

International Islamic University Chittagong

Department of Computer Science and Engineering (CSE)



Syllabus for 4 Years B. Sc. Engineering Degree in Computer Science and Engineering (CSE)

Semester: Autumn 2022

*As per Recommendations made in the
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International Islamic University Chittagong
Faculty of Science and Engineering
Department of Computer Science and Engineering

Syllabus for B. Sc. Engineering in CSE
Autumn 2022

1. The Mission, Vision, Objectives and Motto of IIUC:

1.1 Introduction: International Islamic University Chittagong (IIUC) is one of the top graded government approved private universities in Bangladesh. Having fulfilled the requirements as laid down in the Private University Act of 1992, and after obtaining the necessary clearance from University Grants Commission (UGC), and the permission of Government of Bangladesh (GOB) through the Ministry of Education, **International Islamic University Chittagong (IIUC)** started functioning on **February 11, 1995**. The credit for the idea of establishing this University goes to Islamic University Chittagong Trust (IUCT). In the **year 2000**, Islamic University Chittagong (IUC) was upgraded into **International Islamic University Chittagong (IIUC)**.

IIUC framed its own Statutes, Ordinances and Regulations governing the manifold activities of IIUC - academic, administrative, financial, student welfare, discipline etc. as per the **Private University Act, 1992, 1998 and revised Act, 2010**. Most statutory bodies formed under the provisions of the Act have since then been functioning.

1.2 Vision of the University:

The Vision of the University is to offer nationally competitive and internationally recognized opportunities for learning to make this University as the Centre of Excellence in different areas of scholarship, like Shari'ah and Islamic Studies, Business Studies, Social Science, Science & Engineering, Arts & Humanities, Law, and such other faculties that will be introduced in future. Its door is open to the admission seekers from all over the world, regardless of race, region and religion. This university cherishes the dream of becoming one of the highest seats of learning and creator of knowledge in the South East Asia.

1.3 Mission of the University:

Number of Missions	The Missions of the International Islamic University Chittagong (IIUCMS) are to
IIUC MS – 1	produce through the pursuit of education properly trained up manpower to contribute to socio-economic development & moral upliftment of the society
IIUC MS – 2	cultivate in students' expertise as well as ethical sensitivity and intelligence,
IIUC MS – 3	Have an ability to think independently beyond their areas of study, so that they can sustain justice in all walks of life.



1.4 The objectives of the University are to

- i. Create a new generation of competent youths, who will be equipped with academic excellence, professional expertise and adorned with moral height.
- ii. Follow a policy of continued Modernization of Knowledge and academic curricula in different disciplines of education so that its students can imbibe the true spirit of religious value as an effective guiding principle in their profession and daily life.

1.5 The Motto of IIUC is to “Combine Quality with Morality”.

2. Teaching Methods and Policy:

2.1 Methods: Outcome-based education (OBE) and Bi- Semester system of Continuous Quality Improvement (CQI) through self-examination and external review. In this process students are evaluated throughout a course of study rather than exclusively by examination at the end. It is multidimensional based on students (a) attendance in the Classes; (b) performance in Assignments and Class Tests ,(c) Scores in the Mid-Term and the Final Examination (d) Lab. Reports, (e) Thesis/ Project/ internship ,(f) Presentations (g) Viva-voce , (f) Industry visits (g) Co-Curricular and Extra-curricular activities.

2.2 Policy: The University is committed to the life-long success of students in its undergraduate and master's programs through high-quality instruction and learning experiences. IIUC has **Integrated Education** Policy, where a student achieves holistic learning through awareness of his surroundings and other relevant knowledge bases. IIUC emphasizes the diffusion of scientific, technical and professional knowledge on the one hand, & building up of character in youth by making religion and ethics an integral part of education on the other. In this regard, there are some courses for the students of all Faculties at IIUC, which are not a part of the main curriculum of the Departments, but those are named as **University Requirement Courses (URC)**.

2.3 Morality Development Program (MDP): IIUC incorporates studies on the values of mutual respect & peaceful co-existence in the courses under the **“Morality Development Program (MDP)”** which includes all students of the university irrespective of caste, creed or religion.

2.4. Co-Curricular and Extra-curricular activities: IIUC supports student participation in a broad array of *Co-Curricular and Extra-curricular activities* as an integral component of its commitment to student life and success. These programs mainly includes leadership training, cultural, environmental, recreational and social activities, debating & public speaking programs, intellectual discussions, games & sports, excursion and study tours home & abroad to complement academic pursuits. By these programs students earn capacity to express out themselves properly, maintain personality and learn to respect people of other faiths through mutual understandings among various regions, religions, beliefs and cultures. All *Co and Extra-curricular* activities are run by the clubs named after the Departments such as Computer club, Business club etc under the close supervision and monitoring etc under the close supervision and monitoring of competent authority

2.5 Student Advisor: IIUC provides Academic Guidance and Counselling Service by the Student Academic Advisor of the respective section of students under each Semester. The students' Academic Guidance and Counselling Service is an integral part of the academic program of students of IIUC. Its objective is to guide students to obtain the best results, adapt with the /university environment and take advantage of the opportunities available to them and solve individual problems through counselling.



A special arrangement has been made for Academic Guidance and Counselling at the University, in each department of IIUC to provide academic career and student welfare counselling by the Student Adviser of the respective section of students under each Semester i.e., section adviser is the Student Academic Advisor for Academic Guidance and Counselling (*Ref: the 207th Syndicate Meeting held on 27.01.2018*). The Academic Adviser shall specify at least two periods a week which will be displayed in their time table and ensure that they are available at their offices in specific periods to enable the students to meet their advisers. Student adviser shall maintain a file for the students advising record in each semester.

3. The Mission, Vision and Objectives of the Faculty of Science & Engineering and the Department of Computer Science and Engineering

3.1. The Mission of the Faculty of Science and Engineering:

The mission of the Faculty of Science and Engineering is to foster excellence in teaching, research, and learning within a systems approach to science and engineering education. Our goal is to produce engineering graduates with both a strong base of technical knowledge and the complementary skills needed to be successful professional engineers in the modern world.

3.2. The Vision of the Faculty of Science and Engineering:

The vision of the Faculty of Science and Engineering is to be a dynamic centre of innovation and creativity dedicated to teaching, learning, professionalism, research, entrepreneurship, and partnership with local and global communities. The aims of the Faculty are to provide international standard quality programs of undergraduate and graduate education; to be a research active unit advancing the knowledge of science and engineering; and to serve the community and industry as an agent of technological, and educational innovation and advancement.

3.3. The Objectives of the Faculty of Science and Engineering:

The Faculty plans to achieve this vision and mission through the pursuit of the following specific objectives:

F1:	Prepare graduates for personal and professional success with awareness of and commitment to their ethical and social responsibilities, both as individuals and in team environments.
F2:	Enable graduates to keep on self- development throughout their careers.
F3:	Produce graduates with the necessary background and technical skills to work professionally and fulfill the need of industry.
F4:	Organize, in collaboration with stakeholders, conferences, symposia and workshops to upgrade technical and scientific levels in Electrical and Electronic Engineering.
F5:	Carry out and publish academic knowledge.
F6:	Activities to promote research innovation, commercialization and Entrepreneurship Increase.

3.4. Vision and Mission of the Department of Computer Science and Engineering:

3.4.1 Vision:

Inspired by the mission of the university, the department of Computer Science and Engineering is striving to create a breed of students who can imagine boldly, think clearly, argue precisely and implement efficiently. Our mission is to perform high impact research leading to sustainable innovation in the area of computer science and engineering thus contributing to the economic



growth of the country through a meaningful partnership between the Community, the Industry and the University.

3.4.2 Mission:

At the very heart of science and technology education lie comprehension, imagination and implementation. The objective of our programs is to contribute in creating a globally recognized and locally sustainable knowledge eco-system through which students will graduate to provide leadership in industry, enterprise, public service and welfare; to encourage and support innovative research; create enthusiasm in learning through hands on training; while creating knowledge throughout the process. We also provide a platform for lifelong learning through graduate programs and continuing education endeavors.

The curriculum objectives for the undergraduate education are to teach communicative skills (oral and written communication) with a strong humanities background through a thorough liberal arts foundation. To have students have a comprehensive understanding of Computer Science and Engineering related subjects (i.e. a major), and a sub-specialization (minor) in a subject of student's own interest and appreciate their inter-connectivity with founding principles. Focus is maintained on outcome-based learning. Outcome is quantifiable through students' enhanced skill in comprehension, analytical capability and decision-making skill.

The undergraduate programs equip students with the tools needed to become innovators and global leaders in computing and equip them with the background necessary to pursue higher studies. Consequently, our programs are designed to have a high impact outcome of contributing to the sustainable development of knowledge-based economy of our nation.

4. The Program Educational Objectives (PEO)

4.1 Program Educational Objectives (PEOs) of B. Sc. in CSE Program

Graduates of the B. Sc. in Computer Science and Engineering (CSE) program are expected to attain the following Program Educational Objectives (PEO) within few years, such as 3-5 years, of graduation.

PEO1	Graduates will establish themselves as leading computing professionals and be able to address evolving challenges in Computer Science and Engineering.
PEO2	Graduates will engage in a lifelong pursuit of knowledge and interdisciplinary learning for industrial, research, and academic careers.
PEO3	Graduates will contribute to sustainable development and the well-being of society through the use of Computer Science and Engineering principles, practices and tools in an ethical and responsible manner.

4.2 Mapping of PEOs with IIUC Mission Statement

No.	PEO statement	Institutional Missions		
		Mission statement 1	Mission statement 2	Mission statement 3
1	Competence	√		
2	Expansion			√
3	Contribution		√	√



5. The Program Learning Outcomes (PLO)

5.1 Program Learning Outcomes (PLOs) of B. Sc. in CSE Program

Graduates of the B. Sc. in Computer Science and Engineering (CSE) program are expected to attain the following Program Learning Outcomes (PLOs) by the time of graduation.

PLO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems
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.
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.
PLO4	Investigation: Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
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.
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.
PLO7	Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PLO8	Ethics: Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.
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
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.
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 multidisciplinary environments.
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.



5.2 Mapping of Program Learning Outcomes to Program Educational Objectives

Program Learning Outcomes (PLOs)	Program Educational Objectives (PEOs)		
	PEO1	PEO2	PEO3
PLO1: Engineering Knowledge	√		
PLO2: Problem Analysis	√		
PLO3: Design/Development of Solutions	√		√
PLO4: Investigation		√	
PLO5: Modern Tool Usage	√		
PLO6: The Engineer and Society			√
PLO7: Environment and Sustainability	√		√
PLO8: Ethics			√
PLO9: Individual Work and Teamwork	√	√	
PLO10: Communication		√	
PLO11: Project Management and Finance	√		
PLO12: Life-Long Learning		√	

6. Admission Requirements

Admission at IIUC is purely on the basis of merit. Furthermore, admission to the available programs depends on the type and level of the program that a candidate wishes to pursue. The general academic qualifications for admission in B.Sc. Engineering:

- i. For SSC/Dakhil, and HSC/Alim (Science Group) system the minimum shall be (SSC GPA) + (HSC GPA) = 6.50. (But score of less than GPA 2.5 in any individual examination is not acceptable). An applicant must submit his/her results during the application. Provisional admission for appeared students should not be allowed.
- ii. For 'O' level & 'A' level system an applicant must have completed 6 papers in 'O' level and 6 papers in 'A' level, in the 'A' level the student must have completed at least 2 papers of Physics, 2 papers of Chemistry and 2 papers of Mathematics. Minimum average GPA of combined 'O' level and 'A' level shall be 'C'. An applicant must submit his/her results during the application. Provisional admission for appeared students should not be allowed.
- iii. For applicants from foreign countries similar standard should be maintained. The applicant must have completed Physics, Chemistry and Mathematics in the 12th level.

English is the primary languages used as the medium of instruction in the University.

7. Duration of Program

To complete the B. Sc. Engineering in Computer Science and Engineering program at the International Islamic University Chittagong, normally takes four academic years (i.e. 8 Semesters). Each academic year is divided into 2 Semesters (Spring Semester: January-June and Autumn Semester: July-December), each having a duration of 15 weeks ($5 \times 15 = 75$ working days). There shall be a Mid-term Examination after conducting 6 weeks classes. 9 Weeks of classes will be conducted after Mid-term examination and after that Semester End Examination will take place at the end of each semester. In order to graduate, total 163 credit hours has to be undertaken and completed by a student during 8 semesters. By registering more number of courses in regular semesters, students may also complete their graduation studies within at least three academic years (i.e. 6 Semesters) of regular studentship. However, a student may be allowed to complete their



graduation studies in the University within maximum of six academic years (i.e. 12 semesters). No student shall ordinarily be admitted after the class starts.

8. Attendance (Ref. Faculty of Science and Engineering Ordinance (FSEO) article no-11):

In order to be eligible to appear, as a regular candidate, at the semester final examinations, a student shall be required to have attended at least 80% of the total number of periods of lectures/tutorials/laboratory classes offered during the semester in every **course**. A student whose attendance falls short of 80% but not below 60% in any **course** may be allowed to appear at the final examinations **as non-collegiate student**. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the authority for the purpose. Students having **less than 60% attendance** in lecture/tutorial/ laboratory of **any course will be declared dis-collegiate. They will not allow appearing in that course** at the final examinations of the semester. They will get ‘F’ grade in the semester result. The basis for awarding marks for class participation and attendance is shown in Table-1

Table-1 (Ref. FSEO article 14.1.4)

Attendance	Marks/Unit
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
less than 60%	0

9. The Grading System

The Grading System for assessing the performance of a course of a student shall be as follows:

Numerical grade Marks%	Letter Grade (LG)	Grade Point (GP/unit)	Remarks/Status
80-100	A+ (A plus)	4.00	Excellent
75 to less than 80	A (A regular)	3.75	
70 to less than 75	A- (A minus)	3.50	Very good
65 to less than 70	B+ (B plus)	3.25	
60 to less than 65	B (B regular)	3.00	Good
55 to less than 60	B- (B minus)	2.75	
50 to less than 55	C+ (C plus)	2.50	Satisfactory
45 to less than 50	C (C regular)	2.25	
40 to less than 45	D	2.00	Pass
00 to less than 40	F	0.00	Fail

The performance of a student will be evaluated in terms of semester **grade point average (GPA)** and **cumulative grade point average (CGPA)** which is the grade average for all semesters. To have graduation degree a student **must obtain CGPA at least 2.5**.

10. Earned Credit (Ref. FSEO article 3.6): The courses in which a student has obtained minimum ‘D’ or higher grade will be counted as credits earned by the student. Any course in which a student has obtained ‘F’ grade will not be counted towards his/her earned credit. ‘F’ grade will



not be counted for GPA calculation but will stay permanently on the Grade sheet and transcripts.

- 11. Grade Point Average (GPA):** The Grade Point Average (GPA) of a semester is computed by dividing the total grade points earned by the number of credit hours attempted in a given semester. The Cumulative Grade Point Average (CGPA) is computed by dividing the total grade points earned by the total number of credit hours attempted at the University up to a particular semester.
- 12. Semester Work load:** Minimum Workload for a regular semester is **12** credit hours or its equivalent and maximum load is up to 28 credit hours. Since IIUC is following the **Open Credit Hour System**, a student may register the expected number of credits with the recommendation of his/ her respective **academic advisor** and the approval of the Head of the Department or the Dean of the Faculty or the Pro-Vice Chancellor as the case may be. But the semester workload must be consistent with the range of GPA. Advisable semester workload for the Faculty of Science and Engineering under Open Credit Hour System (OCHS) based on GPA is given below (Ref. FSEO article 5.4):

Table 4

RANGE of GPA	Maximum Load Allowed
3.75-4.00	28 Cr. Hrs.
3.50-3.74	26 Cr. Hrs.
2.75-3.49	24 Cr. Hrs.
2.25-2.74	22 Cr. Hrs.
2.00-2.24	20 Cr. Hrs.
1.70-1.99	15 Cr. Hrs.
Below 1.70 or Repeat Case (Due to very poor performance)	12 Cr. Hrs.

13. Academic Criteria

13.1 Criteria for Semester Promotion:

- 13.1.1 No semester fail status would exist under open credit hour system.
- 13.1.2 If any student earns ‘C+’ or above grade for any course, the course should be credited.
- 13.1.3 The students must complete Pre-requisite Courses and previous incomplete or ‘F’ or ‘W’ grade courses before registration of advance courses.
- 13.1.4 Students who will not clear all prescribed courses of 1st & 2nd Semester within the 4th Semester he/she would not be allowed to get promoted/registered in the 5th Semester and students who will not clear all prescribed courses of 3rd & 4th Semester within the 6th Semester he/she would not be allowed to get promoted/registered in the 7th Semester. Student can go for internship in the 7th / 8th Semester.

13.2 Criteria for Special Examination:

Special Final Examination has been **withdrawn from Spring-2008** for all students of



Bachelor programs. If a graduating /last semester/outgoing student has an incomplete course only, he/she can complete the course/s according to the following rules:

13.2.1 If any student could not attend Final Examination in a course only **due to illness, accident or scoring of F grade**, he/she can complete the course by attending Special Final Examination. To get the approval of Special Final Examination, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination within 72 hours of Examination held with necessary documents. After getting approval, the incumbent has to pay the Special Final Examination fee.

13.2.2 If any course remain unregistered or not repeated due to removal of the courses from syllabus or has not been offered in the last a few semesters, the course may be completed under special arrangement. To get approval of special arrangement/Independent Study, the incumbent has to apply to the Pro-Vice-Chancellor through the Head of the concerned Department and Controller of Examination subject to the availability of course teacher. The application period will be immediate after publication of Semester result. After getting approval, the incumbent has to complete registration by paying **the tuition fee double than that of the normal fees (based on credit hour). There is no scope of special arrangement for the course /s which are offered by the department or center.**

13.3 Criteria for Repeating Courses

13.3.1 For ‘F’ grade holders the course must be repeated within the next 2 consecutive semesters. Pre-requisite courses should be repeated on priority basis.

13.3.2 The final grade will be computed in the Final Transcript and the previous grade /s will be marked with ‘R’ grade (as intake course) which has no effect on GPA or CGPA. ‘R’ is deleted from Final Transcript during graduation

13.4 Criteria for Failing in a Course:

- 13.4.1 A student, who fails in a course within specific requirements of the Faculty and the curriculum of his/her program, may repeat the same course if the course is classified as “CORE” or “REQUIRED” course.
- 13.4.2 Or, the fail student may replace the course with another one if it is classified as “SUPPORTIVE” or “ELECTIVE” or “OPTIONAL” as determined by the department or the faculty as the case may be.
- 13.4.3 Notwithstanding any other provisions of these Regulations, a graduating student who obtains the minimum CGPA 2.50, but fails in any course, may be allowed to re-sit for that course subject to the examination rules and approval of the authority concerned.

13.5 Criteria for Improvement of Grade:

- 13.5.1 The range of grade in that particular course should be “B-” (B minus).
- 13.5.2 That an application must be submitted to the Controller of Examination through the Head of the Department in order to repeat the course for the purpose of improvement at least two weeks prior to the dead line of registration and it has to



- be approved by the competent authority.
- 13.5.3 That the opportunity for improvement of grade shall be availed within two consecutive Semesters.
- 13.5.4 That payment shall be made in full amount for the course/s on credit hour basis.

13.6 Re-Evaluation of Examination Results:

- 13.6.1 If the awarding grade is in order but the student wants his/her answer script to be reevaluated, than a prescribed Form (available at ACAD) shall have to be filled in and submitted by the student to the University Board of Appeals through the ACAD.
- 13.6.2 Per Course a fee (as determined by the University Board of Examination) must be deposited along with the Form.
- 13.6.3 **An appeal may be made** on any or all of the following grounds:
- If a student strongly believes that he/she deserves higher marks than he/she got in the course in question.
 - If a student reasonably believes that the evaluation has been conducted improperly or a portion of his/her marks has not been counted.

14. Eligibility for Examination

- 14.1 No student shall be eligible to take part in any Semester Final Examination unless:
- 14.1.1 He/she is officially registered in such a course; and
 - 14.1.2 He/she has fulfilled the required percentage of attendance and other requirements.
- 14.2 **Barring from examination:**
- 14.2.1 A student may be barred from taking examination if he/she fails to meet any of the above requirements (article 21.1) for eligibility to sit for an Examination. In such a case, the student may be given the chance to appeal for exoneration.
 - 14.2.2 Unless otherwise recognized, any student debarred from any examination shall automatically receive a grade “Y” which is equivalent to an “F” for that course irrespective of course performance
 - 14.2.3 In addition, the scholarship or financial assistance of students who are barred from the Semester Final Examination may be withdrawn or reduced by a certain amount as the University authority decides on case-by-case basis.
- 14.3 **Cheating in Examination:**
- 14.3.1 A student cheating in examination shall be deemed to have committed an offence and will be liable to disciplinary punishment.
 - 14.3.2 Such punishment may be cancellation of the course in question, drop of the current semester, expulsion for an academic year or expulsion from the University, based on the weight and gravity of the offence.
 - 14.3.3 Student receives the expulsion from the university for cheating in examination can not be readmitted. In addition, the student will be deprived of any financial assistance in the following semester as the university authority decides on case by case basis.



15. Graduation Requirements

15.1 Pre-Graduate Requirements:

- 15.1.1 One Semester prior to graduation a student should submit a check list to Controller of Examination duly filled in.
- 15.1.2 Students intending for graduation should submit an application for graduation to Controller of Examination in the terminal semester in the University.

15.2 Academic Requirements:

- 15.2.1 Have passed all required and elective course as per program of curriculum.
- 15.2.2 Be an acceptable academic standing with a GPA of at least 2.50.
- 15.2.3 Be free from any negative report from the University authority in general and academic Discipline Committee in particular.
- 15.2.4 Have fulfilled co-curricular activities.
- 15.2.5 Have fulfilled other University requirements

15.3 Transcripts:

- 15.3.1 Results of each semester are normally distributed to every student at the beginning of the following semester. The result is for student's reference only and not to be used for any official purposes. The result produces report including the grades of all courses for that semester, the GPA and CGPA.
- 15.3.2 **Official Transcripts** is issued before graduation and upon written request of a student who has paid up all fees. Partial transcripts may also be issued in the same manner to existing students. However, a fee is charged for partial transcript (or testimonial.) of each semester.
- 15.3.3 **Final Transcript and Provisional Certificate** may be withdrawn on payment of fee. Besides, **Original certificate** may be issued on payment of fee only. Charges will be applied for the re-issue of duplicate certificate and transcript also.

14.4 Release of Student's Record:

Student's records are considered highly confidential. Therefore, a written consent from the student is needed before releasing information from his personal record to person outside the University. Information may be furnished to a student's parents or sponsor without such written consent. No information concerning a student's grades will be given over telephone.

16. Programs of Study

The B. Sc. (Engineering) program in the department of Computer Science and Engineering consist of 75 courses carrying 163 Credit Hours. There are 9 University Requirement Courses (URC) carrying 13 credit hours, 3 Interdisciplinary Courses carrying 6 credit hours, Theory Courses carrying 122 credit hours and practical courses carrying 41 credit hours. Total 163 credit hours have to be undertaken and completed by a student during 8 semesters. Duration of each semester is 6 months. Each course carries 100 marks.

There are 50 marks for Continuous Internal Evaluation (CIE) and 50 marks for Semester End Examination (SEE). Assessment pattern for CIE and SEE are as follows

**A: Course Assessment Pattern (Theory courses):**

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

- i. **Delivery methods & activities:** Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,
- ii. **Assessment tools:** Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

B. Course Assessment Pattern (Sessional Courses): There are 100 marks for each Sessional course. Out of 100 marks, **50-60** marks are allotted for continuous assessment on Lab. activities, including 10 marks for attendance (**CIE**) and **40-50** marks is for a practical exam at the end of the Semester in the form of the viva, quiz, etc. at the end of semester final examination (**SEE**).

Marks distribution for projects/thesis and general viva-voce is as follows:

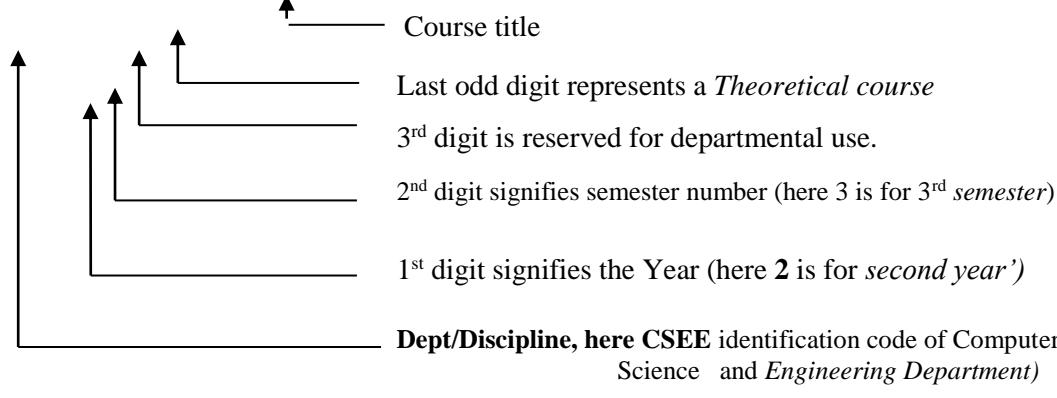
1) Project/Thesis evaluation by Supervisor-	40%
2) Project/Thesis evaluation by Examiner-	30%
<u>3) General Viva-Voce-</u>	<u>30%</u>
Total	100%

Course Identification Plan (Dept. /Discipline)

Following code plan has been adapted for course identification: First **digit** stands for Year, the **Second** digit stands for Semester, the **Third** digit is reserved for departmental use & the **Fourth** digit stands for the course number (odd number has been assigned to theory course and the even number has been assigned to seasonal course). An example of the above statement is as follows:



CSE 2 3 2 1 Data Structures





Summary of Courses

A. Summary of Courses of B. Sc. in CSE Program

Category	Title of the Course	Credit Hours		
		Theory	Sessional	Total
Arts & Humanities Courses	Advanced English	2	0	2
	Bengali Language & Literature	2	0	2
	Sciences of Qur'an and Hadith	1	0	1
	* ¹ Basic Principles of Islam	2	0	2
	* ² A Survey of Islamic History and Culture	1	0	1
	* ³ Life and Teachings of the Prophet Muhammad (SAAS)	1	0	1
	<i>Comparative Religion (may be taken instead of *¹²³)</i>	4	0	4
Total Arts & Humanities Courses		9	0	9
Social Sciences Courses	Text of Ethics and Morality	1	0	1
	Political Thoughts & Social Behavior	1	0	1
	History of emergence of Bangladesh	2	0	2
Total Social Science Courses		4	0	4
Non-Engineering Skills Courses	Financial and Managerial Accounting	2	0	2
	Principles of Economics	2	0	2
	Industrial Management	2	0	2
Total Non-Engineering Skills Courses		6	0	6
Mathematics	Math (I+II+III+IV) and Statistics	14	0	14
Basic Sciences Courses	Physics	6	1.5	7.5
	Chemistry	3	0	3
Total Mathematics & Basic Science Courses		23	1.5	24.5
CSE Major Courses	Core	64	30.5	94.5
	Elective	9	3	12
CSE Minor Courses	Core	8	5	13
	Elective			
Total CSE (Major + Minor) Courses		81	38.5	118
Total		123	40	163

B. Course type wise Credit Hours and Contact Hours distribution:

Course Type	Theoretical Cr. Hrs.	Practical Cr. Hrs.	Total
University Required General Education and Language Courses	13	0	13
Interdisciplinary Courses	6	0	6
Core Courses	Mathematics and Statistics Courses	14	0
	Basic Science Courses	9	1.5
	Other Engineering Courses	8	5
	Computer Science and Engineering Courses	72	28.5
	Field Work	0	1
	Project / Thesis	0	4
	General Viva Voce	1	0
Total	123	40	163



C. Semester wise Credit Hours and Contact Hours distribution:

Semester	No. of Courses	Contact Hours / Week			Credit Hours		
		Theory	Practical	Total	Theory	Practical	Total
1 st	8	17	6	23	15	3	18
2 nd	10	17	11	28	17	5.5	22.5
3 rd	9	16	9	25	15	4.5	19.5
4 th	11	16	11	27	16	5.5	21.5
5 th	9	17	8	25	16	4	20
6 th	11	16	11	27	15	5.5	20.5
7 th	12	14	10	24	13	6	19
8 th	11	16	12	28	16	6	22
Total	81	129	78	207	123	40	163

D. List of University Requirement Courses

Serial No	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0223	UREM-1101	Text of Ethics and Morality	2		1		
2	0231	UREL-1106	Advanced English	3		2		
3	0221	URED-1201	Basic Principles of Islam ('Aqidah + 'Ibadah))	2		2		
4	0221	URED-2302	Sciences of Quran and Hadith	2		1		
5	0221	URED-2305	Comparative Religion (for Non-Muslim Students) Substitute to URED-1201 and URED-2302	4		3		
6	0232	URBL-2401	Bengali Language and Literature	2		2		
7	0312	URED-3503	Introduction to Political Thoughts and Social Behavior	2		1		
8	0221	URED-3604	Life and Teachings of Prophet Muhammad (SAAS)	2		1		
9	0222	URIH-4701	A Survey of Islamic History and Culture	2		1		
10	0222	URHE-4801	History of the Emergence of Bangladesh	2		2		



Serial No	ISCED	Course No.	Course Title	Contact Hours/Week	Credit Hours	Prerequisite Courses
		Total	9 Courses	19	13	

E. List of Interdisciplinary Courses

Serial No	ISCED	Course No.	Course Title	Contact Hours/Week	Credit Hours	Prerequisite Courses
1	0411	ACC-2401	Financial and Managerial Accounting	2	2	
2	0311	ECON-3501	Principles of Economics	2	2	
3	0413	MGT-3601	Industrial Management	2	2	
		Total	3 Courses	6	6	

F. List of Core Courses

Serial No	ISCED	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1.	0541	MATH-1107	Mathematics I (Differential and Integral Calculus)	3		3		
2.	0541	MATH-1207	Mathematics II (Geometry and Differential Equations)	3		3		MATH-1107
3.	0541	MATH-2307	Mathematics III (Matrices, Linear System of Equations and Vector Analysis)	3		3		MATH-1207
4.	0541	MATH-2407	Mathematics IV (Complex Variable, Fourier Analysis and Z-transform)	3		3		MATH-2307
5.	0542	STAT-2311	Probability and Statistics	2		2		
6.	0533	PHY-1101	Physics I (Mechanics, Waves, Heat and Thermodynamics)	3		3		
7.	0533	PHY-1201	Physics II (Electromagnetism, Optics and Modern Physics)	3		3		PHY-1101



Serial No	ISCED	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
8.	0533	PHY-1204	Physics II Lab (Electromagnetism, Optics and Modern Physics)		3		1.5	
9.	0531	CHEM-2301	Chemistry	3		3		
10.	0713	EEE-1121	Basic Electrical Engineering	3		3		
11.	0713	EEE-1122	Basic Electrical Engineering Lab		3		1.5	
12.	0714	EEE-1221	Electronics	3		3		EEE-1121
13.	0714	EEE-1222	Electronics Lab		3		1.5	
14.	0714	EEE-2421	Electrical Drives and Instrumentation	2		2		EEE-1221
15.	0714	EEE-2422	Electrical Drives and Instrumentation Lab		2		1	
16.	0715	ME-2412	Engineering Drawing Lab		2		1	
17.	0613	CSE-1121	Computer Programming 1	3		3		
18.	0613	CSE-1122	Computer Programming 1 Lab		3		1.5	
19.	0613	CSE-1221	Computer Programming 2	3		3		CSE-1121 CSE-1122
20.	0613	CSE-1222	Computer Programming 2 Lab		3		1.5	
21.	0613	CSE-1223	Discrete Mathematics	3		3		
22.	0613	CSE-1230	Competitive Programming 1		2		1	
23.	0613	CSE-2321	Data Structures	3		3		CSE-1121
24.	0613	CSE-2322	Data Structures Lab		2		1	
25.	0613	CSE-2323	Digital Logic Design	3		3		EEE-1121
26.	0613	CSE-2324	Digital Logic Design Lab		3		1.5	
27.	0613	CSE-2340	Software Development 1		4		2	CSE-1221 CSE-1222
28.	0613	CSE-2421	Computer Algorithms	3		3		CSE-2321
29.	0613	CSE-2422	Computer Algorithms Lab		2		1	



Serial No	ISCED	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
30.	0612	CSE-2423	Database Management Systems	3		3		
31.	0612	CSE-2424	Database Management Systems Lab		3		1.5	
32.	0613	CSE-2427	Theory of Computation	3		3		
33.	0613	CSE-2430	Competitive Programming 2		2		1	
34.	0612	CSE-3521	Computer Architecture	3		3		CSE-2323
35.	0612	CSE-3523	Microprocessors, Microcontrollers and Embedded Systems	3		3		
36.	0612	CSE-3524	Microprocessors, Microcontrollers and Embedded Systems Lab		2		1	
37.	0612	CSE-3525	Data Communication	3		3		
38.	0613	CSE-3527	Compiler	3		3		CSE-2427
39.	0613	CSE-3528	Compiler Lab		2		1	
40.	0613	CSE-3529	Systems Analysis and Design	3		3		
41.	0612	CSE-3532	Tools and Technologies for Internet Programming		4		2	CSE-1222
42.	0613	CSE-3631	Operating Systems	3		3		CSE-3521
43.	0613	CSE-3632	Operating Systems Lab		2		1	
44.	0612	CSE-3633	Computer Networks	3		3		CSE-3525
45.	0612	CSE-3634	Computer Networks Lab		3		1.5	
46.	0619	CSE-3635	Artificial Intelligence	3		3		
47.	0619	CSE-3636	Artificial Intelligence Lab		2		1	
48.	0613	CSE-3641	Software Engineering	3		3		CSE-3529



Serial No	ISCED	Course Code	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
49.	0613	CSE-3642	Software Engineering Lab		2		1	
50.	0613	CSE-3644	Software Development 2 Lab		2		1	CSE-3532
51.	0613	CSE-4741	Computer Graphics	3		3		MATH-2307
52.	0613	CSE-4742	Computer Graphics Lab		2		1	
53.	0619	CSE-4743	Computer Security	2		2		
54.	0619	CSE-4744	Computer Security Lab		2		1	
55.	0613	CSE-4745	Numerical Methods	2		2		CSE-1121
56.	0613	CSE-4746	Numerical Methods Lab		2		1	
57.	0541	CSE-4747	Mathematical Analysis for Computer Science	3		3		STAT-2311
58.	0288	CSE-4750	Technical Writing and Presentation		2		1	
59.	0031	CSE-4708	Field Work		3 weeks		1	
60.	0613	CSE-4805	Social, Professional and Ethical Issues in Computing	2		2		
61.		CSE-48xy	Option 1	3		3		
62.		CSE-48xy	Option 1 Lab		2		1	
63.		CSE-48xy	Option 2	3		3		
64.		CSE-48xy	Option 2 Lab		2		1	
65.		CSE-48xy	Option 3	3		3		
66.		CSE-48xy	Option 3 Lab		2		1	
67.	0619	CSE-4800	Project / Thesis		8		4	
68.	0031	CSE-4822	General Viva	1		1		
		Total	68 Courses	104	78	104	40	

**G. List of Optional Courses (*three courses to be taken from the optional courses*)**

ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
0619	CSE-4819	Special Topic on Computer Science and Engineering	3		3		
0619	CSE-4820	Special Topic on Computer Science and Engineering Lab		2		1	
0619	CSE-4823	Fault Tolerant System	3		3		CSE-3521
0619	CSE-4824	Fault Tolerant System Lab		2		1	
0619	CSE-4825	Basic Graph Theory	3		3		CSE-2321
0619	CSE-4826	Basic Graph Theory Lab		2		1	
0619	CSE-4827	Simulation and Modeling					MATH-3501
0619	CSE-4828	Simulation and Modeling Lab		2		1	
0619	CSE-4839	Digital System Design	3		3		
0613	CSE-4840	Digital System Design Lab		2		1	
0613	CSE-4843	Decision Support System and Expert System	3		3		
0613	CSE-4844	Decision Support System Expert System Lab		2		1	
0612	CSE-4845	Distributed Database	3		3		
0612	CSE-4846	Distributed Database Lab		2		1	
0613	CSE-4847	Software Project Management	3		3		
0613	CSE-4848	Software Project Management Lab		2		1	



ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
0613	CSE-4849	Software Quality Assurance	3		3		
0613	CSE-4850	Software Quality Assurance Lab		2		1	
0612	CSE-4851	Wireless and Mobile Communication	3		3		
0612	CSE-4852	Wireless and Mobile Communication Lab		2		1	
0612	CSE-4853	Optical Fiber Communication	3		3		
0612	CSE-4854	Optical Fiber Communication Lab		2		1	
0612	CSE-4855	Communication Engineering	3		3		
0612	CSE-4856	Communication Engineering Lab		2		1	
0619	CSE-4857	VLSI Design	3		3		
0619	CSE-4858	VLSI Design Lab		2		1	
0619	CSE-4859	Real Time Embedded Systems	3		3		
0619	CSE-4860	Real Time Embedded Systems Lab		2		1	
0619	CSE-4861	Multimedia Theory	3		3		
0619	CSE-4862	Multimedia Theory Lab		2		1	
0619	CSE-4863	Digital Signal Processing	3		3		
0619	CSE-4864	Digital Signal Processing Lab		2		1	
0619	CSE-4865	Bioinformatics	3		3		
0619	CSE-4866	Bioinformatics Lab		2		1	
0619	CSE-4867	Speech and Language Processing	3		3		



ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
			Theory	Practical	Theory	Practical	
0619	CSE-4868	Speech and Language Processing Lab		2		1	
0619	CSE-4869	Geographical Information System	3		3		
0619	CSE-4870	Geographical Information System Lab		2		1	
0619	CSE-4871	Neural Network and Fuzzy System	3		3		
0619	CSE-4872	Neural Network and Fuzzy System Lab		2		1	
0619	CSE-4873	Computer Vision and Robotics	3		3		
0619	CSE-4874	Computer Vision and Robotics Lab		2		1	
0619	CSE-4875	Pattern Recognition and Image Processing	3		3		
0619	CSE-4876	Pattern Recognition and Image Processing Lab		2		1	
0619	CSE-4877	Machine Learning and Data Mining	3		3		
0619	CSE-4878	Machine Learning and Data Mining Lab		2		1	
0619	CSE-4879	Computer Interfacing	3		3		
0619	CSE-4880	Computer Interfacing Lab		2		1	



Mapping between the Course Outcomes (COs) of all core courses and the Program Outcomes (POs).

Course Code	Course Name	CO	Program Outcomes											
			PO1 a	PO2 b	PO3 c	PO4 d	PO5 e	PO6 f	PO7 g	PO8 h	PO9 i	PO10 j	PO11 k	PO12 l
EEE-1121	Basic Electrical Engineering	CO1	X											
		CO2	X											
		CO3	X											
		CO4		X										
EEE-1122	Basic Electrical Engineering Lab	CO1	X											
		CO2						X						
		CO3									X	X		
CSE-1121	Computer Programming 1	CO1	X											
		CO2		X										
		CO3		X										
CSE-1122	Computer Programming 1 Lab	CO1	X											
		CO2		X										
		CO3					X							
PHY-1101	Physics I	CO1	X											
		CO2	X											
		CO3	X											
		CO4	X											
MATH-1107	Mathematics-I	CO1	X											
		CO2	X											
		CO3	X											
CSE-1221	Computer Programming 2	CO1	X											
		CO2	X											
		CO3		X										
		CO4	X											
CSE-1222	Computer Programming 2 Lab	CO1	X											
		CO2	X											
		CO3	X											
		CO4					X				X	X		
MATH-1207	Mathematics-II	CO1	X											
		CO2	X											
		CO3		X										
EEE-1221	Electronics	CO1	X											
		CO2		X										
		CO3		X										
		CO4	X											
		CO5		X										
EEE-1222	Electronics Lab	CO1	X											
		CO2									X			



Course Code	Course Name	CO	Program Outcomes									
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
		CO3	X								X	X
CSE-1223	Discrete Mathematics	CO1	X									
		CO2		X								
		CO3		X								
CSE-1230	Competitive Programming 1	CO1	X									
		CO2	X									
PHY-1201	Physic II	CO1	X									
		CO2	X									
		CO3		X								
		CO4	X									
PHY-1204	Physics Lab	CO1	X									
		CO2	X									
CHEM-2301	Chemistry	CO1	X									
		CO2	X									
CHEM-2304	Chemistry Sessional	CO1	X									
		CO2	X									
		CO3	X									
CSE-2321	Data Structures	CO1	X									
		CO2	X	X								
		CO3	X	X								
		CO4		X								
CSE-2322	Data Structures Lab	CO1	X									
		CO2	X	X								
		CO3	X	X								
STAT-2311	Probability and Statistics	CO1	X									
		CO2		X								
		CO3	X									
		CO4			X							
CSE-2323	Digital Logic Design	CO1	X									
		CO2		X								
		CO3		X								
CSE-2324	Digital Logic Design Lab	CO1	X									
		CO2		X								
		CO3			X						X	
MATH-2307	Mathematics III	CO1	X									
		CO2		X								
		CO3	X									
		CO4	X									
		CO5		X			X					
CSE-2340	Software Development 1	CO1		X		X				X	X	
		CO2					X			X	X	
		CO3		X						X	X	
ME-	Engineering	CO1	X									



Course Code	Course Name	CO	Program Outcomes									
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
2412	Drawing	CO2					X					
		CO3	X									
		CO4	X									
CSE-2421	Computer Algorithms	CO1	X									
		CO2		X								
		CO3										
		CO4	X	X								
		CO5		X			X					
CSE-2422	Computer Algorithmes Lab	CO1	X									
		CO2	X	X								
		CO3		X			X					
CSE-2423	Database Management Systems	CO1	X									
		CO2				X						
		CO3			X							
CSE-2424	Database Management Systems Lab	CO1	X									
		CO2			X							X
		CO3		X			X					
CSE-2425	Theory of Computing	CO1	X									
		CO2	X									
		CO3	X									
		CO4	X	X								
MATH-2407	Mathematics IV	CO1	X									
		CO2	X									
		CO3	X									
		CO4				X						
EEE-2421	Electrical Drives and Instrumentation	CO1	X									
		CO2		X								
		CO3		X								
		CO4	X									
		CO5		X								
EEE-2422	Electrical Drives and Instrumentation Lab	CO1	X									
		CO2				X						
		CO3			X						X	X
		CO4							X		X	
CSE-2430	Competitive Programming 2	CO1		X								
		CO2			X							
CSE-3521	Computer Architecture	CO1	X									
		CO2		X								
		CO3		X								
		CO4	X									
		CO5	X									
CSE-3523	Microprocessors, Microcontrollers	CO1	X									
		CO2	X									



Course Code	Course Name	CO	Program Outcomes											
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	and Embedded Systems	CO3		X										
CSE-3524	Microprocessors, Microcontrollers and Embedded Systems Lab	CO1	X											
		CO2		X										
		CO3			X									
		CO4		X	X		X				X	X	X	
		CO5						X	X					
CSE-3525	Data Communication	CO1	X											
		CO2		X										
		CO3	X											
		CO4	X											
CSE-3527	Compiler	CO1	X											
		CO2			X									
		CO3			X									
CSE-3528	Compiler Lab	CO1					X							
		CO2	X											
		CO3	X				X							
CSE-3529	Systems Analysis and Design	CO1	X											
		CO2		X										
		CO3		X										
		CO4		X							X	X	X	
CSE-3532	Tools and Technologies for Internet Programming	CO1	X											
		CO2	X											
		CO3	X											
		CO4		X	X	X	X				X	X	X	
		CO5						X	X			X		
CSE-3631	Operating Systems	CO1	X											
		CO2		X										
		CO3		X										
CSE-3632	Operating Systems Lab	CO1	X											
		CO2		X										
		CO3		X										
ACC-2401	Financial and Managerial Accounting	CO1										X		
		CO2										X		
		CO3										X		
		CO4										X		
CSE-3633	Computer Networks	CO1	X											
		CO2		X										
		CO3		X										
		CO4								X				
		CO5							X					X
CSE-3634	Computer Networks Lab	CO1		X			X							
		CO2				X								



Course Code	Course Name	CO	Program Outcomes									
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CSE-3635	Artificial Intelligence	CO3		X						X		
		CO1	X									
		CO2		X								
		CO3		X								
CSE-3636	Artificial Intelligence Lab	CO4			X							
		CO1				X						
		CO2		X								
CSE-3637	Software Engineering	CO3			X						X	
		CO1	X									
		CO2		X								
		CO3		X								
CSE-3638	Software Engineering Lab	CO4		X		X						
		CO1		X		X						
		CO2		X								
		CO3			X							
CSE-4741	Computer Graphics	CO4		X								
		CO1	X									
		CO2	X									
		CO3		X								
CSE-4742	Computer Graphics Lab	CO4		X					X			X
		CO1		X								
		CO2		X								
CSE-4743	Computer Security	CO3			X							
		CO1	X									
		CO2		X								
		CO4		X								
CSE-4744	Computer Security Lab	CO1				X						
		CO2			X							
		CO3			X	X					X	
		CO4								X		X
CSE-4745	Numerical Methods	CO1	X									
		CO2	X									
		CO3	X									
		CO4	X									
		CO5	X									
		CO6	X									
CSE-4746	Numerical Methods Lab	CO1	X									
		CO2	X									
		CO3		X								
CSE-4747	Mathematical Analysis for Computer	CO1		X								
		CO2		X								
		CO3		X								

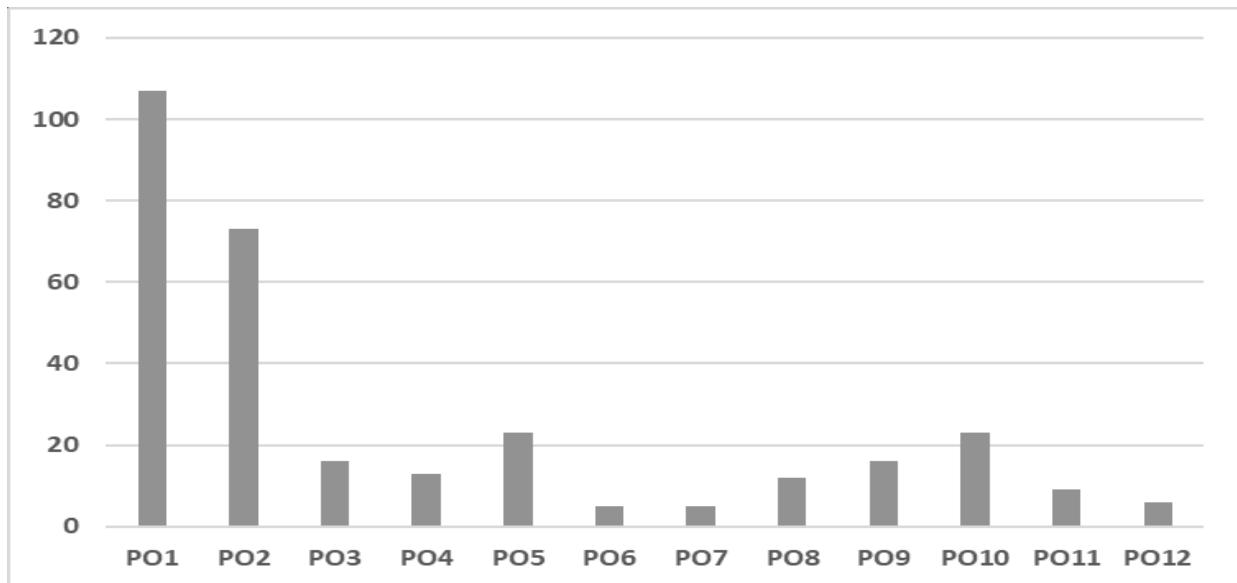


Course Code	Course Name	CO	Program Outcomes											
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	Science	CO4		X										
CSE-4750	Technical Writing and Presentation	CO1	X											
		CO2		X										
		CO3					X							X
		CO4					X							
		CO5							X	X				X
		CO6										X		
CSE-4708	Field work	CO1	X											
		CO2				X			X	X				
		CO3										X		
		CO4												X
CSE-4822	General viva	CO1	X											
		CO2										X		
CSE-4805	Social, Professional and Ethical Issues in Computing	CO1									X			
		CO2									X			
		CO3									X			
		CO4					X							
		CO5					X							
		CO6								X				
CSE-4800	Project / Thesis	CO1	X	X		X	X						X	
		CO2			X									X
		CO3				X		X	X	X				
		CO4										X		
		CO5									X			
ECON-3501	Principles of Economics	CO1										X		
		CO2										X		
		CO3										X		
MGT-3601	Industrial Management	CO1											X	
		CO2										X		
		CO3										X		
Total no of CLOs under each PLO for this section			107	73	16	13	23	5	5	12	16	23	9	6



Summary of the mapping between COs and POs that the number of COs from all of the courses that map with the PLO

PLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
Total	107	73	16	13	23	5	5	12	16	23	9	6





International Islamic University Chittagong
Faculty of Science and Engineering
Department of Computer Science and Engineering

Semester wise Distribution Plan of Courses

FIRST SEMESTER:

SL. No	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-1121	Computer Programming 1	3		3		-
2	0613	CSE-1122	Computer Programming 1 Lab		3		1.5	-
3	0713	EEE-1121	Basic Electrical Engineering	3		3		-
4	0713	EEE-1122	Basic Electrical Engineering Lab		3		1.5	-
5	0541	MATH-1107	Mathematics I (Differential and Integral Calculus)	3		3		-
6	0533	PHY-1101	Physics I (Mechanics, Waves, Heat and Thermodynamics)	3		3		-
7	0231	UREL-1106	Advanced English	3		2		-
8	0223	UREM-1101	Text of Ethics and Morality	2		1		-
		Total	8 Courses	17	6	15	3	

SECOND SEMESTER

SL. No	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-1221	Computer Programming 2	3		3		CSE-1121
2	0613	CSE-1222	Computer Programming 2 Lab		3		1.5	
	0613	CSE-1223	Discrete Mathematics	3		3		
3	0714	EEE-1221	Electronics	3		3		EEE-1121
4	0714	EEE-1222	Electronics Lab		3		1.5	
5	0541	MATH-	Mathematics II	3		3		MATH-1107



SL. No	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
		1207	(Geometry and Differential Equations)					
6	0533	PHY-1201	Physics II (Electromagnetism, Optics and Modern Physics)	3		3		PHY-1101
7	0533	PHY-1204	Physics II Lab (Electromagnetism, Optics and Modern Physics)		3		1.5	
8	0613	CSE-1230	Competitive Programming 1		2		1	
9	0221	URED-1201	Basic Principles of Islam ('Aqidah + 'Ibadah))	2		2		
		Total	10 Courses	17	11	17	5.5	

THIRD SEMESTER

#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-2321	Data Structures	3		3		CSE-1121 CSE-1122
2	0613	CSE-2322	Data Structures Lab		2		1	
3	0613	CSE-2323	Digital Logic Design	3		3		EEE-1221
4	0613	CSE-2324	Digital Logic Design Lab		3		1.5	
5	0541	MATH-2307	Mathematics III (Matrices, Linear System of Equations and Vector Analysis)	3		3		MATH-1207
6	0542	STAT-2311	Probability and Statistics	2		2		
7	0531	CHEM-2301	Chemistry	3		3		
9	0613	CSE-2340	Software Development 1		4		2	CSE-1221
10	0221	URED-2302	Sciences of Quran and Hadith	2		1		



#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
		Total	9 Courses	16	9	15	4.5	

FOURTH SEMESTER

#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-2421	Computer Algorithms	3		3		CSE-2321
2	0613	CSE-2422	Computer Algorithms Lab		2		1	
3	0612	CSE-2423	Database Management Systems	3		3		
4	0612	CSE-2424	Database Management Systems Lab		3		1.5	
5	0612	CSE-2427	Theory of Computation	3		3		
6	0541	MATH-2407	Mathematics IV (Complex Variable, Fourier Analysis and Z-transform)	3		3		MATH-2307
7	0714	EEE-2421	Electrical Drives and Instrumentation	2		2		EEE-1221
8	0714	EEE-2422	Electrical Drives and Instrumentation Lab		2		1	
9	0715	ME-2412	Engineering Drawing Lab		2		1	
10	0613	CSE-2430	Competitive Programming 2		2		1	
11	0232	URBL-2401	Bengali Language & Lituratre	2		2		
		Total	11 Courses	16	11	16	5.5	

FIFTH SEMESTER.



