations.

6. Evaluate current technologies and issues that are specific to image processing systems.

Applicable specialty

The course "Digital Image Processing" is applicable in Engineering such as in computer vision, machine vision, automation systems, robotics, mechatronics, computing system, Biomedical Engineering, Aerospace Engineering, Industrial process Engineering, Robotics, and so on.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLO)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Demonstrate a knowledge of a broad range of fundamental image processing and image analysis techniques and concepts	Y											
CLO2	Identify, Demonstrate and apply their knowledge by analyzing image processing problems and recognizing and employing (or proposing) effective solutions		Y	Y									
CLO3	Evaluate image processing algorithms and object detection, tracking, Neural network, deep learning.		Y										
CLO4	Analyze the requirements for picture sampling and quantization, as well as their repercussions.			Y									
CLO5	Design and create practical solutions to a range of common image processing problems and to critically assess the results of their solutions, including shortcomings				Y								

Y=Yes

Course Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Digital Image Fundamental	Lecture, Discussions	CT1, Homework	CLO1
	2	Elements of Visual Perception	Lecture, Tutorials, Discussions		
	3	Light and the Electromagnetic Spectrum	Lecture, Discussion		
2	4	Image Sensing and Acquisition	Lecture, Discussion		
	5	Basic Relationships between Pixels, Mathematical Tools Used in Digital Image Processing	Lecture, Discussion		
	6	Image Sampling and Quantization	Lecture, Tutorials, Discussion		
3	7	Intensity Transformation Functions	Lecture, Tutorials, Discussion		CLO1
	8	Image Negatives, Log Transformations,	Lecture, Tutorials, Discussion		
	9	Gray-level, bit-plane slicing	Lecture, Discussion		
4	10	Histogram Processing	Lecture, Discussion		
	11	Histogram Equalization,	Lecture, Discussion		

	12	Histogram Matching (Specification), Local Histogram Processing	Lecture, Tutorials, Discussion	Assignment/Homework	CLO2, CLO5
5	13	Basic of Spatial Filtering	Lecture, Discussion		
	14	Smoothing Spatial Filters – Average filter, Gaussian filter,	Lecture, Discussion		
	15	Sharpening Spatial Filters- the gradient, The Laplacian	Lecture, Discussion		
6	16	Frequency Domain Filtering: Fourier Series and Transform	Lecture, Tutorials, Discussion		
	17	1D & 2D Discrete Fourier Transform (DFT)	Lecture, Tutorials, Discussion		
	18	Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters	Lecture, Tutorials, Discussion		
7	19	Homomorphic filtering, FFT, Image restoration and Reconstruction: Degradation/ restoration process	Lecture, Tutorials, Discussion		
	20	Noise Models, Minimum Mean Square Error (Wiener) Filtering,	Lecture, Tutorials, Discussion		
	21	Geometric Mean Filter	Lecture, Discussion		

Mid Term					CLO1-CLO3
8	22	Color Image Processing: Color Fundamentals, Color Models, Pseudo color Image Processing,	Lecture, Tutorials, Discussion	CT2	CLO3, CLO4
	23	Basics of Full-Color Image Processing, Color Transformations	Lecture, Tutorials, Discussion		
	24	Smoothing and sharpening of color image	Lecture, Discussion		
9	25	Image Compression: Fundamentals, types of redundancies, Image Compression model	Lecture, Group work, Discussion		
	26	Huffman Coding, Run-Length Coding	Lecture, Tutorials, Discussion		
	27	Discrete Cosine Transform (DCT), JPEG, MPEG, Karhunen and Loeve Transform (KLT)	Lecture, Tutorials, Discussion		
10	28	Morphological Image Processing: Basics, Erosion and Dilation, Opening and Closing	Lecture, Discussion		
	29	Basic Morphological Algorithms: Boundary Extraction, Hole Filling, Extraction of Connected Components	Lecture, Discussion		