#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0612	CSE-3521	Computer Architecture	3		3		
2	0612	CSE-3523	Microprocessors, Microcontrollers and Embedded Systems	3		3		
3	0612	CSE-3524	Microprocessors, Microcontrollers and Embedded Systems Lab		2		1	
4	0612	CSE-3525	Data Communication	3		3		
5	0613	CSE-3527	Compiler	3		3		
6	0613	CSE-3528	Compiler Lab		2		1	
7	0613	CSE-3529	Systems Analysis and Design	3		3		
8	0612	CSE-3532	Tools and Technologies for Internet Programming		4		2	
9	0312	URED-3503	Introduction to Political Thoughts and Social Behavior	2		1		
		Total	9 Courses	17	8	16	4	

SIXTH SEMESTER

#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-3631	Operating Systems	3		3		CSE-3521
2	0613	CSE-3632	Operating Systems Lab		2		1	
3	0612	CSE-3633	Computer Networks	3		3		CSE-3525
4	0612	CSE-3634	Computer Networks Lab		3		1.5	
5	0619	CSE-3635	Artificial Intelligence	3		3		
6	0619	CSE-3636	Artificial Intelligence Lab		2		1	



#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
7	0613	CSE-3641	Software Engineering	3		3		CSE-3529
8	0613	CSE-3642	Software Engineering Lab		2		1	
9	0613	CSE-3644	Software Development 2 Lab		2		1	CSE-3532
10	0411	ACC-2401	Financial and Managerial Accounting	2		2		
11	0221	URED-3604	Life and Teachings of Prophet Muhammad (SAAS)	2		1		
		Total	11 Courses	16	11	15	5.5	

SEVENTH SEMESTER

#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-4741	Computer Graphics	3		3		MATH-2307
2	0613	CSE-4742	Computer Graphics Lab		2		1	
3	0619	CSE-4743	Computer Security	2		2		
4	0619	CSE-4744	Computer Security Lab		2		1	
5	0613	CSE-4745	Numerical Methods	2		2		CSE-1121
6	0613	CSE-4746	Numerical Methods Lab		2		1	
7	0541	CSE-4747	Mathematical Analysis for Computer Science	3		3		STAT-2311
8	0288	CSE-4750	Technical Writing and Presentation		2		1	
9	0311	ECON-3501	Principles of Economics	2		2		



#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
10	0031	CSE-4708	Field Work		3 weeks		1	
11	0619	CSE-4800	Project / Thesis		2		1	
12	0222	URIH-4701	A Survey of Islamic History and Culture	2		1		
		Total	12 Courses	14	10	13	6	

EIGHTH SEMESTER

#	ISCED	Course No.	Course Title	Contact Hours/Week		Credit Hours		Prerequisite Courses
				Theory	Practical	Theory	Practical	
1	0613	CSE-4805	Social, Professional and Ethical Issues in Computing	2		2		
2		CSE-48xy	Option 1	3		3		
3		CSE-48xy	Option 1 Lab		2		1	
4		CSE-48xy	Option 2	3		3		
5		CSE-48xy	Option 2 Lab		2		1	
6		CSE-48xy	Option 3	3		3		
7		CSE-48xy	Option 3 Lab		2		1	
8	0413	MGT-3601	Industrial Management	2		2		
9	0619	CSE-4800	Project / Thesis		6		3	
10	0031	CSE-4822	General Viva	1		1		
11	0222	URHE-4801	History of the Emergence of Bangladesh	2		2		
		Total	11 Courses	16	12	16	6	



Template of the synopsis

Template of the synopsis of a theoretical course

ISCED Code: Credit Hours:	Course Title: Contact Hours:	1: Introduction				
Course Assessments	CIE: Continuous Internal Evaluation		Attendance	10 Marks		
			Class test/ Assignment/ Quizzes	10 Marks		
		Mid-term	30Marks			
				SEE: Semester End Examination	50 Marks	
Objectives	2: Objectives					
	S/N	Course Learning Outcomes (CLOs): Upon the successful completion of the course, students will be able to		Corresponding PLOs	Bloom's taxonomy domain/level	3: CLO-PLO
				PLO-Y ₁		
		PLO-Y ₂				
		PLO-Y _N				
4: Course Contents						
5: References						

A Sample Question Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category (Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



- i. Delivery methods & activities:** Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,
- ii. Assessment tools:** Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Semester end examination. Project evaluation & Viva

B. Template of the synopsis of a sessional course

Course Code:	Course Title:	}	_____	1: Introduction
Contact Hours:	Credit Hours:			
Objectives	_____			2: Objectives
S/N	Course Learning Outcomes (CLOs): Upon the successful completion of the course, students will be able to	Corresponding PLOs	Bloom's taxonomy domain/level	
CLO-X ₁		PLO-Y ₁		
CLO-X ₂		PLO-Y ₂		
CLO-X _N		PLOY _N		3: CLO-PLO

List of the Experiment is shown in laboratory manual of the department.

Reference Books:	_____	4: References
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Course Assessment Pattern (Sessional Courses): There are 100 marks for each Sessional course. Out of 100 marks, 50-60 marks is allotted for continuous assessment on Lab. activities including 10 marks for attendance (**CIE**) and 40-50 marks is for practical exam at the end of Semester, viva, quiz etc. at the end of Semester End examination (**SEE**).

A. Delivery methods & activities: Lecture, White Board Writing, Power point Presentation, Practical Demonstration, Data Collection, Data Analysis, Report Writing, Q/A, discussion,

B. Assessment tools: Class Attendance, Assignment, Lab Report, Quizzes, Lab Exams. (Mid & Final), Table Viva



Synopsis of the Courses

A. University Requirement Courses



1st Semester			
Course Code:		UREM-1101	
Course Title:		Text of Ethics and Morality-I	
Credit: 1		Contact: 2 lectures per week	
Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives: The main objectives of this course are:

To make students capable of understanding the text of the Holy Qur'an so that they can understand the rules of ethics from the main and basic ethical book as well as to make students capable of understanding the basic Arabic language so that they can communicate with the foreign countries and be fit with labor market worldwide especially in the Middle East. To inspire students in reading the Holy *Qur'an*, which is the complete code of life. To make students familiar with *Ayats of Ahkam* of the Holy *Qur'an* so that they can lead their life being enlightened with them.

S/N	Course Outcomes (CLOs): Upon the successful completion of the course, students will be able to	Corresponding IIUC Mission	Bloom's taxonomy domain/level
CLO1	Understand the text of the Holy Qur'an as well as the basic Arabic language to communicate easily in the job market globally.	IIUCMS-1	Cognitive/ Understanding
CLO2	Understand the rules of ethics and morality from the basic ethical book –the holy Quran.	IIUCMS-1	Cognitive/ Understanding
CLO3	Achieve knowledge on the various legal issues that are depicted in Qur'anic texts related to different laws of human life as well as able to save themselves from any evil activity, which boost up morally throughout their professional life.	IIUCMS-3	Cognitive/ Applying

Course Contents:

<i>Chapter</i>	<i>Section-A (Midterm Exam: 30 Marks)</i>	<i>Number of Lectures</i>	<i>CLOs</i>
1	1. An introduction to the text of Ethics and Morality. 2. Selected text on the introductory chapter of a valuable Ethical Book - the holy Qur'an 3. An introduction to Arabic language. 4. Identifying the forms of Arabic alphabet with example.	04	CLO1
2	1. Selected text on procreation of the creation of humankind: 22:5 2. Selected text on Islamic monotheism: 2: 1-5; 112: 1-4 3. Text on ensuring social peace by removing bad behavior 49:10-12 4. The sun letters and the moon letters 5. Arabic numbers and common Arabic words used in daily life. 6. Arabic prepositions.	06	CLO1
3	1. Selected text on duties and obligations towards family and relatives = 4: 34-36. 2. Selected text on the transition of human life: 10:24. 3. Selected text on the rule of livelihood = 2: 172- 174, 5:3-5.	04	CLO2



	4. Exercise of Arabic demonstrative pronouns.		
Section-B (SEE: 50 Marks)			
4	1. Selected text on the rule and impact of interest (<i>al-riba</i>) and loan = 2: 275-279. 2. Selected Text on the rules and impact of drug and gambling =5: 90-91 3. Exercise of Arabic interrogative pronoun. 4. The name of days and months in Arabic. 5. Formation of Arabic word	05	CLO2 CLO3
5	1. Selected Text on the rules and ethical directions of marriage, <i>mahr</i> and veil: 4: 2-4; 24: 30-31, 33:59.; 2. Text on the rule and ethical directions of divorce 2:227-230; 3. The names directions in Arabic. 3. Formation of verb in Arabic.	03	CLO1 CLO2
6	1. Formation of particle in Arabic. 2. Selected text on the sermon of a father to his son =31:13-19.	02	CLO1
7	1. Selected text on the characteristics of human beings = 23:1-11; 25: 63-76	02	CLO1
8	1. Formation of Arabic sentence. 2. Conversation in Arabic: ‘Yourself’.	04	CLO1
30			

Text Books:

- Abbott, N., Studies in Arabic literary papyri II, Qur'anic commentary and tradition, Chicago: University of Chicago, 1967.
- Dr. M. Fazlur Rahman, Everyday Arabic Conversation, Riyad Prokashani, Dhaka, 2005.
- Haleem, M. A., Understanding the Qur'an: themes and Style, London: I. B. Tauris, 1999.
- Izzath Uroosa, Learning Arabic Language of the Qur'an, Darussalam, Riyadh, 2010.
- Saheeh International, The Qur'an Arabic Text with Corresponding English Meanings, Jeddah, Saudi Arabia, 1997.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.



Course Code: UREL-1106

Course Title: Advance English

Credits: 2 CH

Contact Hours: 3

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Rationale of the Course: This course has been designed for the students of first semester because they need to develop four basic skills of English (i.e. Listening, Speaking, Reading and Writing) to a level that they can comprehend lectures given in English, comprehend literary, non-literary, formal and informal texts and communicate effectively both orally and in written form. They also need to prepare themselves for IELTS/TOEFL exams so that they can take these exams for their higher study abroad. They also need to build up confidence in their own speaking and writing which will be provided by teaching them essential grammatical points. This course is designed with an objective to fulfill this aim.

S/N	Course Outcomes (CLOs): Upon the successful completion of the course, students will be able to	Corresponding IIUC Mission	Bloom's taxonomy domain/level
CLO1	Acquire four skills of English language which enable them to study, analyze, explain both orally and in written form different aspects of science and engineering.	IIUCMS-1	Cognitive/ Understand
CLO2	Understand the lectures given in English and write answers in the examination using correct and standard English.	IIUCMS-1	Cognitive/ Understand
CLO3	Communicate effectively in relation with science and engineering by overcoming English language barriers.	IIUCMS-1	Cognitive/Apply
CLO4	Get good grades in all international examinations, competitive examinations as well as internal examinations by using fluency in both spoken and written English.	IIUCMS-1	Cognitive/ Apply
CLO5	Study and comprehend Science and Engineering texts, reference books which are written in English, engineering and science related articles in national and international journals and acquire substantial knowledge about science and engineering.	IIUCMS-2	Cognitive/ Analyse
CLO6	Develop a self-confidence in the use of English all through the science and engineering career and thus to achieve a lucrative social status.	IIUCMS-3	Cognitive/ Evaluate

Course content:

Chapter	Section-01: Mid-term : (Reading-1 (Seen-08), Reading-2 (Unseen-07), Writing-1 (Sentence Construction)-05, Writing-2 (composition)-05, Listening-05 or Speaking-05)	Number of Lectures	CLOs
1	- Reading from the prescribed Text. (First half of the prescribed text) (Any one of the following texts will be chosen for both midterm & final) ● Exercises in Reading Comprehension Edited by: E.L. Tibbits Longman Group Limited, Longman House Burnt Mill, Essex, UK ● Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London ● The Pilgrim's Progress (selected passages) John Bunyan	5	CLO-1



	William Collins Sons & Co. Ltd. London (part one) <ul style="list-style-type: none"> ● The Old Man and the Sea (selected passages) Earnest Hemingway Peacock Books B-2, Vishal Enclave, New Delhi-110027		
2	(Passages in the examination will be unseen). Students will practice reading Dhaka Courier/daily newspaper/Passages for IELTS reading module at the lab. Focus will be given on: Strategies of reading, scanning for specific details and skimming for general understanding, identifying main and supporting ideas, summarizing, understanding argument, identifying opinion/attitude and making inferences, analysis and interpreting variety of texts, techniques and strategies for improving comprehension skills, practicing comprehension from literary and non-literary texts, techniques of speed reading. The following websites will be used: <ul style="list-style-type: none"> ● http://www.dhakacourier.com.bd/ ● http://ielts-up.com/reading/ielts-reading-practice.html#academic ● https://allmedialink.com/english-newspaper-of-bangladesh/ ● http://www.indiacelebrating.com/paragraph/paragraph-on-moral-values/ 	5	CLO-1
3	-Sentence writing and composition Sentences: sentence variety, (Construction of assertive, imperative, interrogative, optative, exclamatory, simple, complex, compound), common errors (use of active in place of passive and vice versa/sequence of tense/WH questions/ Y/N questions etc.) Composition: Paragraph (free and guided) Writing/completing a story.	4	CLLO-2
4	Speaking and listening Speaking- Introducing oneself, dialogue. Listening: Listening for specific information, identifying detail Developing vocabulary: Students are required to sign up with – <ul style="list-style-type: none"> ● https://www.vocabulary.com/ ● https://helloenglish.com/ (Students will use their own android devices/laptops/computers at the lab and work at home with the above two sites. The teacher will monitor their progress and take occasional tests) The following site will be used for listening practice. <ul style="list-style-type: none"> ● http://ielts-up.com/listening/ielts-listening-practice.html 	4	CLO-3
Section-02: SEE; 50 marks: Reading-1 (Seen-15), Reading-2 (Unseen-10), Writing-1 (Sentence Construction)-10, Writing-2 (composition)-05, Listening-05, Speaking-05			
5	Reading from the prescribed Text. (The last half of the prescribed text) (Any one of the following texts will be chosen for both midterm & final) <ul style="list-style-type: none"> ● Exercises in Reading Comprehension Edited by: E.L. Tibbits Longman Group Limited, Longman House Burnt Mill, Essex, UK <ul style="list-style-type: none"> ● Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London <ul style="list-style-type: none"> ● The Pilgrim's Progress (selected passages) John Bunyan William Collins Sons & Co. Ltd. London (part one) <ul style="list-style-type: none"> ● The Old Man and the Sea (selected passages) Earnest Hemingway Peacock Books B-2, Vishal Enclave, New Delhi-110027	6	CLO-3



6	<p>(Passages in the examination will be unseen). Students will practice reading Dhaka Courier/daily newspaper/Passages for IELTS reading module at the lab.</p> <p>Focus will be given on : Strategies of reading, scanning for specific details and skimming for general understanding, identifying main and supporting ideas, summarizing, understanding argument, identifying opinion/attitude and making inferences, analysis and interpreting variety of texts, techniques and strategies for improving comprehension skills, practicing comprehension from literary and non-literary texts, techniques of speed reading.</p> <p>The following websites will be used:</p> <ul style="list-style-type: none"> ● http://www.dhakacourier.com.bd/ ● http://ielts-up.com/reading/ielts-reading-practice.html#academic ● https://allmedialink.com/english-newspaper-of-bangladesh/ ● http://www.indiacelebrating.com/paragraph/paragraph-on-moral-values/ 	7	CLO-5
7	<p>Sentences: common grammatical problems, tense, article, preposition, subject verb agreement, clause, modals, conditional sentence</p> <p>Composition: Composition:</p> <ul style="list-style-type: none"> *Describing pie chart, column chart, graphs, tables, * Agreeing/ disagreeing on some opinion, * Business letters, formal and informal letters. 	7	CLO-6
8	<p>Speaking- describing people and places, narrating events, extempore speech and presentation techniques</p> <p>Listening: Listening for specific information, identifying detail</p> <p>Developing vocabulary: Students are required to sign up with –</p> <ul style="list-style-type: none"> ● https://www.vocabulary.com/ ● https://helloenglish.com/ <p>(Students will use their own android devices/laptops/computers at the lab and work at home with the above two sites. The teacher will monitor their progress and take occasional tests)</p> <p>The following site will be used for listening practice.</p> <p>http://ielts-up.com/listening/ielts-listening-practice.html</p>	7	CLO-6

Books Recommended:

1. Text Book: Exercises in Reading Comprehension,
Edited by: E.L. Tibbitts,
Longman House Harlow,
Essex, UK
2. Raymond Murphy, *Intermediate English Grammar*, Foundation Books, 2/19 Ansari Road, Daryaganj, New Delhi-110002, ManasSaikia, 1995. (Published by arrangement with Cambridge University Press, The Edinburgh Building, and Shaftsbury Road, Cambridge CB2 2RU, U.K.).
3. Wren & Martin, *High School English Grammar and Composition-*, New Delhi, S. Chand & Company Ltd. 2002.
4. Thomson & Martinet, *Practical English Grammar*, Oxford University Press, Walton Street, Oxford OX2 6DP, 1993 (reprinted in India by arrangement with Oxford University Press).
5. Michael A. Pyle and Mary Ellen Munoz, *Cliffs TOEFL Preparation Guide*, New Delhi, BPB Publications, B-14, Connaught Place, New Delhi-110001, 1992.
6. Bruce Rogers, *Peterson's TOEFL Success*, Princeton, New Jersey, Peterson's, 2000.
7. AS Hornby, *Oxford Advanced Learner's Dictionary of Current English*, Oxford University Press, 2002-2003.
8. Chowdhury & Hossain, *Advanced English*, Dhaka, Sayma Chowdhury and Halima Chowdhury, 2004.
9. Mohammad Sarwar Alam & Mohammad Taher Hossain Salim, *English Sentences: Learning through Structures & Functions*, Friends' Book Corner, 16 Rafin Plaza 2nd floor, 3/B Mirpur Rood, Dhaka-Bangladesh. 2018
10. Build up Your English, A.J. Glover, The English Language Book Society and J.M. Dents and Sons Ltd. London



- <http://www.dhakacourier.com.bd/>
- <http://ielts-up.com/reading/ielts-reading-practice.html#academic>
- <https://allmedialink.com/english-newspaper-of-bangladesh/>
- <http://www.indiacelebrating.com/paragraph/paragraph-on-moral-values/>
- <https://www.vocabulary.com/>
- <https://helloenglish.com/>

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: **CIE**=Continuous Internal Evaluation, **SEE**= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva

Course Code: URED-1201

Course Title: Basic Principles of Islam ('Aqidah+ 'Ibadah)

Credits: 2CH

Contact: 02 Per Week

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Rationale of the Course: Soundness of belief & thinking and righteousness of actions are the foundation of a good life. Again actions that are related between us and our Creator are termed as 'Ibadah. This course is designed to provide the students with the pure belief system of Islam that will guide them to sound thinking for removing some misconceptions & traditional superstitions contradicting the basic faith & tenets of Islam. This course also provides them with a clear and comprehensive concept of 'Ibadah in Islam to encourage them to be used to it and to illuminate every walk of life in accordance with the lessons derived from it as the slaves of Allah (SWT).

SL	Course Learning Outcomes (CLOs) Upon the successful completion of the course, students will be able to	Corresponding Mission of IIUC	Bloom's taxonomy domain/level
CLO-1	Understand the clear concept of Islamic Aqidah, its importance, benefits and effects on our practical life	IIUCMS-01& 02	Cognitive/ Understanding
CLO-2	Understand the meaning of belief in Allah (<i>Tawhid</i>), nurse it in their minds and protect it from	IIUCMS-02& 03	Cognitive/ Analyzing



	any filthy beliefs (Shirk & Tashbih), hypocrisy (Nifaq), other contemporary misconceptions or superstitious fancies		
CLO-3	Understand the other articles of faith and their relationship with the main belief - belief in oneness of Allah	IIUCMS-02& 03	Cognitive/ Understanding
CLO-4	Understand the concept of worship in Islam and its all-embracing view	IIUCMS-01& 03	Cognitive/ Analyzing, Understanding
CLO-5	Understand the significance of some prescribed rituals of Islam that will help them to be a practicing Muslims holding proper beliefs and performing those rituals of Islam.	IIUCMS-02& 03	Cognitive/ Understanding

Course Content:

Chapter	Course Outline: <u>Section-A (Midterm Exam: 30 Marks)</u>	Number of Lectures	CLOs
01	Chapter# 01: Islamic ‘Aqidah: An introduction: (a) Islam: Its definition and characteristic (b) Islamic ‘Aqidah: Its definition and importance.	4	CLOs -1
02	Chapter# 02: <u>Some Articles of Faith (Pillars of Iman):</u> [01] Believe in Allah (SWT): * We must believe in Tawheed: (1) Existence of Allah (SWT) (2) Tawhid: Definition and classifications (Tawhid Al-Rabubiah, Tawhid Al-Uluhiah, and Tawhid Al-Asma Was-Sifat) (3) Impact of Tawhid. * We must avoid Shirk: (1) Definition, classifications and consequences (2) Examples of some Shirks in contemporary society. [02] Belief in Allah’s Angels (Malaikah): (a) Belief in Angels of Allah (SWT): It’s meaning, their Nature and Functions (b) Benefits of belief in Angels. [03] Belief in the Books of Allah: (a) Belief in the Books of Allah: It’s meaning and an introduction to the revealed Books and Scriptures (b) The position of the Holy Qur’an amongst the other revealed Books (c) Benefits of belief in the Books of Allah (SWT).	6	CLOs-2
03	Chapter# 03: <u>Some Articles of Faith (Pillars of Iman):</u> [01] Belief in Allah’s Prophets: (a) Belief in Allah’s Prophets: It’s meaning and purpose of their sending (b) Features of Prophethood and Contributions of the Prophets towards humanity (c) Muhammad (SAAS) is the greatest, the best and the last among all the Prophets and Messengers. [02] Belief in the Akhirah (Life after Death): (a) Definition and Stages of Akhirah (b) The logic and evidence regarding Akhirah (c) Impact and benefits of belief in Akhirah. [03] Belief in Qadr/ Taqdir (Fate) and divine decree: (a) Definition of belief in Qadr/ Taqdir (b) Opinions of the scholars regarding Taqdir (c) Concept of man’s freedom of will in Islam. [04] The nullifiers of Iman: (a) Kufr and Nifaq: Definition, classifications and consequences (b) Description of the nullifiers of Iman in details.	4	CLO-3
04	Section-B (SEE: 50 Marks) Chapter# 04: ‘Ibadah: Its introduction: (a) Meaning of ‘Ibadah (b) Various types of ‘Ibadah (c) The best ‘Ibadah (d) Objectives and aims of ‘Ibadah. (e) Conditions of ‘Ibadah.	2	CLOs-4



05	<p>Chapter# 05: Characteristics of 'Ibadah and signs of 'Ibadur Rahman: Characteristics of 'Ibadah in Islam: Free from Intermediaries, Not being confined to specific places, All-Embracing View (Scope of 'Ibadah)...etc.</p> <p>Signs of 'Ibadur Rahman (Servants of Ar- Rahman): According to the Holy Qur'an.</p> <p><i>Taharah & Najasah:</i> Definition of <i>Taharah</i> (purity) and <i>Najasah</i> (impurity), ways and means of <i>Taharah</i>: <i>Wadu, Gusl.</i></p>	4	CLOs-4
06	<p>Chapter# 06: <u>Some Articles of Islam (Pillars of Islam) and Defense system of Islam:</u></p> <p>Salah (Prayer): Its significance, teachings & some basic rules:</p> <ul style="list-style-type: none"> (a) Definition and kinds (b) Importance (c) Prerequisites of Salah (Shurutus-Salah) (d) Essentials/ Basic components of Salah (Arkanus-Salah) (e) How to perform the Salah in detail (practically)? (f) Things that invalidate the prayer (Mufsidatus-Salah) (g) Sajdah that makes prayer correct (Sajdatus-Sahu) (h) Friday prayer (Salatul-Jumu'ah) (i) The funeral prayer (Salatul-Janazah) (j) Prayer of the traveler (Salatul-Musafir) (k) 'Eid prayer (Salatul-'Eid) (l) Impact of Salah. <p>Zakah (poor-due) : Its significance, teachings & some basic rules:</p> <ul style="list-style-type: none"> (a) Definition and types (b) Importance (c) kinds of property on which Zakah is obligatory (d) Who should give Zakah (e) Due recipients of Zakah (f) Zakah and poverty alleviation (g) Impacts/ benefits of Zakah. 	4	CLOs-5
07	<p>Chapter# 07: Sawm (Fasting): Its significance, teachings & some basic rules:</p> <ul style="list-style-type: none"> (a) Definition and types (b) Importance (c) Things which invalidate the fast (Mufsidatus-Sawm) (d) Who must fast? (e) Exemption from fasting (f) Recompense of mistake (<i>Qada</i> and <i>kaffarah</i>) (g) <i>Sahdktul Fitr/ Zakatul Fitr</i> (h) Impact of Sawm. <p>Hajj (pilgrimage): Its significance, teachings & some basic rules:</p> <ul style="list-style-type: none"> (a) Definition and types (b) Importance (c) How to perform Hajj in detail? (d) Impact of Hajj. 	4	CLOs-5
08	<p>Chapter# 08: Defense system of Islam:</p> <ul style="list-style-type: none"> (a) Definition and classification of Jihad from various aspects (b) Importance of Jihad (b) Differences between Jihad and Terrorism. 	2	CLO4

List of Books:

1. Rafique Dr. Abu Bakr, Islam The Ultimate Religion (Book one) Islamic 'Aqidah', Chittagong: ABC Publications, 2002.
2. Mohammad Amimul Ahsan and others, Towards Understanding 'Ibadah in Islam, Bangladesh Institute of Islamicthought (BIIT), Humanscience Series-06, First Eddithion, May-2015.

Basic Principles of Islam (Pillars of Islam):

1. Bhuiyan, Mohammad ShafiulAlam, The Fundamental Beliefs of a Pure Muslim, 1st edition, WAMY, Bangladesh office, Dhaka, 2003.
2. Sabiq, Assayed, Al-'Aqeed Al- Islamiyah, Cairo, Al-Fathu Lil-IslamiliArabi, 10th edition-2000.
3. Bilal Philips, Dr. Abu Ameenah. The Fundamentals of Thwhid (Islamic Monotheism), International Islamic Publishing House.
4. Farid, Ahmed, An Encounter with Islam, Dhaka: Islamic Foundation, BaitulMukarram, Dhaka, 1995.

Basic Principles of Islam (Pillars of Islam):

1. Abdalati, Hammudah, Islam in Focus, The Dept. of Islamic Affairs, The Ministry of Awqaf and Islamic Affairs, State of Qatar, 1995/ Islamic Teaching Course. Vol.-1



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| 2. Al-Quardawi, Dr. Yousuf, Al-'Ibadah in Islam, Wahba publication, Egypt, 24 th edition, 1995. |
| 3. Alkhuli, Muhammad Ali, The Light of Islam, E 4, Riyadh: Al Farazdak Press, 1983. |
| 4. Sarwar, Ghulam, Islam: Beliefs and Teachings, London: The Muslim Educational Trust, 1980. |

Course Assessment Pattern (Theory courses):

Bloom's Category	Evaluations out of 100 marks				SEE (50marks)
	CIE (50 marks)				
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.

Course Code: URED-2302

Course Title: Sciences of Qur'an and Hadith

Credit: : 01CH

Contact: 02 C.H.

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Rationale of the Course: The Holy Qur'an and Hadith are the main sources of Islamic Knowledge. They are the primary sources of Islamic *Aqidah*, *Ibadah*, *Muamalah* and *Akhlaq*. So after taking basic beliefs exactly from them and acquiring comprehensive knowledge about '*Ibadah*', it is necessary to know the method of explanation and understanding the Holy Qur'an and Hadith in order to apply them in our worldly life. Thus this course is designed to make the students familiar with these two primary sources of Islamic knowledge and help them to remove any misconception prevailing in the society concerning with or contrary to the spirit of the Qur'an and Hadith by establishing their authenticity and superiority.

SL	Course Learning Outcomes (CLOs) Upon the successful completion of the course, students will be able to :	Corresponding IIUCMS	Bloom's taxonomy domain/level
CLO1	To understand the nature and features of the holy Quran and Sunnah as the last revelation of Allah (SWT).	IIUCMS-1,2&3	Cognitive/ Understand
CLO2	To analyse how the both Quran and Sunnah has been collected, preserved and transmitted to us accurately and how the text of both are existed at present.	IIUCMS-1,2&3	Cognitive/ Analyse



CLO3	To understand the text of the holy Quran and Hadith based on their general and specific contexts.	IIUCMS-1,2&3	Cognitive/Understand
CLO4	To analyse why <i>Shariah</i> does not accept any change or modification by human kind.	IIUCMS-1,2&3	Cognitive/Analyse
CLO5	To understand the miraculous nature of the holy Quran, and how the Sunnah classified from various angles to find out authentic Hadith.	IIUCMS-1,2&3	Cognitive/Understand

Course Content:

Chapter	Course Outline: <u>Section-A (Midterm Exam: 30 Marks)</u>	Nmber of Lectures	CLOs
01	Al-Quran: Some General information: (1) Definition of the Sciences of the Qur'an Literally and Terminologically (2) Definition of the <i>Qur'an</i> Literally and Terminologically (3) Various Names and Attributes of the Holy <i>Qur'an</i> and their Significance (4) Characteristics of the Holy <i>Qur'an</i> (5) Central Subject Matter & the Main Themes of the Holy <i>Qur'an</i> (6) The necessity of the Holy <i>Qur'an</i> (7) The authenticity of the Holy <i>Qur'an</i> .	4	CLOs-1
02	The Quranic Revelation (<i>Wahi</i> of the Holy <i>Qur'an</i>): (1) Meaning of <i>Wahi</i> (2) Various classifications and procedure of <i>Wahi</i> (3) Stages of revelation of the Holy <i>Qur'an</i> (4) Gradual revelation of the Holy <i>Qur'an</i> and the wisdom behind it (5) The First and the Last Revelation.	4	CLOs2
03	Division of the text of the Holy Quran: (1) The <i>Aayah</i> of the <i>Qur'an</i> : Definition of <i>Aayah</i> . The Number of <i>Aayah</i> , words and letters of the Holy <i>Qur'an</i> . The Arrangement of the <i>Aayah</i> of the Holy <i>Qur'an</i> (2) The <i>Surah</i> of The <i>Qur'an</i> : Definition of <i>Surah</i> . The Arrangement of <i>Surah</i> of the Holy <i>Qur'an</i> . The classification of <i>Surah</i> of the Holy <i>Qur'an</i> .	4	CLO-4
Section-B (SEE: 50 Marks)			
04	Understanding the text of the holy Quran: (1) Makki&Madani Revelations: (a) The Definition of <i>Makki</i> and <i>Madani</i> (b) The Characteristics of <i>Makki</i> and <i>Madani</i> Revelations (c) The benefits of knowing <i>Makki</i> and <i>Madani</i> Revelations. (2) Asbabunnuzul (The Causes of Revelation): Meaning and classification of <i>Asbabunnuzul</i> . The benefits of Knowing <i>Asbabunnuzul</i> . (3) Al-Naskh (Abrogation) Definition, The proofs, The Classifications of <i>Naskh</i> . The benefits of knowing <i>Naskh</i> (abrogating) and <i>Mansukh</i> (abrogated) verses.	4	CLO5
05	Transmission of Quranic Revelation: (1) Types of transmission of Quranic revelation: Verbal Transmission & written form of transmission (2) Collection and compilation (<i>Jam`ul Quran</i>) (3) Stages of collection (4) difference between collection of Abu Bakr (ra) and Othman (ra).	3	CLO3
06	<i>Ijaz al-Quran (Inimitability of The Holy Qur'an):</i> Definition of <i>Ijaz</i> , Condition, The Proofs of <i>Ijaz</i> . Various aspects of <i>Ijaz Al-Qur'an</i> .	3	CLO5
07	General Information About Sunnah and Hadith: (1) Definition of <i>Sunnah</i> (2) Difference among <i>Qur'an</i> , <i>Sunnah</i> and <i>Hadith Qudshi</i> (3) The Position, importance and authority of <i>Sunnah</i> in Islamic <i>Shari'ah</i> (4) history of Collection & Compilation of <i>Sunnah</i> .	4	CLO3
08	Explanation of some important terms of Sunnah, the classification of Hadith and fabrication in Hadith: (1) Explanation of some important terms of Sunnah: <i>Isnad/Sanad, Matn, Rawee</i> and <i>Riwayah, Al-jame', Al-Musnad, Al-Sahih, Al-Sunan, Sahihayn, Muttafaqun 'Alayh, Al-kutub As-Sittah...etc.</i> (2) The classification of Hadith: (a)According to the reference to a particular authority (b) According to the links in the <i>Isnad</i> (c) According to the number of narrators involved in each stage of the <i>Isnad</i> (d) According to the reliability and memory of the narrator.(3) Fabrication in Hadith: (a) Definition of Fabrication (b) Causes and consequence of fabrication (c) Some examples of commonly	4	CLO5



	used fabricated <i>Hadith</i> in our society.	
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List of Books

Sciences of Our'an:

1. Denffer, Ahmad, vol. '*Ulum Al-Qur'an: An Introduction to the Sciences of the Qur'an*', The Islamic Foundation, UK, reprinted by – A.S. Noordeen, Kuala Lumpur. 1983.
2. Ushama, Dr.Thameem, *Sciences of the Qur'an: An Analytical Study*, International Islamic University Malaysia, Cooperative Limited, Kuala Lumpur. 1998.
3. Bucaille, Dr. Maurice, *The BibleThe Qur'an & Science*, Thinkers Library, Selangor Darul Ehsan. Malaysia, 1996.
4. Badruddin Muhammad bin Abdullah Al-Badruddeen Al- Zarkashi, *Al-Burhan Fi UlumilQur'an*, Dar Al-Marifah, Bairuth, VI. 01.
5. *A Study of the Holy Qur'an and its Teachings*, First edition, IQRA International Education Foundation, Chicago, April-1999.

Sciences of Hadith:

1. Al-Azami, Dr Mohammad Mustafa, *Studies in Early Hadith Literature*, American Trust publication, Indiana, 1978.
2. Hasan, Dr.Suhail, An Introduction to the Science of *Hadith*, London, AL-Qur'an Society, 1994.
3. Marhribi, Al-Hassan, Introduction to the Study of the *Hadith*, Roshmee, South Africa, Roshmee Islamic School, 1994.
4. Salih, Muhammad Adeeb, *Lamahat fee Usul al-Hadeth*, Damascus, 1393 AH.
 1. Siddiqi, Muhammad Zubayr, *Hadith Literature: its Origin, Development & Special Features*, Cambridge, Islamic Texts Society, 1993.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			SEE (50marks)
		CIE (50 marks)			
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: **CIE**=Continuous Internal Evaluation, **SEE**= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.

Course Code: URED 2305

Course Title: Comparative Religion (for Non-Muslim Students only)

Credits: 3 CH

4 Contact Hrs./week

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks



The Rationale of the Course: Today there are several Religions In this world. Many men many minds and scopes of thinking are available. So, the Religions demand from everyone to compare among all these Religions and chose the excepted Religion by the Almighty Allah the Cherisher and sustainer of the worlds. So the followers of this chosen Religion will be able to perform their activities according to the directions of their belief and chosen Religion. This course is designed to help the students to know about the several Religions and compare their chosen Religion with other Religions and create a firm decision and belief to practice on it without hating any other relations. They also be able to make a good relationship between Islamic beliefs and their actions, thus they can make their activities perfect for both lives here and hereafter.

SL	Course Learning Outcomes (CLOs) : Upon the successful completion of the course, students will be able to :	Corresponding IIUCMS	Bloom's taxonomy domain/level
CLO1	Acquire basic knowledge about Major Religions	IIUCMS-1,2&3	Cognitive/ Understand
CLO2	Understand about the teachings and admonitions of different religions.	IIUCMS-1,2&3	Cognitive/ Understand
CLO3	Analyze the principles of Major Religions.	IIUCMS-1,2&3	Cognitive/ Analyze
CLO4	Evaluate the ultimate Goal of the followers of different religions.	IIUCMS-1,2&3	Cognitive/ Evaluate
CLO5	Students will develop skills in observing and critically analyzing religion in the contemporary world.	IIUCMS-1,2&3	Cognitive/ Analyze

Course Content Outlines:

Chapter	Contents	Number of lectures	Corresponding CLOs
1	<u>Section-A (Midterm Exam: 30 Marks)</u> Comparative Religion: ➤ Definition of Religion ➤ Significance, Necessity and characteristics of Religion. ➤ Approaches to the study of religions (Historical, Anthropological, Sociological, Philosophical and Phenomenological etc.)	4	CLO1
2	Origin and Development of Major Religions: A. Basic History of major religions (Judaism, Christianity, Hinduism, Buddhism and Islam). B. Founders and Profounders of religions.	7	CLO1
3	The features of Major Religions and Holy Books and Sacred Texts: A. The distinguishing features of major religions (Judaism, Christianity, Hinduism, Buddhism and Islam). B. Holy books and sacred texts of major religions.	7	CLO1
4	Section-B (SEE: 50 Marks) The Comparative study of God in major religions A. Concept of God in Judaism. B. Concept of God in Christianity. C. Concept of God in Hinduism D. Concept of God in Buddhism. E. Concept of God in Islam.	6	CLO2
5	Religious rituals, festivals and Holy places A. Rituals of major religions. B. Festivals of major religions. B. Holy places of major religions.	5	CLO3
6	The Comparative study of religious mentors and prophets in major religions A. Necessity of prophets and spiritual guides for human life. B. Comparative study of prophecy and religious mentors in famous religions.	4	CLO3



	The comparative study of life after death in major religions A. Concept of death in different religions. B. Concept of the Day of Judgment in different religions C. Concept of Heaven and Hell in different religions D. Concept of Reward and Punishment in different religions.	4	CLO3
7	The understanding of Man and Universe in major religions: A. The purpose of Human being in different religions. B. The purpose of the Universe.	4	CLO3
8	The common in major religions: A. Ethics and Morality. B. Evil. C. Justice, D. Destiny and Luck. E. Religious Diversity. F. Non-violence and peaceful co-existence. G. Harmony and Interfaith dialogue. Social Justice and Human Ideological rights.	4	CLO5

Texts Books:

1. Sharpe, E. J. (1989), Comparative Religion: A history.
2. Eliade, M. (1996) Pattern in Comparative Religion of Nebraska Press.
3. Eastman, Roger (1999), The ways of Religion: An Introduction to the Major Traditions, Oxford University Press, US, 3 Editions.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
X	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.

Course Code: URBL-2401	Course Title: Bengali Language and Literature		
Credits:2 CH	Contacts:2 CH Per Week		
Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Rationale of the Course: মাতৃভাষা মানবজীবনের অত্যাবশ্যকীয় অনুষঙ্গ। বাংলা আমাদের মাতৃভাষা এবং মহান মুক্তিযুদ্ধের মাধ্যমে অর্জিত স্বাধীন সার্বভৌম বাংলাদেশের রাষ্ট্রভাষা। শিক্ষার্থীদের ভাষাগত ও সৃজনশীল দক্ষতা অর্জনের জন্য কোর্সের পাঠ্যসূচিতে বাংলা ভাষার উত্তর ও বিকাশ, ব্যাকরণের উল্লেখযোগ্য প্রায়োগিক বিষয়, নির্মিতি ও সাহিত্যের বিভিন্ন রূপশ্রেণিতে বাংলা সাহিত্যের প্রথিতযশা সাহিত্যিকদের কিছু উল্লেখযোগ্য সাহিত্যকর্ম সংযুক্তির মাধ্যমে কোস্টিকে সময়োপযোগী ও ভারসাম্যপূর্ণ করা হয়েছে।



S/N	Course Outcomes (CLOs): Upon the successful completion of the course, students will be able to	Corresponding IIUC Mission	Bloom's taxonomy domain/level
CLO1	ভাষা ও নিমিত্তি অধ্যয়নের দ্বারা শিক্ষার্থীগণ যোগাযোগের মাধ্যম হিসেবে স্বচ্ছ ভাববিনিময়ে বিশুদ্ধ ভাষাগত পারদর্শিতা লাভ করবেন।	IIUCMS-1	Cognigive/Understand
CLO2	প্রতিবেদন ও বক্তব্য তৈরির কৌশল আয়ত্তের মাধ্যমে প্রতিযোগিতামূলক কর্মপরিবেশের উপযোগী কার্যকর যোগাযোগদক্ষতা ও কর্মরূপী ব্যক্তিত্ব গঠনে সক্ষম হবেন।	IIUCMS-1	Cognigive/Understand
CLO3	গল্প পঠন ও গল্প লেখন সম্পর্কিত দক্ষতা শিক্ষার্থীগণের সৃজনশীলতা বিকশিত করবে।	IIUCMS-1	Cognitivd/Apply
CLO4	বাংলা সাহিত্যের উল্লেখযোগ্য সাহিত্যকর্মের সাথে পরিচিতি ও সাহিত্যের বিভিন্ন আঙিকের (কবিতা, ছোটগল্প, প্রবন্ধ, নাটক) স্বরূপ উপলব্ধি করার যোগ্যতা শিক্ষার্থীদের সামাজিক ব্যবস্থা সম্পর্কে জ্ঞানার পরিধি বৃদ্ধি সহ বিরোধ নিষ্পত্তি করার যোগ্য করে গড়ে তুলবে।	IIUCMS-1	Cognigive/Apply
CLO5	অসাম্প্রদায়িকতা, বাংলা সংস্কৃতি, মুক্তিযুদ্ধের চেতনা সমৃদ্ধ ও জীবনমূর্খী গল্প-কবিতা পাঠের মাধ্যমে শিক্ষার্থীগণ উদারনেতৃত্ব মানবিক মূল্যবোধ অর্জনে সমর্থ হবেন।	IIUCMS-2	Cognigive/Understand
CLO6	জাতীয়, আন্তর্জাতিক, ঐতিহ্যিক বিষয়ে সংক্ষিপ্ত আলোচনা বাংলা লোকসংস্কৃতি ও শিল্প- সাহিত্যের প্রতি ইতিবাচক মনোভাব তৈরি করবে।	IIUCMS-3	Cognitive/Evaluate

Course Content:

Chapter	Content	Number of Lectures	CLOs
	Midterm Exam : 30 Marks ভাষা ও নিমিত্তি: 20 1. বাংলা ভাষার উত্তর ও বিকাশ। 2. বাংলা বর্ণ ও ধ্বনি পরিচয়। 3. প্রতিবেদন বা বক্তব্য লেখন। বাংলা সাহিত্য: 10 ছোটগল্প : (ক) পোস্টমাস্টার (রবীন্দ্রনাথ ঠাকুর) (খ) পুইয়াচা (বিচ্ছিন্ন বন্দেশাধ্যায়) (গ) নয়নচারা (সৈয়দ ওয়ালীউল্লাহ)	12	
01 নিমিত্তি	1. বাংলা ভাষার উত্তর ও বিকাশ। 2. বাংলা বর্ণ ও ধ্বনি পরিচয়। 3. বাংলা বানানের নিয়ম। 4. ঘতিচিহ্ন।	4	CLO1 CLO2
02 নিমিত্তি	1. বঙ্গনূবাদ/স্কুলে গল্প লেখা। 2. প্রতিবেদন বা বক্তব্য লেখন। 3. পত্র লিখন। 4. সংক্ষিপ্ত আলোচনা।	4	CLO1 CLO6
03 কবিতা	(ক) বঙ্গভাষা (মাইকেল মধুসূদন দত্ত) (খ) আজ সৃষ্টি সুখের উল্লাসে (কাজী নজরুল ইসলাম) (গ) তোমাকে পাওয়ার জন্য হে স্বাধীনতা (শামসুর রাহমান)	8	সোখণো সোখণো
	Final Exam :50 Marks ভাষা ও নিমিত্তি: 30 1. বাংলা বানানের নিয়ম। 2. ঘতিচিহ্ন। 3. বঙ্গনূবাদ/স্কুলে গল্প লেখা। 4. পত্র লিখন। 5. সংক্ষিপ্ত আলোচনা।(ক.একুশে ফেরুজারি ;খ.মুক্তিযুদ্ধ; গ.বাংলার লোকসংস্কৃতি;ঘ. মানবতা ও মৈত্রিকতা;ঙ.আধুনিক তথ্যপ্রযুক্তি।)	18	



	<p>বাংলা সাহিত্য : ২০</p> <p>কবিতা : (ক) বঙ্গভাষা (মাইকেল মধুসূদন দত্ত) (খ) আজ সৃষ্টি সুখের উল্লাসে (কাজী নজরুল ইসলাম) (গ) তোমাকে পাওয়ার জন্য হে স্বাধীনতা (শামসুর রাহমান)</p> <p>প্রবন্ধ : (ক) সভ্যতার সংকট (রবীন্দ্রনাথ ঠাকুর) (খ) যৌবনে দাও রাজচিকা (প্রমথ চৌধুরী)</p> <p>নাটক : কবর (মুনীর চৌধুরী)</p>		
০৪ ছোটগল্প	(ক) পোস্টমাস্টার (রবীন্দ্রনাথ ঠাকুর) (খ) পুইমাচা (বিভূতিভূষণ বন্দ্যোপাধ্যায়) (গ) নয়নচারা (সৈয়দ ওয়ালীউল্লাহ)	৬	সুখঙ্গ সুখঙ্গ সুখঙ্গ
০৫-প্রবন্ধ	(ক) সভ্যতার সংকট (রবীন্দ্রনাথ ঠাকুর) (খ) যৌবনে দাও রাজচিকা (প্রমথ চৌধুরী)	৬	সুখঙ্গ
০৬- নাটক	কবর (মুনীর চৌধুরী)	6	CLO4

Learning Materials:

Text Book

বাংলা ভাষা ও সাহিত্য (রফিকুল ইসলাম ও সৌমিত্র শেখর)

Reference Books

- 1.মুহম্মদ শহীদুল্লাহ,বাঙালা ভাষার ইতিবৃত্ত।
- 2.মুহম্মদ আব্দুল হাই,ধ্বনিবিভ্রান্তি ও বাংলা ধ্বনিতত্ত্ব।
- 3.জীনাত ইমতিয়াজ আলী,ধ্বনিবিভ্রান্তির ভূমিকা।
- 4.মাহবুবুল হক,বাংলা বানানের নিয়ম।
- 5.মুহম্মদ শহীদুল্লাহ,বাঙালা ব্যাকরণ।
- 6.প্রমিত বাংলা বানানের নিয়ম,বাংলা একাডেমি।
- 7.জ্যোতিভূষণ চাকী,বাংলা ভাষার ব্যাকরণ।
- 8.রবীন্দ্রনাথ ঠাকুর,গল্পগুচ্ছ।
- 9.প্রমথ চৌধুরী,প্রবন্ধ সংগ্রহ।
- 10.কাজী নজরুল ইসলাম,সংষিদ্ধতা।
- 11.শামসুর রাহমান,বন্দী শিবির থেকে।
- 12.রবীন্দ্রনাথ ঠাকুর,কালান্তর।

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			SEE (50marks)
		CIE (50 marks)			
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				



Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.

Course Code: URED 3503

Course Title: Political Thoughts and Social Behavior

Credits:1 CH

Contacts:2 CH Per Weak

Course Assessments	CIE: Continuous Internal Evaluation	Attendance Class test/ Assignment/ Quizzes Mid-term	10 Marks 10 Marks 30Marks
	SEE: Semester End Examination		50 Marks

The Rationale of the Course: Following are the Objectives of the course:

- Rationale of the Course:** Following are the Objectives of the course:

 - i. To help the students demonstrate an in-depth understanding of their real position in this temporary world.
 - ii. To understand their relation with the state and society.
 - iii. To help them in performing their duties and responsibilities towards their state, society and humanity at large.

SL	Course Learning Outcomes (CLOs) : Upon the successful completion of the course, students will be able to :	Corresponding IIUCMS	Bloom's taxonomy domain/level
CLO1	Acquire basic knowledge about politics, Islamic politics, Law & Constitution, State and Government	IIUCMS-1,2&3	Cognitive/Understand
CLO2	Realize the nature of Citizen and Citizenship and relationship between state and citizen, citizen and government as well	IIUCMS-1,2&3	Cognitive/Apply
CLO3	Understand about the dealings and behavior of a man relating to himself, his Family and society	IIUCMS-1,2&3	Cognitive/Understands
CLO4	Analyze the principles of permissible and prohibition in Islam in regards to dress, food and drinking and in other parts of life	IIUCMS-1,2&3	Cognitive/Analyze
CLO5	Evaluate the Economic System of Islam and Festivals in Islam	IIUCMS-1,2&3	Cognitive/Evaluate

Course Contents:

Chapt er	Chapter Title	Contents	Number of Lectures	Correspondi ng CLOs
	Section A: Mid Term 30 Marks			
	Politics and Islamic Politics:			
01	A. Nature of the course from viewpoint of Islamic jurisprudence B. Literal and terminological Meaning of of Politics C. Definition of Islamic Politics D. Basic Principles of Islamic Political System E. Conventional Political System and Islam	3	CLO1	
02	Shariah and constitution : A. Meaning of Shariah B. Sources of Shariah C. Difference between Shariah and man-made law D. Definition of Constitution E. Contents and main features of an Islamic Constitution	3	CLO1	
03	State and Government: A. Meaning of State B. Elements of State	3	CLO1	



	C. The major characteristics of modern national states D. Meaning of Islamic State E. Basic principles of an Islamic state F. Meaning, Objective, types of government G. Relation between state and government H. Organs of a government - Executive, Legislative and Judiciary		
04	Citizen and Citizenship: A. Meaning of citizenship B. Types of citizenship and C. Rights & duties of citizens	3	CLO2
Section B-	Semester End Examination (SEE): 50 Marks		
05	Marriage and Family: A. Marriage in Islam B. Objective, Nature and some features of marriage in Islam C. Classification of Marriage D. Legal effects of various types of marriage E. Prohibited Marriages F. The general essentials of a Muslim marriage	3	CLO3
06	Matrimonial Disputes Resolution and Divorce: A. Definition of Matrimonial Disputes B. Sources and causes of matrimonial disputes C. Quranic Approach to matrimonial disputes D. Divorce as a last resorts to dissolve a matrimonial disputes	3	CLO3
07	Women in Islam: A. Status of women in Islam B. Rights and duties of women in Islam	2	CLO3
08	Family Relationship Social Relationship & Festivals in Islam: A. Husband-wife relationship B. Parent-child relationship C. Family relationship D. Kinship E. Neighbourhood F. Wide circle of relationship relationship G. Eid-al-Fitr and Eid-Al-Adha	3	CLO3
09	Economic System & Dress Code in Islam: A. Earning and Expenditure by Halal Means B. Right to property and Individual Liberty C. System of <i>Zakah</i> (Welfare Contribution) D. Prohibition of <i>Riba</i> (Interest or usury) E. Law of Inheritance (<i>Mirath</i>) , Conclusion F. Common Clothing Regulations G. Clothing Regulations for Man H. Clothing Regulations for Woman	3	CLO5
10	Principles of permissible and prohibition: A. All things are lawful for mankind except what have been prohibited explicitly by Allah and His Messenger B. Only Allah (SWT) has the right to declare a thing lawful or prohibited C. Allah has prohibited only shameful things D. What has been made lawful for us is sufficient E. the means or causes that lead to unlawful action are also prohibited F. what is prohibited, it is prohibited for all G. a grave necessity legalizes temporarily an illegal thing	4	CLO4

References:



1. Bhuiyan, Mohammad ShafiulAlam (2007), *The Government and Politics in Islam*, Dhaka: Noor Publications.
2. Hamid, E. A. (2004). *The Qur'an and Politics*, London: International Institute of Islamic Thought.
3. Islam, A. B. M. M. (2005). *Islamic Constitution: Quranic and Sunnatic Perspectives*.
4. A'LaMaududi, S. A. (1980). *The Islamic Law & Constitution*: Islamic Books.
5. Sarwar, G. (1982). *Islam, beliefs and teachings*: Muslim educational trust.
6. Hannan, S. A. (2017). *Social Laws of Islam*. Dhaka: Bangladesh Institute of Islamic Thought (BIIT)
7. Zino, Muhammad bin Jamil, *Islamic Guidelines*, Darusalam, Riyadh, 1996.
8. Al-Qaradawi, Y. (1988). *Halal and Haram in Islam*.
9. Ahmad, M. (2009). *Business ethics in Islam*: International Institute of Islamic Thought (IIIT).
10. Chapra, M. U. (2016). *The future of economics: An Islamic perspective* (Vol. 21): Kube Publishing Ltd.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

- i. **Delivery methods & activities:** Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,
- ii. **Assessment tools:** Class Attendance, Class test, Quizzes/ Assignment.Mid-Term & Final Exam. Project evaluation & Viva

Course Code: URED 3604

Course Title: The Life and Teachings of the Prophet Muhammad (SAAS)

Credits: 1 CH

Contacts: 2 CH

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Rationale of the Course: The life of Prophet (SAAS) has remained as a source of inspiration not only for the Muslims but also for the people of different races, colors and origins belonging to various levels of society. It has led various people to make a deeper study of his message and even fashion their own lives on his pattern. Every deed of Prophet's (SAAS) life is to be followed by every individual of Muslim Ummah. Love of Allah's messenger (SAAS) is an integral part of our Iman and hence the highest love for the Prophet (SAAS) is made as a test for our faith. This course, therefore, has been designed to have an insight thought

S/N	Course Outcomes (CLO): Upon the successful completion of the course, students will be able to	Corresponding IIUC Mission	Bloom's taxonomy domain/level
CLO1	The students will have proper knowledge regarding the life and		



	times of Prophet Muhammad (SAAS)	IIUCMS-1,2&3	Cognitive/ Understanding
CLO2	Students will be able to identify the Prophet (SAAS) as the only ideal mentor to follow.	IIUCMS-1,2&3	Cognitive/ Understanding
CLO3	Students will be able to lead their life according to the exalted characters, manners, habits and behaviors of the teacher of mankind and beloved Prophet (SAAS)	IIUCMS-1,2&3	Cognitive/ Applying

Course Content:

Chapter	Content	Number of Lectures	Corosponding CLO
Section-A, Mid Term: 30 Marks			
01	An introduction to <i>Siratunnabi</i> (SAAS): A comprehensive view, <i>Sirah</i> and its literally and technical meaning, Selection of Arabia as the birthplace of the Final Prophet (SAAS),	2	CLO1 CLO2
02	Socio-Political, Religious condition of pre-Islamic Arabia: an Overview. Early life of Prophet (SAAS): Birth and Childhood, Business trip to Syria with his uncle Abu Talib, Battle of <i>Fujjar</i> and formation of <i>Hilful-Fudul</i> , Contribution of Mohammad (SAAS) in the business of Khadijah, Marriage with Khadijah.	3	CLO1 CLO2
03	Early life of Prophet (SAAS): Rebuilding of <i>Al-Ka 'bah</i> , Search for the truth and receiving the truth. Beginning of Islamic Movement at <i>Makkah</i> : (From first revelation to the emigration to Abyssinia): Prophet hood, First revelation and its impact. Propagation of Islam Begins in secret.	2	CLO1 CLO3
04	The early Muslims, End of the First Phase. Islamic Movement becomes public, The Prophet on the Mount of <i>Safa</i> .	2	CLO1 CLO2
05	Oppositions from the Quraysh begin, Qur'anic approach towards <i>Quraysh</i> , Oppositions,	2	CLO2
06	Migration to Abyssinia. Prophet (SAAS) at <i>Makkah</i> : Boycott and Confinement of the Prophet (SAAS) and <i>Banu Hashim</i> by the <i>Quraysh</i> , The year of sorrow.	2	CLO2
07	<i>Ta 'if</i> - the most difficult day, <i>Mi 'raj</i> of the Prophet. Covenants of <i>Al- 'Aqabah</i> .	2	CLO2
Section-B: Semester End Examination (SEE): 50 Marks			
08	<i>Hijrah</i> of the Prophet (SAAS).	1	CLO2
09	The Prophet (SAAS) at <i>Madinah</i> : (From migration to <i>Hudaybiyah</i>) Construction of the Mosque,	2	CLO2
10	The Charter of <i>Madinah</i> ,	2	CLO3
11	Important Battles till the agreement of <i>Hudaybiyah</i> - The Battle of <i>Badr</i> , The Battle of <i>Uhud</i> , The Battle of <i>Ahzab</i> , Campaigns against the Jews of <i>Madinah</i> , <i>Hudaybiyah</i> Agreement	3	CLO3
12	Letters of the Prophet (SAAS) to the kings beyond Arabia, Battle of <i>Muta</i> , Battle of <i>Hunayun</i> , The conquest of <i>Makkah</i> . The Farewell Pilgrimage,	2	CLO3
13	The Farewell Address of the Prophet (SAAS) and its lessons,	2	CLO1 CLO2
14	Departure of the Prophet (SAAS), Contributions of the Prophet (SAAS)	2	CLO2



List of Books:

1. Nadwi, SaiyidSulaiman, *Muhammad The Ideal Prophet: A Historical, Practical, Perfect Model for Humanity*. Translated by Mohiuddin Ahmad. Islamic Book Trust K.L.N.D.
2. Guillaume, Alfred. *The Life of Muhammad: A Translation of IbnIshaq'sSiratRasul Allah*. London: Oxford University Press, 1955.
3. Lings, Martin. *Muhammad: his life based on the earliest sources*. New York: Inner Traditions International, 1983.
4. Nasr, SeyyedHossein, *Muhammad: Man of God*. Chicago, IL: Kazi Publ., 1995.
5. Ramadan, Tariq. *In the Footsteps of the Prophet: Lessons from the Life of Muhammad*. New York: Oxford University Press, 2009.
6. Watt, William Montgomery. *Muhammad: Prophet and Statesman*. London: Oxford University Press, 1961.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			SEE (50marks)
		CIE (50 marks)			
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	5	-	-	05
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	X	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.

A. Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions

Power point Presentation,

B. Assessment tools: Class Attendance, Class test, Quizzes/ Assignment.

Mid-Term & Final Exam. Project evaluation & Viva

Course Code: URIH-4701

Course Title: A Survey of Islamic History and Culture

Credits: 1 CH

Contacts: 2 CH

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
SEE: Semester End Examination			50 Marks

Rationale of the Course: The objective of this study is to enrich the learners with the glorious history of four pious *Khalifah* of Islam and their remarkable contributions towards the development of just administration, advancement of civilization and education and their great services towards humanity at large. This course also aims at making the



students acquainted with the glorious contribution of the Muslims towards the world civilization during the *Ummayads* and *Abbasids Khilafah*. The contributions include the advancement of administration, society, civilization, different branches of science such as geography, mathematics, history, medical science, philosophy etc.

S/N	Course Outcomes (CLO): Upon the successful completion of the course, students will be able to	Corresponding IIUC Mission	Bloom's taxonomy domain/level
CLO1	With the study of this course, the learners will be able to explore the glorious history of early Islamic society and state, particularly of four pious <i>Khalifah</i> and their successors.	IIUCMS-1,2&3	Cognitive/ Understanding
CLO2	The learners will also have the idea about the Muslim contributions towards the difference branches of world civilization.	IIUCMS-1,2&3	Cognitive/ Understanding
CLO3	This study will also help the students to realize the historical processes of development of Muslim society in early time and to make a comparison with the present society.	IIUCMS-1,2&3	Cognitive/ Applying
CLO4	It will enable the learners to appreciate various good practices and cultures that will in turn be resulted in becoming a responsible citizen.	IIUCMS-1,2&3	Cognitive/ Analyze

SL.NO	CONTENT OF COURSE (as Summary)	Number of Lectures	Corospon ding CLO
01.	<u>Section A (Midterm Examination: 30 Marks):</u> Introduction to the course and its objectives. Chapter One: <i>Khilafah</i> : Definition, Origin and Development of <i>Khilafah</i> ; Types of <i>Khilafah</i> ; Election system to the office of <i>Khilafah</i> ; <i>Khilafah</i> and <i>Mulukiyyah</i> ; Qualifications, Duties and Responsibilities of a <i>Khalifah</i> .	3	CLO1
02.	Chapter Two: Introduction to the Four Pious <i>Khalifah</i>: Achievements and Contributions of the Pious <i>Khalifah</i> . Comprehensive study of the historical events during four pious <i>Khalifah</i> : Abu Bakr (R) -the savior of Islam, Umar (R) - the model of modern administration and great conqueror of Islamic empire, Uthman (R) – compiler of the Holy Qur'an, Causes of revolt, assassination of Uthman (R) and its effect on the history, Ali (R) - civil wars during his time and end of the four Pious <i>Khalifah</i> .	6	CLO2 CLO3 CLO7
03.	Chapter Three: Administration under the Four Pious <i>Khalifah</i>: The <i>Shura</i> , Civil Administration, Revenue System, <i>Bait-al-Mal</i> , Judicial Administration, Police-Prison, Religious Administration and Military Administration.	3	CLO7
	Section B: Semester End Examination (SEE): 50 Marks		
04.	Chapter Four: The Umayyads <i>Khilafah</i> (661 A.D-750 A.D): A brief introduction to Umayyads <i>Khilafah</i> , Credit and Achievements of Muawiah (R), Administrative reforms of Abdul Malik, Expansion of Islamic empire under Walid bin Abdul Malik, Umar bin Abdul Aziz and his Administrative Reforms. Central and Provincial Administration, Social Condition. Umayyads contribution towards the development of civilization & education, and Fall of the Umayyads.	6	CLO4
05.	Chapter Five: The Abbasids <i>Khilafah</i> (750 A.D-1258 A.D): Golden Age of the Abbasids- Abul Abbas as Saffah, Abu Zafar al-Mansur, Harun or-Rashid, Al-Mamun, Abbasids Society, Rights of Women and non-Muslims in Muslim Society, Scientific and Literary development, Education, Development of Art and Architecture. Abbasids Administration- Civil, Military, Judicial and Revenue Administration and Fall of Baghdad.	6	CLO4 CLO7
06.	Chapter Six: A Brief Analysis on the Umayyads <i>Khilafah</i> of Spain and Fatimids <i>Khilafah</i> of Egypt and North Africa.	2	CLO4 CLO5
07.	Chapter Seven: Muslim contribution to different fields of civilization: a) Geography; b) Medical Sciences and Medicine;	4	CLO5 CLO6



- c) Chemistry;
- d) Mathematics;
- e) Astronomy;
- f) Historiography;
- g) Art and literature; and
- h) Painting and Calligraphy

Text Book:

P.K. Hitti, *History of the Arabs*, Macmillan edition, 1970, London.
 K. Ali, *A Study of Islamic History*, Adam Publishers & Distributors, 2006, Dhaka.
 Mofizullah Kabir, *An Outline of Islamic History*, Dhaka.

Reference:

S.A.Q. Hussaini, *The Arab Administration*, 1956, Lahore.
 Syeed Ameer Ali, *A Short History of Saracens*, Macmillan edition, 1916, London.
 T.I. Arnold, *The Caliphate*, Oxford, 1924, London.
 Muhammad Ali, *The Early Caliphate*, Cambridge, 1936, London.
 W. Muir, *Caliphate, Its Rise, Decline and fall*, Edinburg, 1934.
 B. Lewis, & P.M. Holt (ed.), *Cambridge History of Islam*, 1947.
 Syeed Ameer Ali, *The Spirit of Islam*, Christophers, 1891, London.
 Thomas Arnold, *The Legacy of Islam*, Oxford, 1931, London.
 Joseph Hell, *The Arab Civilization*, W. Heffer & sons, limited, 1926, London.
 Hamilton GibbA.R. *Studies on the Civilization of Islam*, Princeton, 1982, London.
 R. Levy, *The Social Structure of Islam*, Cambridge 1979, London.
 R.A. Nicholson, *A Literary History of the Arabs*, Cambridge 1930, London.
 A.M.A. Shushtery, *Outline of the Islamic Culture*, The Bangalore Printing & Publishing Co. Ltd., 1954, India.
 S.M. Imamuddin, *Arab Muslim Administration*, 1976, Karachi.
Encyclopedia of Islam
 S. KhudaBaksh, *Islamic Civilization* vol 1-2, Idara Islamiyat-e-Diniyat, or Kitab Bhavan, 1984, Delhi.
 H.K. Sherwani, *Studies in Muslim Political Thought and Administration*, Muhammad Ashraf, 1945, Lahore.
 M.A. Shabon, *The Abbasid Revolution*, Cambridge, 1970, London.
 M.A. Shabon, *Islamic History; A New Interpretation*, 1971, London.
 R.H. Turner, *Science in Medieval Islam: An Illustrated Introduction*. 1995, Austin: University of Texas Press.
 M.Iqbal, *The Reconstruction of Religious Thought in Islam*. 1986, Institute of Islamic Culture, Lahore.
 M.N. Roy, *The Historical Role of Islam*, Ajanta Publications, 1981, Delhi.
 Musa Ansari, *Moddhojurer Muslim Sovvota o Sonskruti*, Bangla Academy, 1999, Dhaka.
 Board of Researchers, *Scientific Indications in the Holy Quran*, Islamic Foundation Bangladesh, 2004, Dhaka.
 R.M. Savory, *Introduction to Islamic Civilization*, Cambridge University Press, 1977, London.
 Franz Rosenthal, *A History of Muslim Historiography*, Leiden, 1952.
 CobbS., *Islamic Contributions to Civilization*, Avalon Press, Washington, 1963.
 Ziauddin Sardar, *Science, Technology and development in the Muslim World*, Croom Helm, 1977, London.
 M. AkborAli, *Bigghane Musalmander Obodan* (Muslim Contribution to science) Volume 1-12, 1936, Dhaka.

Course Assessment Pattern (Theory courses):

Bloom's Category	Evaluations out of 100 marks				SEE (50marks)
	CIE (50 marks)				
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
X	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the				



	semester.
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Note: **CIE**=Continuous Internal Evaluation, **SEE**= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.

Course Code:

Course Title: History of the Emergence of Bangladesh

Credits: 2 CH

GEHE-3601

Contacts: 3 lectures per week

Course Assessments	CIE:	Attendance	10 Marks
	Continuous Internal Evaluation	Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Rationale of the Course: The course has been designed to study the dynamic and diverse movements of the people of Bangladesh to achieve its independence in 1971. The course, primarily, focuses on the rising of Bengali nationalism and the national identity crisis of the Bengali along with significant autonomous vibrations regarding changes in the politics of social dominance in the period –from appearance of united Pakistan to the emergence of Bangladesh as an independent country.

SL	Course Learning Outcomes (CLOs) : Upon the successful completion of the course, students will be able to :	Corresponding IIUCMS	Bloom's taxonomy domain/level
CLO1	Analyze the historical contexts and socio-political perspectives for the Independence movement of Bangladesh	IIUCMS-1&3	Cognitive/ Analyze
CLO2	Appreciate the background and events of the glorious War of Liberation of Bangladesh	IIUCMS-1&3	Cognitive/ Understand
CLO3	Estimate the role of national leaders and political parties in the Independence movement of Bangladesh	IIUCMS-2&3	Cognitive/ Evaluate
CLO4	Evaluate the role of Bangabondhu Sheikh Mujibur Rahman as the founder and un-parallel leader of the Independence movement of Bangladesh.	IIUCMS-1&2	Cognitive/ Evaluate
CLO5	Uphold the spirit of liberation war resulting in the enhancement of patriotism.	IIUCMS-1,2&3	Cognitive/ Apply

Course Content:

Chapter	Section-A (Midterm Exam: 30 Marks)	Number of lectures	Corresponding CLOs
01.	Introduction to the country and its people: Geographical features and their influence, ethnic composition, language, cultural syncretism and religious tolerance, distinctive identity of Bangladesh in the diverse context.	06	CLO1
02.	Proposal for undivided sovereign Bengal and the partition of the Sub-Continent, 1947: Rise of communalism under the colonial rule, Lahore Resolution 1940, The proposal of Suhrawardi and Sarat Bose for undivided Bengal: consequences, The creation of Pakistan 1947.	03	CLO1
03.	Pakistan: Structure of the state and disparity: Central and provincial structure, influence of military and civil bureaucracy, economic, social and cultural disparity.	06	CLO1
04.	Language Movement and quest for Bengali identity: The Language Movement: context and phases, United Front: election of 1954,	03	CLO2 CLO3



consequences, misrule by Muslim League and struggle for democratic politics, framing of the constitution of Pakistan in 1956.

Section-B (SEE: 50 Marks)

05.	Military regimes of Ayub Khan and Yahya Khan (1958-1971): 03	CLO2 CLO3 CLO4
06.	Rise of nationalism and the Movement for self-determination: 06 Resistance against cultural aggression and resurgence of Bengali culture, Student movement 1962, the six point movement: reactions, importance and significance. The Agartala conspiracy case 1968, Mass upsurge of 1969.	CLO2 CLO3 CLO4
07.	Election of 1970 and the Declaration of Independence: Election result and centres refusal to comply, The non-cooperation movement, the 7 th March Address, Operation Search-light, Declaration of Independence and the arrest of Bangabondhu Sheikh Mujibur Rahman.	06 CLO2 CLO3 CLO4 CLO5
08.	The war of Liberation 1971: Genocide and repression of people, Formation of Bangladesh government and proclamation of Independence, Formation of MuktiBahini, Publicity Campaign in the war of Liberation, Contribution of students, women and the masses, The role of super powers, The Anti-liberation activities, killing of the intellectuals, Trial of Bangabondhu and reaction of the World Community, The role of ArabWorld in the Liberation War, The role of India in the Liberation War, Formation of joint command and the Victory.	06 CLO2 CLO3 CLO4 CLO5
09	Immediate Development of Independent Bangladesh: Homecoming of Bangabondhu, Making of the constitution, Reconstruction of the war ravaged country. Reign of Bangabandhu (1972-1975). Contribution of National leaders of Bangladesh: AK FazlulHuq, MaulanaVashani, Hussein ShahidSuhrawardi, Bangabondhu Sheikh Mujibur Rahman, Syed Nazrul Islam, Tajuddin Ahmed, HM Kamruzzaman, Captain M Mansur Ali, MAG Osmani.	06 CLO6 CLO7

Text Books:

- Muntasir Mamun and Soumitra Shekhar, *Swadhin Bangladesher Obvyudyer Itihas*, (Dhaka: University Grand Commission-UGC, Bangladesh, 2017).
- Rounaq Jahan, *Pakistan: Failure in National Integration*, (Dhaka: University Press Limited, 1977).
- Md. Thowhidul Islam and others, *Bangladesh Studies*. (Dhaka: Bangladesh Institute of Islamic Thought-BIIT, 2017).

Reference Books:

- Sirajul Islam (ed.), *Banglapedia: National Encyclopedia of Bangladesh*, Vol. 1-14, (Dhaka: Asiatic Society of Bangladesh, 2014).
- Sirajul Islam (ed.), *BangladeshherItihash*, Vol. 1-3, (Dhaka: Asiatic Society of Bangladesh, 2014).
- Dr. Md. Emran Zahan & Dr. Md. Siddiqur Rahman Khan, *BangladeshherItihas 1972-2014*, (Dhaka: AbosarProkashanaSangstha, 2018).
- Maidul Hasan, *Muldhara 71*, (Dhaka: The University Press Ltd., 1986).
- Shamsul I. Khan, *Political Culture, Political Parties and the Democratic Transition in Bangladesh*, (Dhaka: The University Press Ltd., 2008).
- Abul Mansur Ahmad, *Amar Dekha Rajniteer Poncash Bochor*, (Dhaka: Srijon Prokashoni Ltd., 1988).
- Kamruddin Ahmed, *Social History of East Pakistan*, (Dhaka: Crescent Book Center, 1967).



- Shaikh Maqsud Ali, *From East Bengal to Bangladesh: Dynamics and Perspectives*, (Dhaka: The University Press Ltd., 2009).
- Siddiq Salik, *Witness to Surrender*, (Dhaka: The University Press Ltd., 1997).
- Moudud Ahmed, *Bangladesh: Constitutional Quest for Autonomy*, (Dhaka: The University Press Ltd., 2003).
- Akbar Ali Khan, *Discovery of Bangladesh*, (Dhaka: The University Press Ltd., 2009).
- Talukdar Maniruzzaman, *Bangladesh Revolution and its Aftermath*, (Dhaka: The University Press Ltd., 1992).
- M.A. Barnik, *Rasthra Bhasha Andoloner Itihas*, (Dhaka: AHDPH, 1998).
- Oli Ahad, *Jatiyo Rajniti 1945-1975*, (Dhaka: Bangladesh Co-operative Book Society, 2004).

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	-	-	-	5
Understand	-	5	5	-	5
Apply	-	5	-	-	10
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	10
Create	-	5	-	-	10
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: **CIE**=Continuous Internal Evaluation, **SEE**= Semester End Examination.

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment. Mid-Term & Final Exam. Project evaluation & Viva.



B. Interdisciplinary Courses



4th Semester		
ISCED Code	Course Code	Course Title
0411	ACC-2401	Financial and Managerial Accounting
Credit Hours: 2	Contact Hours: 2	Type: Non-Engineering Skill
Prerequisite:	none	
Co-requisite:	none	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

This course prepares the students with the knowledge in understanding the foundation of Accounting, Managerial Accounting and Financial Accounting. It familiarizes the students with the preparation of financial statement in the context of the financial industry today.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1	Explain the basic concept of financial accounting, cost accounting and management accounting.	20%
2	Analyze the basic concept of Financial and Cost Accounting and preparation of different statements and reports.	30%
3	Apply the tools from financial accounting and cost accounting to facilitate the decision making i.e., Budgeting, Make or Buy decision.	40%
4	Compare the different business situations and suggest to best solution with analytical abilities.	10%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the basic concept of financial accounting, cost accounting and management accounting.	PLO1	Cognitive/ Understand	Lecture, Discussion	Class test, Assignment, Exam
CLO2	Analyze the basic concept of Financial and Cost Accounting and preparation of different statements and reports.	PLO11	Cognitive/Understand	Lecture, discussion, quantitative Problem solving	Assignment Class test, Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Apply the tools from financial accounting and cost accounting to facilitate the decision making i.e., Budgeting, Make or Buy decision.	PLO11	Cognitive/Apply	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam
CLO4	Compare the different business situations and suggest to best solution with analytical abilities.	PLO11	Cognitive/ Evaluate	Lecture, Class discussion, Competitive Problem solving	Problem solving Assignment.

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Preliminaries: Introduction to Accounting, History and development of accounting thought, types of accounting, Accounting Principles & ethics, Accounting Equation & Transaction Analysis.	04	CLO1
2	Introduction to Financial Statements: Recording Business Transactions, the Accounts & their types.	04	CLO2
3	Double-Entry Book keeping System; Invoice, discount from purchase price, purchase return and allowances, Sale of inventory, sales discount, sales returns and allowances; Journals, ledger & Trial balance.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Correcting errors in the trial balance: The Adjusting and Closing Procedure: The adjusting process, Accrual versus cash basis Accounting, Preparation of Adjusted trial balance and financial statements, closing entries & reversing entries.	04	CLO2
5	Using accounting information in decision-making. Accounting in practice, Worksheet. Purchase book, sales book, cashbook, petty cashbook, etc. Control accounts and subsidiary accounts. Bank reconciliation statement.	05	CLO3
6	Cost In General: Cost in general: objectives & classifications; Costing Journals; Job order costing, Process costing & Overhead costing, cost sheet; Cost of goods sold statement.	03	CLO3
7	Marginal & Relevant costing: Marginal costing tools and techniques, cost-volume-profit analysis.	03	CLO4



8	Guidelines for Decision-Making: Budget, Capital budgeting; planning, evaluation & control of capital expenditures.	03	CLO4
		30	

Books :**Text Book :**

1. Charles T. Horngren & Walter T. Harrison (2nd Edition): Accounting.
2. Adolph Matz & Milton F. Usry: Cost Accounting- Planning And control

Reference Books :

1. Sankar Prasad Basu & Monilal Das.: Practice in Accountancy.
2. Jerry J. Weygandt, Donald E. Kieso & Paul D. Kimmel.: Accounting Principles.
3. Jay M Smith & K Fred Skousen.: Intermediate Accounting.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination



6th Semester		
ISCED Code	Course Code	Course Title
0311	ECON-3501	Principle of Economics
Credit Hours: 2	Contact Hours: 2	Type: Interdisciplinary Courses
Prerequisite: None		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

Understand a broad range of economic concepts, theories and analytical techniques that will cover the understanding of both micro and macro- economics. This course helps to learning and grasping the economic behavior of human and expose to economic way of thinking and also understand the markets of goods and services and policy choices that affect these markets. This course introducing to GDP, growth, instability, monetary policy, fiscal policy and economic planning.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Explain the knowledge of the fundamental concepts and theories of micro and macro-economics.	50
2.	Analyze the key indicators of economic growth.	30
3.	Compare the economic theories and concepts to analyze behavior of individuals, firms and nations to act as a responsible citizen.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the knowledge of the fundamental concepts and theories of micro and macro-economics.	PLO11	Cognitive- <i>C1 - Recall data, C2 - Understand</i>	Lecture, Class discussion, Presentation slide	Class test, Assignment, Exam
CLO2	Analyze the key indicators of economic growth.	PLO11	Cognitive- <i>C4 - Analysis</i>	Lecture, Class discussion, Presentation slide	Assignment Class test, Exam
CLO3	Compare the economic theories and concepts to analyze behavior of	PLO11	Cognitive- <i>C5 - Synthesize</i>	Lecture, Class discussion, Presentation	Class test, Assignment Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	individuals, firms and nations to act as a responsible citizen.			slide	

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Basic Concepts of Economics as a separate discipline, scope & importance. Subject matter of economics- micro and macro economics, their difference and interdependencies.	02	CLO1
2	Introducing Classes, Key point of Economics: Theory of demand and supply and market equilibrium & price determination. Price elasticity of demand and supply. Income and cross elasticity of demand. Normal goods, inferior goods, complementary and substitute goods. Indifference curve analysis. Budget line and consumer equilibrium. Consumer surplus. Marginal utility analysis.	04	CLO1
3	Production and Equilibrium: Theory of production, production function, long run and short run production function. Factors of production, marginal and average productivity of factors. Sequent and iso cost curve and producers' equilibrium.	04	CLO3
Section-B (SEE: 50 Marks)			
4	Market: Concept of market and market structure- Monopoly, Oligopoly, Monopolistic and perfect competition.	02	CLO2
5	Cost: Total cost, marginal cost, average cost and variable cost function.	04	CLO2
6	National income: Production efficiency and return to scale. Concepts of national income- GDP, GNP, NDP etc. Different approaches of measuring national income- value added approach, income approach and expenditure approach. Inflation.	04	CLO2
7	Economic policy: Concept of monetary policy and fiscal policy with reference of Bangladesh. Open market policy and bank rate policy. Concept of economic growth, development, poverty, welfare and inequality. Different growth and development model- Keynesian model, Neo-classical model etc.	02	CLO3
8	Economic Management: System of economic management- Capitalism versus Socialism and role of state. Development planning priority and process.	02	CLO2



	Seventh five year plan of Bangladesh- FY2016- FY2020		
		24	

Books:

Text Book:

1. Economics By P.A. Samuelson

Reference Books:

1. Economics, (Principles, Problems and Policies) By McConnell & L.Bru
2. The Price System and Resource Allocation By Richard Leftwich
3. The Theory of Price By G.J. Stigler

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	05
Apply	-	5	-	-	05
Analyze	-	5	-	-	15
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



6th Semester		
ISCED Code	Course Code	Course Title
0413	MGT-3601	Industrial Management
Credit Hours: 2	Contact Hours: 2	Type: Interdisciplinary Courses
Prerequisite: None		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- Understand the basic principles of management and four functions of managers.
- Being familiar with the principles of organizing and manpower development.
- Interpret financial statements and other financial reports of industrial companies.
- Design different combinations of systems for management control in an organization.
- Introducing different industrial laws relating to employee rights and work environment.
- Understanding the industrial production system and quality control.
- Understanding the basic principles of marketing management.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Explain the theories and principles of modern management and apply the concepts to the management of organizations in private and public sector.	50
2.	Understand how managers can effectively plan in today's dynamic environment,	30
3.	Identify what strategies organizations might use to become more innovative and explain how the industrial company markets and price its products and also how the company deal with its environment.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the theories and principles of modern management and apply the concepts to the management of organizations in private and public sector.	PLO11	Cognitive- <i>C1 - Recall data, C2 - Understand</i>	Lecture, Class discussion, Presentation slide	Class test, Assignment, Exam
CLO2	Understand how managers can effectively plan in today's	PLO11	Cognitive- <i>C4 - Analysis</i>	Lecture, Class	Assignment Class test,



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	dynamic environment,			discussion, Presentation slide	Exam
CLO3	Identify what strategies organizations might use to become more innovative and explain how the industrial company markets and price its products and also how the company deal with its environment.	PLO11	Cognitive- <i>C5 - Synthesize</i>	Lecture, Class discussion, Presentation slide	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Preliminaries: Definition, Importance of management, Evolution, Functions of management, Introduction to Industry & organizational management.	02	CLO1
2	Organization and it's Environment: Environmental context of the Organization.	03	CLO1
3	Organizing & staffing: Theory & structure, Co-ordination, Span of control, Authority delegation, Formal & Informal Groups, Committee and task force, Manpower planning & Development.	06	CLO3
Section-B (SEE: 50 Marks)			
4	Cost & Financial Management: Investment analysis, benefit-cost analysis & it's implications in decision making. Cost planning & Price Control, budget & budgetary control, development planning process	05	CLO2
5	Marketing management: Concepts, strategy, sales promotion, Transportation & Storage. Technology management: Management of innovation & changes, technology lifecycle.	04	CLO2
6	Production Management: Designing operations system in production and service-oriented industry. Product layout, process layout, & fixed position layout. Organizational technologies: automation, computer-assisted manufacturing, flexible manufacturing system, and robotics. TQM, bench marking, ISO 9000, SQC.	03	CLO2
7	Industrial law: Law of contract, sale of goods, Hire and purchase, Negotiable instrument Act, patent right and validity. Factories act, Industrial relations ordinance, workmen's compensation act.	03	CLO3
8	Professional Practice: Tender documentation, General conditions of tender, Tech. Specification, Purchase & procurement rules-2004, Technical evaluation, Copyright, Intellectual property right.	02	CLO2
			28

**Books:****Text Book:**

- Griffin, Ricky W. *Fundamentals of management*. Cengage Learning, 2013

Reference Books:

- Weihrich, Heinz, and Harold Koontz. *Management: A global perspective*. Tata McGraw-Hill, 2005.
- Stevenson, William J., and Ceyhun Ozgur. *Introduction to management science with spreadsheets and student CD*. McGraw-Hill, Inc., 2006.
- Terry, George Robert, and Stephen G. Franklin. *Principles of management*. RD Irwin, 1968.
- Flippo, Edwin B. "Personnel Management. International Student Edition." (1990).
- Monappa, Arun, Ranjeet Nambudiri, and Patturaja Selvaraj. *Industrial Relations And Labour Laws*. Tata McGraw-Hill Education, 2012.
- Naceur Jabnoun, Islam & Management; 3rd edition, 2008; International Islamic Publishing House; ISBN-6035010164
- Faridi, F. R., ed. *Islamic Principles of Business Organization and Management : selected Papers of the Seminar on Islamic Principles of Organizational Behavior, Held at Herndon, Virginia, USA, September, 1988*. Qazi Publishers, 1995.
- Schiffman, Leon G., and Leslie Lazar Kanuk. "Consumer behaviour." (2012).

Assessment Pattern:

Bloom's Category		Evaluations out of 100 Marks			SEE (50 Marks)
		CIE (50 Marks)			
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember		-			5
Understand		9	2		10
Apply		9	3		3
Analyze		22	3		25
Evaluation		-	3		7
Create		-	-		-
x	Responding				
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester.				

Note: **CIE**= Continuous Internal Evaluation, **SEE**= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions and Power-point Presentation.

Assessment tools: Class Attendance, Class Tests, Quizzes/ Assignments, Mid-term & Final Exam, Project evaluation & Viva.



C. Core Courses

C.1. Mathematics and Statistics Courses



1st Semester		
ISCED Code	Course Code	Course Title
0541	MATH-1107	Course Title: Mathematics-I (Differential and Integral Calculus)
Credit Hours: 3	Contact Hours: 3	Type: Core, Math
Prerequisite: None		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
		SEE: Semester End Examination	50 Marks

Course Objectives:

The objective of this course is to provide the students with an understanding of how to find out the rate of change of various functions, and to determine the area and volume of different types of objects. This course aims to introduce the student with the various techniques of differentiation and integration.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Compute the functions, limit and continuity of a function, derivatives, integrals and extrema of single-variable and/or multi-variable functions.	15
2.	Understand the techniques of differentiation and integration.	60
3.	Demonstrate the applications of differentiation and integration.	15

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Compute the functions, limit and continuity of a function, derivatives, indeterminate forms and extrema of single-variable and/or multi-variable functions.	PLO1	Cognitive, Understanding, Level 2	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final) Class Test (Quizzes/ Assignment/ Class Performances/ Presentations)



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Understand the techniques of differentiation and integration.	PLO1	Cognitive, Understanding, Level 2	Lecture, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final) Class Test (Quizzes/Assignment/ Class Performances/ Presentations)
CLO3	Demonstrate the applications of differentiation and integration.	PLO1	Cognitive, Applying, Level 3	Lecture, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final) Class Test (Quizzes/Assignment/ Class Performances/ Presentations)

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Functions , Limit, Continuity and Differentiability, Physical meaning of derivative of a function, Indeterminate Forms.	08	CLO1
2	Differentiation , Successive differentiation and Leibniz theorem	06	CLO2
3	General Theorems and Expansions: Rolle's Theorem, Mean Value Theorem, Taylor's Theorem and Maclaurian's Theorem.	04	CLO2
Section-B (SEE: 50 Marks)			
Group: A (20 Marks)			
4	Partial Differentiation , Euler's formula, Maxima and minima	04	CLO2
5	Indefinite integral : Physical meaning of integration of a function, method of Substitution, Integration by parts, special trigonometric functions and rational and partial fractions, different techniques of integration	06	CLO2
Group: B (30 Marks)			
6	Definite integral : Fundamental theorem, general properties, and evaluations of definite integral and reduction formula, definite integral as the limit of a sum, Integration by method of successive reduction, Gamma and Beta Function.	07	CLO2



7	Multiple Integral: Jacobian theorem, Double Integral, Change of order of integration, triple Integral, Physical application of double and triple integral. Quadrature, Determination of length of curves, Finding Area of a region.	07	CLO2
8	Integration by Revolution: Arc length of a curve, Areas of surfaces of revolution, Volumes of solids of revolution. Solving Real world problems through calculus.	03	CLO3
45			

Text Books:

	Name of Authors	Title of the Books	Edition	Publisher's Name	Year
1.	P. K. Bhattacharjee	A Text Book on Differential Calculus	First Flat	Gonith Prokashon	2006
2.	Abu Yusuf	Differential Calculus	Revised Reprinted	Mamun Brothers	2007
3.	P. K. Bhattacharjee	A Text Book on Integral Calculus	First 2nd	Gonith Prokashon	2007
4.	K.A. Stroud	Engineering Mathematics	7th	Palgrave Macmillan	2013

Reference Books:

	Name of Authors	Title of Book	Edition	Publisher's Name	Year
1.	Erwin Kreysig	Advanced Engineering Mathematics	10th	John Wiley & Sons Inc.	2011
2.	Thomas, Finey	Calculus and Analytic Geometry	9th	Addison Wesley	1995
3.	Earl W. Swokowski	Calculus with Analytic Geometry	2nd	Prindle	1984

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	-

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



2nd Semester		
ISCED Code	Course Code	Course Title
0541	MATH-1207	Course Title: Mathematics-II (Geometry and Differential Equations)
Credit Hours: 3	Contact Hours: 3	Type: Core, Math
Prerequisite: MATH-1107, Mathematics I (Differential Calculus & Integral Calculus)		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
		SEE: Semester End Examination	50 Marks

Course Objectives:

Geometry deals with space and shapes. The objective of this course is to develop an understanding of the visual ability, to enable the students to make the design of solving problems, *and to improve the skills of reasoning*. Through this course student will learn how to solve different types of differential equations.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate knowledge of geometry and its applications in the real life contexts as well as into complex engineering problems.	30
2.	Solve differential equations using various methods.	50
3.	Formulate the mathematical model and interpret the results by analyzing the real-world problems related to Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution Problems, Electrical Circuits problems etc. through a set of differential equations.	10

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate knowledge of geometry and its applications in the real life contexts as well as into complex engineering problems.	PLO1	Cognitive, Understanding, Level 2	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final), Class Test (Quizzes/Assignment/ Class Performances/ Presentations)
CLO2	Solve differential equations using various methods.	PLO1	Cognitive, Understanding, Level 2	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final), Class Test (Quizzes/Assignment/ Class Performances/ Presentations)
CLO3	Formulate the mathematical model and interpret the results by analyzing the real-world problems related to Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution Problems, Electrical Circuits problems etc. through a set of differential equations.	PLO1	Cognitive, Applying, Level 3	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam (Mid Term & Final), Class Test (Quizzes/Assignment/ Class Performances/ Presentations)

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Two-Dimensional Geometry: Change of Axes, Pair of straight lines. Properties of Pair of straight lines. General equation of second degree presents a pair of straight lines. Nature of general	08	CLO1



	equation of second degree.		
2	Three-dimensional Geometry: Rectangular co-ordinate System, Direction cosines, Direction ratios, Projections. Equation of planes, Different forms of planes.	06	CLO1
3	Straight lines in three-dimension, Angle between two lines, Angle between a lines and a plane, coplanar lines and Shortest distance, Spheres.	04	CLO1
Section-B (SEE: 50 Marks) Group: A (20 Marks)			
4	First order differential equation: Definition, solution of first order and first degree differential equation with initial conditions, Solution of Linear differential Equation, Separable Equations, homogeneous equations, Bernoulli Equation, Exact Differential equations, Integrating Factors.	08	CLO2
5	Higher order Differential equations with constant coefficients: Solution of higher order homogeneous differential equations, Solution of non-homogeneous differential equations, Auxiliary Equations, Complementary function and particular integral.	05	CLO2
Group: B (30 Marks)			
6	Bessel's functions, Legendre's polynomials and their properties, Linear differential Equation of second-degree using Method of variation of parameter & Method of Undetermined coefficients.	07	CLO2
7	Linear & Non-Linear Partial Differential Equations: Elimination of arbitrary constants and functions, Lagrange's method, Charpit's method.	04	CLO2
8	Physical Applications: Solution of Practical (Real world) problems using differential equations such as Growth and Decay Problems, Temperature Problems, Falling Body Problems, Dilution Problems, Electrical Circuits problems, Orthogonal Trajectories, Spring Problems, Buoyancy Problems, Classifying Solutions etc.	03	CLO3
45			

Text Books:

	Name of Authors	Title of the Books	Edition	Publisher's Name	Year
1.	P. K. Bhattacharjee	Co-ordinate geometry and vector analysis	Revised	Gonith Prokashon	2012
2.	Bhu Dev.Sharma	Differential Equations	Revised	<u>Kedar Nath Ram Nath</u>	1999
3.	Dr. Md. Mustafa Kamal Chowdhury	Differential Equations with Application	First	<u>D. A Printind Press & Publication</u>	2014
4.	K.A. Stroud	Engineering Mathematics	7th	Palgrave Macmillan	2013

Reference Books:



	Name of Authors	Title of the Books	Edition	Publisher's Name	Year
1.	Erwin Kreyszig	Advanced Engineering Mathematics	10th	John Wiley & Sons Inc.	2011
2.	Robert JT bell	Coordinate Geometry	3rd	Atlantic Publishers and Distributors	2015
3.	Thomas, Finey	Calculus and analytic geometry	9th	Addison Wesley	1995

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	-	-	10	-

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination.



3rd Semester		
ISCED Code	Course Code	Course Title
0541	MATH-2307	Course Title: Mathematics III (Matrices, Linear System of equations and Vector Analysis)
Credit Hours: 3	Contact Hours: 3	Type: Core, I
Prerequisite: MATH-II		
Co-requisite:		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

Linear Algebra and Vector Calculus introduce many operations and methods. This course will show students how to simplify many types of complex problems using matrix algebra and vector geometry.

Course Learning Outcomes (CLOs):

Sl. No.	CLOs	Weighatage
CLO1	Understand the fundamentals of Matrix , Linear system of equations & Vector analysis	20%
CLO2	Implement the fundamental knowledge of Matrix, linear system of equations, vector functions, vector field, scalar field, gradient, divergence, curl, differentiation and integration of vector valued functions, partial derivatives in different problems	30%
CLO3	Solve line integrals, surface area, surface integrals, volume integrals, and the work done in different problems	30%
CLO4	Apply Green's theorem, Stoke's theorem, Gauss' theorem in solving mathematical problems	20%

Mapping of CLO-PLO:

Sl. No.	CLOs Description	PLOs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessme nt tools
CL O1	Understand the fundamentals of Matrix , Linear system of	PLO1	Cognitive/Understand	Lecture, Tutorial,	Exam, Class test,



	equations & Vector analysis			Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Assignment
CL O2	Implement the fundamental knowledge of Matrix, linear system of equations, vector functions, vector field, scalar field, gradient, divergence, curl, differentiation and integration of vector valued functions, partial derivatives in different problems	PLO1	Cognitive/Apply	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion Hand Note, etc.	Exam, Class test, Assignment
CL O3	Solve line integrals, surface area, surface integrals, volume integrals, and the work done in different problems	PLO1	Cognitive/ Apply	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion	Exam, Class test, Assignment



				n Hand Note, etc.	
CL O4	Apply Green's theorem, Stoke's theorem, Gauss' theorem in solving mathematical problems	PLO1	Cognitive/Apply	Lecture, Tutorial, Class Discussio n, Problem Solving, Assignme nt, Home Work, Presentati on Slides, Group Discussio n Hand Note, etc.	Exam, Class test, Assignme nt
CL O5	Mathematical Analysis using MATLAB	PLO5		Lab	

Course Content:

Segments	Content	Duration	CLOs
	Section-A (Midterm Exam: 30 Marks)		
1	Vector presentation by matrix, different types of matrices, , Transpose of a Matrix, Ad joint and inverse of a matrix, augmented matrix, row operation method, rank of Matrices. Distinguish between determinant and matrix, Normal Vector, Ortho-normal Vectors, Ortho-gonality, Gram-Schmidt Ortho-normalization Process, co-variance matrix., decision matrix, Echelon form, consistency and inconsistency of linear system of equations	07	CLO1
2	algebraic operations on matrices , Mathematical Problems using Matrix, Solution of homogeneous and non- homogeneous linear system of equations, Vector Spaces, subspaces, linearly dependent and independent vectors. Eigen values, eigenvectors, graphical presentation of eigen vectors	07	CLO2
3	Diagonalization, Caley-Hamilton theorem, similar matrices, Adjacency Matrix with graphical representation, Geometrical Application of Matrices,	04	CLO2



	Eigen Decomposition Theorem,		
	Section-B (SEE: 50 Marks) Group: A (20 Marks)		
4	Singular Value Decomposition (SVD), LU Decomposition, QR decomposition, Cholesky decomposition. Physical application of Matrix Decomposition Theorem, Mathematical Analysis of Matrices using MATLAB.	05	CLO2
5	Scalar and vectors, operation of vectors, dot product, cross product of vectors & their geometrical interpretation , Vector components in spherical and cylindrical systems, Scalar Field, Vector Field, Derivative of vectors and mathematical problems.	05	CLO2
	Group: B (30 Marks)		
6	Del operator, gradient, divergence and curl and their physical significance and problems, Normal vectors, Angle between surfaces, directional derivatives, Scalar triple product, proof of some problems	05	CLO2
7	Vector geometry such as Line Integrals, double integral, triple integral, surface integral, volume integral, Area Enclosed by a closed Curve, Line Integrals round a closed curve	05	CLO3
8	Physical significance of Vector integration and Problems, Plane Polar Coordinates, Cylindrical Polar Coordinates, Spherical Polar Coordinates., Greens, Gauss theorem and their applications, Stocks theorem , Vector Analysis using MATLAB	07	CLO4, CLO5

Text Books

Serial No	Name of authors	Title of the Book	Edition	Publisher's Name	Year
01	Roger A. Horn & Charles R. Johnson	Matrix Analysis		Cambridge University Press, UK	1985
02	Murray R. Spiegel , Seymour Lipschutz	Vector Analysis	2nd edition	Schaum Outline Series, McGraw-Hill Education – Europe.	2009
03	Richard Bronson	Linear algebra	2 nd edition	Academic Press is an imprint of Elsevier Inc	2007

Reference Books

Serial No	Name of authors	Title of the Book	Edition	Publisher's Name	Year



01	Murray R. Spiegell	Mathematical Handbook of Formulas and Tables	2 nd edition,	McGraw-Hill, Inc , Schaum's Outline Series,	1999
02	Matiur Rahman& Isaac Mulolani	Applied Vector Analysis		CRC Press LLC, New York	2001
03	P.E. Lewis & J.P .Ward	Vector Analysis for Engineers and Scientists		Wesley Publishing Company, Inc,	1989
04	Rao V. Dukkipati	Engineering Mathematics	first edition	New age International (p) Ltd New Delhi	2012
05	P.N. Chattarjee	Matrices	1 ^{5th} edition	Rajhans Press	1996
06	Seymour Lipschutz & Marc Lars Lipson	Linear Algebra	4 th edition	Schaum's Outline Series. New York, McGraw-Hill, Inc.	2009
07	Richard Bronson	Matrix Operation	2 nd edition	Schaum Outline Series , McGraw-Hill	2011
08	B. V. Ramana	Higher Engineering Mathematics			2008

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	-

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination



4 th Semester		
ISCED Code	Course Code	Course Title
0541	MATH-2407	Course Title: Mathematics IV (Complex Variable, Fourier Analysis and Laplace transform)
Credit Hours: 3	Contact Hours: 3	Type:
Prerequisite: MATH-III		
Co-requisite:		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ quiz	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Course Objectives:

This course gives the students a sound knowledge of how to transform of an object through a complex system and create a mapping between input and output image. It develops the analytical ability to demonstrate the applications of Fourier series, Fourier Transform and Laplace Transform.