	30	Convex Hull, Thinning, Thickening, Skeletons, Pruning	Lecture, Group work, Discussion		
11	31	Image Segmentation: Mathematical background,	Lecture, Group work, Discussion	CT3, Project	CLO3-CLO4
	32	*Point* and Line detection, Edge model, Basic Edge Detection	Lecture, Discussion		
	33	Advance Edge Detection: Mar-Hildreth and Canny	Lecture, Discussion		
12	34	Edge Linking: Basics, Local Processing, Hough Transform	Discussion, Tutorials		
	35	Thresholding: Basics, Otsu's Method	Discussion, Group work		
	36	Region-Based Segmentation, Segmentation Using Morphological Watersheds	Lecture, Tutorials, Discussion		
13	37	Wavelets in image processing	Lecture, Discussion		
	38	Object Recognition: Prototype Matching, Optimum Statistical Classifiers	Lecture, Tutorials, Discussion		
	39	Neural Networks and Deep Learning: Fundamentals, Back	Lecture, Group		

		Propagation, Multilayer Feedforward Neural Networks	work, Discussion		
14	40	Deep Convolution Neural Networks	Lecture, Group work, Discussion	ASG	CLO4
	41	Review Class			
	42	Review Class			
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy:

Continuous assessment in class room and closed book final examination system.

Marks distribution:

Assessment and Evaluation Factor		Marks	CLO	Bloom Taxonomy
Continuous Assessment (40%)	Class Test (1-3)	15%	CLO1, CLO3	C1, C2-C5, P5
	Assignment/Homework	05%	CLO2, CLO5	C2, C3
	Class Participation	05%	CLO3, CLO4	A2
	Mid Term	15%	CLO1, CLO2	A3, C2-C6
	Project	10%	CLO5	C2-C6
Final Examination		50%	CLO1, CLO3, CLO4	C2-C5, P5, C3-C4
Total Marks		100%		
CO=Course Outcomes, C=Cognitive Domain, P=Psychomotor Domain, A=Affective Domain				

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB (Referred, Improvement and Backlog) exams will be conducted according to the Examination Policy for Undergraduate Programs of BAUST.

Learning Materials

Recommended Readings/Reference Text books

1. Digital Image Processing. Fourth Edition. Rafael C. Gonzalez & Richard E.
2. Digital Image Processing using MATLAB. Second Edition. Rafael C. Gonzalez & Richard E.

CSE 4246: Digital Image Processing Sessional

Course Details

Course Code: CSE 4246

Course Title: Digital Image Processing Sessional

Course Type: Optional

Level-Term: 4-II

Academic Session: Summer-2022

Course Teacher/Instructor: Dr. Jahangir Alam

Pre-requisite: CSE 3107

Credit Value: 1.5

Contact Hours: 3.00

Total Marks: 100%

Rationale

Digital Image Processing Sessional course is designed to implement various image processing mechanisms to process image pixel in spatial and frequency domain.

Course Objectives

1. To obtain practical experience using image processing techniques on real time image.
2. To able to enhance image for real time application.
3. To able to apply segmentation techniques to partition image into meaningful regions with respect to a particular application.

Course Content

Laboratory works based on CSE 4245.

Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

CLOs	Course Learning Outcomes (CLOs) (Upon completion of the course, the students will be able to)	Program Learning Outcomes (PLOs)											
		1	2	3	4	5	6	7	8	9	10	11	12
CLO1	Understand the fundamentals of image processing and enable to work with pixels in an image	Y		Y									
CLO2	Choosing the appropriate approach to enhance image for a particular application			Y									

CLO3	Implement various Image Processing algorithms to solve real-world applications.				Y								

Y=Yes

Course Plan

Week	**Lab**	**Topics**	**Remarks**
1	1,2	Introduction to Digital Image Processing Using Matlab/Python	
3	3,4	Some basic Intensity transformation function	
5	5,6	Histogram Processing	
7	7,8	Spatial Filter	
9	9,10	Edge Detection	
11	11,12	Segmentation	
13	13,14	Image Compression	