Course Learning Outcomes (CLOs):

Sl. No.	CLOs	Weightage
CLO1	Demonstrate the understanding of the basic principles and operations set theory, mathematical operations with complex numbers, geometrical interpretation and the related fundamental theories involving complex functions and the concept of transformation in a complex plane	20%
CLO2	Apply the concept of transformation of an object into complex space and different mathematical operation of complex functions	20%
CLO3	Use Fourier series, Laplace's Transforms, Fourier Transform in different scenario	35%
CLO4	Analyze the harmonics & spectrum of different types of waves	15%
CLO5	Demonstrate the harmonic analysis using MATLAB	10%

Mapping of CLO-PLO:

Sl. No.	CLOs	PLOs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CLO1	Demonstrate the understanding of the basic principles and operations set theory, mathematical operations with complex numbers, geometrical interpretation and the related fundamental theories involving complex functions and the concept of transformation in a complex	PLO1	Cognitive/ Understand	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation	Exam, Class test, Assignment



	plane, different types of Signals			Slides, Group Discussion, Hand Note, etc.	
CLO2	Apply the concept of transformation of an object into complex space and different mathematical operation of complex functions	PLO1	Cognitive/ Apply	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion, Hand Note, etc.	Exam, Class test, Assignment
CLO3	Use Fourier series, Laplace's Transforms, Fourier Transform in different scenario	PLO1	Cognitive/Apply	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion, Hand Note, etc.	Exam, Class test, Assignment
CLO4	Analyze the harmonics & spectrum of different types of waves	PLO2	Cognitive/Analyze	Lecture, Tutorial, Class Discussion, Problem Solving, Assignment, Home Work, Presentation Slides, Group Discussion, Hand Note, etc.	Exam, Class test, Assignment
CLO5	Demonstrate the harmonic analysis using MATLAB	PLO5	Cognitive/Apply	LAB	Exam, Class test, Assignment

**Course Content:**

Segments	Content	Duration	CLOs
	Section-A (Midterm Exam: 30 Marks)		
1	Complex Valued Functions: Complex Number, Demoivre's Theorem, Complex mapping, Linear Transformation: translation, magnification and rotation, Non-linear transformations: inversion, bilinear. Set theory: Function, Relation etc	05	CLO1
2	Complex Differentiation: Differentiation of a complex function, Analytic function, Singularities, the Cauchy-Riemann Equations, harmonic functions	07	CLO2
3	Complex Integration: Complex Path Integrals, closed contour, Cauchy's Theorem, The Residue Theorem, Poles	06	CLO2

	Section-B (SEE: 50 Marks) Group: A (20 Marks)		
4	Fourier Series: Physical Significance of Fourier series, Periodic Signal, Trigonometric form and Complex form of Fourier series, Fourier Integral, Frequency Spectrum, Piecewise Continuous waveforms, Even symmetry, Odd symmetry, Half-wave symmetry, Phase Spectrum, , Sketch different types of Periodic Signals, Application of Fourier Series	06	CLO3
5	Convolution: Harmonic analysis, convolution theorem, convolution sum, convolution Integral	05	CLO4
	Group: B (30 Marks)		
6	Laplace transforms: Unit Step Function, Impulse Function, Ramp Function, Sketch Waveform, Derive Laplace transform from Fourier transform ,the Laplace transforms of different functions, The First Shift Theorem, Multiplication Theorem, Division Theorem,, Laplace transforms of unit step functions, Inverse Laplace transforms	08	CLO3
7	Fourier Transform: A-periodic Signal, Fourier transforms, Inverse Fourier Transform, Solution of IVP by Laplace Transforms	05	CLO3
8	Fourier Analysis using MATLAB	03	CLO5

Text Books



Serial No	Name of authors	Title of the Book	Edition	Publisher's Name	Year
01	Stroud K. A	Advanced Engineering Mathematics	Fourth Edition	Palgrave Macmillan press Ltd, London	2003
02	Murray R. Spiegel	Theory and problems of Complex Variables	Complex variables SI (METRIC) edition	SOS	1981
03	Merle C Potter	Advanced Engineering Mathematics	3 rd edition	Oxford University Press	2005

Reference Books

Serial No	Name of authors	Title of the Book	Edition	Publisher's Name	Year
1.	Glyn James	Advanced Engineering Mathematics	2 nd edition	Pearson Education Limited	1993, 1999
2.	Rao V. Dukkipati	Engineering Mathematics	first edition	New age International (p) Ltd New Delhi	2012
3.	Joel L. Schiff	the Laplace Transform, theory and applications		Springer	1999
4.	Erwin Kreyszig	Advanced Engineering Mathematics	8 th edition	John Wiley & Sons Inc, Singapore, Peter Janzow	1999
5.	Michael D. Greenberg	Advanced Engineering Mathematics	2 nd edition	Prentice -Hall International , Inc, USA	1998
6.	Alamgir Chowdhury	Higher Trigonometry		Azra Printing Press, Dhaka	1995
7.	J. Brown and R. Churchill	Complex Variables and Its applications		McGraw-Hill Higher Education	
8.	H.S. Kasana, - PHI. Srimanta Pal, Subodh C. Bhunia	Complex Variables (Theory and Applications)		Oxford University Press	
9.	Murray R. Spiegel	Theory and Problems of Theoretical Mechanics	SI (Metric) Edition	McGraw-Hill International Book Company, New York	1967
10.	Lambe G. C	Advance Level Applied Mathematics		Hodder and Stoughton London	1980
11.	Peter V. O'Neil	Engineering Mathematics-II		Thomson (Cengage) Learning	2007
12.	B. V. Ramana	Higher Engineering Mathematics		Tata McGraw-Hill Publishing Company Ltd	2008
13.	R. K. Jain & S. R. K. Iyenger	Advance Engineering Mathematics		Narosa Publishing House	2002.
14.	B. S. Grewal	Higher Engineering Mathematics		Khanna Publishers	2005
15.	C. Ray Wylie &	Advanced Engineering		Tata McGraw-Hill	2003



	Louis C. Barrett	Mathematics		Publishing Company Ltd	
16.	Y.K. Kwok	Applied Complex Variables for Scientists and Engineers		Cambridge University Press	2002

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	-

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



3rd Semester		
ISCED Code	Course Code	Course Title
0542	STAT-2311	Probability and Statistics
Credit Hours: 2	Contact Hours: 2	Type: Core, Engineering
Prerequisite: STAT-1201 (Statistics)		
Co-requisite: CSE-4747 (Mathematical Analysis for Computer Science)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

This course is to provide an understanding for the engineering student on statistical concepts to include measurements of location and dispersion, probability, probability distributions, hypothesis testing, regression, and correlation analysis.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate understanding of descriptive statistics by practical application of quantitative reasoning and to the solution of engineering problems with data visualization.	30
2.	Will Be able to compute and interpret the results of correlation and regression.	10
3.	Demonstrate probability and its related distributions to the solution of engineering problems.	50
4.	Create hypothesis for data analysis	10

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Knowledge of descriptive statistics	PLO1	Cognitive/ understanding	Lecture, Class discussion, Assignment, Note	Exam, Assignment
CLO2	Interpret the results of Correlation and Regression	PLO2	Cognitive/ Analyze	Lecture, Class discussion, Assignment, Note	Exam, Assignment, Problem Solving
CLO3	Demonstrate probability and its distributions to engineering problems	PLO1	Cognitive/ Applying	Lecture, Class discussion, Assignment Problem Solving	Exam, Quiz, Assignment,
CLO4	Create hypothesis for data analysis	PLO4	Cognitive/Creating	Lecture, Class discussion, Assignment, Problem Solving	Exam, Assignment, Hypothesis testing

Course Content:

Chapter	Section-A <i>(Midterm Exam: 30 Marks)</i>	Lecture	CLO
1	Preliminary idea of Statistics: Origin, History and Development Statistics,	5	CLO1



	Definition of Statistics, Characteristics, Function, Limitations, Necessity & importance of Statistics, The role of Statistics in Engineering, Population and Sample, Variable and Constants, Different types of variables, Parameter, Statistic, Scale of measurement, Statistical data, collecting engineering data, Preparation of Questionnaire and Schedule, Presentation and Classification of Data, Construction of Frequency distribution, Graphical presentation of Frequency distribution.		
2	Measures of Central Tendency: Different types of mean with their properties and relationship, Quintiles with their graphical presentation, Application of different measures of central tendency.	3	CLO1
3	Measures of Dispersion of a Series of Data: Range, Standard Deviation, Mean Deviation, Quartile Deviation, Variance and Standard Deviation, Coefficient of Variation and their uses, Properties and applications of different measures of dispersion, moments, skewness and kurtosis.	4	CLO1
Section-B (Final Exam: 50 Marks)			
Group-A (20 Marks)			
4	Correlation Theory and Regression Analysis: Simple Correlation and its measure, Scatter Diagram, properties of simple correlation coefficient, Spearman's Rank correlation coefficient, Simple linear regression, properties of regression coefficient, regression curve, regression equation, Least-square method of curve fittings, Co-efficient of determination, Theorems & Problems.	4	CLO2
5	Basic concepts of probability: History, meaning and Scope of probability, Approaches of defining probability: Classical, Empirical, Subjective and Axiomatic probability, Experiment, random experiment, Sample Space, Event, different types of events, Tree diagram, Conditional probability and independence, some elementary theorems on probability, and conditional probability, Laws of Probability – Additive and Multiplicative Law, Prior probability, Posterior probability, total probabilities & Bayes' theorem and their applications.	4	CLO3
Group-B (30 Marks)			
6	Random Variables and Mathematical Expectation: Discrete and continuous random variables, Probability mass function and density function, Distribution function and their properties, Mathematical expectation and variance of a random variables. Theorems & Problems	3	CLO3
7	Probability Distributions: Binomial distribution, Poisson distribution and Normal distribution – Their properties, uses, Theorems & Problems	4	CLO3
8	Test of hypothesis and Estimation: Preliminary ideas of statistical hypothesis test, level of significance, one tailed and two tailed test, p-value, Test of significance, Test regarding single mean, test of equality of two mean, test of equality of several means (Analysis of variance), test regarding proportion. General concepts of Estimation.	3	CLO4

Resources:

Text Books

1. Montgomery Douglas C & Runger George C, “*Applied Statistics and Probability for Engineers*”, John Wiley and Sons, Inc. Fifth Edition, (2011). ISBN: 978-0-470-05304-1
2. Walpole R.E, Myers R.H, Myers S.L, & Ye K.Y, “*Probability and Statistics for Engineers and Scientist*”, Prentice Hall, 9th ed. (2012). ISBN 978-0-321-62911-1
3. R.N. Shill & S.C. Debnath, “*An introduction to the theory of Statistics*”, STAR Publication, 4th Edition (2016).



Reference Books

1. L-Garcia, A. "Probability, Statistics and Random Processes for Electrical Engineering" , 1st Cambridge University Press, Third Edition (2014). ISBN-13: 978-0131471221
2. Keshava & Reddy E. "Probability and Statistics". Pearson Education India, 5th Edition (2015). ISBN: 9789332558229

Online Resources:<https://www.khanacademy.org/math/statistics-probability>

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective Learning	Mid-term: (30)	Assignment/ Class Test: (10)	Attendance Marks (:10)	Written Exam: (50)
Remember	-	5	-	-	5
Understand	-	-	5	-	10
Apply	-	5	-	-	05
Analyze	-	5	-	-	10
Evaluation	-	10	5	-	15
Create	-	5	-	-	05
x	Responding	x	x	10	
Remarks	Course teachers may change the magnitude of marks in Bloom's category(Both for CIE and SEE), but he/she will have to keep in mind that the % of higher order learning mode must be about 60% or more and all the Bloom's categories to be addressed during the semester. If necessary, a course teacher may also use Cognitive (Knowledge), Affective (Attitude) and Psychomotor (Skills) domain of Bloom's Taxonomy.				

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



C.2. Basic Science Courses



2nd Semester		
ISCED Code	Course Code	Course Title
0533	PHY-1101	Physics-I
Credit Hours: 3	Contact Hours: 3	Type: Core, Basic Science
Prerequisite: N/A		
Co-requisite: N/A		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

This course is designed to provide students in Applied Science who wish to study engineering at university with an enhanced background in order to improve their chances of success in their chosen program.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the basic knowledge of mechanics, optics and thermodynamics in the context of engineering.	60%
2.	Apply mathematical knowledge of mechanics, optics and thermodynamics to formulate and solve basic engineering problems.	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the basic knowledge of mechanics, optics and thermodynamics in the context of engineering.	PLO1	Cognitive/ Understand	Lecture, Class discussion, Assignment, Note	Class test, Assignment, Exam
CLO2	Apply mathematical knowledge of mechanics, optics and thermodynamics to formulate and solve basic engineering problems.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Assignment Class test, Exam

Course Content:

Segment	Contents	Duration	CLOs
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Section-A (Midterm Exam: 30 Marks)			
1	Dynamics of Rigid Body: Linear motion of a body as function of time, position and velocity, momentum, conservation theorem of momentum and energy, collision and torque, center of mass of rigid body, rotational kinetic energy, fly wheel, axes theorems and their applications.	02	CLO1 CLO2
2	Gravity and Gravitation: Definitions, compound pendulum, gravitational potentials and fields and relation between them, potential due to spherical shell, escape velocity and Kepler's law of planetary motion.	06	CLO1 CLO2
3	Introductory quantum mechanics: Wave function, Uncertainty principle, Postulates, Schrodinger time independent equation, Expectation value, Probability, Particle in a zero potential, Calculation of energy.	04	CLO1 CLO2
Section-B (SEE: 50 Marks)			
4	Waves: Waves in elastic media, Differential equation of a progressive wave, Power and intensity of wave motion, standing waves, Sound waves, beats and Doppler's effect in sound, Group velocity and phase velocity.	04	CLO1 CLO2
5	Oscillation: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring mass system, Calculation of time period of torsional pendulum, Damped oscillation, Forced oscillation, Resonance.	06	CLO1 CLO2
6	Heat and Thermodynamics: Thermodynamic system, first and second law of thermodynamics and their applications, the thermodynamic temperature scale, Carnot's heat engine, the efficiency of engine, combined first and second law of thermodynamics, entrop, Entropy, Thermodynamics functions, Maxwell relations, Third Law of thermodynamics.	02	CLO1 CLO2
7	Interference: Defects of images: spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. Theories of light; Interference of light: Young's double slit experiment, interference in thin films, Newton's rings, interferometers;	04	CLO1 CLO2
8	Diffraction & Polarization: Diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; polarization: Production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction.	02	CLO1 CLO2
		30	

Books :**Text Book :**

1. Physics for Engineers (Part-I), "Physics For Engineers (Part-II)" 1st Edition, Hafiz Book Center, 2009.

Reference Books :



1. David Halliday and Robert Resnick, "Physics part-I.", Wiley, 1988.
2. Brij Lal, N. Subrahmanyam, "Properties of Matter", Eurasia Publishing House Limited, 1993.
3. Brij Lal, M N Avadhanulu & N Subrahmanyam, "A Text Book of Optics", S. Chand Publishing, 2012
4. Young and Fredman, "University Physics", Pearson, 2016.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



2nd Semester		
ISCED Code	Course Code	Course Title
0533	PHY-1201	Physics-II
Credit Hours: 3	Contact Hours: 3	Type: Core, Basic Science
Prerequisite: PHY-1101 (Physics-I)		
Co-requisite: N/A		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

This course is designed to provide students in Applied Science who wish to study engineering at university with an enhanced background in order to improve their chances of success in their chosen program.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the basic knowledge of electromagnetism, structure of matter and modern physics in the context of engineering.	60%
2.	Apply mathematical knowledge of electromagnetism, structure of matter and modern physics to formulate and solve basic engineering problems.	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the basic knowledge of electromagnetism, structure of matter and modern physics in the context of engineering.	PLO1	Cognitive/ Understand	Lecture, Class discussion, Assignment, Note	Class test, Assignment, Exam
CLO2	Apply mathematical knowledge of electromagnetism, structure of matter and modern physics to formulate and solve basic engineering problems.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Assignment Class test, Exam

Course Content:



Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Charge and Electric Potential: Electric charge, conductors and insulators, Coulomb's law, electric field, Electric field strength, Gauss's law and its applications, electric potential and potential function, electric dipole, dielectrics in Gauss' law.	02	CLO1 CLO2
2	Magnetic field: Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faraday's Law of electromagnetic induction, Lenz's Law, Self induction, Mutual induction; Magnetic properties of matter: Hysteresis curve.	06	CLO1 CLO2
3	Current and Resistance: Current and current density, Ohm's law, potential difference, RC circuits, generation of alternating current and e.m.f.	04	CLO1 CLO2
Section-B (SEE: 50 Marks)			
4	Structure of matter: Crystalline and non-crystalline solid, single crystal and polycrystalline solids, unit cell, Crystal systems, Coordination number, NaCl and CsCl structure, Packing fraction, Crystal planes and directions, Miller indices, calculation of inter-planar spacing for cubic system, Relation between inter-planar spacing & Miller indices.	04	CLO1 CLO2
5	Defects & Bond in Solid: Different types of defects; Different types of bonds in solids, calculation of cohesive and bonding energy, Distinction between metal, insulator and semiconductor in terms of energy band.	06	CLO1 CLO2
6	Relativity: Postulates of special theory of relativity, Lorentz transformation, time dilation and length contraction, relativity of mass, energy-mass relation, energy-momentum relation.	02	CLO1 CLO2
7	Modern Physics: Bohr's atomic model, radius and energy of Hydrogen atom, atomic nucleus and binding energy, photo-electric effect, Compton Effect, De-Broglie waves, X-ray diffraction, atomic spectra and Zeeman Effect.	04	CLO1 CLO2
8	Radioactivity: Definition, radioactive decay laws, half-life, mean life, alpha decay, beta decay, gamma decay, cross section, nuclear fission & fusion.	02	CLO1 CLO2
30			

Books :**Text Book :**

- Physics For Engineers (Part-II), "Physics For Engineers (Part-II)" 1st Edition, Hafiz Book Center, 2009.

Reference Books :

- R. Murugesan, [Kiruthiga Sivaprasath](#), "Modern Physics" 18th Edition, S. Chand, 2017.
- Arthur Beiser, "Concepts of Modern Physics" 6th Edition, Tata McGraw - Hill Education,



1994.
3. R. Murugeshan, "Electricity and Magnetism" 10th Edition, S. Chand, 2017.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



2nd Semester		
ISCED Code	Course Code	Course Title
0533	PHY-1204	Physics Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite: N/A		
Co-requisite: PHY-1101 (Physics-I), PHY-1201		(Physics-II)

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- Apply the analytical techniques and graphical analysis to the experimental data.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate the working knowledge of fundamental physics and basic electrical and/or mechanical engineering principles to include advanced knowledge in one or more engineering disciplines.	50
2.	Analyze the experiments of engineering physics and Use the modern engineering physics techniques and tools, including laboratory instrumentations.	50

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the working knowledge of fundamental physics and basic electrical and/or mechanical engineering principles to include advanced knowledge in one or more engineering disciplines.	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO2	Analyze the experiments of engineering physics and Use the modern engineering physics techniques and tools,	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work,	Assignment, Class performance, Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	including laboratory instrumentations.			Note	

Lecture Plan:

Week	Activities	Topics	CLOs
1	Introduction	Introduction to the lab equipments.	CLO1 CLO2
2	Expt.-1	<ul style="list-style-type: none"> Determination of the resistance of a wire by means of post office box. 	CLO1 CLO2
3	Expt.-2	<ul style="list-style-type: none"> Experimental verification of the laws of series and parallel connections of resistance by means of a post office box. 	CLO1 CLO2
4	Expt.-3	<ul style="list-style-type: none"> Determination of the end corrections for a meter bridge. 	CLO1 CLO2
5	Expt.-4	<ul style="list-style-type: none"> To Determine the Value of g, Acceleration Due to Gravity, by Means of a Compound Pendulum. 	CLO1 CLO2
6	Lab test 1		
7	Expt.-5	<ul style="list-style-type: none"> Calibration of a meter bridge wire. 	CLO1 CLO2
8	Expt.-6	<ul style="list-style-type: none"> To Determine the Moment of Inertia of a Fly- wheel about the Axis of Rotation. 	CLO1 CLO2
9	Expt.-7	<ul style="list-style-type: none"> Determination of specific resistance of the material of a wire by a meter bridge. 	CLO1 CLO2
10	Expt.-8	<ul style="list-style-type: none"> To determine the frequency of a Tuning fork by Melde's Experiment. 	CLO1 CLO2
11	Expt.-9	<ul style="list-style-type: none"> To Determine the Young's Modulus by the Flexure of a Beam (Bending Method) 	CLO1 CLO2
12	Expt.-10	<ul style="list-style-type: none"> Determination of the resistance of a galvanometer by half deflection method. 	CLO1 CLO2
13	Lab Viva for individual Expt.	<ul style="list-style-type: none"> Lab viva on the basis of Lab report submission. 	CLO1 CLO2
14	Lab Viva for individual Expt.	<ul style="list-style-type: none"> Lab viva on the basis of Lab report submission. 	CLO1 CLO2
15	Final Lab Exam		

Books :**Text Book :**

- G. Ahmed and M. Shahabuddin, "Practical Physics" Hafiz Book Centre, 1969.

Reference Books :

- G. L. Squires, "Practical Physics", University Press, Cambridge, 1985.



2nd Semester		
ISCED Code	Course Code	Course Title
0531	CHEM-2301	Chemistry
Credit Hours: 3	Contact Hours: 3	Type: Core, Basic Science
Prerequisite: N/A		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

This course is designed to provide students in Applied Science who wish to study engineering at university with an enhanced background in order to improve their chances of success in their chosen program.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate the chemical engineering idea and understanding of the chemical behavior, physical properties of the common substances.	60%
2.	Demonstrate the basic proficiency to solve the chemical problems and discussing the interactions between matter and energy at the atomic and molecular levels.	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the chemical engineering idea and understanding of the chemical behavior, physical properties of the common substances.	PLO1	Cognitive/ Understand	Lecture, Class discussion, Assignment, Note	Class test, Assignment, Exam
CLO2	Demonstrate the basic proficiency to solve the chemical problems and discussing the interactions between matter and energy at the atomic and molecular levels.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Assignment Class test, Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			



1	Periodic Classification of Elements: Modern periodic table, Periodic law, Periodic system, Correlation of Atomic structure with periodic properties of elements, Ionization potential, Electron affinity, Electromagnetivity, Atomic and ionic radii, Properties of oxides.	02	CLO1 CLO2
2	Electronic Theory of Elements: Different types of bonds, ionic, covalent, co-ordinate and hybridization of atomic orbitals, bonding in simple molecules, Elementary idea about MOT.	06	CLO1 CLO2
3	Chemistry of Transition Elements, Lanthanides and Actinides: Definitions, Electronic configurations, general properties.	04	CLO1 CLO2
Section-B (SEE: 50 Marks)			
4	Electrochemistry: Electrolytic dissociation, Theory of electrolytic conductance. Ionic mobility and transference number, Simple ideas about electrode potential and reversible cells.	04	CLO1 CLO2
5	Types and properties of solutions: Units of concentration, ideal and real solutions, Henry's Law, Distribution of solids between two immiscible liquids, Distribution law, Partition coefficient and solvent extraction, Properties of dilute solutions.	06	CLO1 CLO2
6	Chemical Equilibrium: Law of mass action, Determination of equilibrium constant, heterogeneous and homogeneous equilibrium, Le Chatelier principle and Van Hoff equation.	02	CLO1 CLO2
7	Chemical Kinetics: Order and molecularity kinetics of first and second order reaction, Determination of order of reactions, Arrhenius equation and energy of activation,	04	CLO1 CLO2
8	Surface Chemistry and Colloids: Adsorption, Langmuir and Gibbs adsorption isotherm, Colloids, Definitions of terms, Electrodialysis, Classification, Preparation and properties of colloids, Elementary idea about emulsions and gels. Importance of colloids,	02	CLO1 CLO2
30			

Books :**Text Book :**

1. R. D. Madan, "Modern Inorganic Chemistry ", 1st Edition, S. Chand, 1987.

Reference Books :

4. M.M. Haque and M.A. Nawa , "Principles of Physical Chemistry " Brothers Publication, 2015-2016.
5. E.S Gilreath," Fundamental Concepts in Inorganic Chemistry." McGraw-Hill Education; International Ed edition (January 1, 1958).

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5



Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination



C.3. Engineering Courses



ISCED: 0713

Course Code: EEE-1121

Course Title: Basic Electrical Engineering

Credit Hours: 3

Contact Hours: 3 lecture hours per week

Type: Core, Engineering

Prerequisite: N/A

Co-requisite: EEE-1122 (Basic Electrical Engineering Lab)

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's, Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in three phase circuit analysis and passive RLC filter circuits are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

Course Objective:

The objectives of this course are to

1. familiarize with the fundamentals of electrical circuits
2. learn to solve circuits by using different theorem
3. learn the techniques to analyze the three-phase ac circuit

Course Learning Outcomes (CLOs):

At the completion of the subject, students should be able to perform the following tasks:

#	CLO Description	Weightage (%)
1.	Explain the basic concepts and laws of electric circuits, and different types of signals.	20
2.	Solve the electrical networks using nodal and mesh analysis techniques.	20
3.	Compute the impedance, resonance and complex power of sinusoidal circuits.	30
4.	Analyze the transient response of RL, RC and RLC circuits.	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the basic concepts and laws of electric circuits, and different types of signals.	PLO1	Cognitive /understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Solve the electrical networks using nodal and mesh analysis techniques.	PLO1	Cognitive /apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Compute the impedance, resonance and complex power of sinusoidal circuits.	PLO1	Cognitive /apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment, Problem Solving
CLO4	Analyze the transient response of RL, RC and RLC circuits.	PLO2	Cognitive /analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment, Circuit Problem Solving

Course Content:**Section-A (Mid-term: 30 Marks)**

1. Circuit Elements and Basic Laws: D.C voltage, current, resistance and power; dependent and independent sources, active and passive elements, networks definitions, conversion between Y and Δ networks, Reduction of complicated networks, KVL & KCL.

2. Network Analysis: Elementary network topology, network constraints, and network equilibrium equations. Nodal and mesh network analysis, Supernode, Supermesh, Source Transformation.

3. Network Theorems: Superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.

Section-B (Final Exam: 50 Marks)**Group-A (20 Marks)**

4. Signal and Waveforms: Signal waveforms: D.C., step, impulse, square pulse, sinusoidal, triangular, and exponential. General description of signals: time constant, rms value, duty cycle, crest factor, form factor.

5. A.C Circuits: Instantaneous, Average and R.M.S. values of current, voltage and power, Real, Reactive and Apparent power, Volt-ampere, Phase and Phase difference, Power Factor, Impedance, Determination of Average and R.M.S values of different sinusoidal and non-sinusoidal waves, power calculation of RL, RC and RLC circuits, Nodal and Mesh Analysis.

Group-B (30 Marks)

6. Phasor Algebra: Use of complex quantities in AC circuits, PhasorDiagram, Nodal and Mesh Analysis using Phasor, resonant circuits, Q value and band width, frequency response.



7. Filters: Different types of filters, Fundamental concepts of RL and RC filter, Properties of symmetrical networks filter fundamentals.

8. 3-φ Circuits: Introduction to Polyphase Circuits, three-phase three wire system, Y and Δ connected system, Power calculation in balanced 3-φ systems.

Text Book:

1. C.K. Alexander and M.N.O. Sadiku, Fundamental of Electric Circuits, 5th Edition, McGraw-Hill 2009
2. I. Robert L. Boylestad, Introductory Circuit Analysis, 11th ed., Prentice Hall, 2006.

Reference Books:

1. J. Nilsson and S. Riedel, Electric Circuits 8th ed. Prentice-Hall, 2007
2. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuits, 7th ed, John Wiley, 2006
3. B. L. Theraja, A Textbook of Electrical Technology Volume-1, 23rd Edition, S. Chand, 2008 Nannapaneni Narayana Rao, Fundamentals of electromagnetics for Electrical and Computer Engineering, Prentice Hall, 2009

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-		-	-	5
Understand	-	5	5	-	15
Apply	-	10	-	-	20
Analyze	-	15	5	-	10
Evaluation	-			-	
Create	-		-	-	
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

**ISCED: 0713****Course Code: EEE-1122****Course Title: Basic Electrical Engineering Sessional****Credit Hours: 1.5****Contact Hours: 3 lecture hours per week****Type: Core, Engineering****Prerequisite: EEE-1121 (Basic Electrical Engineering)****Co-requisite: N/A**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Rationale / Summary:

Fully experimental work in laboratory. This lab works will cover open-ended experimental topics on basic understanding of the theoretical course EEE-1121. Experiments are to be carried out every week in a small group. Discussion about experimental data with analysis is required to students, through group discussions and their own reports. Repeating discussion and analysis on experimental results are expected to brush up engineering mind of students involved.

Course Objective: The objectives of this course are to

1. familiarize with the fundamentals of electrical circuits experiment
2. learn to solve circuits by using different theorem
3. learn the techniques to analyze the three-phase ac circuit

Course Learning Outcomes (CLOs):

At the completion of the subject, students should be able to perform the following tasks:

#	CLO Description	Weightage (%)
1.	Implement theoretical knowledge from previously learned course to perform experiments	40
2.	Conducting open-ended experiments using appropriate tools in electrical circuits.	40
3.	Comply with ethical values and responsibility towards team members in punctuality, bench tidiness and analysis	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Implement theoretical knowledge from previously learned course to perform experiments	PLO1	Cognitive /Apply	Lecture, Class discussion, Assignment, Note	Pre-Labs, Lab performance, Lab report, Pre report
CLO2	Conducting open-ended experiments using appropriate tools in electrical circuits.	PLO5	Cognitive /apply	Lecture, Class discussion, Assignment, Note	Pre Labs Lab performance, Lab report
CLO3	Comply with ethical values and responsibility towards team members in punctuality, bench tidiness and analysis	PLO8, PLO10	Cognitive /apply	Lecture, Class discussion, Assignment, Lab work, Note	Pre Labs Lab performance, Lab report

To familiar with the operation of different electrical instruments.

1. To verify the following theorems:
 - i. KCL and KVL theorem,
 - ii. Superposition theorem,
 - iii. Thevenin's theorem,
 - iv. Norton's theorem and
 - v. Maximum power transfer theorem
2. To design and construct of low pass and high pass filter and draw their characteristics curves.
4. To investigate the voltage regulation of a simulated transmission network.
Study the characteristics of Star-Delta connection
5. Study the frequency response of an RLC circuit and find its resonant frequency.
6. To perform also other experiments relevant to this course.

Text Book:

3. C.K. Alexander and M.N.O. Sadiku, Fundamental of Electric Circuits, 5th Edition, McGraw-Hill 2009
4. I. Robert L. Boylestad, Introductory Circuit Analysis, 11th ed., Prentice Hall, 2006.

Reference Books:

4. J. Nilsson and S. Riedel, Electric Circuits 8th ed. Prentice-Hall, 2007
5. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuits, 7th ed, John Wiley, 2006
6. B. L. Theraja, A Textbook of Electrical Technology Volume-1, 23rd Edition, S. Chand, 2008 Nannapaneni Narayana Rao, Fundamentals of electromagnetics for Electrical and Computer Engineering, Prentice Hall, 2009

**ISCED: 0714****Course Code: EEE-1221****Course Title: Electronics****Credit Hours: 3****Contact Hours: 3 lecture hours per week****Type: Core, Engineering****Prerequisite: EEE-1121 (Basic Electrical Engineering)****Co-requisite: EEE-1222 (Electronic Device and Circuit Lab)**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Describe the fundamentals of solid-state electronics	10
2.	Sketch the output wave-shape of different diode circuits	25
3.	Differentiate the generated and filtered wave-shapes	10
4.	Understand the transistor and switching circuits	25
5.	Analyze different operational amplifier circuits and their applications	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Describe the fundamentals of solid state electronics	PLO1	Cognitive/Remember	Lecture, Class discussion, Assignment, Note	Class Test, Exam
CLO2	Sketch the output wave-shape of different diode circuits	PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Class Test
CLO3	Differentiate the generated and filtered wave-shapes	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Class Test



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO4	Understand the transistor and switching circuits	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Class Test
CLO5	Analyze different operational amplifier circuits and their applications	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Class Test, Exam

Section-A (Mid-term: 30 Marks)

1. Fundamentals of Semiconductor Devices: Electronic structure of the elements, N and P type semiconductor, carrier densities, generation and recombination of excess carriers, carrier life time, and continuity equation. The PN junction, biasing and V-I characteristics of diodes, rectifier concept, half wave and full wave rectifiers, Zener diode and voltage regulators.

2. Bipolar Junction Transistor and Biasing Techniques: Transistor current components, Common-base configuration, Common-emitter configuration, Common-collector configuration, operating point, Fixed bias, Emitter bias, bias stability, thermal stability.

3. Wave shaping & Op-amp circuit applications: Linear wave shaping, Wave shaping techniques, High pass and low pass RC circuits (sinusoidal, step voltage, pulse, square wave, exponential and ramp inputs). Clipping and clamping circuits, Design of different Clipping and Clamping circuits according to application.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Field Effect Transistor: JFET, Pinch-off voltage, Drain characteristics, MOSFET, Biasing FET devices, FET Small-signal model, FET amplifier analysis, FET as voltage-variable resistor.

5. Switching Circuits and Multivibrator: Transistor Switches, Schmitt Triggers, Transistor monostable multivibrator, Switching speed improvements, Solid-State Multivibrators.

Group-B (30 Marks)

6. Operational Amplifier Fundamentals: Ideal Op-Amp, Virtual Ground Concept, Basic Op-Amp Circuits, Op-Amp applications: current-to-voltage converters, voltage-to-current converters, Difference amplifier, Instrumentation amplifier, integrator, differentiator

7. OP-Amp Applications: Oscillators, Timers (555), function generators, Phase locked loop (PLL), analog switches

8. Nonlinear Circuit Applications: Comparators, Schmitt Triggers, Precision Rectifiers, Peak Detectors, Log/Antilog Amplifiers, Analog Multipliers

Text Books:

1. R.L. Boylestad, Louis Nashelsky, Electronic device and circuit theory, Sedra Smith, Microelectronics Circuits
2. Robert F. Coughlin, Frederick F. Driscoll, Prentice Hall, Operational Amplifier and Linear Integrated Circuits

**Reference Books:**

1. V.K. Mehta, Principles of Electronics
2. J. Millman, C. C. Halkias, Electronic device and circuit
3. B.L. Thereja, Basic Electronics- Solid State

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-	5	-	-	5
Understand	-	5	5	-	15
Apply	-	10	-	-	20
Analyze	-	10	5	-	10
Evaluation	-			-	
Create	-		-	-	
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



ISCED: 0714

Course Code: EEE-1222

Course Title: Electronic Devices and Circuit Lab

Credit Hours: 1.5

Contact Hours: 3 lab hours per week

Type: Core, Engineering Course

Prerequisite: EEE-1122 (Basic Electrical Engineering Lab)

Co-requisite: EEE-1221 (Electronics)

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Demonstrate the familiarity with basic semi-conductor devices	30
2.	Solve electronic circuits individually and in team	30
3.	Implement basic electronic knowledge in developing moderate project	40

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the familiarity with basic semi-conductor devices	PLO1	Cognitive/Apply	Lecture, Lab work	Lab Report, Lab Test Lab Performance
CLO2	Solve electronic circuits individually and in team	PLO9	Cognitive/Apply	Lecture, Lab work	Lab Report, Lab Test Lab Performance
CLO3	Implement basic electronic knowledge in developing moderate project	PLO2, PLO10, PLO11	Cognitive/Apply	Lecture, Group discussion, Lab work,	Project Proposal, Fund Rising and Utilization Report, Project Presentation

Experiment Names:

1. To familiar with electronic devices and Laboratory Equipments.
2. To study of V-I Characteristics curve of P-N junction diode.



3. To study of V-I Characteristics curve of a Zener diode.
4. To study of Half-Wave Rectification circuit.
5. To study of Full-Wave Rectification circuit (Bridge & Center-tap)
6. To familiar with NPN and PNP Transistors.
7. To study of Full-Wave filter circuit.
8. To study of Common Emitter (CE) Transistor Amplifier circuits.
9. To study of Clipping and clamping circuit.
10. To study of output characteristics of an FET.
11. To study of JFET as an amplifier.
12. To study of output characteristics of a JFET.
13. To perform other experiments related to this course.

Text Books:

3. R.L. Boylestad, Louis Nashelsky, Electronic device and circuit theory, Sedra Smith, Microelectronics Circuits
4. Robert F. Coughlin, Frederick F. Driscoll, Prentice Hall, Operational Amplifier and Linear Integrated Circuits

Reference Books:

4. V.K. Mehta, Principles of Electronics
5. J. Millman, C. C. Halkias, Electronic device and circuit
6. B.L. Thereja, Basic Electronics- Solid State

**ISCED: 0714****Course Code: EEE-2421****Course Title: Electrical Drives and Instrumentation****Credit Hours: 2****Contact Hours: 2 lecture hours per week****Type: Core, Engineering****Prerequisite: EEE-1121 (Basic Electrical Engineering)****Co-requisite: EEE-2422 (Electrical Drives and Instrumentation Sessional)**

This course aims to equip students with the knowledge of transformer, DC and AC electrical drive systems which are commonly used in industries. The course also covers the general concepts of electrical measurement and instrumentation techniques.

Objectives:

This course is designed to provide students. The material will be presented using the normal mix of lectures and laboratory experiments and demonstrations. This course objective is also to

- To provide technical knowledge to solve industrial problems related to AC and DC Drives systems
- To introduce the students to electrical measurement and instrumentation techniques.
- To introduce the basic concepts and working principles of electrical machines

Course Learning Outcomes (CLOs):

At the completion of the subject, students should be able to perform the following tasks:

#	Course Learning Outcomes	Weightage (%)
1.	Understand the operation of transformer, DC /AC Drives for industrial applications.	25
2.	Solve the problems in AC/DC Variable Speed Drive system used for the given industrial application.	20
3.	Select an appropriate motor for a given industrial application.	20
4.	Understand various measuring techniques for both electrical and non-electrical quantities.	25
5.	Comprehend the fundamentals and differentiate errors of an instrumentation measurement system.	10

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the operation of transformer, DC /AC Drives for industrial applications.	PLO1	Cognitive/understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Solve the problems in AC/DC Variable Speed Drive system used for the given industrial application.	PLO2	Cognitive /apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Select an appropriate motor for a given industrial application.	PLO2	Cognitive / apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO4	Understand various measuring techniques for both electrical and non-electrical quantities.	PLO1	Cognitive/understand	Lecture, Class discussion, Assignment, Note,	Exam, Quiz, Assignment
C05	Comprehend the fundamentals and differentiate errors of an instrumentation measurement system.	PLO2	Cognitive/analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment

Course Content:

Section-A (Mid-term: 30 Marks)

1. Introduction to Electrical Drives

Introduction to electrical machines. Rotational motion, Newton's law, and power relationships. Magnetic field, Faraday's law, induced voltage on a conductor moving in a magnetic field, production of force on a wire in a magnetic field, Classification of Load torques, Mechanical and Electrical Power Calculation, Sizing of electric motors for given load system, Classes of Motor Duty, De-rating factor for electric motor sizing, Energy Efficient Motors, Motor name plate.

2. Transformers: Single-phase transformers: Construction, principle of operation and equivalent circuit, phasor diagram, efficiency and regulation. Short and open circuit tests. Three-phase transformers: Construction and connections.

3. DC Motor Drives: Principles of operation and construction of DC machines, Emf equation and principle of commutation. Controlled rectifier fed dc drives, Power factor, supply harmonics and ripple in motor current, Chopper controlled dc drives, Closed loop control of DC Drives, Two and four quadrant controls.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Induction Motor Drives: Principles of operation and basic construction of three-phase induction motor. Slip equation, equivalent circuit, determination of equivalent circuit parameters by no-load and blocked-rotor tests. Volts per Hertz drives, Flux vector control drives, Direct torque control drives, Soft-Starters, Selection of speed drives and soft starters, Line reactors, Troubleshooting of AC Drives system, Drives parameter programming.



- 5. Synchronous Motor Drives:** Stepper Motor Drives, Switched reluctance motor drives, Permanent Magnet Synchronous Motor (Interior Permanent Magnet and Surface Permanent Magnet, Brushless DC motor). Thyristor and microprocessor based speed control of motors.

Group-B (30 Marks)

6. General Concepts of Measurements and instruments

Variables and measurement signals, the three stages of generalized measurement system, some common terms used in the measurement system, mechanical loading, impedance matching, and frequency response. Factors considered in selection of instruments - Measurement accuracy and precision. Error analysis and classification, sources of error.

7. Instrumentation amplifiers: Differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices, spectrum analyzers and logic analyzers

8. Measurement of Non Electrical Quantities: Transducers- terminology, types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and optoelectronic transducers; Measurement of Temperature: Resistance thermometer, and thermo couples.

Text Books:

1. Malaric, R., "Instrumentation and Measurement in Electrical Engineering", Brown Walker Press, 2011.
2. Stephen J. Chapman : Electric Machinery Fundamentals

Reference Books:

3. Sawhney, A.K., "A Course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai & Sons, New Delhi, 2001
4. Ernest, O. Doeblin., "Measurement Systems: Applications and design", Mc-Graw Hill, 2004.
5. Beckwith, T.G and Buck, N.L., "Mechanical Measurements", Addison Wesley, 2007.
6. Golding, E.W., and Widdis, F.C., "Electrical Measurements and Measuring Instruments", A H Wheeler & Company, Calcutta, 1993.
7. B.L. Theraja & A.K. Theraja : A textbook of Electrical Technology

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember	-		-	-	5
Understand	-	5	5	-	15
Apply	-	10	-	-	20
Analyze	-	15	5	-	10
Evaluation	-			-	
Create	-		-	-	
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

**ISCED: 0714****Course Code: EEE-2422****Course Title: Electrical Drives and Instrumentation Sessional****Credit Hours: 2****Contact Hours: 2 lecture hours per week****Type: Core, Engineering****Prerequisite: EEE-1121 (Basic Electrical Engineering)****Co-requisite: EEE-2422 (Electrical Drives and Instrumentation)****Course Learning Outcomes (CLOs):**

At the completion of the subject, students should be able to perform the following tasks:

#	Course Learning Outcomes	Weightage (%)
1.	Apply engineering knowledge and follow instructions to perform experiments in (i) Electrical drives and (ii) Measurement and Instruments	20
2.	Perform the experimental using appropriate engineering tools	30
3.	Develop a project based on achieved theoretical knowledge	30
4.	Comply with ethics values and responsibility towards others in safety and bench tidiness	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Apply engineering knowledge and follow instructions to perform experiments in (i) Electrical drives and (ii) Measurement and Instruments	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Pre-Lab Logbook, Lab Report, Lab Performance, Open Ended
CLO2	Perform the experimental using appropriate engineering tools	PLO5	Cognitive/Applying	Lecture, Class discussion, Assignment, Note	Lab Performance, Lab Report,
CLO3	Develop a project based on achieved theoretical knowledge	PLO3 PLO9 PLO10 PLO11	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note	Project, Report



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO4	Comply with ethics values and responsibility towards others in safety and bench tidiness	PLO8 PLO10	Cognitive/Analyze	Lecture, Class discussion, Assignment, Lab work, Note	Lab Performance, Lab report

Experiment Names:

1. To study the characteristics of motor
2. To study the characteristics of chopper amplifier
3. To construct a multimeter.
4. To perform also other experiments relevant to this course.

Text Books:

1. Malaric, R., "Instrumentation and Measurement in Electrical Engineering", Brown Walker Press, 2011.
2. Stephen J. Chapman : Electric Machinery Fundamentals

Reference Books:

3. Sawhney, A.K., "A Course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai & Sons, New Delhi, 2001
4. Ernest, O. Doeblin., "Measurement Systems: Applications and design", Mc-Graw Hill, 2004.
5. Beckwith, T.G and Buck, N.L., "Mechanical Measurements", Addison Wesley, 2007.
6. Golding, E.W., and Widdis, F.C., "Electrical Measurements and Measuring Instruments", A H Wheeler & Company, Calcutta, 1993.
7. B.L. Theraja & A.K. Theraja : A textbook of Electrical Technology



C.4. CSE Courses

C.4.1 CSE Compulsory Courses



1st Semester		
ISCED Code	Course Code	Course Title
0613	CSE-1121	Computer Programming 1
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: None		
Co-requisite: CSE-1122 (Computer Programming 1 Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are to

- a. Familiarize with the basic terminologies used in computer programming,
- b. Proficiently transform designs of problem solutions into a standard programming language
- c. Proficiently use fundamental programming elements including variable declaration, data types and simple data structures (arrays, strings, and structures), decision structures, loop structures, functions, input and output for console and text files

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the fundamentals of programming and the basic structure of C programming language	10
2.	Apply the appropriate control statements to solve different problems.	20
3.	Use functions, arrays, strings, pointers, structures, unions, file manipulation etc to solve different problems.	70

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the fundamentals of programming and the basic structure of C programming language	PLO1	Cognitive/ Understand	Lecture, Class discussion, Assignment, Note	Class test, Assignment, Exam
CLO2	Apply the appropriate control statements to solve different problems.	PLO2	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Assignment Class test, Exam
CLO3	Use functions, arrays,	PLO2	Cognitive/Apply	Lecture, Class	Class test,



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	strings, pointers, structures, unions, file manipulation etc. to solve different problems.			discussion, Assignment, Note	Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Basic organization of computer, definition of software, its classification; Problem solving steps; Flow charts; Introduction of C: history and Characteristics of C, Identifiers and keywords, data types, constants, variables, statements, symbolic constant.	02	CLO1
2	Operators: arithmetic, unary, relational, logical, assignment, conditional operators; precedence of operators, expressions, type conversions, library functions. Input and Output: Managing data input (scanf, getchar, gets etc), Managing data output (printf, putchar, puts etc), formatted input and output.	06	CLO1
3	Control statements: Branching- if and if... else statements, nested if, switch statement; Looping- while, do...while and for looping statements.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Nested Looping, break and continue statement, goto statement.	04	CLO2
5	Function: defining a function, accessing a function, function prototypes, passing arguments to a function, Recursions, Storage class.	06	CLO3
6	Array: defining an array, processing an array, passing arrays to functions, Multidimensional array, String: string basics, string library functions, string copy, string concatenation, string comparison, Array of Strings.	02	CLO3
7	Pointers: pointer declarations, operations on pointers, Pointers and arrays, Pointers and functions, Dynamic memory allocation. Structure: defining a structure, processing a structure, structure and pointers, passing structures to functions, self-referential structure; Union.	04	CLO3
8	File: opening and closing a file, creating a file, processing a file, Low level programming – bitwise operations, bit fields; Some additional features of C (Enumerations , Command line parameters, Header files, Preprocessors, Macros etc.)	02	CLO3
			30

Books:

Text Books:



#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Byron S. Gottfried	Programming with C	3rd Edition	McGraw-Hill	2011	0-07-014590-3

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Herbert Schildt	<i>Teach Yourself C</i>	3rd Edition	Osborne McGraw-Hill	1997	
2.	Stephen G. Kochan	<i>Programming in C</i>	4th Edition	Sams Publishing	2014	
3.	E. Balagurusamy	<i>Programming in ANSI C</i>	7th Edition	Tata McGraw-Hill Publishing Company Limited	2016	
4.	C Kernighan & D.M. Ritchie	The C Programming Language	2nd Edition	Prantice-Hall of India	1994	
5.	Yashavant Kanetkar	Let us C	16th Edition	BPB Publications	2017	
6.	Paul Deitel, Harvey Deitel	<i>C How to Program</i>	7th Edition	Pearson Education, Inc	2013	
7.	J Hanly and E Koffman, , 8/e, Pearson, 2016	Problem Solving and Program Design in C	8th Edition	Pearson Education, Inc	2016	
8.	Herbert Schildt: C	<i>The Complete Reference</i>	4th Edition	Osborne McGraw-Hill	2000	

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



1st Semester		
ISCED Code	Course Code	Course Title
0613	CSE-1122	Computer Programming 1 Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite: None		
Co-requisite: CSE-1121 (Computer Programming 1)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are to

- Use an integrated development environment (IDE) to write, compile, and execute programs
- Apply debugging and testing techniques to locate and resolve errors
- Proficiently transform designs of problem solutions into a standard programming language
- Proficiently use fundamental programming elements including variable declaration, data types and simple data structures (arrays, strings, and structures), decision structures, loop structures, functions, pointer, input and output for console and text files

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Use an integrated programming environment to write, compile, and execute and debug.	10
2.	Apply different programming elements such as variables, simple data structures (arrays, strings, structures), selection structures, repetition structures, functions, pointer, file manipulation, etc. to solve different problems.	70
3.	Implement a simple information management system that requires using array of structures, functions, and file processing.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Use an integrated programming environment to write, compile, and execute and debug.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note	Class test, Assignment, Exam, Lab Performance
CLO2	Apply different programming elements	PLO2	Cognitive/Apply	Lecture, Class discussion,	Class test, Assignment,



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	such as variables, simple data structures (arrays, strings, structures), selection structures, repetition structures, functions, pointer, file manipulation, etc. to solve different problems.			Assignment, Lab work, Note	Exam, Lab Performance
CLO3	Implement a simple information management system that requires using array of structures, functions, and file processing.	PLO5	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Project	Class test, Assignment, Exam, Lab Performance, Project Report

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	<ul style="list-style-type: none"> • Familiarize with the C Compiler • Practice with the simple I/O, simple operators, basic data types and elementary library functions 	CLO1
2	Lecture, Problem solving	Solving problems that involve the use of simple if, if...else	CLO2
3	Lecture, Problem solving	Solving problems that involve use of nested if, switch	CLO2
4	Lecture, Problem solving	Solving problems that involve use of simple loop	CLO2
5	Lecture, Problem solving	Solving problems that involve use of nested loop	CLO2
6	Lab test 1		
7	Lecture, Problem solving	Solving problems that involve use of array	CLO2
8	Lecture, Problem solving	Solving problems that involve use of 2D array	CLO2
9	Lecture, Problem solving	Solving problems that involve use of string	CLO2
10	Lecture, Problem solving	Solving problems that involve use of 2D string	CLO2
11	Lecture, Problem solving	Solving problems that involve use of function, recursion	CLO2
12	Lecture,	Solving problems that involve use of pointer, dynamic memory,	CLO2



Week	Activities	Topics	CLOs
	Problem solving	structure, bitwise operators	
13	Lecture, Problem solving	Solving problems that involve use of file	CLO2
14	Lecture, Problem solving	Design a simple project I	CLO3
15	Lecture, Problem solving	Design a simple project II	CLO3

Books :

Text Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Byron S. Gottfried	Programming with C	3rd Edition	McGraw-Hill	2011	0-07-014590-3

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Herbert Schildt	<i>Teach Yourself C</i>	3rd Edition	Osborne McGraw-Hill	1997	
2.	Stephen G. Kochan	<i>Programming in C</i>	4th Edition	Sams Publishing	2014	
3.	E. Balagurusamy	<i>Programming in ANSI C</i>	7th Edition	Tata McGraw-Hill Publishing Company Limited	2016	
4.	C Kernighan & D.M. Ritchie	<i>The C Programming Language</i>	2nd Edition	Prantice-Hall of India	1994	
5.	Yashavant Kanetkar	<i>Let us C</i>	16th Edition	BPB Publications	2017	
6.	Paul Deitel, Harvey Deitel	<i>C How to Program</i>	7th Edition	Pearson Education, Inc	2013	
7.	J Hanly and E Koffman, , 8/e, Pearson, 2016	Problem Solving and Program Design in C	8th Edition	Pearson Education, Inc	2016	
8.	Herbert Schildt: C	<i>The Complete Reference</i>	4th Edition	Osborne McGraw-Hill	2000	

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5



Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



2nd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-1221	Computer Programming 2
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-1121 (Computer Programming 1)	
Co-requisite:	CSE-1122 (Computer Programming 1 Lab)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

Object Oriented Programming is an approach to program using Objects and Classes. This course equips the students with in-depth knowledge of different features and techniques of Object-Oriented Paradigm and hence able them to program in Object Oriented Approach using language like C++.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Identify basic input/output system	15
2.	Illustrate the basic features of OOP such as polymorphism, inheritance etc.	70
3.	Demonstrate familiarity with the use of Class library of a standard OOP language	15

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Identify basic input/output system	PLO1	Cognitive/ Understand	Lecture, Discussion	Class test, Assignment, Exam
CLO2	Illustrate the basic features of OOP such as polymorphism, inheritance etc.	PLO1	Cognitive/Understand	Lecture, discussion, Competitive Problem solving	Assignment Class test, Exam
CLO3	Demonstrate familiarity with the use of Class library of a standard OOP language	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam

**Course Content:**

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Definition of OOP, C++ Console I/O, Introduction to Classes and Objects, Basic concept of Object-Oriented Programming, Difference between Structured Programming and Object-oriented programming, Difference between C/C++, Benefits of OOP, Characteristics of Procedure Oriented Programming, Characteristics of Object-Oriented Programming and applications of Object-Oriented Programming.	02	CLO1
2	Introducing Classes, Arrays, Pointers and References: Access Specifiers, Constructor and Destructor, Constructors with parameters, Object Pointers, Relation between Classes, Structures and unions, In-line functions, Automatic in-line functions, assigning objects, passing objects to functions, returning objects from function, Friend functions, Static member functions, Array of objects, Pointer to objects, this pointer, using new and delete, passing references, returning references;	06	CLO2
3	Function Overloading: Overloading function, Constructor Overloading, Copy constructor, Default arguments, Overloading ambiguity, Address of overloaded function.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Operator Overloading: Binary operator overloading, Unary operator overloading, Relational and logical operator overloading, Operator overloading using friend functions, Limitations of operator overloading.	04	CLO2
5	Inheritance: Defining derived classes, Single inheritance, multiple inheritance, multilevel inheritance, Hierarchical inheritance, Virtual base classes, Constructors in derived classes, nesting of classes.	06	CLO2
6	Virtual Functions: Pointers to derived classes, Applying Polymorphism using virtual functions, Polymorphic class, Pure Virtual functions, Abstract classes, early binding, and late binding.	02	CLO2
7	Template, Exception Handling and Standard Template Library: Generic functions, Generic classes, Exception handling, throwing mechanism, catching mechanism, Rethrowing mechanism, Specifying exceptions Templates, Components of STL, Container, Algorithms.	04	CLO3
8	C++ I/O System: Streams, Stream classes, Unformatted I/O, Binary I/O, formatted I/O, I/O manipulators, Inserters, Extractors, File I/O streams, Opening and closing files, Random access files, I/O status checking, Customized I/O and file	02	CLO3
		30	

Books :

Text Book :
1. Herbert Schildt, "Teach yourself C++" 2nd Edition McGraw-Hill, 2005
Reference Books :
1. E Balagurusamy, "Object-Oriented Programming with C++", 4th Edition, McGraw-Hill 2. Irvine, "C++ Object Oriented Programming", 1st edition Prentice Hall 3. Bruce Eckel, "Thinking in C++", 2nd edition, Mind View Inc.