Assessment Strategy

Components		**Grading**	**CLOs**	**Bloom Taxonomy**
Continuous Assessment (40%)	Lab Test	20%	CLO2	C3
			CLO3	C4
	Class Participation	5%	CLO1	P1
	Assignment	15%	CLO3	C3, C4
Online Test-1		20%	CLO1	P1
			CLO2	C2
Online Test-2		20%	CLO1	P1
			CLO2	C2
Viva/Quiz		20%	CLO2	C3-C6
Total Marks		100%	CLO3	

(CO=Course Outcomes, C=Cognitive Domain, P=Psychomotor Domain, A=Affective Domain)

Reference books

1. Digital Image processing using MATLAB, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins

CSE 4243: Control System

Course Details:
Course Code: CSE 4243 Course Title: Control System Course Type: Optional Course Level-Term: 4-I/4-II Academic Session: Summer-2022 Course Teacher/Instructor: Dr. Jahangir Alam Pre-requisite: MATH 1141, PHY 1103, MATH 2145, EEE 1163, EEE 1269, MATH 2247 Credit Value: 3.0 Contact Hours: 3.00 Total Marks: 100%
Rationale
The course deals with fundamental concepts of control system terminology, performance analysis in time & frequency domain and various graphical methods for stability analysis. At the end of the course the students will be able to model electrical, mechanical and electro- mechanical systems, design controllers for various inter-disciplinary applications.
Course Objectives
To develop the OBE learning system in engineering field, the students will able to achieve the fundamentals knowledge of Control System as well as its applications are in the following, 1. To provide with basic knowledge of control systems, associated terminologies, transfer function. 2. To make students familiar with basic electrical, mechanical & electromechanical system and their representation in Differential Equation /Transfer function form. 3. To understand different methods to simplify large system and represent in a single transfer function block. 4. To make students familiar with system performance analysis in time & frequency domain. 5. To empower students to understand the system stability using Routh-Hurtwitz (RH) criteria, Root Locus techniques in time domain and Bode plot and Nyquist technique in frequency domain 6. To provide basic pathway to design controllers & compensators for a particular system to meet desired response.
Mapping of Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs):

CLOs	**Course Learning Outcomes (CLOs)**	**Program Learning Outcomes (PLO)**

	(Upon completion of the course, the students will be able to)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Understand the general concept of a system and classify systems into different types and represent a system using different techniques like block diagram, signal flow graph.			Y									
CLO2	Understand the general concept of a system and classify systems into different types and represent a system using different techniques like block diagram, signal flow graph.				Y								
CLO3	Analyze system's absolute and relative stability using different time and frequency domain methods.						Y						

Course Plan/Lecture Plan:

Week	Lecture	Topic	Teaching-Learning Strategy	Assessment Strategy	Corresponding CLOs
1	1	Introduction to Control Systems & Theory: Definition of Control Systems & Theory, Terminologies, Examples of Control System, Robust Control System, Control System Performance & Design Process, Test Waveforms Used in Control Systems, Historical Review; Examples.	Lecture, Tutorials, Discussions	CT, Homework	CLO1
	2	Transfer Function and Mathematical Modeling of Control Systems Introduction, Transfer Function,	Lecture, Tutorials, Discussions		

		Convolution Integral of LTI System, Impulse Response Function, Laplace Transform Theorems & Table, Function Transformations, Automatic Control Systems Representation, Different Kinds of Block Diagram; Examples.		ASG	CLO1
	3	Mathematical Modeling of Mechanical system and Electrical & Electronic Systems: Mechanical system, Electrical and Electronic Systems, Electromechanical System; Examples.	Lecture, Discussion		
2	4	Mathematical Modeling of Mechanical system and Electrical & Electronic Systems: Mechanical system, Electrical and Electronic Systems, Electromechanical System; Examples.	Lecture, Discussion		
	5	Reduction of Block Diagram: Procedures for Drawing Block Diagram, Reduction of Block diagram; Examples.	Lecture, Discussion		
	6	Signal Flow Graphs & Mason's Rules: Signal Flow Graphs, Terms of Signal Flow Graph, Signal Flow Graph Algebra, Signal Flow Graph of Linear System, Signal Flow Graphs of Control Systems,	Lecture, Tutorials, Discussion		CLO2

		Mason's Gain Formula for Signal Flow Graphs; Examples.		Homework	
3	7	Signal Flow Graphs & Mason's Rules: Signal Flow Graphs, Terms of Signal Flow Graph, Signal Flow Graph Algebra, Signal Flow Graph of Linear System, Signal Flow Graphs of Control Systems, Mason's Gain Formula for Signal Flow Graphs; Examples.	Lecture, Tutorials, Discussion	Assignment /Homework	CLO3
	8	1st Order Transient and Steady State Response Analyses: Typical Test Signals & Functions, Absolute & Relative Stability, Steady-State Error.	Lecture, Tutorials, Discussion		
	9	1st Order Transient and Steady State Response Analyses: First-Order Systems, Characteristics of Exponential Response Curve, Important Property of LTI Systems, 2nd-Order Systems, Servo System; Examples.	Lecture, Discussion		
4	10	2nd Order Transient and Steady State Response Analyses: Dynamic Behavior of 2nd-order system, Transient Response Specifications.	Lecture, Tutorials, Discussion	Assignment /Homework	CLO2, CLO5
	11	2nd Order Transient and Steady State Response Analyses: 2nd	Lecture, Discussion		

		Order Systems: Rise Time, Peak Time, Maximum Overshoot, Settling Time.			
	12	Servo System with Velocity Feedback & Transient Response of Higher-Order Systems: Servo System with Velocity Feedback, Impulse Response of 2^{nd} Order Systems;	Lecture, Tutorials, Discussion		
5	13	Servo System with Velocity Feedback & Transient Response of Higher-Order Systems: Transient Response of Higher-Order Systems, Real poles and pairs of complex-conjugate poles, Dominant Closed-Loop Poles, Examples.	Lecture, Tutorials, Discussion	Assignment /Homework	CLO2, CLO5
	14	Stability Analysis & Criterion: Stability Analysis, Stability Analysis in Complex Plane, Routh's Stability Criterion.	Lecture, Discussion		
	15	Stability Analysis & Criterion: Relative Stability Analysis, Application of Routh's Stability Criterion; Examples.	Lecture, Discussion		
6	16	Effects of Control Actions on System Performance: Proportional Control of Systems, Integral Control of Systems, Response to Torque Disturbances;	Lecture, Tutorials, Discussion	Assignment /Homework	CLO2, CLO5

	17	Effects of Control Actions on System Performance: Derivative Control Action, Proportional Control of Systems with Inertia Load, Proportional +Deviation Control of Systems with Inertia Load, Classification of Control Systems;	Lecture, Tutorials, Discussion		
	18	Effects of Control Actions on System Performance: SSE in Unity-Feedback Control System, Steady State Errors (SSE); Examples.	Lecture, Tutorials, Discussion		
7	19	Steady-State Error in Terms of Gain K: Steady-State Error in Terms of Gain K;	Lecture, Tutorials, Discussion		
	20	Steady-State Error in Terms of Gain K: Summary: Steady-State Error in Terms of Gain K Root Locus Method;	Lecture, Tutorials, Discussion		
	21	Steady-State Error in Terms of Gain K: Steady-state Errors for Disturbances; Examples.	Lecture, Discussion		
					CLO1-CLO3
8	22	Roots Locus Plots of Negative Feedback Systems: Root Locus Method of Negative Feedback Systems, Root Locus Method: Angle & Magnitude Conditions;	Lecture, Tutorials, Discussion	CT2	CLO3, CLO4
	23	Roots Locus Plots of Negative Feedback Systems: General	Lecture, Tutorials, Discussion		