**Course Assessment Pattern (Theory courses):**

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



2nd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-1222	Computer Programming 2 Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-1122 (Computer Programming 1 Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- To implement the object-oriented concepts to solve problems
- To develop an application applying the object-oriented concepts
- Implementing the theoretical concepts of different features of object-oriented programming into practice
- Understand how the features aid in modeling real world problems by doing simple projects

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Apply basic input/output system	15
2.	Apply the basic features of OOP such as polymorphism, inheritance etc.	30
3.	Demonstrate the use of Class library of a standard OOP language	15
4.	Develop an application using the knowledge of OOP.	40

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Apply basic input/output system	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO2	Apply the basic features of OOP such as polymorphism, inheritance etc.	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO3	Demonstrate the use of Class library of a standard OOP language	PLO1	Cognitive/ Apply	Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO4	Develop an application using the knowledge of OOP.	PLO5 PLO9 PLO10	Cognitive/Create	Demo interview, Presentation	Project, Presentation, Report

Lecture Plan:



Week	Activities	Topics	CLOs
1	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 1,2,3,4 from lab practice sheet 1 Topic: Class, object 	CLO1
2	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 5,6,7,8 from lab practice sheet 1 and from text book practice section. Topic: Class, Object, Access Specifiers, Constructor and Destructor 	CLO2
3	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 9,10,11 from lab practice sheet 1 and from text book practice section. Topic: Constructors with parameters, passing objects to functions, returning objects from function, Friend functions 	CLO2
4	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 12,13 from lab practice sheet 1 and from text book practice section. Topic: Array of objects, this pointer 	CLO2
5	Lecture	<ul style="list-style-type: none"> Introduction to the OOP project, Previous project showcase Project idea discussion, Assign simple project to the groups 	CLO4
6	Lab test 1		
7	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problems from text book practice section. Topic: Operator Overloading 	CLO2
8	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 1 to 5 from lab practice sheet 2 and from text book practice section Topic: Inheritance, Defining derived classes, Single inheritance, multiple inheritance 	CLO2
9	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 6 to 10 from lab practice sheet 2 and from text book practice section Topic: Multilevel inheritance, Hierarchical inheritance, Virtual base classes, Constructors in derived classes, Nesting of classes. 	CLO2
10	Lecture, Discussion	<ul style="list-style-type: none"> Submitted project check Discuss the coding, techniques and processes and Discuss about the next updates in project 	CLO4
11	Lecture	<ul style="list-style-type: none"> Topic: C++ I/O System: Unformatted I/O, formatted I/O, I/O manipulators, File I/O streams, Opening and closing files 	CLO3
12	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section Topic: Generic Containers (C++ string class, vector, deque, list, stack, queue, priority queue, pair, map etc.), Iterators, Generic Algorithms (find, binary search, sort etc.), 	CLO3
13	Lab test 2		
14	Lecture	<ul style="list-style-type: none"> Submitted project check Discussion about Modelling & architecture, Software Implementation 	CLO4
15	Lecture	<ul style="list-style-type: none"> Practice the problems in text book Topic: Polymorphic class, Pure Virtual functions, Abstract classes, early binding, and late binding. 	CLO2

Books:

Text Book:

- Herbert Schildt, "Teach yourself C++" 2nd Edition McGraw-Hill, 2005

Reference Books:

- E Balagurusamy, "Object-Oriented Programming with C++", 4th Edition, McGraw-Hill
- Irvine, "C++ Object Oriented Programming", 1st edition Prentice Hall
- Bruce Eckel, "Thinking in C++", 2nd edition, Mind View Inc.

**ISCED: 0613****Course Code: CSE-1223****Course Title: Discrete Mathematics****Credit Hours: 3****Contact Hours: 3 lecture hours per week****Type: Core, Engineering****Prerequisite: None**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

1. To obtain general knowledge about the areas of discrete mathematics and algebra
2. To understand a variety of methods used to construct mathematical proofs
3. To acquire an insight into applications such as coding and design

Course Learning Outcomes(CLOs) :

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
CLO1	Understand fundamental concept of different discrete structures like set, function, relation, graph, tree etc. and their properties	20
CLO2	Understand the concept of different types of formal logic and mathematical reasoning	20
CLO3	Apply the concept of formal logic and mathematical reasoning	40
CLO4	Apply various concepts of number theory and combinatorics	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand fundamental concept of different discrete structures like set, function, relation, graph, tree etc. and their properties	PLO1	Cognitive/Understand	Lecture, Class discussion, Note	Exam, Quiz, Assignment
CLO2	Understand the concept of different types of formal logic and mathematical reasoning	PLO1	Cognitive/Understand	Lecture, Class discussion, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Apply the concept of formal logic and mathematical reasoning	PLO1	Cognitive/Apply	Lecture, Class discussion, Note	Exam, Quiz, Assignment
CLO4	Apply various concepts of number theory and combinatorics	PLO1	Cognitive/Apply	Lecture, Class discussion, Note	Exam, Quiz, Assignment

8 Stanza Syllabus:

Stanza	Topics
1.	Set: Introduction to Set, Set operation, Representation of Sets, Algebraic Properties of Set, Computer representation of set.
2.	Logic: Introduction to Logic, Prepositional Calculus, propositional equivalences, Predicate and quantifier, Translating sentence into logical expressions.
3.	Function & Relation: Introduction to function, Some important functions, Properties of function, Rate of Growth: Big O Notation, Sequence and summation. Introduction to Relation, Representation of Relation, Properties of Relation, Composition of Relation, Equivalence Relations, Partition, Closures of Relation.
4.	Number Theory: Theorem of Arithmetic, Modular Arithmetic, GCD, LCM, Prime Number, Congruence, Application of Congruence, Application of Number Theory, Chinese Remainder Theory.
5.	Mathematical reasoning: Methods of Proof, Mathematical Induction, Recursion.
6.	Counting: Basic Counting principle, Inclusion-Exclusion principle, Application of Sum rule and Product rule, Pigeon hole principle, Permutation and Combination, Binomial coefficients, Recurrence relations.
7.	Graph: Graph terminology, Representation of graph, Graph Isomorphism, Graph connectivity, Euler and Hamilton paths, Shortest Path Problems, Planner Graphs, Graph coloring.
8.	Tree: Definition of Trees, Application of trees, Tree Traversal, Trees and sorting, Spanning trees, Minimum spanning trees.

Text Books:

1. Kenneth H. Rosen Discrete Mathematics and Its Applications 7th edition McGraw-Hill 2012 ISBN-13: 978-0073383095 ISBN-10: 0073383090

Reference Books:

1. Seymour Lipschutz and Marc Laris Lipson Schaum's Outline of Theory and Problems of Discrete Mathematics 2nd edition McGraw-Hill 1997 ISBN-13: 978-0071615860 ISBN-10: 0071615865
2. J. P. Tremblay and R. P. Manohar Discrete Mathematical structures with applications to Computer Science McGraw-Hill 1975 ISBN: 0070651426



3. Donald F. Stanat and David F. McAllister "Discrete Mathematics in Computer Science " Prentice-Hall 1977 ASIN: B01A64QCMY
4. "B. Kolman R.C. Busby and S. Ross" Discrete Mathematical Structures 3rd edition "Prentice- Hall " 1996 ISBN-13: 978-0-13-229751-6 ISBN-10: 0-13-229751-5
5. C. L. Liu Elements of Discrete Mathematics 2nd edition McGraw-Hill 1985 ISBN-10: 0070381305 ISBN-13: 978-0070381308



2 nd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-1230	Competitive Programming 1
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-1122 (Computer Programming 1 Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- To introduce students to the algorithmic way of thinking and problem solving by computers.
- To help the student to enhance their analyzing skills.
- Foster creativity, teamwork, and innovation.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate understanding of programming knowledge to find the output of problems	50
2.	Develop source code of computer programs, which are able to solve given problems	50

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate understanding of programming knowledge to find the output of problems	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note, Problem solution	Exam, Quiz, Assignment, Continuous Evaluation
CLO2	Develop source code of computer programs, which are able to solve given problems	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Note, Problem solution	Exam, Quiz, Assignment, Continuous Evaluation

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	INTRODUCTION	CLO1
2	Lecture,	Solving problems that involve the use of simple if, if..else, nested if	CLO2



Week	Activities	Topics	CLOs
	Problem solving	<ul style="list-style-type: none"> • Codeforces Newcomers Sheet-1 • [uva – 11172, 11854, 10055] 	
3	Lecture, Problem solving	Solving problems that involve the use of simple loop, nested loop <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-2 • [uva – 382, 100, 488] 	CLO2
4	Lecture, Problem solving	Solving problems that involve the use of Array <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-3 [A-P] • [uva – 591, 10038, 10050] 	CLO2
5	Lecture Problem solving	Solving problems that involve the use of Multidimensional Array <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-3 [Q-Z] • [uva – 541, 11716, 490] 	CLO2
6	Lab work	Solving problems that involve the use of String <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-4 [A-K] • [uva -12577, 458, 12700] 	CLO2
7	Lecture, Problem solving	Solving problems that involve the use of String <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-4 [L-Z] • [uva – 10062, 445,] 	CLO2
8	Viva	Assessment on Sheets -1 to 4	CLO1
9	Lecture, Problem solving	Solving problems that involve the use of function <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-5 	CLO2
10	Lecture, Problem solving	Solving problems that involve the use of basic Mathematics [Prime Number, GCD, LCM, Factorial & Fibonacci] <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-6 [B, G, J, H, P] • [uva- 686, 543, 583, 11388, 10450] 	CLO2
11	Lecture, Problem solving	Solving problems that involve the use of basic Mathematics [Modular Arithmetic, Combinatorics, Big Integer, Logarithm, Exponentiation, Sequences & Summation] <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-6 [A, C, F, K, L, M, N, O, Q] • [uva- 10127, 369, 389, 113, 713] 	CLO2
12	Lecture, Problem solving	Solving problems that involve the use of Geometry Codeforces Newcomers Sheet-6 [R-Z]	CLO2
13	Lecture, Problem solving	Solving problems that involve the use of Recursion <ul style="list-style-type: none"> • Codeforces Newcomers Sheet-7 	CLO2
14	Lecture, Problem solving	Solving problems that involve the use of STL <ul style="list-style-type: none"> • [Codeforces 230A] & [UVA 484] 	CLO2
15	Viva	Assessment on Sheets -5 to 7	CLO1

Books :

Text Book :

1. Steven Halim and Felix Halim, " Competitive Programming 3" 3rd Edition Lulu.com, 2013

Reference Books :

1. Steven S Skiena , Miguel A. Revilla, "O Programming Challenges: The Programming Contest Training Manual", 1st Edition, Springer, 2003
2. William B. Poucher , Miguel A. Revilla, " From Baylor to Baylor", 1st edition Lulu.com,2010



3 rd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-2321	Data Structures
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-2322 (Data Structures Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

- Be familiar with basic techniques of algorithm analysis
- Be familiar with writing recursive methods
- The implementation of linked data structures such as linked lists and binary trees
- Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Describe the basics of various data structures and related algorithms.	20%
2.	Analyze performance of various data structure & related algorithms.	20%
3.	Apply important static and dynamic data structures.	30%
4.	Choose appropriate data structure and algorithm methods in solving problems and compare among them.	30%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Describe the basics of various data structures and related algorithms.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Analyze performance of various data structure & related algorithms.	PLO1 PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO3	Apply important static and dynamic data structures.	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab	Exam, Quiz, Assignment, Competitive



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
				work, Note, Competitive Problem Solving	Problem Solving
CLO4	Choose appropriate data structure and algorithm methods in solving problems and compare among them.	PLO2	Cognitive/Evaluate	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Elementary Data organization, Information; Data types; Data Structure, Data Structure operations; Algorithm; Time-Space tradeoff of Algorithms. Mathematical notation & Functions; Algorithmic Notation; Control structures; Sub-algorithms. String; String operations; Pattern matching algorithms	02	CLO1
2	Linear Array: Linear Array & its representation in memory; Traversing LA, Insertion & Deletion in LA, Bubble Sort, Linear Search & binary Search. 2D Array & its representation in memory; Matrices; Algebra of matrices; sparse matrices	06	CLO3
3	Stack: its representation & applications; PUSH and POP operation on stack. Polish Notation, reverse polish notation; Evaluation of a postfix expression; Transforming infix expression into postfix expression.	04	CLO3
Section-B (SEE: 50 Marks)			
4	Queue – its representation; Insertion & deletion in Queue; Deques; Priority Queues. Recursion [Factorial function, Fibonacci sequence, Ackermann function, Towers of Hanoi]	04	CLO3
5	Linked list - Linked list & its representation in memory; Traversing, Searching, Insertion & Deletion operation on Linked list; Header linked lists; two way lists.	06	CLO3
6	Complexity of algorithms, Rate of growth: Big O, Ω and Θ notations; Complexity of Linear Search, Binary search & Bubble sort algorithm. Sorting - Insertion sort, selection sort, quick sort, merge sort; Searching & data modification; Hashing: Hash function, collision resolution	02	CLO2
7	Tree - Tree terminology; representation of binary trees in memory; Traversing binary tree; Binary search tree; Insertion & deletion on binary search tree; Heap; Insertion & deletion on heap; Heapsort; B trees; General tree; Balanced binary search tree (AVL tree, red-black tree)	04	CLO4



8	Graph – graph terminology; representation of graphs – adjacency matrix, path matrix, adjacency list; Traversing a graph – BFS & DFS	02	CLO4
		30	

Books :**Text Book :**

1. Seymour Lipschutz Data Structures Special Indian Tata McGraw-Hill 2014 ISBN-13: 978-0-07-060168-0

Reference Books :

1. "Y. Langsam Augenstein A. M. Tanenbaum" Data Structures Using C and C++ 2nd Edition Prentice Hall India 2014 ISBN:13 978-0387202778
2. "Edward M. Reingold Wilfred J. Hansen" Data Structures 1st Edition CBS Publishers and Distributors 1983 ISBN-13: 978-0316739511
3. Robert Sedgewick Algorithms in C 3rd "Pearson Education Inc" 2001 ISBN-13: 978-0321573513
4. D. Samanta Classic Data Structures 2nd Prentice Hall of India 2003 ISBN-10: 8120318749

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		5			5
Apply		10	5		15
Analyze					
Evaluation		15	5		30
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



3 rd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-2322	Data Structures Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-1122 (Computer Programming 1 Lab)		
Co-requisite: CSE-2321 (Data Structures)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30 Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

- Impart a thorough understanding of linear data structures such as linked list, arrays, stacks, queues and their applications.
- Learn a thorough understanding of non-linear data structures such as trees, graphs and their applications.
- Familiarize with various sorting, searching and hashing techniques and their performance comparison.
- design and analyze recursive algorithms in data structures

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate the familiarity with various data structure & algorithmic methods	30
2.	Apply appropriate data structure & related algorithms in solving problems	35
3.	Evaluate performance of different data structures and algorithms in solving particular problem.	35

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the familiarity with various data structure & algorithmic methods	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO2	Apply appropriate data structure & related algorithms in solving problems	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO3	Evaluate performance of different data structures and	PLO1, PLO2	Cognitive/Evaluate	Lecture, Class discussion, Assignment, Lab work, Note,	Exam, Quiz, Class performance, Competitive



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	algorithms in solving particular problem.			Competitive Problem Solving	Problem Solving

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 1,2,3 from lab practice sheet Topic: Array, Looping 	CLO1
2	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 4,5,6,7 from lab practice sheet . Topic: Array, Sorting 	CLO2
3	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 8,9,10,11 from lab practice sheet . Topic: Searching 	CLO3
4	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 12,13,14,15,16 from lab practice sheet. Topic: String processing 	CLO2
5	Lecture Problem solving & Discussion	<ul style="list-style-type: none"> Solving problem number 17,18,19,20 from lab practice sheet. Topic: Matrix operation Introduction to the project, Previous project showcase Project idea discussion, Assign simple project to the groups 	CLO2 CLO3
6	Lab test 1		
7	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 21,22,23,24 from lab practice sheet. Topic: Stack operation 	CLO2
8	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 25 to 29 from lab practice sheet and from text book practice section Topic: Queue operation and Recursion 	CLO2
9	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 30 to 32 from lab practice sheet and from text book practice section Topic: Linked List operation 	CLO2
10	Lecture, Problem solving & Discussion	<ul style="list-style-type: none"> Solving problem number 33 to 35 from lab practice sheet and from text book practice section Topic: Linked List operation Submitted project check Discuss the coding, techniques and processes and Discuss about the next updates in project 	CLO3
11	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 36 to 39 from lab practice sheet and from text book practice section Topic: Sorting and complexity analysis 	CLO3
12	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 40 to 45 from lab practice sheet and from text book practice section Topic: Tree operation 	CLO2
13	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem number 46 to 49 from lab practice sheet and from text book practice section Topic: Tree operation 	CLO2
14	Lab test 2		
15	Lecture	<ul style="list-style-type: none"> Submitted project check Discussion about Modelling & architecture, 	CLO3



Week	Activities	Topics	CLOs
		SoftwareImplementation	

Books :**Text Book :**

1. Seymour Lipschutz Data Structures Special Indian Tata McGraw-Hill 2014 ISBN-13: 978-0-07-060168-0

Reference Books :

1. "Y. Langsam Augenstein A. M. Tanenbaum" Data Structures Using C and C++ 2nd Edition Prentice Hall India 2014 ISBN:13 978-0387202778
2. "Edward M. Reingold Wilfred J. Hansen" Data Structures 1st Edition CBS Publishers and Distributors 1983 ISBN-13: 978-0316739511
3. Robert Sedgewick Algorithms in C 3rd "Pearson Education Inc" 2001 ISBN-13: 978-0321573513
4. D. Samanta Classic Data Structures 2nd Prentice Hall of India 2003 ISBN-10: 8120318749



3rd Semester		
ISCED Code	Course Code	Course Title
0714	CSE-2323	Digital Logic Design
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: EEE-1221 (Electronics)		
Co-requisite: CSE-2324 (Digital Logic Design Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

This course is concerned with the logic design of digital electronic circuits. Digital circuits are employed in the design of digital systems such as digital computers, control systems, data communications, and many other applications that required electronic digital hardware. The course covers the basic tools for designing digital circuits and teaches methods and procedures suitable for a variety of digital applications.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the knowledge of Number system, Boolean algebra and different types of Combinational and Sequential logic circuits.	20
2.	Interpret different digital electronics circuits in terms of different systems of Boolean expression and their simplification, truth table, state table etc.	40
3.	Analyze various problems related to digital electronics and implement digital circuits like adder, comparator, converter, decoder, encoder, ROM, PLA, counter, register etc.	40

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the knowledge of Number system, Boolean algebra and different types of Combinational and Sequential logic circuits.	PLO1	Cognitive/ Understand	Lecture, Class discussion.	Class test, Assignment, Exam
CLO2	Interpret different digital electronics circuits in terms of different systems of Boolean expression and their simplification, truth table, state table etc.	PLO2	Cognitive/Apply	Lecture, discussion, Problem solving.	Assignment Class test, Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Analyze various problems related to digital electronics and implement digital circuits like adder, comparator, converter, decoder, encoder, ROM, PLA, counter, register etc.	PLO2	Cognitive/Analyze	Lecture, Class discussion, Problem solving.	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Binary Systems, Boolean Algebra and Logic Gates: Number system, binary codes, binary logics, logic gates, Boolean algebra, canonical and standard forms.	02	CLO1
2	Simplification of Boolean Functions: The Map Method. Two-, Three-, Four-, Five And Six- variable Maps, Product of Sum Simplification, NAND And NOR Implementation, Don't Care Conditions, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-or and Equivalence Functions.	05	CLO2
3	Combinational Logic: Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, designing various types of combinational circuit using logic gates.	05	CLO2
Section-B (SEE: 50 Marks)			
4	Combinational logic with MSI and LSI: MSI and LSI, Binary Parallel Adder, look ahead carry, decimal Adder, Magnitude Comparator, decoder, encoder, multiplexer & demultiplexer.	05	CLO2
5	Sequential Logic: Flip-flops, triggering of flip-flops, analysis of clocked Sequential circuits, state reduction and Assignment, design procedure, design with state equations, designing various types of sequential circuits.	06	CLO2
6	Registers, Counters, and the Memory: Registers, shift registers, ripple counters, asynchronous counter, and synchronous counter, memory, read only memory, programmable logic array, random access memory, and memory unit.	05	CLO3
7	Register Transfer and Processor Logic Design: Interregister transfer, arithmetic-logic and shift-operations, design a simple computer, processor organization, arithmetic logic unit, design of arithmetic logic unit, design of accumulator.	02	CLO3
30			

Books:



Text Book:

1. M. Morris Mano Digital Logic and Computer Design 4th edition Pearson education ISBN-13: 978- 0-13-277421-5

Reference Books :

1. Md. Mozammel Huq Azad Khan Digital logic design 1st Edition University Grants Commission of Bangladesh 2006 ISBN-13: 978-9848090244
2. Thomas L. Floyd Digital Fundamentals 11th Edition Pearson 2014 ISBN-13: 978-0132737968
3. Tocci-widmer Digital Systems 12th Edition Pearson Prentice Hall 2016 ISBN-13: 978-0134220130

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		5	5		5
Apply		15	5		30
Analyze		5			10
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



3 rd Semester		
ISCED Code	Course Code	Course Title
0714	CSE-2324	Digital Logic Design Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite:		
Co-requisite:		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Mid term	30 Marks
		Final term	30Marks
SEE: Semester End Examination		30 Marks	

Objectives:

- This course is concerned with the practical aspects of designs based on the course CSE-2323, Digital logic design theory.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the usage of the tools for implementing simple, combinational and sequential logic circuit.	20
2.	Implement different efficient combinational and sequential logic circuits for different logical problems.	60
3.	Design small project as a team member to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the usage of the tools for implementing simple, combinational and sequential logic circuit.	PLO1	Cognitive/Understand	Lecture, Class discussion, Lab work.	Class performance, Exam
CLO2	Implement different efficient combinational and sequential logic circuits for different logical problems.	PLO2, PLO5	Cognitive/Apply	Lecture, Class discussion, Lab work.	Class performance, Exam
CLO3	Design small project as a team member to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.	PLO3 PLO9	Cognitive/Analyze	Class discussion, Lab work.	Class performance, Exam

Lecture Plan:

Week	Activities	Topics	CLOs
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Week	Activities	Topics	CLOs
1	Lab Work	Investigating the Logic Gates: <ul style="list-style-type: none"> a. Fundamental Logic Gate - AND, OR, NOT. • Fundamental Logic Gate - NAND and NOR. 	CLO1
2	Lab Work	Deducing truth tables from logic functions: <ul style="list-style-type: none"> a. Deduce the truth table for the given switching circuit. Find the Boolean function from the truth table and implement the logic circuit. b. An alarm system will ring when smoke is detected or movement is detected during night only. Design and implement the logic circuit. • If two numbers A and B are added, whether the summation is odd or even can always be determined from the LSB of the two numbers. Design and implement a circuit, which will take the LSB of two numbers as inputs and determine whether the addition of these two will produce an odd or even number. 	CLO2
3	Lab Work	Using De Morgan: <ul style="list-style-type: none"> a. Design a circuit to verify De Morgan's Law for two variables. • Design a circuit using only a) NAND gates b) NOR gates that implements the Boolean function $(A \bar{B}) + (\bar{B}C)$ 	CLO2
4	Lab Work	Boolean Function Minimization: <ul style="list-style-type: none"> a. Design and implement a circuit using basic gates that would take a 4-bit binary as input and produce a high level output only if the number is prime or divisible by five. b. Design a circuit to implement the following functions (Minimize if necessary) $f(A,B,C,D) = \sum(2,3,4,6,7,10,11,14)$ $f(A,B,C,D) = \prod(1,3,5,7,9,11)$ • Derive the output equations for a 3-bit binary to gray code converter and implement it. 	CLO2
5	Lab Work	Combinational Circuits: <ul style="list-style-type: none"> a. Design and implement a circuit using basic gates that would take a 4-bit binary number as input and convert it into Excess - 3 • Design and implement a 4-bit adder subtractor circuit with one selection variable to switch for addition and subtraction. 	CLO2
6	Lab Work	Adders and Decoders <ul style="list-style-type: none"> a. Design and implement a 4-bit BCD adder circuit using 4-bit binary adder circuit. Use IC-7483 for your design. Design a 2-bit comparator to compare 2-bit numbers P and Q. The circuit should provide 3 output lines to indicate $P > Q$, $P = Q$ and $P < Q$. 	CLO2
7	Lab Work	Priority Encoder and Multiplexer Circuits: <ul style="list-style-type: none"> a. Using basic gates design and implement a 4 ' 2 priority encoder with the priority of data bit input as given below: (2, 3, 0, 1 given in order of descending priority) b. Design and implement the function given below using 1) 8:1 Multiplexer and 2) 4:1 Multiplexer $F = \sum(0,3,6,8,12)$ 	CLO2
8	Lab Work	Sequential Circuit Design: <ul style="list-style-type: none"> a. Design and implement an S-R flip-flop using only NAND gates. 	CLO2



Week	Activities	Topics	CLOs
		<p>There must be PRESET and CLEAR input.</p> <ul style="list-style-type: none"> • Design and implement a master-slave J-K flip-flop using only NAND gates. 	
9	Lab Work	<p>Counter Circuit Design:</p> <ul style="list-style-type: none"> a. Design and implement a 4-bit asynchronous counter using J-K flip flop. • Design and implement a modulo-13 counter using 4-bit binary ripple counter (7493). 	CLO2
10	Lab Work	<p>Stopwatch and Counter Circuit Design</p> <ul style="list-style-type: none"> a. Design and implement a digital stopwatch showing only seconds. Use 7-segment display to show the stopwatch output. You should also provide START, STOP and CLEAR switch. • Design and implement a 4-bit synchronous up-down counter using J-K flip-flops. 	CLO2
11	Lab Work	<ul style="list-style-type: none"> • Stopwatch and Counter Circuit Design Continued. 	CLO2
12	Lab Work	<ul style="list-style-type: none"> • Projects 	CLO3
13	Lab Work	<ul style="list-style-type: none"> • Projects 	CLO3
		Final exam	

Books :

Text Book :

M. Morris Mano Digital Logic and Computer Design 4th edition Pearson education ISBN-13: 978- 0-13-277421-5

Reference Books :

1. Md. Mozammel Huq Azad Khan Digital logic design 1st Edition University Grants Commission of Bangladesh 2006 ISBN-13: 978-9848090244
2. Thomas L. Floyd Digital Fundamentals 11th Edition Pearson 2014 ISBN-13: 978-0132737968
3. Tocci-widmer Digital Systems 12th Edition Pearson Prentice Hall 2016 ISBN-13: 978-0134220130



3rd Semester		
ISCED Code	Course Code	Course Title
0619	CSE-2340	Software Development 1
Credit Hours: 2	Contact Hours: 4	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-1122 (Computer Programming 1 Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are

- a. To introduce the concepts and methods required for the construction of large software systems.
- b. To improve understanding of the discipline of software development.
- c. To provide knowledge of techniques for the analysis and design of complex software intensive systems.
- d. To help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain.
- e. To provide a brief account of associated professional and legal issues.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Collect and Analyze the requirements for the software	30%
2.	Implement the software system	30%
3.	Test the software against the gathered requirements.	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Collect and Analyze the requirements for the software	PLO2 PLO9 PLO10	Cognitive/Analyze	Lecture, discussion, Note	Class performance, viva
CLO2	Implement the software system	PLO5 PLO9 PLO10	Cognitive/Create	discussion, Assignment, Note	Exam
CLO3	Test the software against the gathered requirements.	PLO2 PLO9 PLO10	Cognitive/Analyze	Lecture, Class discussion, Assignment, Lab work	Project showcase, Class test

**Resources:****Text Books::**

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Herbert Schildt	The Complete Reference	7 th Edition	Tata McGraw-Hill Education	2007	978-0-07-163177-8
3	Kathy Sierra & Bert Bates	Head first java	2 nd Edition	O'Reilly Media, Inc.	2005	0596009208

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Russ Miles, Dan Pilone	Head First Software Development	3rd Edition	O'Reilly Media, Inc.	2017	9780596527358
2	Hans van Vliet	Software Engineering: Principles and Practice	2 nd Edition	Wiley	2007	9780471975083

Online Resources:

- I. https://www.tutorialspoint.com/software_engineering/index.htm
- II. <https://www.javatpoint.com/software-engineering-tutorial>
- III. <https://www.geeksforgeeks.org/software-engineering/>

Weightage Distribution among Assessment Tools:

Assessment Tools	Weightage (%)
Class Attendance	10
Class Tests and Assignments	10
Midterm examination	30
Final Examinations	50

Grading Policy:

As per IIUC grading policy

Course Content:**Section-A (Mid-term: 30 Marks)**

1. Introduction: of the course, software processes, software project management, great software development: pleasing your customer, gathering requirements: knowing what the customer wants, project planning: planning for success, user stories and tasks: getting to the real work.
2. OOP basic: introduction, control statements, understanding encapsulations (class & objects in java), data type in java, data type conversion, date, time, method, parameterized method.
3. Polymorphism: method overloading, constructor, difference between constructor and method, constructor overloading, constructor chaining, data structure in java and their use.

Section-b (final exam: 50 marks)**Group-a (20 marks)**



4. Inheritance: basics, method overriding, super class, sub class, abstract class & methods. Interface: basics, interface vs. multiple inheritance, difference b/w interface & abstract class.

5. Framework: introduction (installations & procedures), I/O system development using the prescribed tools in the framework, I/O system manipulations.

Group-b (30 marks)

6. Exceptions & exceptions handling, software design, database overview: foundation of tables, data handling using multiple actions, attach with background.

7. Requirement analysis, requirement specifications, modelling & architecture, software implementation.

8. Testing & continuous integration, debugging, software maintenance, documentation techniques.

Weekly Activity Plan:

Week	Activities	Topics
1	Lecture (4)	Introduction of the course, Software Processes, Software Project Management, Software development life cycle
2	Lecture (4)	Gathering requirements: knowing what the customer wants, Project planning: planning for success, User stories and tasks: getting to the real work.
3	Lecture (4) Class test 1	OOP basic introduction, Control statements, Understanding encapsulations
4	Lecture (4)	Data type in python, data type conversion, Date, Time, Method, Parameterized method
5	Lecture (4)	Polymorphism (Method overloading) Constructor, Difference between Constructor and Method
6	Lecture (4) Project Proposal	Constructor overloading, constructor chaining. Data structure in python (Array, Array List) and their use.
7	Lecture (4)	Inheritance basics, Method overriding, Super class, Sub class, Abstract class & methods, Interface basics
8	Lecture (4)	Interface vs. multiple inheritance Difference b/w interface & Abstract class, Framework introduction (installations & procedures)
9	Lecture (4)	Exceptions & Exceptions handling, Software design, Take user input
10	Lecture (4) Class test 2	Take user input Save user information and view into a table. MSSQL introduction, SQL server installation, Database table create.
11	Lecture (4)	Data insert, delete, update (without SQL query & with query) SQL connections create with python project.
12	Lecture (4)	Data handling from <i>User Interface</i> , Specifications, Criteria for specification
13	Lecture (4)	Requirement analysis, Requirement specifications
14	Lecture (4)	Modelling & architecture, Software Implementation
15	Lecture (4) Project Showcase	Software maintenance, Documentation techniques.



4th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-2421	Computer Algorithms
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2321 (Data structures)		
Co-requisite: CSE-2422 (Computer Algorithms Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

This course introduces students to the general tools and techniques for analyzing and designing computer algorithms. Initially necessary mathematical preliminaries required for analyzing and designing computer algorithms are taught. Then this course familiarizes students with several algorithmic approaches and corresponding problems. To take this course, students should be able to program in a standard programming language preferably in C/C++. They should have familiarity with basic data structures. Some mathematical maturity also is expected; students should have some idea of what constitutes a mathematical proof and how to write one. Some knowledge of basic probability will also be helpful. Knowledge of this course will be needed as prerequisite knowledge for future courses such as Artificial Intelligence, Computer Networks and Compiler.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate familiarity with major algorithms and data structures	10%
2.	Analyze algorithms for understanding and comparing their working mechanism	20%
3.	Analyze algorithms for deriving proof of correctness	40%
4.	Analyze the asymptotic performance of algorithms	20%
5.	Analyze and apply important algorithmic design techniques and methods of analysis	10%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate a familiarity with major algorithms and data structures	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment,	Exam, Quiz, Assignment
CLO2	Analyze algorithms for understanding and comparing their working mechanism	PLO1	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Analyze algorithms for deriving proof of correctness	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO4	Analyze the asymptotic performance of algorithms	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO5	Analyze and apply important algorithmic design techniques and methods of analysis	PLO1 PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment	Exam, Quiz, Assignment,

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Algorithm and Data structure: Introduction to algorithm; Properties of good algorithm; Correctness proof and techniques for time and space complexity analysis of algorithms (using insertion-sort as an example); Application areas of algorithm; Growth of functions and asymptotic notations	5 lecture hours	CLO1 CLO2 CLO3 CLO4
Section-B (SEE: 50 Marks)			
2	Divide and Conquer approach Sorting and Heaps: Divide and Conquer approach; Asymptotic bound of recursive algorithm by solving recurrence, substitution method, recursion tree method, master method; Maximum subarray problem; Merge-sort and complexity analysis; Quick-sort, Randomized Quick-sort and complexity analysis; Heap, Heap construction algorithm, Heapsort, Priority queue, complexity analysis of related algorithms; Sorting in Linear Time, Lower bound of sorting, Counting sort, Radix sort.	5 lecture hours	CLO1 CLO2 CLO3 CLO4 CLO5
3	Dynamic Programming: Dynamic programming, Elements of dynamic programming, Memoization, Matrix-chain multiplication and longest common subsequence problems as examples, Complexity analysis of the algorithms.	5 lecture hours	CLO1 CLO2 CLO3 CLO4 CLO5
4	Greedy Algorithms and String Matching Algorithms: Greedy algorithms, Activity selection problem, Elements of greedy strategy, Huffman codes and its application; String Matching Algorithms, Naive string-matching algorithm, Rabin-Karp algorithm; Complexity analysis of the algorithms	5 lecture hours	CLO1 CLO2 CLO3 CLO4 CLO5
5	Graphs Basic & Traversal Techniques: Representation of Graphs, Breadth First Search, Depth First Search, Algorithm of BFS and DFS, Application of BFS and DFS, Minimum Spanning Tree, Kruskal's and Prim's Algorithm, Complexity analysis of the algorithms	5 lecture hours	CLO1 CLO2 CLO3 CLO4



6	Shortest Path Algorithms: Single-source shortest path, Dijkstra's Algorithm, Bellman-Ford's Algorithm; All-pairs shortest path, Floyd-Warshall's Algorithm; Complexity analysis of the algorithms	5 lecture hours	CLO1 CLO2 CLO3 CLO4
7	Computational Geometry & Number Theory: Computational Geometry, Line Segment Properties, Convex Hull, Graham Scan Algorithm of Convex Hull, Number Theory, GCD, Modular Arithmetic, Prime Number generation, Complexity analysis of the algorithms	5 lecture hours	CLO1 CLO2 CLO3 CLO4
8	Theory of NP-Completeness and Coping with Hardness: Theory of NP-Completeness, P, NP, NP-Complete and NP-Hard Problems; Backtracking, N-Queen Problem; Branch and Bound; Approximation algorithms	5 lecture hours	CLO1 CLO2 CLO3 CLO4 CLO5
		40	

Books :**Text Books:**

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, MIT Press, 2009, ISBN-13: 978-0262033848
- Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 1st Edition, Orient Black Swan, 2008, ISBN-13: 978-8173716126

Reference Books :

- Robert Sedgewick, Algorithms, 4th Edition, Addison-Wesley Professional, 2011, ISBN-13: 978-0321573513
- Steve Skiena, The Algorithm Design Manual, 2nd Edition, Springer, 2008, ISBN-13: 978-1849967204
- Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, 1st Edition, Prentice Hall, 1998, ISBN-13: 978-0137689958
- Mark Allen Weiss, Data Structure and Algorithm Analysis in C++, 4th Edition, Pearson, 2013, ISBN-13: 978-0132847377
- Jeff Edmonds, How to Think About Algorithms, 1st Edition, Cambridge University Press, 2014, ISBN-13: 978-1107439887
- Steven Halim and Felix Halim, Competitive Programming 3, 3rd Edition, Lulu.com, 2013
- Donald Ervin Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Professional, 3rd edition, 1997, ISBN-13: 978-0201896831
- Donald Ervin Knuth, The Art of Computer Programming, Volumes 1, 2, 3, 4A, Addison-Wesley Professional, 1st edition, 2011, ISBN-13: 978-0321751041

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		-	-		-
Understand		2	5		5
Apply		5	10		20
Analyze		3	5		15



Evaluation		-	5		5
Create		-	5		5
x	Responding	-	-	10	-

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



4th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-2422	Computer Algorithms Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-2322 (Data Structures Lab)		
Co-requisite: CSE-2421 (Computer Algorithms)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are to

- familiarize with the major algorithms and data structures
- proficiently apply important algorithmic design paradigms and methods of analysis
- synthesize efficient algorithms in common engineering design situations

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate a familiarity with major algorithms and data structures	50%
2.	Apply important algorithmic design paradigms and methods of analysis	30%
3.	Synthesize efficient algorithms in common engineering design situations	20%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate a familiarity with major algorithms and data structures	50%	Demonstrate a familiarity with major algorithms and data structures	50%	Demonstrate a familiarity with major algorithms and data structures
CLO2	Apply important algorithmic design paradigms and methods of analysis	30%	Apply important algorithmic design paradigms and methods of analysis	30%	Apply important algorithmic design paradigms and methods of analysis



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Synthesize efficient algorithms in common engineering design situations	20%	Synthesize efficient algorithms in common engineering design situations	20%	Synthesize efficient algorithms in common engineering design situations

Activity Plan:

Week	Activities	Topics	CLOs
1	Lab work	1. Implementation of Insertion-sort 2. Implementation of Merge-sort	CLO1 CLO2
2	Lab work	3. Implementation of Quick-sort with its randomized	CLO1 CLO2
3	Lab work	4. Implementation of Heap and Heap-sort 5. Implementation of Priority queue using binary heap	CLO1 CLO2
4	Lab work	6. Implementation of Counting sort 7. Implementation of Radix sort	CLO1 CLO2
5	Lab work	8. Solving Matrix-chain multiplication problem 9. Solving longest common subsequence problem	CLO1 CLO2
6	Lab work	10. Solving problem with the technique of memorization 11. Solving selected competitive programming problem that requires dynamic programming	CLO1 CLO2
7	Lab work	12. Solving activity selection problem 13. Implement Huffman tree and generating prefix	CLO1 CLO2
8	Lab work	14. Implementation of Naive string-matching algorithm 15. Implementation of Rabin-Karp algorithm	CLO1 CLO2
9	Lab work	16. Implementation of Breadth First Search 17. Implementation of Depth First Search	CLO1 CLO2
10	Lab work	18. Implementation of Kruskal's Algorithm for finding minimum spanning tree 19. Implementation of Prim's Algorithm for finding minimum spanning tree	CLO1 CLO2
11	Lab work	20. Implementation of Dijkstra's algorithm for solving single-source shortest path problem 21. Implementation of Bellman-Ford's algorithm for solving single-source shortest path problem	CLO1 CLO2
12	Lab work	22. Implementation of Floyd-Warshall's algorithm for solving all-pairs shortest path problem	CLO1 CLO2
13	Lab work	23. Determining whether two line segment intersect 24. Determining convex hull of a set of points using Graham's scan algorithm	CLO1 CLO2



Week	Activities	Topics	CLOs
14	Lab work	25. Implementation of extended Euclid's algorithm for finding GCD 26. Implementation of different prime number generation algorithms 27. Solving N-Queen Problem 28. Solving different backtracking problems	CLO1 CLO2
15	Programming Contest	29. Testing the problem solving skills of students by giving them problems	CLO3

Books :

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3rd Edition, MIT Press, 2009, ISBN-13: 978-0262033848
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, 1st Edition, Orient Black Swan, 2008, ISBN-13: 978-8173716126

Reference Books:

1. Robert Sedgewick, Algorithms, 4th Edition, Addison-Wesley Professional, 2011, ISBN-13: 978-0321573513
2. Steve Skiena, The Algorithm Design Manual, 2nd Edition, Springer, 2008, ISBN-13: 978-1849967204
3. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, 1st Edition, Prentice Hall, 1998, ISBN-13: 978-0137689958
4. Mark Allen Weiss, Data Structure and Algorithm analysis in C++, 4th Edition, Pearson, 2013, ISBN-13: 978-0132847377
5. Jeff Edmonds, How to Think About Algorithms, 1st Edition, Cambridge University Press, 2014, ISBN-13: 978-1107439887
6. Steven Halim and Felix Halim, Competitive Programming 3, 3rd Edition, Lulu.com, 2013
7. Donald Ervin Knuth, The Art of Computer Programming, Volume 1, Addison-Wesley Professional, 3rd edition, 1997, ISBN-13: 978-0201896831
8. Donald Ervin Knuth, The Art of Computer Programming, Volumes 1, 2, 3, 4A, Addison-Wesley Professional, 1st edition, 2011, ISBN-13: 978-0321751041



4 th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-2423	Database Management System
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2424 (Database Management System Lab)		
Co-requisite: CSE-2424 (Database Management System Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- 1. Familiarize with data model, including all entities, relationships, attributes, and business rules
- 2. Ability to apply data integrity and security, normalization techniques
- 3. Design and Develop an enterprise data model that reflects the organization's goal

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand Relational Databases, Database design, Data Storage and Querying, Transaction Management.	40%
2.	Apply Relational Algebra, SQL, Query Optimization techniques, Data Integrity, Security, normalization techniques, Indexing Techniques, ACID Properties.	20%
3.	Create an enterprise data model that reflects the organization's fundamental business rules.	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand Relational Databases, Database design, Data Storage and Querying, Transaction Management.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Apply Relational Algebra, SQL, Query Optimization techniques, Data Integrity, Security, normalization	PLO4	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	techniques, Indexing Techniques, ACID Properties.				
CLO3	Create an enterprise data model that reflects the organization's fundamental business rules.	PLO3	Cognitive/Create	Class discussion, Assignment	Exam, Project, Assignment

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Database, data, database management system, Database system versus file system, Data model, Database language, Database user administration, Database system structure, Storage manager, Overview of Physical storage medium.	02	CLO1
2	Entity-Relationship Model: Entity sets, Relationship sets, Mapping Cardinalities, Keys, Attributes, Entity relationship diagram, Weak entity sets, Specialization, Generalization, Structure of Relational databases, Database Schema.	06	CLO3
3	The Relational Algebra and SQL: Selection, projection, Union, Set difference, Cartesian-product, Rename, Set-intersection, Natural-join, Division, Assignment, projection, Aggregate functions, Deletion, Insertion, Updating, Views, Nested sub-queries, Set membership, Set comparison.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Integrity, Security and Relational Database Design: Domain constraint, Integrity, Assertions, Triggers, Authorization, Authentication, Security, Privileges, Roles, and Audit trails, Encryption-Decryption Algorithm, Decomposition etc.	04	CLO2
5	Functional Dependency and Normalization: Functional Dependencies, Closure of a set of Functional dependencies. Un-normal Form (UNF), First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), Boyce and Code Normal Form (BCNF).	04	CLO2
6	Indexing and Hashing: Ordered indices, Hash indices, Hash function, Primary index, Secondary index, Dense, sparse, Multilevel indices, B+ tree index files, Handling Bucket Overflows, Overflow Chaining, Closed Hashing, Open Hashing, Linear probing, Hash indices, Dynamic Hashing.	04	CLO2
7	Transaction: ACID Properties, Transaction state diagram, Implementation of Atomicity and Durability, Shadow copy technique, Concurrent Execution, Serializability, Recoverability, Recoverable schedule, Cascade-less Schedules, Implementation in Isolation, Testing of Serializability.	04	CLO2
8	Concurrency control, Recovery System and Distribute databases: Lock-Based Protocols, granting of locks, Two-phase locking protocol, Graph based protocol, Tree protocol, Timestamp based protocols,	02	CLO2



	Deadlock detection and recovery. Failure classification, Storage types, Checkpoints. Distributed data, Replication and Fragmentation.		
		30	

Books:

Text Book:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concept", 6th Edition McGraw-Hill, 2011, ISBN : 978-0-07-352332-3
2. Ramez Elmasri, Shamkant B. Navathe Fundamentals of database systems, 6th Pearson Education, 2011, ISBN : 10: 987-0-136-08620-9

Reference Books:

1. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom Database Systems: The Complete Book, 3rd Edition, Pearson (Addison-Wesley + Prentice-Hall) 2008, 9870138613370
2. Connolly, Thomas M., Begg, Carolyn E. Database systems: a practical approach to design, implementation, and management, 4th, Addison-Wesley, 2005, 987321210255

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			Written Exam (50)
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	
Remember					5
Understand		5	5		15
Apply					
Analyze		15	5		30
Evaluation					
Create		10			
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



4 th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-2424	Database Management System Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2423 (Database Management System)		
Co-requisite: CSE-2423 (Database Management System)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

1. familiarize with database languages such as SQL and PL/SQL
2. Ability to apply structured query language for data searching and develop different types of database applications
3. Apply different concept to Database management system such as Integrity, Security, Normalization, Indexing, Transaction, Recovery system, Distributed system.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate familiarity with SQL and fundamental of Database Management System	50%
2.	Create different types of database applications using structured query language	30%
3.	Apply different concept for Database management such as Integrity, Security, Normalization, Indexing, Transaction, Recovery system, Distributed system.	20%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate familiarity with SQL and fundamental of Database Management System	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work,	Exam, Quiz, Assignment,
CLO2	Create different types of database applications using structured query language	PLO3 PLO9	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work,	Exam, Quiz, Assignment, Project



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Apply different concept for Database management such as Integrity, Security, Normalization, Indexing, Transaction, Recovery system, Distributed system.	PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture	Topic: <ul style="list-style-type: none"> Introduction to SQL, Relational Database Management System. Oracle12: Object Relational Database Management System, SQL statements, about PL/SQL and its environments. 	CLO1
2	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section. Topic: Writing Basic SQL statements, Capabilities of SQL SELECT Statements, Restricting and sorting data. 	CLO1
3	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section. Topic: Single-Row-Functions 	CLO1
4	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section. Topic: Displaying Data from multiple tables 	CLO1
5	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section. Topic: Aggregating data using Group Functions. 	CLO1
6	Lab test 1		
7	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problems from text book practice section. Topic: Sub queries, Multiple-Column Sub queries 	CLO1
8	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section Topic: Manipulating Data, Creating and Managing Tables including constraints. 	CLO2
9	Problem solving	<ul style="list-style-type: none"> Instant Database Creation on some unknown domain 	CLO2
10	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section Topic: Other Database Objects, Controlling User Access. 	CLO3
11	Lecture	Topic: <ul style="list-style-type: none"> PL/SQL, Declaring Variables, writing Executable Statements. Working with Composite Data types. 	CLO1
12	Lecture, Problem solving	<ul style="list-style-type: none"> Solving problem from text book practice section Topic: Interacting with the Oracle Server, Writing Control Structures. 	CLO3
13	Lab test 2		



Week	Activities	Topics	CLOs
14	Lecture, Problem solving	<ul style="list-style-type: none"> • Solving problem from text book practice section • Topic: Writing Explicit Cursors, 	CLO1
15	Lecture, Problem solving	<ul style="list-style-type: none"> • Revised Class 	CLO1, CLO2, CLO3

Books:

Text Book :	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concept, 6th Edition McGraw-Hill, 2011, ISBN : 978-0-07-352332-3
2.	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of database systems, 6th Pearson Education, 2011, ISBN : 10: 987-0-136-08620-9
Reference Books :	
1.	Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, Database Systems: The Complete Book, 3rd Edition, Pearson (Addison-Wesley + Prentice-Hall) 2008, ISBN : 9870138613370
2.	Connolly, Thomas M., Begg, Carolyn E. Database systems : a practical approach to design, implementation, and management, 4th, Addison-Wesley, 2005, ISBN : 987321210255

**ISCED: 0613****Course Code: CSE-2427****Course Title: Theory of Computation****Credit Hours: 3****Contact Hours: 3 lectures hours per week****Type: Core, Engineering****Prerequisite: CSE-1223 (Discrete Mathematics), CSE-2421 (Computer Algorithms)****Co-requisite: CSE-2422 (Computer Algorithms Lab)**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

This course covers the theoretical computer science areas of formal languages and automata, computability and complexity.