		Rules for Constructing Root Loci; Examples.		CT	CLO3, CLO4
	24	Example of Roots Locus Plots of Negative Feedback Systems: Examples of Root Locus Method of Negative Feedback Systems, Root Locus Method: Angle & Magnitude Conditions;	Lecture, Discussion		
9	25	Example of Roots Locus Plots of Negative Feedback Systems: General Rules for Constructing Root Loci; Examples.	Lecture, Group work, Discussion		
	26	Comments on Roots Locus Plots of Negative Feedback Systems and Overview of Positive Feedback Systems: Comments on Roots Locus Plots and Roots Locus Plots Positive Feedback Systems; Examples.	Lecture, Tutorials, Discussion		
	27	Introduction of Control System Analysis and Design by Frequency Response Analyses: Preliminary Design Consideration, Design by Root-Locus Method;	Lecture, Tutorials, Discussion	Assignment /Homework	CLO5
10	28	Introduction of Control System Analysis and Design by Frequency Response Analyses: Series Compensation, Parallel (or Feedback) Compensation,	Lecture, Discussion		

		Series Compensation & Parallel (or Feedback) Compensation, Commonly Used Compensators-Output, Region;		Assignment /Homework	CLO5
	29	Introduction of Control System Analysis and Design by Frequency Response Analyses: System Types, Device, Control Systems, Effects of the Additional Poles & Zeros, Steady-State O/P to Sinusoidal I/P; Examples.	Lecture, Discussion		
	30	Frequency-Response Characteristics, Basic Factors of G(jω) H(jω), Resonant Frequency: Bode Diagrams, Log Plots, Basic Factors, Presenting Frequency-Response Characteristics in Graphical Forms;	Lecture, Group work, Discussion		
11	31	Frequency-Response Characteristics, Basic Factors of G(jω) H(jω), Resonant Frequency: Basic Factors of G(jω) H(jω), Resonant Frequency and the Resonant Peak Value; Examples.	Lecture, Group work, Discussion	CT3, Project	CLO3-CLO4
	32	Procedure for Plotting Bode Diagrams, and System Types: General Procedure for Plotting Bode Diagrams, Minimum & Nonminimum-Phase Systems,	Lecture, Discussion		

		Transport Lag, System Type & Log-Magnitude Curve,			
	33	Procedure for Plotting Bode Diagrams, and System Types: Determination of Static Velocity Error Constants, Static Position Error Constants, Static Acceleration Error Constants; Examples.	Lecture, Discussion	Assignment /Homework	CLO5
12	34	Polar Plots, General Shapes of Polar plots: Polar Plots, General Shapes of Polar plots; Examples.	Discussion, Tutorials		
	35	Nyquist Stability, Mapping Theorem: Nyquist Stability, Mapping Theorem; Examples.	Discussion, Group work		
	36	Nyquist Stability, Mapping Theorem: Poles-Zeros on jω axis, Stability Analysis, Conditionally Stable Systems, & Multiple-loop System: Poles-Zeros on jω axis, Stability Analysis, Conditionally Stable Systems, Multiple-loop System; Examples.	Lecture, Tutorials, Discussion		
13	37	Nyquist Stability to Inverse Polar Plot, Relative Stability, Phase & Gain Margin, Resonant Peak Mr & ωr: Nyquist Stability to Inverse Polar Plot, Relative Stability, Phase & Gain Margin, Resonant Peak; Examples.	Lecture, Discussion	Assignment /Homework	CLO4

	38	Nyquist Stability to Inverse Polar Plot, Relative Stability, Phase & Gain Margin, Resonant Peak Mr & ωr: Nyquist Stability to Inverse Polar Plot, Relative Stability, Phase & Gain Margin, Resonant Peak; Examples.	Lecture, Tutorials, Discussion		
	39	Step Transient Response & Frequency Response, BW, M & N circles: Step Transient Response & Frequency Response, BW, M & N circles; Examples.	Lecture, Group work, Discussion		
14	40	Z-transformations, Nonlinearity and Applications	Lecture, Group work, Discussion		
	41	Review Class			
	42	Review Class			
Final Exam					CLO2-CLO4

Assessment and Evaluation

Assessment Strategy

Continuous assessment in class room and closed book final examination system.

Marks distribution:

Assessment and Evaluation Factor		Marks
Continuous Assessment (40%)	Class Test (1-3)	15%
	Assignment/Homework	05%
	Class Participation	05%
	Mid Term	15%
	Project	10%
Final Examination		60%
Total Marks		100%

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB (Referred, Improvement and Backlog) exams will be conducted according to the Examination Policy for Undergraduate Programs of BAUST.

Learning Materials

Recommended Readings/Reference Text books

1. Modern Control Engineering, Fifth Edition, by Katsuhiko Ogata.
2. Control System Engineering, Sixth Edition, by Norman S. Nise.
3. Control Engineering Theory & Applications, by Jahangir Alam, et al.

Supplementary Readings

1. Automatic control systems by S. Hasan Saeed.
2. Automatic Control System by Benjamin C. Kuo.
3. Modern Control Systems by Richard C. Dorf.

CSE 4244: Control System Sessional

Course Details
Course Code: CSE 4244 Course Title: Control System Sessional Course Type: Optional Course Level-Term: 4-I/4-II Academic Session: Summer-2022 Course Teacher/Instructor: Dr. Jahangir Alam Pre-requisite: MATH-1141, PHY-1103, MATH-2145, EEE-1163, EEE-1269, MATH-2247

Credit Value: 3.0

Contact Hours: 0.75

Total Marks: 100%

Rationale

This course aims to familiarize with the modeling of dynamical systems, to simulate and analyze the stability of the system using MATLAB.

Course Objectives

To develop the OBE learning system in engineering field, the students will able to achieve the fundamentals knowledge of Control System Sessional as well as its applications are in the following,

1. Express the knowledge of MATLAB-SIMULINK to analyze system response.
2. Understand and be able to use the laboratory techniques, tools, and practices of control engineering.
3. To learn about practical control system design.

Mapping of Course Learning Outcomes (CLOs) with the Program Learning Outcomes (PLOs)

CLOs	**Course Learning Outcomes (CLOs)** (Upon completion of the course, the students will be able to)	**Program Learning Outcomes (PLO)**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLO1	Observe different types of response of numerous control systems	Y											
CLO2	Observe dynamic performance of a system from different time domain specification parameters					Y							
CLO3	Evaluate the theoretical concepts implemented in practical systems									Y			

Y=Yes

Course Plan/Lecture Plan:

Week	**Lecture**	**Topic**	**Teaching-Learning Strategy**	**Assessment Strategy**	**Corresponding CLOs**

1	1	Study & observation of step response of a transfer function.	Practical Experiments		
2	2	Study & observation of ramp & impulse response of a transfer function.	Lecture, Tutorials, Discussions		
3	3	Time domain analysis of a closed loop control system.	Practical Experiments		
4	4	Simulation of block diagram of (a) RC network, (b) RL network and (c) RLC network.	Practical Experiments		
5	5	Simulation & observation of a DC motor.	Practical Experiments		
6	6	Observation of transfer functions from state model.	Practical Experiments		
7	7	Midterm Evaluation		Quiz, Assignment/Homework	CLO1, CLO2, CLO5
8	8	Bode Graphics of Control system	Practical Experiments		
9	9	MATLAB program to find the rise time, peak time, maximum overshoot and settling time.	Practical Experiments		
10	10	Study & observation of root locus of a transfer function.	Practical Experiments		
11	11	Study & observation of Nyquist & Polar plot of a transfer function.	Practical Experiments		
12	12	Observation of Bode diagram of a transfer function.	Practical Experiments		
13	13	Practice Session; SIMULINK and Control system analysis	Practical Experiments		

14	14	Lab Final Examination			

Assessment and Evaluation

Assessment Strategy

Continuous assessment in class room and closed book final examination system.