Course Objective:

At successful completion of the course, students should:

1. Learn several formal mathematical models of computation along with their relationships with formal languages.
2. Distinguish different computing languages and classify their respective types.
3. Recognize and comprehend formal reasoning about languages.
4. Understand that there are limitations on what computers can do, and learn examples of unsolvable problems.
5. Show a competent understanding of the basic concepts of complexity theory. They will learn that certain problems do not admit efficient algorithms, and identify such problems.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate knowledge of different mathematical models of computation and their relation to formal languages	15
2.	Apply the knowledge formal language theory	20
3.	Analyze and design finite automata, pushdown automata, Turing machines	15
4.	Understand key notions of computation, such as algorithm, computability, complexity, decidability, reducibility	15
5.	Analyze limitations of some computational models and possible methods of proving them	20
6.	Analyze problems that do not have efficient algorithms and possible methods of proving them	15

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate knowledge of different mathematical models of computation and their relation to formal languages	PLO1	Cognitive/Understand	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Apply the knowledge of formal language theory	PLO1	Cognitive/Apply	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Analyze and design finite automata, pushdown automata, Turing machines	PLO2	Cognitive/Analyze	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment
CLO4	Understand key notions of computation, such as algorithm, computability, complexity, decidability, reducibility	PLO1	Cognitive/Understand	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment
CLO5	Analyze limitations of some computational models and possible methods of proving them	PLO2	Cognitive/Analyze	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment
CLO6	Analyze problems that do not have efficient algorithms and possible methods of proving them	PLO2	Cognitive/Analyze	Lecture, Class Discussion, Assignment, Note	Exam, Quiz, Assignment

Experiment Names:

Regular Languages, finite automaton, Examples of finite automata, Designing finite automata, Equivalence of NFAs and DFAs, The regular operations - Closure under the regular operations. Regular Expressions. Equivalence with finite automata. Non-regular Languages - The pumping lemma for regular languages.

Context-Free Languages: Formal definition of a context-free grammar - Examples of context-free grammars. Ambiguity - Chomsky normal form. Pushdown Automata, Formal definition of a pushdown automaton - Examples of pushdown automata, Equivalence with context-free grammars. Computability Theory: the Church-Turing Thesis. Turing machine, Nondeterministic Turing machines, Hilbert's problems.

Decidability: Decidable languages, The halting problem – the diagonalization method..

Complexity Theory: The Classes P, NP, Examples of problems in these classes. The P versus NP question. NP-Completeness, Polynomial time reducibility, The Cook-Levin Theorem. Examples of



NP-Complete Problems: The vertex cover problem - The Hamiltonian path problem - The subset sum problem. Approximation algorithm, Probabilistic Algorithms.

Text Books:

1. Michael Sipser: Introduction to the theory of computation.
2. Hopcroft Motwani Ullman: Introduction to Automata Theory Languages and Computation."

Reference Books:

3. Lewis Papadimitriou: Elements of the theory of computation.
4. Peter Linz: An introduction to formal languages and automata.
5. Zvi Kohavi: Switching and Finite Automata Theory.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					5
Understand		5	5		15
Apply		10			10
Analyze		15	5		20
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



2 nd Semester		
ISCED Code	Course Code	Course Title
0613	CSE-2430	Competitive Programming 2
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite:	CSE-1230 (Competitive Programming 1)	
Co-requisite:	None	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

The main objectives of this course are:

- To help the students to enhance their analysing skills.
- To make them familiar with solving competitive problems using different algorithms.
- Foster creativity and innovation.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Analyze performance of different algorithms for different problems	50
2.	Create appropriate algorithms to solve competitive problems	50

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Analyze performance of different algorithms for different problems	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment, Continuous Evaluation, Contest
CLO2	Create appropriate algorithms to solve competitive problems	PLO3	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment, Continuous Evaluation, Contest

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	Introduction	CLO1
2	Lecture, Problem solving	Getting familiar with Online Judges	CLO1



Week	Activities	Topics	CLOs
3	Lecture, Problem solving	Time and Space Complexity Analysis	CLO1
4	Lecture, Problem solving	Solving Data Structure related problems	CLO1
5	Lecture, Problem solving	Solving and analyzing Data Structure related problems using STL	CLO2
6	Lecture, Problem solving	Several STL containers and algorithms	CLO1
7	Lecture, Problem solving	Greedy Techniques	CLO1
8	Lecture, Problem solving	Divide and Conquer Paradigm related problem solving	CLO1
9	Lecture, Problem solving	Dynamic Programming Paradigm related problems I	CLO1
10	Lecture, Problem solving	Dynamic Programming Paradigm related problems II	CLO2
11	Lecture, Problem solving	Graph Searching	CLO1
12	Lecture, Problem solving	Several Graph Algorithm related problems	CLO2
13	Lecture, Problem solving	Number Theory	CLO1
14	Lecture, Problem solving	Computational Geometry	CLO1
15	Lecture, Problem solving	String Searching related problems	CLO2

Books :

Text Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Steven Halim and Felix Halim	Competitive Programming 3	3rd Edition	Lulu.com	2013	

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Steven S Skiena , Miguel A. Revilla	Programming Challenges: The Programming Contest Training Manual	1st Edition	Springer	2003	ISBN-13: 978-0387001630
2.	William B. Poucher , Miguel A. Revilla	From Baylor to Baylor	1st Edition	Lulu.com	2010	ISBN-13: 978-1409273059

Online Resources:

- <https://www.topcoder.com/community/competitive-programming/tutorials/>



5th Semester		
ISCED Code	Course Code	Course Title
0714	CSE-3521	Computer Architecture
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2305 (Digital Logic Design)		
Co-requisite:		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are to

- a. To introduce the student with CPU, memory, I/O organization and peripherals.
- b. To introduce students to the contemporary design and implementation of microprocessors.
- c. To help the student to demonstrate an understanding of micro architecture concepts and features employed by contemporary microprocessors, such as pipelining, data forwarding, superscalar, branch predictors and also competence of basic skills in optimizing assembly programs.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the basic organization of computer and different instruction formats and addressing modes.	20%
2.	Analyze and Evaluate the performance of computer	20%
3.	Analyze various issues related to memory hierarchy.	30%
4.	Evaluate various modes of data transfer between CPU and I/O devices	20%
5.	Illustrate various inter connection structures of multi processors.	10%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the basic organization of computer and different instruction formats and addressing modes.	PLO1	Cognitive/ Understand	Lecture, Discussion	Class test, Assignment, Exam
CLO2	Analyze and Evaluate the performance of computer.	PLO1	Cognitive/ Analyze/Evaluate	Lecture, discussion, Competitive Problem solving	Assignment Class test, Exam
CLO3	Analyze various issues related to memory hierarchy	PLO1	Cognitive/Apply	Lecture, Class discussion,	Class test, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
				Competitive Problem solving	Exam
CLO4	Evaluate various modes of data transfer between	PLO1	Cognitive/ Evaluate	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam
CLO5	Illustrate various inter connection structures of multi processors	PLO2	Cognitive/Understand	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Computer architecture Basic, History, Different terminologies of computing device, Types of Computer Architecture	02	CLO1
2	Understanding Program Performance, Defining Performance, Measuring Performance, CPU Performance and its factor, Evaluating performance, MIPS as a performance Measure	02	CLO1
3	Instruction and data access methods, Instruction Set, Stored-Program Concept, Operations of the computer Hardware, Operands of the computer Hardware (Design Principles of Computer Hardware) Representation of Instructions in the Computer, Logical Operations, Instructions for decision making, MIPS Addressing for 32-Bit Immediate and Addresses	03	CLO2
4.	Arithmetic and logical operations, floating point operations, ALU design, Signed and Unsigned numbers, Number Conversion and representation, Arithmetic Operations and Representation.Matrix-chain multiplication and longest common subsequence problems as examples, Complexity analysis of the algorithms. Multiplication, Division and Floating point Hardwar	4	CLO3
5.	Understanding Program Performance, Defining Performance, Measuring Performance, CPU Performance and its factor, Evaluating performance, MIPS as a performance Measure Instruction and data access methods, Instruction Set, Stored-Program Concept, Operations of the computer Hardware, Operands of the computer Hardware (Design Principles of Computer Hardware)	2	CLO2
6	Representation of Instructions in the Computer, Logical Operations, Instructions for decision making, MIPS Addressing for 32-Bit Immediate and Addresses Arithmetic and logical operations, floating point operations, ALU	4	CLO4



	design, Signed and Unsigned numbers, Number Conversion and representation, Arithmetic Operations and Representation		
7	Matrix-chain multiplication and longest common subsequence problems as examples, Complexity analysis of the algorithms. Multiplication, Division and Floating point Hardware	2	CLO4
Section-B (SEE: 50 Marks)			
8	The control unit (Single cycle Data path) : hardwired and micro programmed, Logic Design Convention, Clocking Methodology, Data path Basic, State Element of Data path Building a single Data path (R-Type, I-Type and J-type Instructions) Designing the main control unit (with control signals effect), Operation of the data path.The control unit (Multiple cycle Data path): Hardwired and micro programmed, Multi-cycle implementation Basic. Necessity of multi-cycle implementation, Details of Control Signal Breaking the Instruction Execution into Clock Cycles, Exceptions	05	CLO5
9	Pipelining: Overview of Pipelining, Pipelining Hazard, Pipeline Data Path (R-Type, I-Type and J-type Instructions) Pipeline Control, Exception, Exception Handling	04	CLO5
10	Memory organization: Introduction to memory, memory Hierarchy, Basic on Cache, Accessing a cache, Handling cache miss and writes, Flexible placement of cache block	02	CLO3
11	Introduction to virtual Memory, Virtual to physical, Handling page Fault TLB, Integrating Virtual Memory, TLBs and Caches	02	CLO1
12	I/O systems, channels, interrupts, DMA, I/O Devices basic, Disk Storage and dependability, RAID, Buses and other connections between processors, Memory and I/O Devices, Interfacing I/O devices with processors.	02	CLO1
34			

Books :

Text Book :

1.John Hennessy, David Patterson, "Computer Organization",3rd edition ,Morgan Kaufman publisher
ISBN: 1-55860-604-1

Reference Books :

1. William Stallings, " Computer Organization and Architecture designing for performance ", 8th Edition, Library of Congress Cataloguing-in-Publication data on file
2. M. Morris Mano e, " Digital Logic and Computer Design ", 3rd Edition, Pearson Education

Course Assessment Pattern (Theory courses):

Bloom's Category	Evaluations out of 100 marks			
	CIE (50 marks)		SEE (50marks)	
Cognitive	Affective	Mid-	Assignment/ Attendance	Written Exam



learning	learning	term (30)	Class Test (10)	Marks (10)	(50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination



5th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-3523	Microprocessor, microcontroller and embedded system
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-2323 (Digital Logic Design)	
Co-requisite:	CSE-3524 (Microprocessors, Microcontrollers and Embedded Systems Lab)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

Microprocessor is responsible for processing the tasks within a computer .This course equips the students with the basic features , operations and techniques of 8086 microprocessor , the basics of using microcontroller and the basic characteristics of embedded systems. This course also enables the students to learn the basic concepts of assembly language programming using emulator such as EMU 8086.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understanding of the basic operations, architecture, organization, assembly language instructions of microprocessor, microcontroller and embedded systems	70
2.	Apply assembly language programming to solve problems.	20
3.	Develop the skill of designing various microcontroller -based systems according to practical applications.	10

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understanding of the basic operations, architecture, organization, assembly language instructions of microprocessor, microcontroller and embedded systems	PLO1	Cognitive/Understand	Lecture, Discussion	Class test, Assignment, Exam
CLO2	Apply assembly language programming to solve problems.	PLO2	Cognitive/Apply	Lecture, discussion, Competitive Problem solving	Assignment Class test, Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Develop the skill of designing various microcontrollers -based systems according to practical applications.	PLO3	Cognitive/Apply	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Introductory Concept: Evaluation of microprocessor, Types of microprocessor, system bus, hardware of a microprocessor, memory-addressing technique.	02	CLO1
2	8086 Microprocessor: properties, architecture, registers, FLAGS register, physical address calculation, addressing modes, Addressing Techniques of 8086 Microprocessor.	06	CLO1
3	Instruction: Instruction set, Instruction format, Fetch-decode-Execution cycle, basic concepts of assembly language	04	CLO2
Section-B (SEE: 50 Marks)			
4	Interrupt System: Sources of interrupt, Types of interrupt, handling interrupt request, interrupt vector and table, 8259A priority interrupt controller, Daisy chain..	04	CLO1
5	An overview of Intel 80186, 80286, 80386, 80486 and Pentium microprocessor; Advanced microprocessor: Embedded microprocessor, Bit slice microprocessor, arithmetic processor, Multitasking, Itanium and Merced Microprocessor.	06	CLO1
6	I/O operation: Isolated and memory mapped I/O, 8255A Programmable peripheral Interface, DMA technique, I/O ports, I/O processor	02	CLO1
7	Micro controller: Architecture of 8051, Signals, Operational features, Memory and I/O addressing, Interrupts, Instruction set, Applications. Design of a particular microcontroller based architecture.	04	CLO3
8	Embedded Systems: Introduction to Embedded Systems, Characteristics, Components, Hardware-Software Partitioning, Specification and Modeling, Optimizing Design, SOC, and Application Domains.	02	CLO1
			30

Books :

Text Book :
1. "Bary B Brey", The INTEL Microprocessors 8th edition Prentice Hall 2009, ISBN 13: 978-0-13-502645-8
2. "Mohamed Ali Mazidi Janice Gillispie Mazidi" "The 8051 microcontroller and embedded



systems” 2nd edition Pearson 2005, ISBN 13: 978-0131194021

Reference Books :

1. Dr. M. Rafiquzzaman: Microprocessors & Microcomputer -Based System Design
2. T. Hanley: Microprocessor and microcomputer
3. John F. wakerly: Micro Computer architecture and programming
4. John P. Hayes: Compute architecture and organization
6. Douglas V.: Hall, Microprocessor and Interface.
7. Ramesh Gaonker: Microprocessor Interfacing.

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		15	5		15
Understand		10	5		15
Apply		5			20
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

5th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-3524	Microprocessor, microcontroller and embedded system sessional
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite:	CSE-2324 (Digital Logic Design Lab)	
Co-requisite:	CSE-3523 (Microprocessors, Microcontrollers and Embedded Systems)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

- To know about the basics of 8086 microprocessor operation
- Input data in different addresses using 8086 MDA toolkit.
- Serial and parallel port connection
- Understanding the use of assembly language using the concepts of 8086 microprocessor and microcontroller
- Design a small project using Proteus (open ended project) based on the concept of microcontroller

Course Learning Outcomes (CLOs):



#	CLO Description	Weightage (%)
1.	Accumulating knowledge about the structure of 8086 microprocessor, its instruction set and interfacing technique.	40
2.	Develop the ability to use a suitable trainer kit to load and verify assembly language program in 8086 microprocessor.	40
3.	Develop the ability to design microcontroller-based system for the solution of real-world problems.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Accumulating knowledge about the structure of 8086 microprocessor, its instruction set and interfacing technique.	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO2	Develop the ability to use a suitable trainer kit to load and verify assembly language program in 8086 microprocessor.	PLO5	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO3	Develop the ability to design microcontroller-based system for the solution of real-world problems.	PLO11	Cognitive/ Apply	Class discussion, Lab work, Note	Assignment, Class performance, Exam

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	Familiarization with MDA-8086 microprocessor kit and its operation in “Machine Code” mode.	CLO1
2	Lecture, Problem solving	Introduce the pins of 8086 microprocessor and its internal working procedures.	CLO1
3	Lecture, Problem solving	To load the machine codes of a sample program to MDA-8086, execute it and verify the results.	CLO1
4	Lecture, Problem solving	Introduction of Serial monitor mode operation of MDA-8086 and verification of arithmetic operations.	CLO1
5	Lecture	Introduction and implementation of various logic operations in assembly language.	CLO2
6	Lab test 1		



Week	Activities	Topics	CLOs
7	Lecture, Problem solving	Introduction and implementation of program control instructions in assembly language	CLO2
8	Lecture, Problem solving	Implement various interrupt system of 8086 microprocessor.	CLO2
9	Lecture, Problem solving	Understanding the concept of complex engineering and open ended lab problems	CLO3
10	Lecture, Discussion	Implementation of open ended lab : Kitchen timer and alarm system	CLO3
11	Lecture	Implementation of open ended lab : 4 way traffic system using Rduino (Both with Proteus simulation and hardware).	CLO3
12	Lecture, Problem solving	<ul style="list-style-type: none"> • Solving problem from the above contexts 	CLO3
13	Lab test 2		
14	Problem solving	Design and develop your own open ended lab problem	CLO3
15	Viva	Viva Voce and problem solving	CLO3

Books :

Text Book :

1. Win8086 MANUAL, User's manual ,Modas Eng. Co.,ltd.
2. Assembly language programming and organization of the IBM PC, Ytha YuCharles Marut

Reference Books :

6. Dandamudi, Sivarama , Introduction to Assembly Language Programming, Sivarma P. Dandamundi, ISBN 978-4757-2858-3.



6th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-3525	Data Communication
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: None		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- Understand about the different types policy-making organizations of the communication world.
- Grasp concepts of LANs, MANs, and WANs.
- Understand and explain underlying network concepts.
- Understand the signals using in communication.
- Understand and compare among the various types of modulation techniques.
- Understand interfacing and modem's functions.
- Understand the properties of the transmission media both the guided and unguided and its effect on the signals.
- Understand switching, multiplexing and error handling of signals
- Understand how the frames are constructed to have reliable and efficient communications.
- Understand and classify among the well established different types of DataLink Control Protocols.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1	Understand Data Communications Concepts and its components.	20
2	Analyze the different types of Transmission media and their functions within a Network	20
3	Apply the knowledge of encoding, decoding, and how error correction and error detection in data communication	40
4	Understand switching principles and basics of wireless communication	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand Data Communications	PLO1	Cognitive/Understand	Lecture, Class	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	Concepts and its components.			discussion, Note	
CLO2	Analyze the different types of Transmission media and their functions within a Network	PLO2	Cognitive/ Analyze	Lecture, Class discussion, Note	Exam, Quiz, Assignment
CLO3	Apply the knowledge of encoding, decoding, and how error correction and error detection in data communication work	PLO1	Cognitive/ Apply	Lecture, Class discussion, Note,	Exam, Quiz, Assignment,
CLO4	Understand switching principles and basics of wireless communication	PLO1	Cognitive/ Understand	Lecture, Class discussion, Note,	Exam, Quiz, Assignment,

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Data Communication fundamentals and Network Model: Trend of data communication, Data communication's components, Network criteria, Protocols and Standards, Standards Organizations, Basic concepts of line configuration, Topology, Transmission modes and Categories of Networks, Introduction to network standards and protocols, Layard approach of communication study, OSI model and function of its seven layers, TCP/IP protocol suite and addressing.	4	CLO1,CLO2
2	Analog signal, digital signals, periodic signal, Time and Frequency domain, Composite Signals, Decomposition of digital signal, bandwidth, throughput, transmission impairment: attenuation, distortion and noise. Nyquist bit rate, Shannon capacity and performance analysis, Electromagnetic wave, Electromagnetic spectrum, Guided media: twisted pair cable, coaxial and fiber optic cable. Unguided media: radio wave, microwave and Infrared. Standard connectors, NIC, HUB, bridge, router, gateway and modems, antenna.	5	CLO1,CLO2, CLO4
3	Digital to digital conversion, Line encoding schemes, block coding, scrambling, Analog to digital conversion, PAM, PCM, and DM, Transmission modes: parallel, serial, synchronous, and asynchronous.	5	CLO1, CLO2, CLO3



Section-B (SEE: 50 Marks)			
4	Digital to analog conversion: ASK, FSK, PSK, QAM, MSK, GMSK etc. Bandwidth utilization, Analog to digital conversion: AM, FM and PM.	4	CLO1, CLO4
5	Multiplexing – FDM, WDM, TDM (Synchronous and statistical) spread spectrum FHSS & DSSS, packet-switched data networks, circuit switched data networks, Virtual Circuit networks.	5	CLO1, CLO2, CLO4
6	Data link layer and control, Error detection and correction, framing, flow and error control, Stop-and-Wait protocol, Automatic Repeat Request (ARQ), Go-Back-N, Selective Repeat, HDLC, PPP	5	CLO1, CLO3
7	Wired LAN, Wireless LAN, Connecting LAN, Backbone networks and virtual LAN.	5	CLO1, CLO2, CLO3
8	Cellular Telephone, Satellite Networks, SONET/SDH.	5	CLO1, CLO2, CLO3
		38	

Books :

Text Book :

1. Behrouz A Forouzan. Data Communications and Networking. 4th Edition Alan R. Apt 2007
ISBN

2. "Andrew S. Tanenbaum David J. Wetherall." Computer Networks 5th Edition Pearson 1944
ISBN

Reference Books :

1. William Stallings "Data and Computer Communication" 10th Edition Pearson India 2014 ISBN-13: 978-0-13-350648-8 ISBN-10: 0-13-350648-7
2. F. Halsall Data Communication Computer Network and open systems 4th Edition Harlow: Addison-Wesley 1997 ISBN-13: 978-0201422931 ISBN-10: 020142293X

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		5	5		15
Apply		10			15
Analyze		15	5		20



Evaluation					
Create		-			
x	Responding	x	x	10	

Note:CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



5th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-3527	Compiler
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2427 (Theory of Computation)		
Co-requisite:		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

This is a course to familiarize the students with knowledge and ideas of the construction of computer program translators called compilers. To take this course, students should be able to gain the skills of automata theory which need to design and implementation of the compiler. The competitive and standard programming ability with some mathematical maturity also will be expected; students should have some idea of computer language grammar and computing skills will also be helpful. After studying this course the students will have in-depth knowledge of the design and implementation of compilers maintaining the standard steps.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand the knowledge of language translation to analyze the source program for compiler construction with its front-end and back-end phases.	30
2.	Apply the theory of computing (patterns, tokens, regular expressions, grammar and finite automata) to design and create the compiler for different programming languages and construction of compiler to improve language translation problem solving skills to basic real world situations	30
3.	Apply the Intermediate code generation tools to design the intermediate code generation phase of compiler and enrich the knowledge in code optimization techniques, code generation mechanism to construct and organize a compiler.	40

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the knowledge of language translation to analyze the source program for compiler construction with its front-end and back-end phases.	PLO1	Cognitive/ Understand	Lecture, Class discussion.	Class test, Assignment, Exam
CLO2	Apply the theory of computing (patterns, tokens, regular	PLO2	Cognitive/Apply	Lecture, discussion,	Assignment Class test,



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	expressions, grammar and finite automata) to design and create the compiler for different programming languages and construction of compiler to improve language translation problem solving skills to basic real world situations			Problem solving.	Exam
CLO3	Apply the Intermediate code generation tools to design the intermediate code generation phase of compiler and enrich the knowledge in code optimization techniques, code generation mechanism to construct and organize a compiler.	PLO2	Cognitive/Apply	Lecture, Class discussion, Problem solving.	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Structure of compiler: Translator, Basic principles of compilers and compiler design, types of compilers, applications, phases of a compiler.	02	CLO1
2	Grammars & expressions: Concepts of languages and Grammars, Terminals and non-terminals, Useless non-terminals and Inaccessible tokens, Context-Sensitive Grammars, Context-Free Grammars, Right linear grammar, left linear grammar, Derivations and Parse trees, Ambiguous grammar.	05	CLO2
3	Automata: Lexical analysis, Regular expressions, finite automata, Non-deterministic Finite-State Automata, Minimization of Finite-State Automata, DFA, Symbol table management.	05	CLO2
Section-B (SEE: 50 Marks)			
4	Syntax Analysis: Parser, Error-Recovery, Left recursion, Left factoring, Top-Down Parsers, FIRST and FOLLOW, Recursive-Descent and Predictive Parsing, LL(1) parsing.	05	CLO3
5	Parsing: Bottom-Up Parsing, Operator Precedence parsing, LR Parsers, Construction of SLR, CLR, LALR Parse Tables, Shift-Reduce Parsing.	05	CLO3
6	Syntax-Directed Translation: Syntax-Directed definitions, Semantic Rules, Dependency Graph, Attributes, Construction of Syntax trees, Type checking, Type expressions, Translation Scheme, Type checking of expressions, statements and functions, Type	03	CLO3



	conversions.		
7	Intermediate code generation: Run time environments, Activation tree, Control stack, Run time storage organization, Storage allocation strategies, Intermediate languages, three address statements, quadruples, triples, indirect triples and polish notations.	02	CLO3
8	Code Generation and Optimization: Code generation issues, Instruction costs, Basic blocks, Flow graphs, DAG representation, Next use information, Transformations of Basic Blocks, Peephole optimization, Function preserving transformations, Optimization of Basic Blocks, Different models of code generation, error detection and error handling.	03	CLO3
		30	

Books :**Text Book :**

A. V. Aho, R. Sethi, J.D. Ullman Compiler Principle Techniques and Tools 2nd edition Pearson education 2007 ISBN- 81-7808-046-X

Reference Books :

1. William A Barret, R. M. Bates **Compiler Construction theory and practice** 2nd Edition University Grants Commission of Bangladesh 2006 ISBN-13: 978-9848090244
2. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman **Compiler principles, technique and tools** 2nd Edition Pearson 2007 ISBN-13 : 978-0321486813
3. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman **Introduction to Automata Theory, Language, and Computation** 2nd Edition 2005 Pearson ISBN-13 : 978-0201441246
4. A.J Holub **Compiler Design in C** Prentice-Hall 1990 ISBN-13 978-01 : 31550452
5. Levine **Flex and Bison: Text Processing Tools** O'Reilly Media 2009 ISBN-0596155972

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		11			10
Understand		4	10		10
Apply		13			30
Analyze		2			
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



5th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-3528	Compiler Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-2427 (Theory of Computation)		
Co-requisite: CSE-3527 (Compiler)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Mid term	30 Marks
		Final term	30Marks
	SEE: Semester End Examination		30 Marks

Objectives:

- This course is concerned with the practical aspects of designs based on the course CSE-3527, Compiler.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Implement Lexical Analyzer.	20
2.	Implement parsing algorithm and different types of parser.	50
3.	Construct a simple compiler.	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Implement Lexical Analyzer	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work.	Exam, Class performance, Assignment
CLO2	Implement parsing algorithm and different types of parser.	PLO2	Cognitive/Apply	Lecture, Class discussion, Lab work.	Assignment, Class performance
CLO3	Construct a simple compiler.	PLO2	Cognitive/Apply	Class discussion, Lab work.	Exam, Class performance, Assignment

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lab Work	Introduction to compiler sessional, basic C programming structures, Basic compiler construction tools (LEX, YACC etc.)	CLO1
2	Lab Work	Implementation of comments remover of C program in C programming language	CLO1
3	Lab Work	Implementation of identifier and number checker of C program in C	CLO1
4	Lab Work	Implementation of tokenizer by using C programming language	CLO1
5	Lab Work	Implementation of Lexical analyzer using by LEX tool	CLO1
6	Lab Work	Implementation of Syntax analyzer using by YACC tool	CLO2



Week	Activities	Topics	CLOs
7	Lab Test		
8	Lab Work	Implementation of FIRST and FOLLOW of non-terminals from a CFG grammar	CLO2
9	Lab Work	Implementation of left factoring and Left recursion remover in C	CLO2
10	Lab Work	Implementation of Predictive Parsing Table using FIRST and FOLLOW from a grammar	CLO2
11	Lab Work	Implementation of Shift-reduce Parser from a CFG	CLO2
12	Lab Work	Construction of Calculator using LEX and YACC (Project)	CLO3
13	Lab Work	Implementation of intermediate code generation using C programming	CLO3
14	Lab Test	Lab report and project submission. Preparation for semester final examination	

Books :

Text Book :

A. V. Aho, R. Sethi, J.D. Ullman Compiler Principle Techniques and Tools 2nd edition Pearson education 2007 ISBN-81-7808-046-X

Reference Books :

1. William A Barret, R. M. Bates Compiler Construction theory and practice 2nd Edition University Grants Commission of Bangladesh 2006 ISBN-13: 978-9848090244
2. Alfred V Aho, onica S Lam, Ravi Sethi, Jeffrey D. Ullman Compiler principles, technique and tools 2nd Edition Pearson 2007 ISBN-13 : 978-0321486813
3. John E. Hopcroft, Rajeev Matwani, Jeffrey D. Ullman Introduction to Automata Theory, Language, and Computation 2nd Edition 2005 Pearson ISBN-13 : 978-0201441246
4. A.J Holub Compiler Design in C Prentice-Hall 1990 ISBN-13 97 : 8-0131550452
5. Levine *Flex and Bison: Text Processing Tools* O'Reilly Media 2009 ISBN-0596155972

**ISCED: 0613****Course Code: CSE-3529****Course Title: System Analysis and Design****Credit Hours: 3****Contact Hours: 3 lecture hours per week****Type: Core, Engineering****Prerequisite: N/A****Co-requisite: N/A**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

The student who completes this course should know:

1. The traditional systems/software development methodologies.
2. Traditional analysis and design techniques: entity-relationship diagrams, data flow diagrams, and data dictionaries.
3. How to use prototyping in the analysis and design phases of systems development.
4. Project planning: defining the scope, purpose and activities of a project; setting up a project management web page.
5. PERT/CPM project management techniques, including the use of Microsoft Visio.
6. What a CASE tool is and how it is used in software development.
7. How Object Oriented methodology techniques work.

Course Learning Outcomes (CLOs):

After completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1	Understand project management and system development life cycle.	20%
2	Analyze requirement and feasibility of software application	20%
3	Design an information system.	40%
4	Compile the system design document	20%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand project management and system development life cycle.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Analyze requirement and feasibility of software application	PLO2	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Design an information system.	PLO2	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note, Complex Problem Solving	Exam, Quiz, Assignment,
CLO4	Compile the system design document	PLO2 PLO8 PLO9 PLO10	Cognitive/Create	discussion, Assignment	Exam, Assignment Report, Presentation

8 Stanza Syllabus:

Stanza	Topics
1	Concepts of system and its environment: Information, Types of information, Quality of information, System, Types of systems, Components of system, Source of information.
2	Information gathering: strategy, Information searching methods, Interviewing technique, System development methodologies and life cycle.
3	Feasibility study & Cost/Benefit analysis: Feasibility considerations, steps in feasibility analysis, feasibility report, Cost and Benefit categories, procedure for cost and benefit determination, classification of cost and benefit, cost and benefit evaluation methods.
4	Tools of analysis and design: Data Flow Diagram (DFD), DFD symbols, Constructing DFD; Data Dictionary; Decision Tree, Structured English, Decision Tables.
5	System Design and Construction: The process of design, System design phases, Design methodologies; Structured design; Form-Driven methodology; Input design, Output design, File and database design
6	Testing and Quality Assurance: Testing, Types of system tests; White-Box testing; Black-box testing; Quality factors specifications.
7	Implementation and Maintenance: Types of implementation, Documenting the system, Training and supporting users, Factor models of implementation success; The process of maintaining information system, Types of maintenance, Cost of maintenance, Reducing maintenance cost.
8	Hardware/ Software selection, control and security: Phases in selection, Criteria for software selection, Hardware selection, Financial considerations in selection; Security definitions, Threats to system security, Control measures,



	system failures and recovery.
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Text Books:

1. "Jeffrey Whitten Lonnie D. Bentley" Systems Analysis and Design Methods 7th Edition "McGraw-Hill Education" 2007 "ISBN: 0073052337, 9780073052335"
2. "Kenneth E. Kendall Julie E. Kendall" Systems Analysis and Design 8th Edition Prentice Hall 2010 ISBN-13: 978-0136089162

Reference Books:

1. "Alan Dennis Barbara Haley Wixom Roberta Marie Roth" Systems Analysis and Design, 5th Wiley 2012 "ISBN- 1118057627, 9781118057629"
2. "Akhilesh Bajaj" Systems Analysis and Design for Advanced Modeling Methods: Best Practices 1st Edition IGI Global 2009 ISBN-978-1-60566-344-9 Stanislaw Wrycza
3. "Alan Dennis Barbara Haley Wixom Roberta M. Roth" Systems Analysis and Design 4th Edition "John Wiley & Sons Inc." 2008 ISBN-13: 978-0137689958" Scott Tilley Harry J. Rosenblatt" Systems Analysis and Design 11th Edition Cengage Learning 2017 ISBN-978-1-305-49460

Course Assessment Pattern

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		5	5		15
Apply					
Analyze		10	5		15
Evaluation					
Create		15			20
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

**ISCED: 0612****Course Code: CSE-3532****Course Title: Tools and Technologies for Internet Programming****Credit Hours: 2****Contact Hours: 4 lecture hours per week****Type: Core, Engineering****Prerequisite: Object Oriented Programming II (CSE 2401)**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

- To understand the concept of Web Application Development and its Architecture.
- To understand the Essentials of Web Application Development.
- To understand and practice web page designing techniques.
- To understand and practice embedded dynamic scripting on client side Internet Programming.
- To understand the differences between client side & server side technologies to develop Web Application.

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Understand modern protocols and systems used on the Web (such as HTML, HTTP, URLs, CSS, XHTML, and XML).	10%
2.	Apply appropriate tools for client side and server side programming to make interactive web application.	10%
3.	Analyze the security issues relevant to web applications.	30%
4.	Develop, deploy, and maintain web application	40%
5.	Evaluate professional, ethical, environmental, and social impacts and responsibilities of the designed project.	10%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand modern protocols and systems used on the Web (such as HTML, HTTP, URLs, CSS, XHTML, and XML).	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Apply appropriate tools for client side and server side programming to make interactive web application.	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Analyze the security issues relevant to web applications.	PLO1	Cognitive/Analyze	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment
CLO4	Develop, deploy, and maintain web application	PLO2 PLO5 PLO3 PLO4 PLO9 PLO10 PLO11	Cognitive/ Create	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO5	Evaluate professional, ethical, environmental, and social impacts and responsibilities of the designed project.	PLO6 PLO7 PLO10	Cognitive/Evaluate	Lecture, Discussion	Presentation, Report

List of Experiments:

1. HTML: Basic, Elements, Attributes, Headings, Paragraphs, Formatting, Links, Head, Images, Tables, Lists, Blocks, Layout, Forms, Colors, Colornames, CSS, JavaScript, Entities, URL Encode, Quick List
2. CSS: Introduction, Syntax, Id & Class, Styling Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Navigation Bar, Image Gallery



3. JavaScript: Introduction, Output, Statements, Comments, Variables, Data Types, Objects, Functions, Operators, Comparisons, Conditions, Loop, Errors, DOM Introduction, Number, String, Date, Array, Window, Screen, Location, History, Navigator, Popup Alert
4. PHP part 1: Syntax, Variables, String, Operators, If...Else, Switch, Arrays, While Loops, For Loops, Functions, Forms, \$_GET, \$_POST
5. PHP part 2: Date, Include, File Upload, Cookies, Sessions, E-mail, Error, Exception, PHP Database, PHP ODBC
6. MySQL part 1: Select, Distinct, Where, And & Or, Order By, Insert, Update, Delete, Like, In, Between, Alias, Joins, Union, Create DB, Create Table, Primary Key
7. MySQL part 2: Foreign Key, Drop, Alter, Increment, Views, Dates, Functions- avg(), count(), max(), Group By, Having, format()

Text Books:

1. "Paul Deitel" Internet & World Wide Web How to Program, Fifth Edition "Pearson Education Limited England" 2011 ISBN-10: Harvey Deitel and Abbey Deitel, ISBN-10: 0132151006, ISBN-13: 9780132151009

Reference Books:

1. Marty Hall and Core Web programming, Second Edition "Prentice Hall USA" 2001 ISBN: 987130897930 ISBN-13: 978-0130897930
2. Jeffrey C. Jackson Web Technologies: A Computer Science Perspective First Edition "Pearson Education Limited England" 2006 ISBN: 987131856030 ISBN-13: 978-0131856035
3. Patel Bankim and Bihari Barik Lal Introduction to Web Technology and Internet First Edition "Acme Learning Private Limited New Delhi" 2009 ISBN: 9878190710435 ISBN-13: 978-8190710435
4. Alexis Leon and Mathews Leon Internet for Everyone Second Edition "Vikas Publishing House" 2012 ISBN-10: New Delhi, ISBN-13: 978-8182093188



ISCED: 1613

Course Code: CSE-3631

Course Title: Operating System

Credit Hours: 3

Contact Hours: 3 lecture hours per week

Type: Core, Engineering

Prerequisite: CSE-3521 (Computer Architecture)

Co-requisite: CSE-3632 (Operating System Sessional)

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objective:

The objectives of this course are to:

1. Enable students to understand the operating system.
2. Make the students to understand how the operating system abstractions can be used in the development of application programs.
3. help the students to gain skills in developing basic resource management techniques

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Understand the basics of operating system.	30%
2.	Analyze the performance of various CPU scheduling algorithms and solve process synchronization and deadlock problems.	40%
3.	Examine the efficiency aspect of using system resources (processor, memory, file and disk)	30%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the basics of operating system.	PLO1	Cognitive/ Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Analyze the performance of various CPU scheduling algorithms and solve process synchronization and deadlock problems.	PLO2	Cognitive/ Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Examine the efficiency aspect of using system resources (processor, memory, file and disk)	PLO2	Cognitive/ Analyze	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment

Course Content:

Section-A (Mid-term: 30 Marks)

1. Principle of Operating Systems: Principle of operating systems and Operating system structure: Definition of operating system, Different kinds of operating systems (Desktop, Multiprocessor, Distributed, Clustered, Real time, Handheld systems), Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines.

2. Process: Process management, inter- process communication, Process scheduling, Process Concept, Operations on Processes, Inter process Communication, Communication in Client-Server Systems, Basic Concepts of Process Scheduling, Scheduling Criteria and Scheduling Algorithms.

3. Multiprocessing: Multiprocessing and time sharing, Process coordination: Multiple-Processor Scheduling, Thread Scheduling, Algorithm Evaluation, Control and scheduling of large information processing systems, Resource allocation; Dispatching; Processor access methods; Job control languages.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Deadlock: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

5. Memory Management: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Group-B (30 Marks)

6. Virtual Memory: The idea and advantage of virtual memory, Demand Paging, Page Replacement, Page Replacement Algorithms (FIFO, Optimal page replacement, LRU), Thrashing.

7. File Systems: File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-System Implementation, Directory Implementation and Allocation Methods.

8. Protection and Security: Protection, Principles of Protection, Domain of Protection, Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Fire walling to Protect Systems and Networks.

**Text Books:**

- 1 "Abraham Silberschatz Peter Baer Galvin Greg Gagne" Operating System Concepts 6th Edition Wiley 2001 ISBN-13: 978-0471417439

Reference Books:

1. Andrew S. Tanenbaum Modern Operating Systems. 3rd Edition Prentice Hall 2007
ISBN: 978-0133591620
2. Andrew S. Tanenbaum Distributed Operating Systems 1st Edition Dorling Kindersley Pvt. Ltd 2009 ISBN-13: 978-8177581799
3. Paul S. Wang Mastering LINUX 1st Edition Chapman and Hall 2010 ISBN-13: 978-1439806869

Course Assessment Pattern

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					15
Understand		15	5		15
Apply					
Analyze		15	5		20
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

**ISCED: 0613****Course Code:** CSE-3632**Course Title:** Operating System Lab**Credit Hours: 1****Contact Hours: 2 lecture hours per week****Type:** Core, Engineering**Prerequisite:** CSE-3521 (Computer Architecture)**Co-requisite:** CSE-3631 (Operating System)

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

- Understanding the operating system.
- Understanding the how the operating system abstractions can be used in the development of application programs.
- Develop basic resource management techniques.

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Demonstrate the familiarities with Unix commands and shell programming.	30%
2.	Apply the CPU scheduling algorithms, deadlock algorithms and page replacement algorithms.	35%
3.	Develop different components of a basic operating system.	35%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the familiarities with Unix commands and shell programming.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment,



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Apply the CPU scheduling algorithms, deadlock algorithms and page replacement algorithms.	PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment
CLO3	Develop different components of a basic operating system.	PLO2	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note	Exam, Quiz, Assignment, Lab performance

Serial	Name of Experiments
1	Process scheduling
2	Algorithm evaluation of job scheduling
3	Inter process communication
4	Time sharing system
5	Applying system calls
6	Deadlock handling
7	Deadlock handling
8	Apply swapping technique
9	Paging structure implementation
10	Paging structure implementation
11	Understanding segmentation
12	Understanding segmentation
13	File sharing implementation
14	File sharing implementation

Text Books:

1 "Abraham Silberschatz Peter Baer Galvin Greg Gagne" Operating System Concepts 6th Edition Wiley 2001 ISBN-13: 978-0471417439

Reference Books:

1. Andrew S. Tanenbaum Modern Operating Systems. 3rd Edition Prentice Hall 2007 ISBN: 978-0133591620
 2. Andrew S. Tanenbaum Distributed Operating Systems 1st Edition Dorling Kindersley Pvt. Ltd 2009 ISBN-13: 978-8177581799
 3. Paul S. Wang Mastering LINUX 1st Edition Chapman and Hall 2010 ISBN-13: 978-1439806869
- Advanced assembly language



7th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-3633	Computer Networks
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-3525 (Data Communication)		
Co-requisite: CSE-3634 (Computer Networks Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course are to

- familiarize with the design, implementation, analysis, and evaluation of global network
- learn to design principles and the architecture of this global network infrastructure
- learn the Internet architecture and study the major protocols in detail
- learn the techniques to analyze the performance of major protocols

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand and analyze the complex networks architectures and its components	20
2.	Evaluate the performance of protocols and Networks	30
3.	Demonstrate a familiarity with major network and security algorithms and protocols	30
4.	Identify and apply applications of computer networks with suitable alternatives of the networks	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	The complex networks architectures	PLO1 PLO2	Cognitive /Analyze	Lecture, Discussion	Class test, Assignment, Exam
CLO2	The performance of protocols	PLO4	Cognitive /Analyze	Lecture, discussion, Competitive Problem solving	Assignment Class test, Exam
CLO3	Major network and security algorithms and protocols	PLO8	Cognitive/Apply	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO4	Applications of computer networks with suitable alternatives	PLO7 PLO12	Cognitive /Analyze	Lecture, Class discussion, Competitive Problem solving	Class test, Assignment Exam

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Overview of the Internet, Some History of the Internet, Design principles and the architecture of the global network infrastructure and Internet, Heterogeneity and convergence of Computer Networks, comparative study of various network models TCP/IP, OSI, ATM etc. Design and analysis of the Link layer and multiple access protocols of wired and wireless networks. Throughput analysis of Pure Aloha, slotted Aloha.c.	02	CLO1
2	CSMA, CSMA/CD and CSMA/CA. Discussion on loop free network and collision avoidance network. Hidden node and exposed node problem of wireless network. Introducing and discussing the architectures of different types networks: IEEE802.11, Bluetooth, WPAN, WBAN, WSN.	06	CLO2
3	Introduction to IP, IPv4 addressing: Classful IP addressing, Subnetmask, CIDR, Subnetting, VLSM, Private and Public IP addressing, Network address translation (NAT). Introduction to IPv6: representation, address space, address space allocation, Mapping EUI-64, advantages of IPv6.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Designing issues of Network layer. Routing and forwarding, Circuit switching, Packet switching, datagram and virtual circuit approach Congestion control algorithms in network layer, Quality of service, ICMP, Routing algorithms: link state and distant vector.	04	CLO3
5	Broadcast routing, Unicast routing, Multicast routing, Anycast routing, ARP, RARP, Routing protocols RIP, OSPF, BGP etc.	06	CLO4
6	Design Issues of Transport Layer, Transport layer services, Transport service primitives, Connectionless and connection oriented transport layer service, Elements of transport protocols: Port address, Connection establishment, Connection release, Multiplexing.	02	CLO3
7	Transmission Control Protocol (TCP), TCP services, TCP buffers, TCP features, TCP segments, A TCP connection: connection establishment, data transfer, connection termination. Flow, Error and Congestion control in TCP, Applications of TCP. User datagram protocol: datagram format, UDP services, Applications of UDP, SCTP services, RTP, RTCP, MPLS etc.	04	CLO4



8	Introduction to Application layer, Application layer paradigms: Client-server paradigm, Introduction to network programming, Peer-to-Peer paradigm. Standard client-server protocols: WWW and HTTP, DNS, EmaSymmetric-key algorithms: DES, AES, and Cryptanalysis, Public Key algorithm: RSA, Communication security: IPsec, Firewalls, and Virtual Private Networks.il.	02	CLO3
			30

Text Books:

#	Authors	Title of Book	Edition	Publisher Year	ISBN
1.	Andrew S. Tanenbaum and David J. Wetherall	Computer Networks	5th Edition	Prentice Hall 2011	ISBN-13: 978-0-13-212695-3
2.	Behrouz A. Forouzan	Data Communications and Networking	5th Edition	McGraw Hill Education 2012	ISBN-13: 978-0073376226

Reference Books:

#	Authors	Title of Book Edition	Publisher Year	ISBN
1.	William Stallings	Cryptography and network Security Principles and Practice 7th Edition	Pearson Education 2017	ISBN 13: 978-0-13-335469-0
2.	James Kurose and Keith Ross	Computer Networking: A Top-Down Approach 6th Edition	Pearson 2013	ISBN-13: 978-0133594140

Course Assessment Pattern (Theory courses):



Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		10	5		20
Apply		10	5		20
Analyze		10			10
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



7 th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-3634	Computer Networks Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-3525 (Data Communication)		
Co-requisite: CSE-3633 (Computer Networks)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Lab Performance and Reports	60 Marks
	SEE: Semester End Examination		
			30 Marks

Objectives:

- a. The greater goal of this course is to introduce students the advance software tool for doing research as well as to enable them doing elementary works in the industry of computer networks
- b. Analyze the performance of popular link layer protocols to match the results with that of the theory
- c. Introduce simulation tools to show and implement the way existing communication protocols work
- d. Demonstrate some of the communication protocols at work

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate a fair command over Discrete Event Network simulator for performance analysis.	30
2.	Apply fair command over Network simulator for configuring different types of Networks.	40
3.	Implementing and Investigating the existing communication protocols to improve the efficiency of those protocols	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate a fair command over Discrete Event Network simulator for	PLO5	Cognitive/Apply	Lecture, Class discussion, Lab work,	Performance Report writing



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	configuring different types of Networks and performance analysis.			Note	Viva Presentation
CLO2	Implementing and Investigating the existing communication protocols to improve the efficiency of those protocols.	PLO4	Cognitive/Crete	Lecture, Class discussion, Lab work, Note	Performance Report writing Viva Presentation
CLO3	Design and Developing elementary things that might need in future research in the telecommunication industry.	PLO3 PLO9	Cognitive/Crete	Class discussion, Lab work, Note	Performance Report writing Viva Presentation

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	Install and introduce different parts of a network simulator. Implementing a simple network of two nodes using the simulator.	CLO1
2	Lecture, Problem solving	Enhancing the two-node network with additional features. Develop the simple network into a simple real-world network.	CLO1
3	Lecture, Problem solving	Analyze results (throughput, delay etc.) of the simple network.	CLO2
4	Lecture, Problem solving	Develop the simple network into a simple real-world network.	CLO1
5	Lecture	Implement pure ALOHA using the simulator and measure its performance	CLO2
6			
7	Lecture, Problem solving	Implement IEEE 802.11 using the simulator and measure its performance	CLO2
8	Lecture,	Study of different types of Network cables and practically	CLO1



Week	Activities	Topics	CLOs
	Problem solving	implement the cross-wired cable and straight through cable using clamping tool.	
9	Lecture, Problem solving	Introducing GNS3 software and study of basic commands of networked devices and network configuration commands.	CLO1
10	Lecture, Discussion	Construct a simple LAN using packet tracer; apply VLSM in IP planning.	CLO3
11	Lecture	Configure and analysis a network using Distance Vector Routing Protocol	CLO3
12	Lecture, Problem solving	Configure and analysis a network using Link State Routing Protocol	CLO3
13			
14	Lecture	Project Report and Presentation	CLO3
15	Lecture	Install and introduce different parts of a network simulator. Implementing a simple network of two nodes using the simulator.	CLO3

#	Authors	Title of Book	Edition	Publisher	Year	ISBN
1.	András Varga	Omnet++ Simulation manual	Version 5.5		2016	
2.	Team Contribution	INET Framework for OMNeT++ manual			2016	
3.	Todd Lammle	Cisco Certified Network Associate study guide	6th edition	Wiley Publishing Inc.	2007	ISBN-13: 978-0-470-11008-9

**ISCED: 0619**

6 th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-3635	Artificial Intelligence
Credit Hours: 3	Contact Hours: 3	Type:Core, Engineering
Prerequisite:	None	
Co-requisite:	CSE-3636 (Artificial Intelligence Lab)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