Marks distribution:

Assessment and Evaluation Factor		Marks
Continuous Assessment (70%)	Class Participation	25%
	Lab Report	15%
	Assignment/Homework	10%
	Mid Term	10%
	Viva	10%
Final Examination (Lab Final & Quiz)		30%
Total Marks		100%

Make-up Procedures

- Missed Class Tests, Assignment, Class Participation and Midterm: There will be no make-up exam if anyone intentionally misses class test or midterm exam without any valid and legitimate reason. Absence in the exams will be regarded as absent and Zero (0) marks will be applied. Notifying the instructor before the exam is a must if a student misses any exam for reasons beyond his/her control. In extreme circumstances, if the student cannot inform earlier, he/she must inform the instructor within three (3) days of the exam.
- Missed Final Term: RIB (Referred, Improvement and Backlog) exams will be conducted according to the Examination Policy for Undergraduate Programs of BAUST.

Learning Materials

Recommended Readings/Reference Text books

1. Modern Control Engineering, Fifth Edition, by Katsuhiko Ogata.
2. Control System Engineering, Sixth Edition, by Norman S. Nise.
3. Control Engineering Theory & Applications, by Jahangir Alam, et al.

Supplementary Readings

1. Automatic control systems by S. Hasan Saeed.
2. Automatic Control System by Benjamin C. Kuo.
3. Modern Control Systems by Richard C. Dorf.

ANNEXURE A

PROGRAM LEARNING OUTCOMES (PLOs)

1. **PLO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. **PLO2: Problem analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

3. **PLO3: Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

4. **PLO4: Investigation:** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5. **PLO5: Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **PLO6: The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7. **PLO7: Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, for sustainable development.

8. **PLO8: Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.

9. **PLO9: Individual work and teamwork:** Function effectively as an individual and as a

member or leader of diverse teams as well as in multidisciplinary settings.

10. **PLO10: Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

11. **PLO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work as a member or a leader of a team to manage projects in multi-disciplinary environments.

12. **PLO12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

ANNEXURE B

GRADING POLICY

Grade	Grade Points	Numerical Markings
A+	4.00	80% and above
A	3.75	75% to below 80%
A–	3.50	70% to below 75%
B+	3.25	65% to below 70%
B	3.00	60% to below 65%
B–	2.75	55% to below 60%
C+	2.50	50% to below 55%
C	2.25	45% to below 50%
D	2.00	40% to below 45%
F*	0.00	Below 40%
I	-	Incomplete
W	-	Withdrawal
X	-	Continuation (For Project/ Thesis)

ANNEXURE C

Assessment and Evaluation Factor

Theory:

Class performance	05%
Class Tests	15%
Assignments/ Presentations	05%
Mid-Term Assessment (Exam [1 hour duration] / Project)	15%
Final Examination (3 hours duration)	60%
Total	**100%**

Sessional:

Lab based Sessional

Attendance in experiments and effective participation	25%
Report writing/Assignment	15%
Mid-Term Evaluation (Exam/Project/Assignment/Quiz)	20%
Final Evaluation (Lab Tests and Quiz)	30%
Viva-Voce	10%
Total	**100%**

Programming/ Project Based Sessional

Attendance in experiments and effective participation	25%
Report writing/Assignment/ Programming	15%
Mid-Term Evaluation (Exam/Project/Assignment/Quiz)	20%
Final Evaluation (Lab tests and quiz)	30%
Viva-Voce/ Presentation	10%
Total	**100%**

=======The End=======