- **Understand** strong foundation of fundamental concepts in Artificial Intelligence.
- **Demonstrate** basic exposition to the goals and methods of Artificial Intelligence.
- **Apply** these techniques in applications which involve perception, reasoning and learning.
- Knowledge of methods of blind as well as informed search and ability to practically apply the corresponding techniques.
- General understanding of major concepts and approaches in knowledge representation, planning, learning, robotics and other AI areas.
- Developing programming skills for AI applications.
- Exposure to logic programming with Prolog.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Explain the modern view of AI as the study of agents that receive precepts from the environment and perform actions.	25
2.	Demonstrate awareness of informed search and exploration methods.	25
3.	Apply AI techniques for knowledge representation, planning and uncertainty management.	25
4.	Evaluate different decision making and learning methods.	25

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the modern view of AI as the study of agents that receive precepts from the environment and perform actions.	PLO1	Cognitive/Understand	Lecture, Problem solution	Quiz, Exam
CLO2	Demonstrate awareness of informed search and exploration methods.	PLO2	Cognitive/Understand	Lecture, Problem solution	Quiz, Exam, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Apply AI techniques for knowledge representation, planning and uncertainty management.	PLO2	Cognitive / Apply	Lectures, Notes, Practice Problems	Exam, Class Test, Assignment
CLO4	Evaluate different decision making and learning methods.	PLO4	Cognitive / Evaluate	Lectures, Notes, Practice Problems	Exam, Class Test, Assignment

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Concepts of Artificial Intelligence: Introduction, The Foundations of AI, The History of AI, AI technique, The State of the Art; Problems and Problem Solving: Problems, Example of Problems, Problem Formulation, Problem-solving methods.	02	CLO1
2	Various Searching Techniques: Search Strategies, Uninformed (blind) search strategies like Breadth-First search, Uniform cost search, Depth-First Search etc. and Informed or Heuristic Search Strategies like Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-End Analysis etc.	06	CLO2
3	Propositional and First-Order logic: Knowledge Representation, Reasoning and Logic; Propositional Logic: Syntax, Semantics, Validity and Inference, Rules of Inference for Propositional logic; First-Order Logic: Syntax and Semantics, Using first-order logic.	04	CLO2
Section-B (SEE: 50 Marks)			
4	Inference in first order logic: Inference Rules Involving Quantifiers, Example Proof, Generalized Modus Ponens, Forward and Backward Chaining, Completeness, Resolution.	04	CLO2
5	Game playing: Introduction, Perfect Decisions, Imperfect Decisions, Alpha-Beta Pruning; Natural language processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.	06	CLO2
6	Planning: Basic Plan-Generating Systems, Forward Production System, Representation for Plans, Backward Production System, STRIPS, and Examples with problem domain;	02	CLO2
7	Learning: Introduction to Learning, Inductive Learning, Learning Decision Trees, Neural Net Learning;	04	CLO3
8	Probabilistic Reasoning: Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Fuzzy Logic; Some Expert Systems: Representation and Using Domain Knowledge, Expert System Shells, Explanation, And Knowledge Acquisition.	02	CLO3
30			

Books :

Text Book :

3. Stuart Russell and Peter Norvig: Artificial Intelligence a Modern Approach 3rd Edition Pearson Education Asia. (Text Book)"

**Reference Books :**

2. Elaine Rich and Kevin Knight: "Artificial Intelligence 2nd Edition Tata McGraw-Hill Publishing Company Limited."
3. Nils J. Nilsson: Principles of Artificial Intelligence 5th Edition Narosa Publishing house."
4. L.H. Tsoukalas and R. E. Uhrig: Fuzzy and Neural Approches in Engineering. 1st Edition New York USA"

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



6 th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-3636	Artificial Intelligence Lab
Credit Hours: 1	Contact Hours: 2	Type:Core, Engineering
Prerequisite:	None	
Co-requisite:	CSE-3635 (Artificial Intelligence)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- To become familiar with the basic knowledge of PROLOG programming in order to write simple PROLOG programs and explore more sophisticated PROLOG code on their own.
- To become familiar with the basic concepts of AI.
- The students will be able to develop real world artificial intelligence

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate working knowledge in AI programming tools.	30
2.	Choose appropriate AI methods to solve a given problem.	30
3.	Develop basic AI systems in Prolog.	40

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate working knowledge in AI programming tools.	PLO5	Cognitive / Understand	Lecture & Laboratory Experiments	Assignment, Class performance, Exam
CLO2	Choose appropriate AI methods to solve a given problem.	PLO2	Cognitive / Apply	Lecture & Laboratory Experiments	Assignment, Class performance, Exam
CLO3	Develop basic AI systems in Prolog.	PLO3 PLO10	Cognitive / Create	Laboratory Experiments & Project Work	Assignment, Class performance, Exam

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	Various Uninformed Searching Techniques: Implementing different Uninformed (blind) search strategies like Breadth-First search, Uniform cost search, Depth-First Search etc.	CLO1



Week	Activities	Topics	CLOs
2	Lecture, Problem solving	Various Informed Searching Techniques: Implementing different Informed or Heuristic Search Strategies like Generate-and-test, Hill Climbing, Best-First Search etc.	CLO2
3	Lecture, Problem solving	Using Turbo Prolog: Starting Turbo Prolog, Creating a sample program, Editing, Getting help, Exiting the editor, File operations: Saving and Loading, Compiling and executing, Changing the default windows etc. Facts, Objects and Predicates: Expressing facts, Turbo Prolog objects, objects in knowledge representation theory, objects in procedural programming,	CLO2
4	Lecture, Problem solving	Prolog Variables: The Prolog variables, Bound and free variables. Anonymous Variables, Compound Goals, Backtracking, Variable rules. Using Rules: Rules, Using rules to solve problems, variables in rules, Using the trace, Unification, Execution control, The built-in predicates, The not predicate. Simple Input and Output Input predicates: The readln predicate, The readchar predicate, The readint predicate, The readreal predicate, The inkey and keypressed predicates, Output predicates: The write predicate, The writeln predicate.	CLO2
5	Lecture	Recursion: The concept of recursion, The repeat predicate, Basic rules of recursion, unwinding, practical applications of recursion. Arithmetic Operations: A simple example, The equal operator, Comparison operators, Turbo Prolog's built-in mathematical functions, Testing for binding, Using the arithmetic predicates, Counters, Type conversions, Random-Number Generation.	CLO4
6	Lab test 1		
7	Lecture, Problem solving	Using Compound Objects: Compound objects, Applying compound objects, Reducing the number of rules in a program, Treating related information as a single object, Distinguishing among several kinds of objects, Entering data in a compound object.	CLO2
8	Lecture, Problem solving	Using Lists Declaring list domains, Unification using lists, Lists of list, Programming with lists, List operation, Writing lists, Appending a list, Reversing a list , Finding the last element of a list , Finding the nth element of a list, Multiple domain types in a list.	CLO2
9	Lecture, Problem solving	String Operation Turbo Prolog strings, String operations, Concatenation, The frontstr, Predicate, Determining string length, The frontchar predicate, The fronttoken predicate, The isname predicate, The upper_lower predicate.	CLO2
10	Lecture, Discussion	File Operations with Turbo Prolog: Introduction to files, Opening and closing files, Random file access.	CLO4
11	Lecture	Adversarial Search: Implementing MiniMax Algorithm and Alpha-Beta Pruning.	CLO3
12	Lecture, Problem solving	Building an Expert System: Build an expert system for medical diagnostic system.	CLO3
13	Lab test 2		



Week	Activities	Topics	CLOs																																																																																																																							
14	Lecture	Construct a neural network that computes the OR function of two inputs.	CLO4																																																																																																																							
15	Lecture	<p>Consider the following set of examples, each with six inputs and one target output</p> <table border="1"> <tr><td>I1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>I2</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>I3</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>I4</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>I5</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>I6</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>T</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> </table> <p>a) Run the perceptron learning rule on these data and show the final weights. b) Run the decision tree learning rule and show the resulting decision tree.</p> <p>•</p>	I1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	I2	0	0	0	1	1	0	0	1	1	0	1	0	1	1	1	1	I3	1	1	1	0	1	0	0	1	1	0	0	0	1	1	1	1	I4	0	1	0	0	1	0	0	1	0	1	1	1	0	1	1	1	I5	0	0	1	1	0	1	1	0	1	1	0	0	1	0	0	0	I6	0	0	0	1	0	1	0	1	1	0	1	1	1	0	0	0	T	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	CLO2
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Books :

Text Book :

- 1. Introduction to Turbo Prolog - Carl Townsend

Reference Books :

- 2. The Art of Prolog – Leon Sterling, Ehud Shapiro

**ISCED: 0613****Course Code: CSE-3641****Course Title: Software Engineering****Credit Hours: 3****Contact Hours: 3****Type: Core, Engineering****Pre-requisite: CSE-3529 (Systems Analysis and Design)****Co-requisite: CSE-3642 (Software Engineering Lab)****Course Objectives:**

- Be able to identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements
- Be able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software development project
- Be able to understand of professional, ethical and social responsibility of a software engineer
- Be able to understand of different software architectural styles.
- Be able to understand of implementation issues such as modularity and coding standards.
- Be able to understand of approaches to verification and validation including static analysis, and reviews.
- Be able to convey technical material through written reports which satisfy accepted standards for writing style

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Compare among the various software engineering models.	30
2.	Develop specific project requirements and goals for a software project.	25
3.	Explain the basic concepts and application techniques in software design.	25
4.	Impact the result of testing for assessing and recovery of software error.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Compare among the various software engineering models.	PLO1	Cognitive/ understand	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.
CLO2	Develop specific project requirements and goals for a software project.	PLO2	Cognitive/ Create	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment.
CLO3	Explain the basic concepts and application techniques in software design.	PLO1	Cognitive/ understand	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.
CLO4	Impact the result of testing for assessing and recovery of software error.	PLO2 PLO4	Cognitive/ Analyze	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.

Course Content:

Section-A (Mid-term: 30 Marks)

1. Introduction: Software, nature and problems of software, engineering vs. software engineering, state of the art of software engineering, characteristics of software, basic elements of engineering Software, software process model, costs of software engineering, software engineering methods, professional and ethical responsibility of a software engineer.

2. Software Processes: Software process and software process model, different software process models: linear sequential, water fall, prototyping, incremental, spiral, advanced software development life cycle and other appropriate models.

3. Software Requirements: Requirement definition, Functional and non-functional requirements, requirement specification, software Prototyping, Basic concepts of different formal software specification techniques

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Requirement Engineering Processes: requirement engineering process, software requirements document, requirement validation and evolution, requirement analysis process model, system contest, social and organisational factors, data-flow models, semantic data models, object models, Data dictionaries,

5. Software Design: Context of software design, design process, design quality and strategies, system structuring, control models, modular decomposition, domain-specific architecture, data-



flow design, structural decomposition, detailed design, JSP, Coupling and Cohesion, attributes of design, object-oriented design and Component-level design, design principles, user-system interaction, information presentation, user guidance, interface evaluation, design for reuse.

Group-B (30 Marks)

6. Software Validation and Verification: Verification and validation planning, testing fundamentals, including test plan creation and test case generation, black-box and white-box testing techniques, unit, integration, validation, and system testing, object-oriented testing, inspections

7. Software Evolution: Software maintenance, characteristics of maintainable software, re-engineering, legacy systems, Software reuse and configuration.

8. Software Management: Cognitive fundamentals, management implications, project staffing, software cost estimation techniques, different models (COCOMO, tree, PNR curve, statistical and Delphi), process quality assurance, Software and documentation standards, software metrics and product quality metrics, Zipf's law, Halstead formula, Fan in/Fan out, information Fan in/Fan out, Henry and Kafura's metric, Card and Glass's Systems Complexity, process and product quality, process (analysis, modeling, measurement, SEI process maturity model and classification).

Others: Software reliability metrics, software reliability specification, statistical testing and reliability growth modeling, Use of CASE tools and technological support in engineering software, introduction to unified modeling language—UML

Text Books:

1. Ian Sommerville Software engineering 9th, Pearson-Addison-Wesley 2011 ISBN: 987013703515-2
2. Roger S Pressman Software engineering – a practitioner's approach 7th McGraw-Hill 2010 ISBN 978-0-07-337597-7

Course Assessment Pattern

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		15	5		15
Apply					
Analyze		15	5		15
Evaluation					
Create					20
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

**ISCED: 0613****Course Code: CSE-3642****Course Title: Software Engineering Lab****Credit Hours: 1****Contact Hours: 2****Type: Core, Engineering****Pre-requisite: CSE-3529 (Systems Analysis and Design)****Co-requisite: CSE-3641 (Software Engineering)**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

At the end of the course students should know how writing programs with tough assurance targets, in large teams, or both, differs from the programming exercises they have engaged in so far. They should appreciate the waterfall, spiral and evolutionary models of software development and be able to explain which kinds of software project might profitably use them. They should appreciate the value of other tools and the difference between incidental and intrinsic complexity. They should understand the software development life cycle and its basic economics. They should be prepared for the organizational aspects of their Part IB group project.

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage(%)
1.	Develop requirement specification and identify appropriate software process model	30
2.	Design software model based on the requirement specification	25
3.	Develop software based on the designed model	25
4.	Analyze the software for quality assurance	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Develop requirement specification and identify appropriate software process model	PLO2 PLO4	Cognitive/ Create	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Design software model based on the requirement specification	PLO2	Cognitive/ Create	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment.
CLO3	Develop software based on the designed model	PLO3	Cognitive/ Create	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.
CLO4	Analyze the software for quality assurance	PLO2	Cognitive/ Analyzing	Lecture, Class discussion, Assignment, Note.	Exam, Quiz, Assignment.

Course Content:

Students have to develop a larger piece of software in the Software Engineering Lab. The main objective is to learn group work and to gain practical experience with some software engineering methodologies, methods and supporting tools. The lab is organized into four phases:

1. System design and specification (3 weeks)

Students are given a larger problem to solve. Groups of up to 5 students develop a design document which identifies key components, the interfaces between those components, and the integration tests that can be used later to verify that the system is working correctly. The resulting design document will be graded in the 3rd week of the lab. Grading criteria:

- Design quality and correctness (20%)
- Usability of the design document (10%)
- Organization of the design document (10%)
- Structural UML diagrams (e.g., class diagrams) (10%)
- Behavioral UML diagrams (e.g., sequence or collaboration diagrams) (10%)
- Description and completeness of test cases (20%)
- Presentation of the design during the lab (20%)

Several groups will develop independent design solutions for the same problem. The designs will be presented and the best designs will be selected for further development.

2. Component development using extreme programming (8 weeks)

In the second phase, students will exercise extreme programming cycles in order to develop components identified by the overall system design. Each cycle lasts two weeks (since students only work part-time on the lab). After each cycle, the progress will be discussed and plans will be fixed for the next cycle. Students work in teams of two students in each cycle and groups will change every cycle. The results produced in each cycle will be graded. Grading criteria:

- Challenge and degree of achievement of negotiated task (25%)
- Code quality (proper use of language, information hiding, makefiles ...) (25%)
- Test cases (executable, sufficient in number and quality,) (25%)
- Adequate code documentation, consistency with design documentation (25%)

3. System integration and system testing (2 weeks)

The third phase is concerned with the integration of the components and the testing of the overall system. The integration test cases identified in phase 1 should be exercised (or



updated and complemented as needed). Students work now again in larger groups. The system integration and testing phase must be documented appropriately and the documentation will be graded.

4. Tournament and wrap up (1 week)

In the last phase, there will be a tournament where students can let bugs play against each other. Students who write smart bugs may get some bonus points.

Text Books:

1. Ian Sommerville Software engineering 9th Pearson- Addison-Wesley 2011 ISBN: 987013703515-2
2. Roger S Pressman Software engineering – a practitioner’s approach 7th McGraw-Hill 2010 ISBN 978-0-07-337597-7

**ISCED: 0613****Course Code: CSE-3644****Course Title: Software Development 2 Lab****Credit Hours: 1****Contact Hours: 2****Type: Core, Engineering****Prerequisite: CSE-3532 (Tools and Technologies for Internet Programming)**

Course Assessments	CIE:	Attendance	10 Marks
	Continuous Internal Evaluation	Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Objectives:

The goal of this course is to develop software in application level by the knowledge of previous knowledge such as database system, software engineering, data structure etc. The software will mainly database oriented. In daily life we feel different problem that may be solved by automated system. At the start of the semester students will have to prepare to development on a particular topics. They also have to mention the reason to development such software. They are also required to follow the procedure of software such as collection of user requirements by visiting different organization/institution or company.

They will use any of the following high label programming such as Java, Visual C++ or Visual Basic, Web pages with ASP/JSP/PHP as front-end Oracle, SQL Server, My SQL, Ms Access as back-end.

Some examples of software are:

1. House hold accounting- for budgeting of a particular family.
2. Library management system-to run a library.
3. Payroll system.
4. Lubricating oil management system.
5. Super shop management system.
6. To perform other experiments relevant to this course.

Learning Outcomes:

1. At the end of this course, students should be able to:
2. Independently design programs
3. Produce professional-quality code
4. Implement large programs of greater than 2.5k lines of code
5. Design and execute tests to identify software bugs
6. Repair software bugs, redesigning and refactoring code when necessary
7. Utilize, analyze, and critique code written by others

Syllabus:

Week	Topic
Week 01:	Course Introduction
Week 02:	File IO, Exception Handling
Week 03:	Data Structures, Iteration, Object-Oriented Programming



Week 04:	Inheritance, Interfaces
Week 05:	Debugging, Logging
Week 06:	Multithreading Basics
Week 07:	MIDTERM EXAM
Week 08:	<i>Spring Break – No Classes</i>
Week 09:	Advanced Multithreading
Week 10:	Regular Expressions, Unit Testing
Week 11:	Web, Sockets, HTML, HTTP
Week 12:	Servlets, Jetty, Cookies, Sessions
Week 13:	Databases, SQL, and JDBC
Week 14:	FINAL EXAM
Week 15:	Comprehensive Example
Week 16:	Special Topics
Finals:	Final Project Interactive Grading

Reference Books:

1. Oracle Complete Reference: Oracle Press
2. Official Document of Microsoft Press: Visual Basic 6.0 Programmer's Guide
3. BPB Publications : Mastering Visual Basic 6
4. Jerke (Tata McGraw Hill): The Complete Reference Visual Basic 6
5. Silbershatz, Korth: Database System Concepts
6. Jeffry O Ullman: Principles of Database System
7. Step by Step - Riorain: Microsoft SQL Server 2000 Programming



ISCED: 0031

Course code : CSE-4708

Course title : Field Work

Credit Hours: 1

Contact Hours: 2 weeks

Students will get practical experience for at least 2 weeks from a computer related industry. Students will be evaluated on the basis of a report submitted by them after the completion of the training, oral examination and report from the concerned industry. This training is to be organized during the inter-session break. Or project work.

**ISCED: 0613****Course Code: CSE-4741****Course Title: Computer Graphics****Credit Hours: 3****Contact Hours: 3 lecture hours per week****Type: Core, Engineering****Prerequisite: CSE-2421 (Computer Algorithm), Math-2307 (Mathematics III)****Co-requisite: CSE-4742 (Computer Graphics Sessional)**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
- A thorough introduction to computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering. Topics cover: geometric transformations, geometric algorithms, software systems (OpenGL, shaders), 3D object models (surface, volume and implicit), visible surface algorithms, image synthesis, shading and mapping, ray tracing, radiosity, global illumination, photon mapping, and anti-aliasing.
- The interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

Course Learning Outcomes

Upon completion of this course, students will be able to do the following:

#	CLO Description	Weightage (%)
1.	Explain the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two and three dimensions.	30
2.	Understand the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.	30
3.	Analyze key algorithms for modelling and rendering graphical data.	20
4.	Apply the mathematical foundation of the concepts of computer graphics.	20

Mapping of CLO-PLO:

Sl. No.	CLOs	PLOs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CLO1	Explain the core concepts of computer graphics, including viewing,	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Quiz, Exam, Class test



	projection, perspective, modelling and transformation in two and three dimensions.				
CLO2	Understand the concepts of color models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.	PLO 1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Quiz, Exam, Class test
CLO3	Analyze key algorithms for modelling and rendering graphical data.	PLO2	Cognitive / Analyze	Lecture, Class discussion, Assignment, Note	Quiz, Exam, Class test
CLO4	Apply the mathematical foundation of the concepts of computer graphics.	PLO 2	Cognitive / Apply	Lecture, Class discussion, Assignment, Note	Quiz, Exam, Class test

Course Content:

Section-A (Mid-term: 30 Marks)

- 1. Computer Graphics:** Introduction to computer graphics: brief history, applications, hardware and software and the fundamental ideas behind modern computer graphics, Characteristics of display devices
- 2. Image representation:** Representing primitive's objects: point, line, circle, ellipse, rectangle, polygon, arc and sector, Representation of Characters, Filling Algorithm, Aliasing, Anti-aliasing etc.
- 3. Two Dimensional Objects:** Two-dimensional transformations, translation, rotation, scaling, mirror reflection.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

- 4. Two Dimensional Viewing and Clipping:** Two dimensional viewing, line, circle and polygon clipping, 2D graphics pipeline, Composite and Instance transformation.
- 5. Three Dimensional Objects:** Three-dimensional transformations, translation, rotation, scaling, mirror reflection, three dimensional viewing, line, circle and polygon clipping, 3D graphics pipeline, Composite and Instance transformation.

Group-B (30 Marks)



- 6. Projection & Curves:** Projection, orthogonal and perspective projection, perspective anomalies, parallel projection,
3D curves and surfaces
- 7. Hidden Surface:** Hidden Surface, hidden-surface algorithms, z-buffer algorithm Color and shading models
- 8. Ray Tracing & Modeling** Ray Tracing, Future trends in computer graphics, modeling of 3D Objects, polygonal net model, wire-frame model.

Text Books:

- Roy Plastock and Zhigang Xiang Computer Graphics 2nd McGraw-Hill Education 2000
ISBN-13: 978-0071357814

Reference Books:

- "Foley Hughes" Computer Graphics Principles and Practice 3rd Addison-Wesley Professional 2013 ISBN-13: 978-0321399526
- William M. Newman Principles of Interactive Computer Graphics - McGraw-Hill 1973 ISBN-10: 9870070463379
- "F.S. Hill S.M. Kelley" Computer Graphics Using OpenGL 3rd Pearson 2006 ISBN-13: 978-0131496705
- Alan Watt 3D Computer Graphics 3rd Addison-Wesley 1999 ISBN-13: 978-0201398557
- Steven Harrington Computer Graphics and Programming Approaches McGraw-Hill 1987 ISBN-13: 978-0071004725
- The Red Book OpenGL programming Guide. Eighth Addison-Wesley Professional 2013 ISBN-13: 978-0321773036

Course Assessment Pattern

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		15	5		15
Apply		5			15
Analyze		10	5		20
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

**ISCED: 0613****Course Code: CSE-4742****Course Title: Computer Graphics Lab****Credit Hours: 1****Contact Hours: 2 lab hours per week****Type: Core, Engineering****Prerequisite: CSE-2422 (Computer Algorithm Sessional)****Co-requisite: CSE-4741 (Computer Graphics)****Contact Hours: 2 per week**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Learning Outcomes:

Students who complete the course will have the ability to do the following:

#	CLO Description	Weightage (%)
CLO1	Employ the key ideas (modelling, viewing, transformations) for modelling a 3D object or scene.	30
CLO2	Apply projection, lighting, shading, , colour modelling, textures, ray tracing and rasterization techniques to render a 2D image for a 3D scene.	40
CLO3	Create interactive computer graphics programs using OpenGL.	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Employ the key ideas (modelling, viewing transformations) for modelling a 3D object or scene.	PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work.	Exam, Quiz, Assignment, Competitive Problem Solving



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Apply projection, lighting, shading, , color modelling, textures, ray tracing and rasterization techniques to render a 2D image for a 3D scene.	PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work	Exam, Quiz, Assignment, Competitive Problem Solving
CLO3	Create interactive computer graphics programs using OpenGL.	PLO5	Psychomotor/Guided response	Lecture, Class discussion, Assignment, Lab work, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Experiment Names:

1. Draw a Line using Polynomial Line Algorithm, DDA Line Algorithm, Bresenham's Line Algorithm
2. Draw a Circle using Midpoint Circle Algorithm, Polynomial circle algorithm, Trigonometric circle algorithm, Bresenham's circle algorithm
3. Draw an Ellipse using Polynomial algorithm, Trigonometric algorithm.
4. Draw an Arc and a sector.
5. Scan conversion of various characters: using Bitmap method and Outline method
6. Scan converting a character bangle ka using Bitmap method and Outline method
7. Scan convert Shohid Minar, Sriti Shoudo, a clock and a flower.
8. Rotate a Line, Triangle and Rectangle about a point.
9. Magnifying a circle, a triangle and a rectangle about a point.
10. Create a flower with rotating an object.
11. Scan convert a three-dimensional "F" and cube then rotate the object about x-axis and magnify it.
12. Rotate a 3D cube and Sriti Shoudo using OpenGL.
13. Projection of 3D cube
14. Line & polygon clipping problems.
15. Project using OpenGL.
16. To perform also other experiments relevant to this course.

Text Books:

1. Roy Plastock and Zhigang Xiang Computer Graphics 2nd McGraw-Hill Education 2000
ISBN-13: 978-0071357814

Reference Books:

1. "Foley Hughes" Computer Graphics Principles and Practice 3rd Addison-Wesley Professional 2013 ISBN-13: 978-0321399526



2. William M. Newman Principles of Interactive Computer Graphics - McGraw-Hill 1973 ISBN-10: 9870070463379
3. "F.S. Hill S.M. Kelley" Computer Graphics Using OpenGL 3rd Pearson 2006 ISBN-13: 978-0131496705
4. Alan Watt 3D Computer Graphics 3rd Addison-Wesley 1999 ISBN-13: 978-0201398557
5. Steven Harrington Computer Graphics and Programming Approaches McGraw-Hill 1987 ISBN-13: 978-0071004725
6. The Red Book OpenGL programming Guide. 8th Addison-Wesley Professional 2013 ISBN-13: 978-0321773036



7th Semester		
ISCED Code	Course Code	Course Title
0619	CSE-4743	Computer Security
Credit Hours: 2	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-3633		
Co-requisite: CSE-4744		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- To provide introduction to the concept of Network Security Model and Cryptography systems.
- To give the knowledge of Digital Signature and other Security Measures available.
- To familiarize with the various techniques like PGP and S/MIME.
- To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks.
- To explain the firewall design principles and various intrusion detection system.
- To understand the network privacy and crypto currency.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
CLO1	Understand the concepts of computer security and various symmetric and asymmetric cryptographic methods.	30
CLO2	Apply cryptographic techniques e.g. digital signature, PGP, S/MIME etc.	30
CLO3	Evaluate ip security architecture & transport layer security	20
CLO4	Apply firewall design principles to detect various intrusion systems for achieving maximum system security.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the concepts of computer security and various symmetric and asymmetric cryptographic methods.	PLO1	Cognitive/Understand	Lecture Class Discussion Assignment	Exam Quiz Assignment
CLO2	Apply cryptographic	PLO2	Cognitive/Apply	Lecture Class	Exam



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	techniques e.g. digital signature, PGP, S/MIME etc.			Discussion Assignment	Quiz Assignment
CLO3	Evaluate ip security architecture & transport layer security	PLO4	Cognitive/ Evaluate	Lecture Class Discussion Assignment	Exam Quiz Assignment
CLO4	Apply firewall design principles to detect various intrusion systems for achieving maximum system security.	PLO1	Cognitive/Apply	Lecture Class Discussion Assignment	Exam Quiz Assignment

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Computer Security Concepts, Security Attacks, Security Services, Security Mechanism, A Model for Network Security.	3	CLO1
2	Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers and the Data Encryption.	4	CLO1, CLO2
3	Euclid's Algorithm, Placement of Encryption Function, Traffic Confidentiality, key distribution.	3	CLO1, CLO3
Section-B (SEE: 50 Marks)			
4	Prime Numbers, Fermat's and Euler's Theorems, Principles of Public-Key Cryptography, the RSA Algorithm, Key Management, Diffie- Hellman Key Exchange	4	CLO1, CLO2
5	Cryptographic Hash Function: Applications, Requirements & Security, SHA-3, Authentication Requirements, Authentication Functions, Digital Signatures, Digital Signature Standards. Authentication Application & Electronic Mail, Security: Kerberos, X.509 Authentication Service, Pretty Good Privacy, S/MIME.	4	CLO1, CLO2, CLO3
6	IP Security and Web Security: IP Security overview, IP Security Policy, Encapsulating Security Payload, Transport Level Security	3	CLO1, CLO3, CLO4
7	Wireless Network and Mobile Security: Challenges, Attacks based on Communication, vulnerabilities in Software application, Countermeasures System Security: Intruders, Intrusion Detection,	3	CLO1, CLO4



	Firewalls, Cloud Security: Threats, Cloud Security Controls.		
8	Network Privacy, TOR Network, Blockchain Algorithm, Crypto Currency.	4	CLO1, CLO2

Books :

Text Book :

1. William Stallings, Cryptography and network Security Principles and Practice, 5th Edition, "Pearson Education Inc." 2015, ISBN 13: 978

2. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw

Reference Books :

1. Andreas M. Antonopoulos, Mastering Bitcoin, 1st Edition "O'Reilly Media Inc." , ISBN: 978-1-449-37404-4
2. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition Pearson, and ISBN-13: 978-0133594140
3. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Prentice Hall ISBN-13: 978-0-13-212695-3

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember					
Understand		15	5		15
Apply		5			15
Analyze					
Evaluation		10	5		20
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



7th Semester		
ISCED Code	Course Code	Course Title
0619	CSE-4744	Computer Security Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-3633 (Computer Networks)		
Co-requisite: CSE-4744 (Computer Security)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- Demonstrate** a fair command over advance software tool for performance analysis.
- Analyze** the performance of popular security protocols to match the results with that of the theory.
- Implementing and Investigating** the existing security and privacy protocols to improve the efficiency of those protocols.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
CLO1	Demonstrate a fair command over advance software tool for security vulnerability analysis.	40
CLO2	Analyze the performance of popular security protocols	30
CLO3	Improve the efficiency of existing security after investigating them.	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate a fair command over advance software tool for security vulnerability analysis.	PLO5	Cognitive/Apply	Lecture Class Discussion Assignment Lab Work Papers	Exam Assignment Project Presentation
CLO2	Analyze the performance of popular security protocols	PLO4	Cognitive/Analyze	Lecture Class Discussion Assignment Lab Work Papers	Exam Assignment Project Presentation
CLO3	Improve the efficiency of existing security after investigating them.	PLO3 PLO4 PLO9	Cognitive/Create	Lecture Class Discussion	Exam Assignment Project



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
				Assignment Lab Work Papers	Presentation

Lecture Plan:

Task No.	Week	Experiment Name	CLOs
1.	1	Database design and Granting appropriate privileges to the web application user based on principle of least privilege (class-1)	CLO3
1.	2	Database design and Granting appropriate privileges to the web application user based on principle of least privilege (class-2)	CLO3
2.	3	Database design and Granting appropriate privileges to the web application user based on principle of least privilege (class-3)	CLO3
3.	4	Applying appropriate encryption and hashing methods/algorithms to store confidential information	CLO2
4	5	Implementation of widely used cryptographic algorithms (class-1)	CLO2
4	6	Implementation of widely used cryptographic algorithms (Class-2)	CLO2
5	7	Securing data at IP Layer with IPSEC(class-1)	
5	8	Securing data at IP Layer with IPSEC(class-2)	CLO1
6	9	Cryptanalysis of transposition cipher(class-1)	CLO1
6	10	Cryptanalysis of transposition cipher(class-2)	CLO1
7	11	Installation of Kali Linux	CLO1
8	12	Scanning and Security Vulnerability Analysis with nmap	CLO1

Books :

Text Book :

1. Kali Linux, Tutorials Point (I) Pvt. Ltd., 2017
2. Robert W. Beggs, Mastering Kali Linux for Advanced Penetration Testing, Packt Publishing, 2014, ISBN 978-1-78216-312-1
3. William Stallings, Cryptography and network Security Principles and Practice, 6th edition, Pearson Education, Inc., ISBN 13: 978-0-13-335469-0
4. Andreas M. Antonopoulos, Mastering Bitcoin, O'Reilly Media, Inc, ISBN: 978-1-449-37404-4



7th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-4745	Numerical Methods
Credit Hours: 2	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-4746 (Numerical Methods Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objectives of this course is introducing students to the mostly used numerical methods in the different engineering fields. The emphasis will be on understanding the concepts of the numerical methods and on applying these concepts for solving various problems. C/C++ Programming and MATLAB will be used as tools to solve the problems using the different numerical methods

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Understand the basics of errors in numerical calculations, solution of linear and non-linear equations.	15
2.	Apply the knowledge of numerical calculations to solve errors and solution of linear and non-linear equations.	25
3.	Understand the fundamentals of interpolation and curve fitting.	10
4.	Apply the formulas of interpolation and curve fitting.	15
5.	Understand different theories of numerical differentiation, integration and ordinary differential equations.	15
6.	Apply the formulas of different theories of numerical differentiation, integration and ordinary differential equations.	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand the basics of errors in numerical calculations, solution of linear and non-	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	linear equations.				
CLO2	Apply the knowledge of numerical calculations to solve errors and solution of linear and non-linear equations.	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Understand the fundamentals of interpolation and curve fitting.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note, class test, Problem Solving	Exam, Quiz, Assignment
CLO4	Apply the formulas of interpolation and curve fitting.	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Class test	Exam, Quiz, Assignment
CLO5	Understand different theories of numerical differentiation, integration and ordinary differential equations.	PLO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note, class test	Exam, Quiz, Assignment
CLO6	Apply the formulas of different theories of numerical differentiation, integration and ordinary differential equations.	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, class test	Exam, Quiz, Assignment

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Errors in numerical calculations: What is numerical methods, It's areas, Exact & Approximate numbers, Significant figures, Banker's rounding rule, Sources of errors – Inherent errors, Roundoff errors, Truncation errors; Absolute, Relative & Percentage errors, Error propagation.	03	CLO1 CLO2
2	Solution of non-linear equations: Intermediate value theorem, Bisection method, False position method, Direct substitution method, Newton-Raphson method, Secant method, Evaluation of polynomials, Newton's Binomial expansion formula, Horner's rule,	03	CLO1 CLO2



	Synthetic division, Finding multiple roots using bisection method and Newton-Raphson method		
3	Interpolation: Definition, Finite Differences – Forward difference, Backward difference, Central differences; Shift operator, Averaging operator; Divided difference; Error propagation in a difference table; Newton's Forward and Backward interpolation formula; Central difference interpolation formulas – Gauss Forward, Gauss Backward, Starling's formula, Bessel's formula; Interpolation with unequal intervals – Lagrange's interpolation formula, Newton's general divided difference formula; Inverse interpolation-Lagrange's inverse interpolation formula, method of successive approximation	06	CLO3 CLO4
Section-B (SEE: 50 Marks)			
4	System of linear equations: Definition, Review of Matrix, Matrix inversion method, Gauss Elimination method, Gauss-Jordan method, Cramer's rule, Dolittle LU method, Iterative method - Jacobi's method, Gauss-Seidel method, Eigen vector and Eigen value problem	06	CLO1 CLO2
5	Curve fitting: Definition, importance of curve fitting, Least square method, Fitting a straight line, Non-linear curve fitting	02	CLO3 CLO4
6	Numerical differentiation: Definition, Derivatives using Newton's Forward and Backward difference and Central difference interpolation formulas, Maximum and minimum values of a tabulated function	02	CLO5 CLO6
7	Numerical Integration: Definition, General Quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Boole's rule.	03	CLO5 CLO6
8	Numerical Solution of ordinary differential equations: Review of Differential equation, Taylor's series method, Euler's method, Heun's method, Runge-Kutta method	03	CLO5 CLO6
28			

Books:

Text Book :
1. E Balagurusamy, Numerical Methods, 4th Edition, Tata McGraw-Hill, 2000, ISBN-0-07-463311-2
2. G. Shanker Rao, Numerical Analysis, 3rd edition, New Age International (P) Limited, 2006, ISBN-81-224-1834-1
Reference Books :
1. S.S.Sastry, Introductory Methods of numerical Analysis, 5th Edition, PHI Learning Private Limited, New Delhi-110001 2012 ISBN-978-81-203-4592-8
2. S Balachandra Rao, C K Shantha, Numerical Methods, Revised Edition, Universities Press (India) Private Limited, 2012, ISBN-978-81-7371-472-6
3. Steven C. Chapra & Raymond P. Canale, Numerical Methods for Engineers, 3rd edition, Tata McGraw-Hill, Inc, 2000
4. J. B. Scarborough, Numerical Mathematical Analysis, 6th edition, The John Hopkins Press, 1996

**Course Assessment Pattern (Theory courses):**

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		20
Apply		15	5		25
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



7th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-4746	Numerical Methods Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-1122 (Computer Programming 1 Lab)		
Co-requisite: CSE-4745 (Numerical Methods)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	40 Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The objective of this course is to implement different numerical methods to solve different types of problems by computer. Problems should be of different types, such as numerical linear algebra, solving systems of linear equations, curve fitting, and numerical solutions to ordinary differential equations. C/C++ Programming and MATLAB will be used as tools to solve the problems using the different numerical methods.

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CO Description	Weightage (%)
CLO1	Implement the formulas of solution of linear and non-linear equations, interpolation and curve fitting, numerical differentiation, integration, and ordinary differential equations.	50
CLO2	Apply the knowledge of numerical calculations to solve problems related to the solution of linear and non-linear equations, interpolation and curve fitting, numerical differentiation, integration, and ordinary differential equations.	50

Mapping of CLO-PLO:

#	CO Description	POs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Implement the formulas of solution of linear and non-linear equations, interpolation and curve fitting, numerical differentiation, integration, and ordinary differential equations.	PLO2	Cognitive/Understand	Lecture, Class discussion, Lab works, Note	Exam, Quiz, Assignment, Competitive problem solving
CLO2	Apply the knowledge of numerical calculations to solve	PLO1	Cognitive/Apply	Lecture, Class discussion,	Exam, Quiz, Competitive



#	CO Description	POs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	problems related to the solution of linear and non-linear equations, interpolation and curve fitting, numerical differentiation, integration, and ordinary differential equations.			Assignment, Lab works, Note	problem solving

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	1. Write a program to count number of significant digits in a given number. 2. Write a program to round off a number with n significant figures using banker's rule. 3. Write a program to evaluate a polynomial $f(x) = x^3 - 2x^2 + 5x + 10$ by using Horner's rule $x = 5$.	CLO1
2	Lecture, Problem solving	4. Write a program to find the root of the equation $x^3 - 9x + 1 = 0$, correct to 3 decimal places, by using the bisection method. 5. Write a program to find the root of the equation $x^5 + 3x^2 - 10 = 0$, correct to 3 decimal places, by the using fixed point method. 6. Write a program to find the root of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places, by using Newton-Raphson method. 7. Write a program to find the root of the equation $x^3 - x + 2 = 0$, correct to 3 decimal places, by using false position method.	CLO1
3	Lecture, Problem solving	8. Write a program to find the root of the equation $x^3 - 5x^2 - 29 = 0$, correct to 3 decimal places, by using secant method. 9. Write a program to find the quotient polynomial $q(x)$ such that $p(x) = (x - 2) q(x)$ where the polynomial $p(x) = x^3 - 5x^2 + 10x - 8 = 0$ has a root at $x = 2$. 10. Write a program to find all the roots of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places.	CLO1
4	Lecture, Problem solving	11. The following values of $f(x)$ are given. $\begin{array}{cccccc} x & 1 & 2 & 3 & 4 & 5 \\ y = f(x) & 1 & 8 & 27 & 64 & 125 \end{array}$ Write a program to find difference table for the above values. 12. The following values of $f(x)$ are given. $\begin{array}{cccccc} x & 1 & 2 & 3 & 4 & 5 \\ y = f(x) & 1 & 8 & 27 & 64 & 125 \end{array}$ Write a program to find the values of y when $x = 1.7$ by using Newton's forward interpolation formula.	CLO1
5	Lecture, Problem solving	13. The following values of $f(x)$ are given. $\begin{array}{cccccc} x & 1 & 2 & 3 & 4 & 5 \\ y = f(x) & 1 & 8 & 27 & 64 & 125 \end{array}$ Write a program to find the values of y when $x = 4.7$ by using Newton's backward interpolation formula. 14. The following values of $f(x)$ are given. $\begin{array}{cccccc} x & 1 & 2 & 3 & 4 & 5 \\ y = f(x) & 1 & 8 & 27 & 64 & 125 \end{array}$ Write a program to find the values of x for which $f(x) = 85$ by using Lagrange's inverse interpolation formula. 15. The following values of $f(x)$ are given. Prepare the divided difference	CLO1



Week	Activities	Topics	CLOs
		table for the following data x 1 3 4 6 10 y = f(x) 0 18 58 190 920 Write a program to find the values of y when x = 2.7 by using Newton's divided difference formula.	
6	Lab test 1		
7	Lecture, Problem solving	Solve at least 5 problems from the below: UVa 498, 10341, 10719, 10428, 10268, 10263, 358, 849, 12635, 930 or related any problem from UVa/Codeforces	CLO2
8	Lecture, Problem solving	16. The following values of f (x) are given. x 1 2 3 4 5 y = f(x) 1 8 27 64 125 Write a program to find the first derivative and the second derivative of the function tabulated above at the point x = 1. 17. The following values of f (x) are given. x 1 2 3 4 5 y = f(x) 1 8 27 64 125 Write a program to find the first derivative and the second derivative of the function tabulated above at the point x = 1.5.	CLO1
9	Lecture, Problem solving	18. Write a program to calculate the approximate area under the curve $y = \int_5^{\infty} \log_{10} x \, dx$ by using the trapezoidal rule. /2 eΠ19. Write a program to calculate the approximate area under the curve $y = \int_{\sin x}^{e^x} dx$ by using Simpson's 1/3 rule 20. Write a program to calculate the approximate area under the curve $y = \int_1^x \frac{1}{(1+x^2)} dx$ by using Simpson's 3/8 rule.	CLO1
10	Lecture, Problem solving	21. Write a program to find the determinant of a 3X3 matrix. 22. Write a program to solve the following system of linear equations by using Matrix inversion method. $\begin{aligned} x + y + z &= 1 \\ x + 2y + 3z &= 6 \\ x + 3y + 4z &= 6 \end{aligned}$ 23. Write a program to solve the following system of linear equations by using Cramer's Rule: $\begin{aligned} 27x + 6y - z &= 85 \\ 6x + 15y + 2z &= 72 \\ x + y + 54z &= 110 \end{aligned}$	CLO1
11	Lecture, Problem solving	24. Write a program to solve the following system of linear equations by using Gaussian Elimination method. $\begin{aligned} 2x + y + z &= 10 \\ x + 4y + 9z &= 16 \\ 3x + 2y + 3z &= 18 \end{aligned}$ 25. Write a program to solve the following system of linear equations by using Gauss-Jordan Elimination method. $\begin{aligned} x + 2y + z &= 8 \\ 2x + 3y + 4z &= 20 \\ 4x + 3y + 2z &= 16 \end{aligned}$ 26. Write a program to solve the following system of linear equations by using Jacobi's method. $\begin{aligned} 83x + 11y - 4z &= 95 \\ 3x + 8y + 29z &= 71 \\ 7x + 52y + 13z &= 104 \end{aligned}$ 27. Write a program to solve the following system of linear equations by	CLO1



Week	Activities	Topics	CLOs																																
		using Gauss-Seidel method. $10x_1 + x_2 + x_3 = 12$ $2x_1 + 10x_2 + x_3 = 13$ $2x_1 + 2x_2 + 10x_3 = 14$																																	
12	Lab test 2																																		
13	Lecture, Problem solving	28. Write a program to find the least square line $y = a + bx$ for the following data <table style="margin-left: auto; margin-right: auto;"> <tr><td>x</td><td>-2</td><td>1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>y</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table> 29. Write a program to find the least square parabola $y = a + bx + cx^2$ for the following data <table style="margin-left: auto; margin-right: auto;"> <tr><td>x</td><td>2</td><td>4</td><td>6</td><td>8</td></tr> <tr><td>y</td><td>1.4</td><td>2.0</td><td>2.4</td><td>2.8</td></tr> </table> 30. Write a program to find the best possible values of a and b from the relation $y = ae^{bx}$ for the following data: <table style="margin-left: auto; margin-right: auto;"> <tr><td>x</td><td>2</td><td>10</td><td>26</td><td>61</td></tr> <tr><td>y</td><td>600</td><td>500</td><td>400</td><td>350</td></tr> </table>	x	-2	1	0	1	2	y	1	2	3	4	5	x	2	4	6	8	y	1.4	2.0	2.4	2.8	x	2	10	26	61	y	600	500	400	350	CLO1
x	-2	1	0	1	2																														
y	1	2	3	4	5																														
x	2	4	6	8																															
y	1.4	2.0	2.4	2.8																															
x	2	10	26	61																															
y	600	500	400	350																															
14.	Lecture, Problem solving	31. Write a program to solve the following Differential Equation by using Euler's method. $\frac{dy}{dx} = x^3 + y, \quad y(0) = 1.$ Compute $y(0.02)$ taking $h = 0.01.$ 32. Write a program to solve the following Differential Equation by using Runge – Kutta method. $\frac{dy}{dx} = x + y, \quad y(0) = 1.$ Compute $y(0.1)$ and $y(0.2)$ taking $h = 0.1.$	CLO1																																
15.	Lecture, Problem solving	Solve at least 5 problems from the below: UVa: 11319, 11349, 348, 10109, 10524, 199, 677, 10543, 741, 10231, 10512, 392, 533, 10586, 10394 Or Any problem from UVa / Codeforces related to Final Exam syllabus.	CLO2																																

Books:

Text Book :
1. E Balagurusamy, Numerical Methods, 4th Edition, Tata McGraw-Hill, 2000, ISBN-0-07-463311-2 2. G. Shanker Rao, Numerical Analysis, 3rd edition, New Age International (P) Limited, 2006, ISBN-81-224-1834-1
Reference Books :
1. S.S.Sastry, Introductory Methods of numerical Analysis, 5th Edition, PHI Learning Private Limited, New Delhi-110001 2012 ISBN-978-81-203-4592-8 2. S Balachandra Rao, C K Shantha, Numerical Methods, Revised Edition, Universities Press (India) Private Limited, 2012, ISBN-978-81-7371-472-6 3. Steven C. Chapra & Raymond P. Canale, Numerical Methods for Engineers, 3rd edition, Tata McGraw-Hill, Inc, 2000 4. J. B. Scarborough, Numerical Mathematical Analysis, 6th edition, The John Hopkins Press, 1996



7th Semester		
ISCED Code	Course Code	Course Title
0541	CSE-4747	Mathematical Analysis for Computer Science
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: None		
Co-requisite: None		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

1. This course emphasizes mathematical definitions and proofs and applicable methods to solve and analyze problems that arise in computer science.
2. Model and analyze computational processes using analytic and combinatorial methods.
3. Apply principles of discrete probability to calculate probabilities and expectations of simple random processes.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Derive closed-form and asymptotic expressions from series and recurrences for growth rates of processes.	30%
2.	Apply basic mathematical reasoning techniques and logical operations for engineering problems	30%
3.	Apply mathematical probabilistic model, randomized algorithms, some other analytical problems in computer science	40%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Solve computational problem using mathematical models	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Apply basic mathematical reasoning techniques and logical operations for engineering problems.	PLO1, PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Apply mathematical probabilistic model,	PLO2, PLO3	Cognitive/Apply	Lecture, Class discussion,	Exam, Quiz, Assignment.



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
	randomized algorithms, some other analytical problems in computer science			Assignment, Note.	

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Tower of Hanoi, counting areas with intersecting lines in the plane, order and (non)linearity in recurrences	02	CLO1
2	Manipulations of Sums: Perturbation method, finite and infinite sums, double sums, Approximation with integrals and bounds, calculating sums using generating functions.	06	CLO2
3	Generating functions and counting techniques: Review of elementary counting techniques (sum/product/subtraction/division rule), Solving counting problems using generating functions, Basic maneuvers and solving recurrences with generating functions, Special numbers: Harmonic numbers, Fibonacci numbers	04	CLO2
Section-B (SEE: 50 Marks)			
4	Review of probabilistic notions and combinatorial probability: Strategies to deal with events, outcomes, sample spaces, Conditional probability and independence, Law of total probability and Bayes law -- with motivating problems such as birthday problem, Monty Hall problem etc.	04	CLO3
5	Working with random variables: Formulation of models with random variables; distributions frequently encountered in CS oriented analysis -- uniform (discrete/continuous), distributions frequently encountered in CS oriented analysis -- uniform (discrete/continuous), Bernoulli, Binomial, Poisson, geometric and exponential (and Normal); solving problems using PMF/PDF, CDF, (conditional) expectation and probability generating functions of random variables.	06	CLO3
6	Randomized techniques in CS (including number theory): Randomized load balancing and analysis using concentration bounds; symmetry breaking (e.g., envelop problem, slotted Aloha and associated analysis); variants of randomized algorithms -- Las Vegas type algorithms (quick-sort, Freivalds' algorithm for verifying matrix multiplication), Monte Carlo algorithm for primality testing (Miller-Rabin), following a bit of review of congruence and Fermat's little theorem, Variants of randomized algorithms -- Las Vegas type algorithms (quick-sort, Freivalds' algorithm for verifying matrix multiplication), Monte Carlo algorithm for primality testing (Miller-Rabin), following a bit of review of congruence and Fermat's little theorem.	02	CLO3



7	Markov chains, random walks and queuing theory: Discrete-time and continuous-time Markov chains -- model formulation, transience vs. recurrence and ergodicity; Random walk as stochastic process, PageRank algorithm based on random walk on Web graph;	04	CLO3
8	Markov chains, random walks and queuing theory: Queuing theoretic notions and Little's law, analysis of single-server Markovian queuing models with finite and infinite queues; applications of queuing models in analyzing delays and throughput of routers with buffers	02	CLO3
30			

Books :**Text Book :**

1. Oren Patashnik, Donald E. Knuth, Ronald L. Graham, “Concrete Mathematics”, 2nd Edition, Addison Wesley.
2. Sheldon M. Ross, Introduction to Probability Models, 11th Edition.

Reference Books :

1. Tom Leighton, Albert Meyer, Eric Lehman, Mathematics for Computer Science
2. Michael Mitzenmacher, Eli Upfal, Probability and Computing

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			Written Exam (50)
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva

**ISCED: 0288****Course code : CSE-4750****Course title : Technical Writing and Presentation****Credit Hours: 1****Contact Hours: 2 per week****Pre-requisite: None****Co-requisite: None**

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Course Learning Outcomes (CLOs):

After completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1	Compare the academic English and scientific English	20
2	Illustrate information from recent and update literature on CSE	10
3	Develop appropriate and effective research methodology design in computer science and engineering	10
4	Apply referencing software, editing and drawing software in analyzing and presenting scientific data	20
5	Develop steps and requirement for preparing scientific article for publication	20
6	Take part in presentation of research proposal related to computer science and engineering	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Compare the academic English and scientific English	PLO1	Cognitive/Evaluate	Lecture, Class discussion, Note	Exam, Quiz, Assignment
CLO2	Illustrate information from recent and update literature on CSE	PLO2	Cognitive/Understand	Lecture, Class discussion, Note	Exam, Quiz, Assignment
CLO3	Develop appropriate and effective research methodology design in computer science and engineering	PLO5 PLO12	Cognitive/Create	discussion, Assignment, Complex Problem Solving	Exam, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO4	Apply referencing software, editing and drawing software in analyzing and presenting scientific data	PLO5	Cognitive/Apply	discussion, Assignment, Lab work	Exam, Assignment
CLO5	Develop steps and requirement for preparing scientific article for publication	PLO7 PLO8 PLO12	Cognitive/Create	Lecture, Class discussion, Note, Complex Problem Solving	Exam, Assignment Article writing report
CLO6	Take part in presentation of research proposal related to computer science and engineering	PLO10	Cognitive/Analyze	Assignment, Complex Problem Solving	Exam, Presentation

Course Content :

- 1. Issues of technical writing:** Planning and preparation for writing: Organization, accessibility, audience, style of writing, flow of writing; Word order; Breaking up long sentences; Structuring of paragraph and sentences; Use of punctuation marks; Being concise and removing redundancy; Avoiding ambiguity and vagueness; Writing coherent texts; Highlighting an issue/point; Paraphrasing and plagiarism
- 2. Effective oral presentation:** Preparation and planning; Etiquettes; Structure of an oral presentation; Preparing effective presentation slides and issues related to it; Visuals, use of graphics; Placement and presentation of diagrams and figures; Pace of presentation and volume; Body stuff, posture and movement of body; Handling Q/A; Handling adversity
- 3. Reading and searching skills:** Effective reading; Types of reading, scanning, skimming, intensive and extensive reading; Searching and finding relevant information; Note taking; Summarizing
- 4. Writing styles of definitions, propositions, theorems and proofs**
- 5. Preparation of proposals, reports, research papers, theses and books:** Structure of proposals, reports, theses, research papers books; Issues related to writing title, abstract, preface, contents, bibliography, index, literature review, explaining methods, describing results and discussion on result, conclusion
- 6. Writing of book reviews and referee reports**
- 7. Software and Tools:** Writing/typesetting tools, LATEX; Diagram drawing software, Microsoft Visio; Data analysis and graphing software, Origin Pro; Presentation tools; Version controlling

Text Books:

- 1 Adrian Wallwork English for Writing Research Papers 2nd Springer 2016 ISBN: 978-3-319-26092-1



2 Justin Zobel Writing for Computer Science 3rd Springer 2014 ISBN: 978-1-4471-6638-2

Reference Books:

1. C.R. Kothari Research Methodology – Methods and Techniques 3rd New Age International (P) Limited 2004 ISBN (13):978-81-224-2488-1
2. "Ehtiram Raza Khan Huma Anwar" Research Methods of Computer Science 1st Laxmi Publications Pvt. Limited 2015 "ISBN: 9383828242 9789383828241"



ISCED: 0619

Course code : CSE-4800

Course title : Project / Thesis

Credit Hours: 4

Contact Hours: 8 per week

Research/Study of problems in the field of Computer Science & Engineering. Evaluation based on report, software and oral defense



8th Semester		
ISCED Code	Course Code	Course Title
0688	CSE-4805	Social, Professional and Ethical Issues in Computing
Credit Hours: 2	Contact Hours: 2	Type: Core, Engineering
Prerequisite: none		
Co-requisite: none		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The main objectives of this course are:

1. Identify areas of society where information technology has had a substantial impact and where its effects may be of concern.
2. Appreciate how different perspectives can contribute to making choices about the development and use of computing technology.
3. Appreciate the legal and social issues associated with the use of computers in organizations and computer crime.
4. Critically assess the concepts, theories and issues in recent public debates about technology and society and develop a personal position.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand and identify different ethical philosophies, frameworks, and methodologies.	20
2.	Identify and interpret the codes of professional conduct relating to the disciplines of computer science and software engineering such as ACM Code of Ethics.	20
3.	Analyze the local and global impact of computing on individuals, organizations, and society.	30
4.	Understand and interpret various legal framework related to computing.	30

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand and identify different ethical philosophies, frameworks, and methodologies.	PLO8	Cognitive / Understand	Lecture, Problem solution	Quiz, Assignment, Exam
CLO2	Identify and interpret the codes of professional conduct relating to the disciplines of computer science and software engineering such as ACM Code of Ethics.	PLO8	Cognitive / Evaluate	Lecture	Exam, Assignment



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Analyze the local and global impact of computing on individuals, organizations, and society.	PLO6	Cognitive / Analyze	Lectures, Notes, Practice Problems	Exam, Assignment
CLO4	Understand and interpret various legal framework related to computing.	PLO6	Cognitive/ Evaluate	Lectures, Notes, Practice Problems	Exam, Assignment

Course Content:

Segment	Contents	Duration (Hours)	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: History of computer hardware, software, networking; Overview of Technological Change; Impact of information technology on some sectors.	03	CLO1
2	Privacy and personal information: Definition of privacy. How does computer technology effect privacy? To what moral problems does this lead? Ethical and legal basis for privacy protection; Privacy implications of database systems; Technological strategies for privacy protection.	04	CLO2
3	Cyber Laws: UNCITRAL model law, ICT Act 2006 in Bangladesh, Pornography Control Act 2012, Freedom of expression in cyberspace, Offensive speech and censorship in cyberspace Anonymity, Spam etc.	05	CLO4
Section-B (SEE: 50 Marks)			
4	Computer & Software Reliability: How liability is determined when computer hardware and software fails? Responsibility vs. Liability vs. Accountability; Some historical examples of software risks (such as the Therac-25 case)	04	CLO2
5	Intellectual Property: What is intellectual property” Copyrights, patents, and trade secrets; Software piracy; Software patents; Free software, what is fair use?	03	CLO2
6	Computer Crime: History and examples of computer crime; “Cracking” (“hacking”) and its effects; Viruses, worms, and Trojan horses; Online scams, Identity theft; moral issues related to these crimes.	04	CLO2
7	Computer and Work: Impact of employment, work environment, Employee monitoring, Health issues	03	CLO3
8	Professional Ethics and responsibilities: What is Ethics? What is Computer ethics, some ethical guidelines for computer professionals, Examine and discuss professional codes of ethics, conduct, and practice (IEEE, ACM, SE, AITP, and so forth).	04	CLO3
30			

Books :

Text Book :

1. Sara Baase, A gift of fire : social, legal, and ethical issues for computing technology 4th edition, Pearson Education, Inc., 2013

Reference Books :



- George W. Reynolds, Ethics in Information Technology, 6th Edition, Cengage Learning, Inc., 2019
- Luciano Floridi, The Cambridge Handbook of Information and Computer Ethics, Cambridge University Press, 2010
- Adriano Fabris, Ethics of Information and Communication Technologies, Springer International Publishing AG, 2018
- Joseph Migga Kizza, Ethics in Computing: A Concise Module, Springer International Publishing Switzerland, 2016

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		5	5		15
Apply		10	5		15
Analyze		10			15
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



C.4.2 CSE Optional Courses



7thSemester		
ISCED Code	Course Code	Course Title
0619	CSE-4825	Basic Graph Theory
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-2421	(Computer Algorithm)
Co-requisite:	CSE-4826(Basic Graph Theory Lab)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- The objectives of this course are to
- Understand some applications of graph theory to practical problems and other branches of mathematics
 - Learn about how graph theory developed via a creative organic historical process.
 - See that the simplicity of graph theory makes them ubiquitous, and
 - makes it easier to be creative in these fields than in others

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate understanding of the basic definitions, computer representations, properties of a graph and fundamental theorems of graph theory	50%
2.	Demonstrate understanding of the basic principles of important graph algorithms such as finding shortest path, directed or undirected cycle, minimum spanning tree, maximum flow and minimum cut, etc. and be able to implement programs for them	50%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate understanding of the basic techniques and strategies of applying graph theory to solve advanced data structures and other real world problems on a computer system	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Demonstrate understanding of the basic principles of important graph algorithms such as finding shortest path, directed or undirected cycle, minimum spanning tree, maximum flow and minimum cut, etc. and be able to implement programs for them	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Graph, Tree, Simple graph, Isomorphism, Connectedness, Adjacency, degree, handshaking lemma, Subgraphs, Null graphs, Complete graphs, Cycle graphs, path graphs and wheels, Regular graphs, Bipartite graphs	02	CLO1
2	The complement of a simple graph, The eight circles problem, Six people at a party, The four cubes problem	06	CLO2
3	Representation of Graphs in computer, Breadth First Search, Depth First Search, Algorithm of BFS and DFS	04	CLO2
Section-B (SEE: 50 Marks)			
4	Spanning Tree, Minimum Spanning Tree, Kruskal and Prims Algorithm, cycle and cutset ranks, Topological Sort	04	CLO2
5	Intersection and Interval Graphs, walk, trail, path, Some Theorem, disconnecting set, cutset, bridge;	06	CLO2
6	Eulerian graphs, semi-Eulerian graph, Fleury's algorithm, Hamiltonian graph;The shortest path problem (Floyd Warshall Algorithm);The travelling salesman problem, The Chinese postman problem;	02	CLO2
7	Planar graph, Some theorem on Planar graph, Euler's formula and prove;Faces, Graphs on other surfaces, genus, Dual graph, Chromatic number, Brooks' theorem	04	CLO3
8	Five-color theorem, chromatic index, chromatic polynomial, Directed graph, some definition, strongly connected, Eulerian digraphs and tournaments, Markov chains ,Hall's 'marriage' theorem, Complete matching, Applications of Hall's theorem, Graph Enumeration.	02	CLO3

**Books :****Text Book :**

4. Narsingh Deo, Graph Theory with Application to Engineering with Computer Science, Prentice-Hall of India, 2008, ISBN-8120301455
5. Adrian Bondy, U.S.R. Murty, Graph Theory with Applications, Macmillan, 2000, ISBN-13: 0333226941
6. Robin J. Wilson, Introduction to Graph Theory, 4th Edition, Pearson, 2009, ISBN-978-81-317-0698-5

Reference Books :

7. Haraary Frank, Graph Theory, 3rd Edition, Narosa Publishing House, 2001
8. Marshall, C. W., Applied Graph Theory, John Wiley and Sons, 1989
9. Diestel, R., Graph Theory, Springer, 2000

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination



7thSemester		
ISCED Code	Course Code	Course Title
0619	CSE-4826	Basic Graph Theory Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-2422 (Computer Algorithm Lab)	
Co-requisite:	CSE-4826 (Basic Graph Theory)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- The objectives of this course are to
- Understand some applications of graph theory to practical problems and other branches of mathematics
 - Learn about how graph theory developed via a creative organic historical process.
 - See that the simplicity of graph theory makes them ubiquitous, and
 - makes it easier to be creative in these fields than in others

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate understanding of the basic techniques and strategies of applying graph theory to solve advanced data structures and other real world problems on a computer system	50%
2.	Demonstrate understanding of the basic principles of important graph algorithms such as finding shortest path, directed or undirected cycle, minimum spanning tree, maximum flow and minimum cut, etc. and be able to implement programs for them	50%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate understanding of the basic techniques and strategies of applying graph theory to solve advanced data structures and other real world problems on a computer system	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO2	Demonstrate understanding of the basic principles of important graph algorithms such as finding shortest path, directed or undirected cycle, minimum spanning tree, maximum flow and minimum cut, etc. and be able to implement programs for them	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	<ul style="list-style-type: none"> Develop a code determine a given graph is a cycle, wheel or none 	CLO1
2	Lecture, Problem solving	<ul style="list-style-type: none"> Implementation of Breadth First Search 	CLO2
3	Lecture, Problem solving	<ul style="list-style-type: none"> Implementation of Depth First Search 	CLO2
4	Lecture, Problem solving	<ul style="list-style-type: none"> Implementation of Kruskal's algorithm 	CLO2
5	Lecture, Problem solving	<ul style="list-style-type: none"> Implementation of Prim's algorithm 	CLO4
6	Lab test 1		
7	Lecture, Problem solving	<ul style="list-style-type: none"> Implementation of Topological sort 	CLO2
8	Lecture, Problem solving	<ul style="list-style-type: none"> Develop a code to find the shortest path between every vertices 	CLO2
9	Lecture, Problem solving	<ul style="list-style-type: none"> Develop a code to find the maximum flow from starting node to target node 	CLO2
10	Lecture, Problem solving	<ul style="list-style-type: none"> Given a graph G, develop a code find dual graph of G. Given two graphs G and G*, develop a code to determine G* is an abstract dual of G or not. 	CLO4
11	Lecture, Problem solving	<ul style="list-style-type: none"> Develop a code to color each vertex of a graph such that adjacent vertices have different colors. 	CLO3
12	Lecture, Problem solving	<ul style="list-style-type: none"> Develop a code to color each edge of a graph such that adjacent edges have different colors. Develop a code to color each face of a graph such that adjacent faces have different colors. 	CLO3
13	Lab test 2		



Week	Activities	Topics	CLOs
14	Lecture, Problem solving	<ul style="list-style-type: none"> • Develop a code to find the underlying graph of a directed graph. • Develop a code to determine a directed graph is strongly connected or not. • Given an activity network, develop a code to determine the completion time of the entire job 	CLO4
15	Lecture, Problem solving	<ul style="list-style-type: none"> • Implementation of Hall's marriage theorem. • Implementation of Markov chain problems. 	CLO2

Books :

Text Book :

7. Narsingh Deo, Graph Theory with Application to Engineering with Computer Science, Prentice-Hall of India, 2008, ISBN-8120301455
8. Adrian Bondy, U.S.R. Murty, Graph Theory with Applications, Macmillan, 2000, ISBN-13: 0333226941
9. Robin J. Wilson, Introduction to Graph Theory, 4th Edition, Pearson, 2009, ISBN-978-81-317-0698-5

Reference Books :

10. Haraary Frank, Graph Theory, 3rd Edition, Narosa Publishing House, 2001
11. Marshall, C. W., Applied Graph Theory, John Wiley and Sons, 1989
12. Diestel, R., Graph Theory, Springer, 2000



8th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-4843	Decision Support System and Expert System
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-2423 (Database Management System)	
Co-requisite:	CSE-4844 (Decision Support System and Expert System Lab)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- a. To review and clarify the fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems.
- b. To discuss and develop skills in the analysis, design and implementation of Decision Support Systems and Expert System

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Understand fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems	50
2.	Synthesize development skills in the analysis, design and implementation of Decision Support Systems and Expert System	50

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Understand fundamental terms, concepts and theories associated with Decision Support Systems, computerized decision aids, expert systems, group support systems and executive information systems	PO1	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Synthesize development skills in the analysis, design and implementation of Decision Support Systems and Expert System	PO2 PO3	Cognitive/Create	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction:	04	CLO1



	An overview of Decision technologies, Introduction to different types of decision making: strategic, tactical and operational Decision making in organization. Extension to other 'non organizational' areas of decision making, e.g. military and emergency management. Introduction to different types of decision making: strategic, tactical and operational, Related problems and Exercises		
2	Decision making issues and Models: Implications for design of decision making support, Communication issues. Normative, descriptive and prescriptive analysis: requisite modeling, Contrast with recognition primed decision tools, Related problems and Exercises.	04	CLO1
3	Decision Support Systems: Configuration, Definition, Characteristics and capabilities, Data Management Subsystem, Knowledge-Based Management Subsystems, Model Management Subsystem, User Interface Subsystem, DSS hardware, Related problems and Exercises	04	CLO2
Section-B (SEE: 50 Marks)			
4	DSS Development and Modeling: Introduction, Traditional SDLC, Alternative Development Methodologies, DSS development platforms, DSS development tool selection, Mathematical Programming Optimization, Linear Programming, Dynamic Programming, Heuristic Programming, and Simulation	04	CLO2
5	Data mining: Concepts, Characteristics and benefits, Data in Data Mining, Working procedure of Data mining, Data Mining Applications, Data Mining Process, Data Mining methods, Data Mining Software's, Related problems and Exercises	06	CLO1
6	Data Warehouse: Data Warehouse concept, characteristics of Data Warehouse, Data Warehouse Process and Architecture, Real Time Data warehousing, other related issues of Data warehouse	02	CLO1, CLO2
7	Group Decision Support system: Concepts, Synchronous and asynchronous tools, characteristics, case study, Cutting-edge decision support technologies	02	CLO1
8	Expert System (ES): Basic Concept of Expert System, Feature of ES, Application of ES, Structure of ES, Popular Areas suitable for ES, Development of ES, Benefits and Limitations of ES	04	CLO1, CLO2
		30	

Books :

Text Book :

1. Turban, Efraim, "Decision Support Systems and Expert Systems", 9th Edition, Prentice Hall Pearson Education, 2010, 0-13-6IQ729-X

Reference Books :

1. Phillips-Wren, Gloria E., " A Multiple-Criteria Framework for Evaluation of Decision Support



Systems”, 3rd Edition, Omega, 2004

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



8th Semester		
ISCED Code	Course Code	Course Title
0613	CSE-4844	Decision Support System and Expert System Lab
Credit Hours: 1.5	Contact Hours: 3	Type: Core, Engineering
Prerequisite:	CSE-2424 (Database Management System Lab)	
Co-requisite:	CSE-4843 (Decision Support System and Expert System)	

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- a. To demonstrate development of Decision Support System and Expert System
- b. To help in taking decision using data mining and machine learning

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate the development of Decision Support System and Expert System	50
2.	Analyze to take decision using data mining and machine learning	50

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate the development of Decision Support System and Expert System	PO1 PO3	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work	Exam, Quiz, Assignment,
CLO2	Analyze to take decision using data mining and machine learning	PO3 PO5	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work,	Exam, Quiz, Assignment,

Lecture Plan:

Week	Activities	Topics	CLOs
1.	Lecture	Introduction to SPSS	CLO2
2.	Lecture, Problem solving	Basic Data analysis using SPSS	CLO2
3.	Lecture, Problem solving	Summary Statistics, Correlation	CLO2
4.	Lecture, Problem solving	Regression	CLO2
5.	Lecture	Statistical Analysis for finding the relatedness between different entities of research	CLO2



6.	Lecture, Problem solving	Practical overview of Predicting techniques	CLO2
7.	Lab test		
8.	Lecture, Problem solving	Practical overview of Classification	CLO2
9.	Lecture, Problem solving	Decision Support using Classification Algorithms	CLO2
10.	Lecture	Introduction to Python for Data mining	CLO2
11.	Lecture, Problem solving	Decision Support using Decision Tree	CLO2
12.	Lecture, Problem solving	Decision Support using Clustering Algorithms	CLO2
13.	Lecture, Problem solving	Decision Support using Association Algorithms	CLO2
14.	Lecture, Problem solving	Demonstrate a development of DSS	CLO1
15.	Lab test		

Books :

Text Book :
1. J. Banks, J. S. Carson, B. L. Nelson, D. Nicol, "Discrete-Event System Simulation", 5 th Edition, Prentice Hall, 2010, 0136062121
Reference Books :
1. Turban, Efraim, "Decision Support Systems and Expert Systems", 9 th Edition, Prentice Hall Pearson Education, 2010, 0-13-6IQ729-X
2. Stéphane Tufféry, "Data Mining and Statistics for Decision Making", John Wiley & Sons, Ltd, 2011, 9780470688298.



8th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-4845	Distributed Database
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: CSE-2423 (Database Management Systems)		
Co-requisite: CSE-2424 (Database Management Systems Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The first is an in-depth study of the classical distributed database management issues such as distribution design, distributed query processing and optimization, and distributed transaction management.

The second objective is to study more current distributed database management topics such as pervasive computing, Web data management, different distribution models (push versus pull), interoperability and componentization, and data mining on the web.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Write allocation during the distributed database design process	10%
2.	Explore the techniques used for data fragmentation, replication	20%
3.	Demonstrate how the two-phase commit protocol issued to deal with committing a transaction that accesses databases stored on multiple nodes.	40%
4.	Apply simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer	20%
5.	Synthesize the basic concepts of parallel databases, object distributed databases, and multi databases.	10%

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Write allocation during the distributed database design process	PLO1	Cognitive/Analyze	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO2	Explore the techniques used for data fragmentation, replication	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



CLO3	Demonstrate how the two-phase commit protocol issued to deal with committing a transaction that accesses databases stored on multiple nodes.	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO4	Apply simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO5	Synthesize the basic concepts of parallel databases, object distributed databases, and multi databases.	PLO2 PLO5	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Course Content:

Segment	Contents	Duration	CLOs
Section-A (Midterm Exam: 30 Marks)			
1	Introduction: Introduction to Distributed Databases, Distributed DBMS (DDBMS), Distributed DBMS Architecture, Data Independence, Functional goals of distributed databases, Characteristics of DDBMS, Advantages and Disadvantages of DDBMS.	03	CLO1
2	Data Integration: Virtual vs Materialized integration, Views, View Integration, Conflict analysis, Schema Integration, Data Integration in the Multidatabase, Global query processing, Source Schema Reverse engineering, GAV (global as view), LAV (local as view), Mapping, Wrappers.	06	CLO2
3	Distributed Database Design: Design problem of distributed systems, Design Strategies, Fragmentation, Correctness Rules of Fragmentation, Horizontal Fragmentation, Vertical Fragmentation, Correctness of Vertical Fragmentation, Mixed Fragmentation, Replication and Allocation.	09	CLO2
Section-B (SEE: 50 Marks)			
4	Overview of Query Processing: Query Processing, Query Optimization, Distributed Query Processing Steps, Query Decomposition, Normalization, Analysis, Elimination of Redundancy, Rewriting, Data Localization.	06	CLO3
5	Transaction Management: Definition, Formalization of a Transaction, Properties of Transactions, Atomicity, Consistency, Isolation, Durability Classification of Transactions, Transaction Processing Issues.	03	CLO4



6	Concurrency Control: Concurrency, Conflicts, Schedules, Serializability, Concurrency Control Algorithms, Locking Based Algorithms, Two-Phase Locking (2PL), 2PL for DDBMS, Timestamp Ordering, Deadlock Management, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection.	06	CLO5
7	Distributed DBMS Reliability: Definitions and Basic Concepts, Local Recovery Management, In-Place Update, Out-of-Place Update, Distributed Reliability Protocols, Commit Protocols, Centralized Two Phase Commit Protocol (2PC), Linear 2PC Protocol, Distributed 2PC Protocol, 2PC Protocol and Site Failures, Three Phase Commit Protocol (3PC).	06	CLO4
8	Data Warehouses: Definition, Architecture for a data warehouse, Dimensional Fact Model, Dimensions and hierarchies, OLAP OPERATIONS, Data cube in SQL (ROLAP), Data Warehouse Design, Conceptual Design, Logical Design.	06	CLO3
45			

Books :

Text Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	M. Tamer Oezsu, Patrick Valduriez	Principles of Distributed Database Systems	Second Edition'	Prentice Hall, Springer, New York, NY	2010	ISBN- 978-1-4419-8833-1
2.	Coulouris, Dollimore, and Kindberg. AW	Distributed Systems: Concepts and Design	5th Edition	Pearson	2011	ISBN-13: 978-0132143011

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Ceri and Pelagatti.	Distributed Database Principles and Systems.	1st Edition	McGraw Hill	2017	ISBN-13: 978-0070265110
2.	Kumar and Hsu	Recovery Mechanisms in Database Systems.	1st Edition	Prentice Hall	1997	ISBN-13: 978-0136142157
3.	Bernstein, Hadzilacos and Goodman, AW.	Concurrency Control and Recovery in Database Systems.	1st Edition	Addison-Wesley	1987	ISBN-13: 978-0201107159

**Course Assessment Pattern (Theory courses):**

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)		SEE (50marks)	
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	x	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

Delivery methods & activities: Lecture, White Board Writing, Questions and Answers, Discussions Power point Presentation,

Assessment tools: Class Attendance, Class test, Quizzes/ Assignment on problem solution, Mid-Term & Final Exam. Project evaluation & Viva



8th Semester		
ISCED Code	Course Code	Course Title
0612	CSE-4846	Distributed Database Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-2423 (Database Management Systems)		
Co-requisite: CSE-2424 (Database Management Systems Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

- 1) get familiar with the currently available models, technologies for and approaches to building distributed database systems and services;
- 2) have developed practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case;
- 3) be aware of the current research directions in the field and their possible outcomes;
- 4) be able to carry out research on a relevant topic, identify primary references, analyze them, and come up with meaningful conclusions; and
- 5) be able to apply learned skills to solving practical database related tasks.

Course Learning Outcomes (CLOs):

#	CLO Description	Weightage (%)
1.	Demonstrate currently available models, technologies for and approaches to building distributed database systems and services;	50
2.	Apply the models and approaches to be able to select and apply the appropriate methods for a particular case;	30
3.	Synthesize the current research directions in the field and their possible outcomes	20

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Demonstrate currently available models, technologies for and approaches to building distributed database systems and services;	PLO1	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO2	Apply the models and approaches to be able to select and apply the appropriate methods for a particular case;	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving



#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO3	Synthesize the current research directions in the field and their possible outcomes	PLO2 PLO5	Cognitive/Create	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Lecture Plan:

Week	Activities	Topics	CLOs
1	Lecture, Problem solving	View-based data integration (Relational data model),	CLO1
2	Lecture, Problem solving	Data integration (homogeneous and heterogeneous data sources),	CLO1
3	Lecture, Discussion	Identification of the sources data models	CLO1
4	Lecture, Problem solving	Reverse engineering (conceptual models), Identification and resolution of conflicts,	CLO2
5	Lecture, Problem solving	Conceptual models integration, Choice of the target data model (for global conceptual schema translation),	CLO2
6	Lecture, Discussion	Source schemata translation to the target data model (by means of adapters),	CLO2
7	Lecture, Problem solving	Conceptual model translation,	CLO3
8	Lecture, Discussion	Definition of data views (mappings), Exam Simulation.	CLO3
9	Lecture, Problem solving	SQL Recall, Data warehousing conceptual design, Facts Implementation,	CLO3
10	Lecture, Problem solving	For each fact: attribute tree Implementation,	CLO2
11	Lecture, Discussion	Attribute tree editing, dimensions definition, measures Implementation	CLO2
12	Lecture, Problem solving	Hierarchies Implementation,	CLO1
13	Lecture, Problem solving	Fact schemata creation, glossary Implementation,	CLO2
14	Lecture, Problem solving	Data warehousing logical design,	CLO3
15	Lecture, Discussion	ROLAP model: star schema, snowflake schema	CLO3

**Books :****Text Books:**

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	M. Tamer Oezsu, Patrick Valduriez	Principles of Distributed Database Systems	Second Edition'	Prentice Hall, Springer, New York, NY	2010	ISBN- 978-1-4419-8833-1
2.	Coulouris, Dollimore, and Kindberg. AW	Distributed Systems: Concepts and Design	5th Edition	Pearson	2011	ISBN-13: 978-0132143011

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Ceri and Pelagatti.	Distributed Database Principles and Systems.	1st Edition	McGraw Hill	2017	ISBN-13: 978-0070265110
2.	Kumar and Hsu	Recovery Mechanisms in Database Systems.	1st Edition	Prentice Hall	1997	ISBN-13: 978-0136142157
3.	Bernstein, Hadzilacos and Goodman, AW.	Concurrency Control and Recovery in Database Systems.	1st Edition	Addison-Wesley	1987	ISBN-13: 978-0201107159

Online Resources:

- I) https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_databases.htm



8th Semester		
ISCED Code	Course Code	Course Title
0619	CSE-4871	Neural Network and Fuzzy System
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: Fundamental of Computing		
Co-requisite: CSE-4872 (Neural Network and Fuzzy System Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination	50 Marks	

Objectives:

The objectives of this course are:

- a. To understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- b. To understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- c. To understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Explain the basics, characteristics, applications of neural network.	10%
2.	Demonstrate theoretical and practical aspects of Feed Forward Back Propagation & Counter Propagation Neural Network.	20%
3.	Understand the principle of competitive neural networks and Adaptive resonance theory.	30%
4.	Analyze the architecture and algorithm of associative memory networks and fuzzy systems.	30%
5.	Understand the basic concept of fuzzy sets, fuzzy logic & defuzzification	10%

Mapping of CLO-PLO

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Explain the basics, characteristics,	PLO1	Cognitive/Analyze	Lecture, Class discussion,	Exam, Quiz, Assignment



	applications of neural network			Assignment, Note	
CLO2	Demonstrate theoretical and practical aspects of Feed Forward Back Propagation & Counter Propagation Neural Network	PLO2 PLO3	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Understand the principle of competitive neural networks and Adaptive resonance theory	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO4	Analyze the architecture and algorithm of associative memory networks and fuzzy systems.	PLO2 PLO3	Cognitive/Analysis	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving
CLO5	Understand the basic concept of fuzzy sets, fuzzy logic & defuzzification	PLO1 PLO2	Cognitive/Understand	Lecture, Class discussion, Assignment, Lab work, Note, Competitive Problem Solving	Exam, Quiz, Assignment, Competitive Problem Solving

Course Content:**Section-A (Mid-term: 30 Marks)**

1. **Introductory Concept:** History of neural network, human brain, biological neural network, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses, biasing input, characteristics of neural network, limitation of neural network, application of neural network
2. **Fundamental concept of ANN:** Basic models of artificial neuron, activation function, network architecture, neural network viewed as directed graph, Basic learning rules, supervised and unsupervised learning, Competitive learning.
3. **Perceptrons:** Overview of perceptrons, Single layer of perceptrons, mathematical model of single layer perceptrons, perceptrons learning algorithm, Delta learning rule, Multi-layer perceptrons, Back propagation learning algorithm, mathematical model of MLP network.

Section-B (Final Exam: 50 Marks)



Group-A (20 Marks)

- 4. Function Approximation:** Basis function network, Radial Basis function networks (RBF), MLP vs. RBF networks, Support vector machine (SVM), Hebbian learning and PCA, Linear Associative Memories (LAMs)
- 5. Competitive Network:** Simple competitive network: Winner-take-all network, Adaptive Resonance Theory (ART), ART-1 architecture and algorithm, Kohonen Self-organizing Maps (SOMs), Counter Propagation Network (CPNs)

Group-B (30 Marks)

- 6. Associative memory network:** Linear Feedforward Associative memory network, Recurrent associative memory network, Bidirectional Associative memory network (BAM), Brain-State-in-a-Box (BSB) network, Hopfield networks, Boltzmann machine, Travelling salesman problem
- 7. Fuzzy system:** Introduction to Fuzzy system, Fuzzy relations, fuzzy numbers, Linguistic description and their analytical form, fuzzy control.
- 8. Defuzzification:** Defuzzification Methods, Centroid Method, Center of Sum Method, Mean of Maxima Defuzzification, Applications

12. Recourses:

Text Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	S. Rajasekaran,G.A. Vijayalakshmi Pai	Neural Networks, Fuzzy Logics, and Genetic Algorithm	15th	PHI Learning	2011	978-81-203-2186-1

Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Simon Haykin	Neural Networks -- a Comprehensive Foundation	3rd	Prentice Hall	2008	978-0-13-147139-9
2.	Zurada, Jacek M.	Introduction to Artificial Neural Systems	1st	West	1992	9780314933911
3.	Stamations V. Kartalopoulos	Understanding Neural Networks and Fuzzy Logic	1st	Wiley- IEEE Press	1995	978-0780311282
4.	Bart Kosko	Neural Networks and Fuzzy System	2nd	Prentice Hall	1991	978-0136114352
5.	Mohamad H. Hassoun	Fundamentals of artificial neural networks	3rd	Mohamad H. Hassoun	2015	1995-03-27

Online Resources:

- <https://www.cse.unr.edu/~bebis/CS791S/>
- <https://www.u-aizu.ac.jp/~qf-zhao/TEACHING/NN-I/nn-1.html>



8th Semester		
ISCED Code	Course Code	Course Title
0619	CSE-4872	Neural Network and Fuzzy System sessional
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: CSE-1121 (Computer Programming 1)		
Co-requisite: CSE-1122 (Computer Programming 1 Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
	SEE: Semester End Examination		50 Marks

Objectives:

The main objectives of this course are:

- To introduce the student with fundamental concepts of neural network and to analyze and manipulate the different types of neural network and fuzzy system
- To introduce students with the different algorithms of neural network and fuzzy system
- To help the student to enhance their analysing skills and use the same for writing program in MATLAB/Python.

Course Learning Outcomes (CLOs):

CLO1	Knowledge and understanding: Describe and explain the fundamentals concepts of neural network
CLO2	Use an integrated programming environment to write and execute algorithms of neural network as well as apply debugging techniques to locate and resolve errors.
CLO3	Apply appropriate algorithms to solve real world problems.

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Knowledge and understanding: Describe and explain the fundamentals concepts of neural network	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO2	Use an integrated programming environment to write and execute algorithms of neural network as well as apply debugging techniques to locate and resolve errors.	PLO1 PLO2	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO3	Apply appropriate algorithms to solve real world problems.	PLO2	Cognitive/ Apply	Class discussion, Lab work, Note	Assignment, Class performance, Exam



Text/Reference Books:

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	Simon Hyken	Neural Networks:A Comprehensive Study	2 nd Edition	Macmillan Colledge Publishing Company	1996	

Text /Reference Books :

#	Name of Authors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	S. Rajasekaran,G.A. Vijayalakshmi Pai	Neural Networks, Fuzzy Logics, and Genetic Algorithm	15th	PHI Learning	2011	978-81-203-2186-1
2.	Zurada, Jacek M.	From Baylor to Baylor	1st Edition	Lulu.com	2010	ISBN-13: 978-1409273059
3.	Stamations V. Kartalopoulos	Understanding Neural Networks and Fuzzy Logic	1st	Wiley- IEEE Press	1995	978-0780311282
4.	Bart Kosko	Neural Networks and Fuzzy System	2nd	Prentice Hall	1991	978-0136114352
5.	Mohamad H. Hassoun	Fundamentals of artificial neural networks	3rd	Mohamad H. Hassoun	2015	1995-03-27

Grading Policy:

As per IIUC grading policy

Weekly Activity Plan and List of Experiments:

Week	Activities	Topics
1	Lab work	CONCEPTS OF ANN'S
2	Lab work	KINDS OF ANN'S
3	Lab work	MULTI LAYER ANN'S: TOPOLOGY AND C/CS
4	Lab work	PROBLEM BASED ON BACK-PROPAGATION NETWORK (XOR PROBLEM)
5	Lab work	PATTERN RECOGNITION: CLASSIFICATION OF DIGITS 0-9
6	Lab work	ANN'S APPLICATIONS (Mid-Term)
7	Lab work	PROBLEMS ON ADAPTIVE RESONANCE THEORY



8	Lab work	PROBLEMS BASED ON HOPFIELD MODEL
9	Lab work	RECURRENT ANN'S
10	Lab work	PROBLEMS ON BIDIRECTIONAL ASSOCIATIVE MEMORY NETWORK
11	Lab work	BOLTZMANN MACHINE PROBLEM: TRAVELING SALESMAN PROBLEM
12	Lab work	CONCEPTS OF FUZZY LOGIC
13	Lab work	BASIC ELEMENTS OF FUZZY SYSTEM AND FUZZY APPLICATIONS
14	Lab work	AN INTRODUCTION TO NEUROFUZZY SYSTEM
15	Lab work	FUZZY PRODUCTION RULES (FPR's) & FUZZY ALGORITHM



8th Semester		
ISCED Code	Course Code	Course Title
0619	CSE-4875	Pattern Recognition and Image Processing
Credit Hours: 3	Contact Hours: 3	Type: Core, Engineering
Prerequisite: None		
Co-requisite: CSE-4876 (Pattern Recognition and Image Processing Lab)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes	10 Marks
		Mid-term	30Marks
SEE: Semester End Examination			50 Marks

Course Objective:

After completing this course the students will learn

- The basic concepts of two-dimensional image acquisition, sampling, and quantization.
- Spatial filtering techniques, including linear and non-linear methods.
- The fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
- Programming techniques in digital image processing related problems.
- Understand segmentation and feature extraction process of pattern recognition.
- To develop a complete pattern recognition system to classify the patterns from images.
- Demonstrated teamwork and communication skills through course projects

Course Learning Outcomes (CLOs):

Upon successful completion of this course, students will be able to:

#	CLO Description	Weightage (%)
1.	Explain basic image processing techniques for solving real problems	10%
2.	Apply and demonstrate image processing techniques for solving problems in computer science	60%
3.	Evaluate & Develop the algorithms to solve real world problem for higher level image processing with modern techniques.	30%

Mapping of CLO-PLO:

Sl. No.	CLO Description	PLOs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CLO1	Explain basic image processing techniques for solving real problems	PLO1 PLO2	Cognitive/Understand	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment



Sl. No.	CLO Description	PLOs	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CLO2	Apply and demonstrate image processing techniques for solving problems in computer science	PLO2 PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Note	Exam, Quiz, Assignment
CLO3	Evaluate & Develop the algorithms to solve real world problem for higher level image processing with modern techniques.	PLO4	Cognitive/Apply	Lecture, Class discussion, Assignment, Note,	Exam, Quiz, Assignment,

Course Content:

Lectures	Topics	CLOs
Lec 1-3	1. Introduction: Introduction of Digital Image Processing and Pattern Recognition, Application areas, Fundamental steps of Digital Image Processing, Components of Digital Image Processing, Image & Video, Image & Human eyes, Color TV scheme.	CLO1
Lec 4-6	2. Analog and Digital Image: Analog and Digital Image, Image Acquisition and acquisition devices, Spatial and amplitude quantization, Pixels, Resolution, Aspect Ratio, Gray levels, Relationship color and gray levels.	CLO1
Lec 7-15	3. Image Enhancement: Different types of Image Enhancement operations, Spatial domain and frequency domain processing, Different types of filtering.	CLO1
Lec 16-18	Class Test 1 & Review class	
	Mid Term Exam	
Lec 19-24	4. Image Compression: Fundamental concepts of Image Compression and Data Compression, Data Redundancy, Image Compression models, Error free and Lossy compression, Image Compression Standards.	CLO1, CLO2, CLO3
Lec 25-28	5. Morphological processing: Morphological Image Processing, Dilation, Erosion, Opening, Closing, Hit and Miss etc.	CLO1, CLO2, CLO3
Lec 29-32	6. Segmentation: Image Segmentation, Different types of Segmentation, Edge linking and boundary detection, Thresholding, Region oriented segmentation,	CLO1, CLO2, CLO3
Lec 33	Class Test 2	
Lec 34-37	7. Image Representation: Object representation and description algorithms, Run Code, Chain Code, Signature, Skeleton, Boundary detection, Feature Extraction few case studies.	CLO1, CLO2, CLO3
Lec 38-41	8. Pattern Recognition: Fundamental concepts of Pattern Recognition, Pattern, Pattern Classes, Types of Pattern Recognition, Decision Theoretic methods, Structural method, Statistical method, Neural Network, Few case studies like speech recognition, fingerprint recognition, character recognition etc.	CLO1, CLO2, CLO3
Lec 42-45	Class Test 3 & Review Class	



Books :

Text Book :

R. C. Gonzalez, R. E. Woods, Digital Image Processing, 3rd Edition, McGraw-Hill, 2015, 0-07-014590-3

Reference Books :

- | | |
|---|--|
| 1. R. C. Gonzalez, R. E. Woods | :Digital Image Processing . |
| 2. Earl Gose | :Pattern Recognition and Image Analysis. |
| 3. Related Papers from Journals and Conferences | |
| 4. I.T. Young, J.J. Gerbrands, L.J. van Vliet | :Image Processing Fundamentals |
| 5. Russ, J.C. | :The Image Processing Handbook. |

Course Assessment Pattern (Theory courses):

Bloom's Category		Evaluations out of 100 marks			
		CIE (50 marks)			SEE (50marks)
Cognitive learning	Affective learning	Mid-term (30)	Assignment/ Class Test (10)	Attendance Marks (10)	Written Exam (50)
Remember		5			5
Understand		10	5		15
Apply		15	5		30
Analyze					
Evaluation					
Create					
x	Responding	X	x	10	

Note: CIE=Continuous Internal Evaluation, SEE= Semester End Examination

8th Semester

ISCED Code	Course Code	Course Title
0619	CSE-4876	Pattern Recognition and Image Processing Lab
Credit Hours: 1	Contact Hours: 2	Type: Core, Engineering
Prerequisite: None		
Co-requisite: CSE-4875 (Pattern Recognition and Image Processing)		

Course Assessments	CIE: Continuous Internal Evaluation	Attendance	10 Marks
		Class test/ Assignment/ Quizzes/Continuous Assessment	40 Marks
		Mid-term	20Marks
	SEE: Semester End Examination	30 Marks	

Objective:

The main objectives of this course are:

- To introduce the student with fundamental concepts of images and to analyze and manipulate the different types of images.
- To introduce students with the different algorithms of image processing and pattern recognition.
- To help the student to enhance their analysing skills and use the same for writing program in MATLAB/Python.



Course Learning Outcomes (CLOs):

After completion of this course students will be able to:

CLO1	Knowledge and understanding: Describe and explain the fundamentals concepts of two-dimensional image acquisition, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection. Understanding the Image Restoration, Compression, Segmentation, Representation and Description and Pattern Recognition,
CLO2	Use an integrated programming environment to write and execute algorithms of image processing as well as apply debugging techniques to locate and resolve errors.
CLO3	Compare and apply the appropriate image processing and pattern recognition algorithms to solve real world problems.

Mapping of CLO-PLO:

#	CLO Description	PLOs	Bloom's Taxonomy Domain/Level	Delivery Methods and activities	Assessment Tools
CLO1	Describe and explain the fundamentals concepts of two-dimensional image acquisition, image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection. Understanding the Image Restoration, Compression, Segmentation, Representation and Description and Pattern Recognition,	PLO1	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO2	Use an integrated programming environment to write and execute algorithms of image processing as well as apply debugging techniques to locate and resolve errors.	PLO1, PLO2	Cognitive/Apply	Lecture, Class discussion, Lab work, Note	Assignment, Class performance, Exam
CLO3	Compare and apply the appropriate image processing and pattern recognition algorithms to solve real world problems.	PLO2, PLO3	Cognitive/ Apply	Class discussion, Lab work, Note	Assignment, Class performance, Exam

Text/Reference Books:

Text /Reference Books :

#	Name of Autors	Title of Book	Edition	Publisher's Name	Year	ISBN
1.	R. C.	Digital Image	2th			



	Gonzalez, R. E. Woods	Processing using Matlab				
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Weekly Activity Plan and List of Experiments:

Week	Experiment Name
1.	Image files format and read using MATLAB/Python.
2.	Image enhancement: Binary Image, gray level image, negative, brightness, darkness, thresholding (single, duel, contrast stretching).
3.	Filtering: Smoothing, Sharpening.
4.	Image Histogram: Calculate the histogram of an image, equalize the image.
5.	Temporal and geometric processing: Implement various temporal and geometric processing algorithms.
6.	Lab Test
7.	Compression: Implement various image compression algorithms.
8.	Morphological Processing: Implement different morphological image processing methods.
9.	Segmentation: Implement different segmentation methods.
10.	Implement different feature extraction methods.
11.	Object Recognition: Pattern recognition using different approaches.
12.	Perform other experiments relevant to this course.
13.	Overview
14.	Lab Test



Appendix



Appendix I

Rubric-Template: Internship outline/Industrial Training

ISCED Code	Course Code	Course Title
0031		
Credit Hour: 1		Perquisite (if any):
Contact Hours:		Level/semester:
Course type: Theory/Quantitative/Discipline		Academic session:
Instructor name:		Total marks:

Rational of the course: Internship allows students to gain direct experience. Opportunity to sample various career options: Students can use internships to test their interest in and aptitude for different career areas. This enables students to find out where they might fit best in a professional environment.

Course Objectives: Example

- ✓ Explore career alternatives prior to graduation.
- ✓ Integrate theory and practice.

Course Learning Outcomes:

CLO1.

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6		
CLO1								

Course plan

Week	Topic	Teaching-learning strategy	Assessment strategy	Corresponding CLOs
2 to 8 week placement in the organization	Practical job	Learning by doing and practicing	Report generation and presentation	

Assessment Pattern

- ✓ **Organization:** how the presentation was organized in terms of introduction, logical sequence and cohesiveness of supporting materials in the body of the report, conclusion, references and appendices.
- ✓ **Main theme:** main theme succinctly stated, appropriately repeated and strongly supported.
- ✓ **Supporting materials:** use of a variety of supporting materials with explanations, examples, tables, figures, statistics, etc
- ✓ **Language:** choice of compelling language that enhances effectiveness of the presentation; language is also appropriate to the audience.
- ✓ **Delivery:** delivery posture, gesture, eye contact and vocal expression make the presentation compelling; the presenter appears cultured and confident.

Rubrics for Assessment

Performance Criteria	Excellent (100%)	Good (80%)	Satisfactory (60%)	Pass (40%)	Fail (0)	Score
Organized the	Thoroughly consistent and	Cohesive organizational	Logical organizational	Organizational pattern in terms	Inadequate organizational	



presentation in logical sequence	cohesive organizational pattern in terms of introduction, supporting materials, conclusion & references.	pattern of introduction, supporting materials, conclusion & references somewhat inconsistent	pattern in terms of introduction, supporting materials, conclusion, & references is often lacking.	of introduction, supporting materials, conclusion, & references is barely observable.	pattern	
Stated the main theme clearly	Main theme succinctly stated, appropriately repeated and strongly supported with subject matter	Main theme stated, appropriately repeated and well supported	Main theme stated, appropriately repeated and poorly supported	Main theme stated, sometimes repeated and barely supported	Main theme not stated,	
Used credible supporting materials	Used of a variety of appropriate supporting materials with explanations, examples, tables & figures.	Used several supporting materials with explanations, examples, tables, & figures.	Used a number of supporting materials with limited examples, tables, & figures.	Used some supporting materials but with limited examples.	Used inadequate and inappropriate supporting materials	
Used compelling language	Used language that enhanced effectiveness of the presentation; it was highly appropriate for the audience.	Used effective language for the presentation; was appropriate to the audience.	Used effective language for the presentation, but daunting to the audience.	Used language barely effective; also inappropriate to the audience.	Language totally ineffective	
Made excellent delivery	Delivery posture, gesture, eye contact and vocal expression made the presentation compelling	Delivery posture, gesture, eye contact and vocal expression were appropriate	Often made delivery posture, gesture, eye contact with the audience	Often missed eye contact with audience; presenter appeared nervous	Presenter was very nervous	

Assessment tools

- ✓ Internship report evaluation by two examiners
- ✓ Presentation of internship report

Rubrics for Viva: Viva (CSE-4822)

Performance Criteria	Excellent (10)	Good (8)	Satisfactory (6)	Pass (4)	Needs Improvement	Score
Question -answer Session	Demonstrates knowledge by answering all types of questions with explanations and elaboration in professional manner	Is at ease with expected answers to all questions without elaboration in somewhat professional manner	Is uncomfortable with information and can answer only rudimentary questions	Does not have grasp of information and cannot answer questions about subject	Cannot answer the questions asked	
Question on Fundamental skill (60%)						
Question on Social skill (20%)						
Question on						



Critical thinking (10%)						
Question on personal skill (10%)						

Question on Fundamental Skill: May be 40 %	Questions related to discipline specific knowledge and application skills that a student obtains after a level of study, which influence his/her performance and societal contributions.
Question on Social Skill: May 20%	Questions related to the knowledge needed for working with people at various levels to achieve set goals, communication, community engagement and etc.
Question on Critical Thinking:	Questions related to significant responsibility in making judgments/ decisions towards the management of self, others and for the allocation of substantial resources.
Question on Personal Skill:	Questions related to self-direction and self-enterprise skills, social, professional, environmental and ethical practice/ values, global knowledge and competencies to fulfil employment, entrepreneurial and lifelong learning skills

Rubrics for oral presentation of Project/Thesis/ Internship/Industrial Training.

Assessment will be made on the basis of following performance criteria:

- ✓ **Organization:** How the presentation was organized in terms of introduction, logical sequence and cohesiveness of supporting materials in the body of the report, conclusion, references and appendices.
- ✓ **Main theme:** Main theme succinctly stated, appropriately repeated and strongly supported.
- ✓ **Supporting materials:** Use of a variety of supporting materials with explanations, examples, tables, figures, statistics, etc.
- ✓ **Language:** Choice of compelling language that enhances effectiveness of the presentation; language is also appropriate to the audience.
- ✓ **Delivery:** Delivery posture, gesture, eye contact and vocal expression make the presentation compelling; the presenter appears cultured and confident. A simple rubric can be constructed as follows. The presenter:

Performance Criteria	Excellent (10)	Good (8)	Satisfactory (6)	Pass (4)	Fail (0)	Score
Organized the presentation in logical sequence	Thoroughly consistent and cohesive organizational pattern in terms of introduction, supporting materials, conclusion & references.	Cohesive organizational pattern of introduction, supporting materials, conclusion & references somewhat inconsistent	Logical organizational pattern in terms of introduction, supporting materials, conclusion, & references is often lacking.	Organizational pattern in terms of introduction, supporting materials, conclusion, & references is barely observable.	Inadequate organizational pattern	
Stated the main theme clearly	Main theme succinctly stated, appropriately repeated and strongly supported with subject matter	Main theme stated, appropriately repeated and well supported	Main theme stated, appropriately repeated and poorly supported	Main theme stated, sometimes repeated and barely supported	Main theme not stated,	
Used credible supporting materials	Used of a variety of appropriate supporting materials with explanations, examples, tables & figures.	Used several supporting materials with explanations, examples, tables, & figures.	Used a number of supporting materials with limited examples, tables, & figures.	Used some supporting materials but with limited examples.	Used inadequate and inappropriate supporting materials	



Used compelling language	Used language that enhanced effectiveness of the presentation; it was highly appropriate for the audience.	Used effective language for the presentation; was appropriate to the audience.	Used effective language for the presentation, but daunting to the audience.	Used language barely effective; also inappropriate to the audience.	Language totally ineffective	
Made excellent delivery	Delivery posture, gesture, eye contact and vocal expression made the presentation compelling	Delivery posture, gesture, eye contact and vocal expression were appropriate	Often made delivery posture, gesture, eye contact with the audience	Often missed eye contact with audience; presenter appeared nervous	Presenter was very nervous	