Faculty of Engineering and Technology

Department of Computer Science and Engineering

CSE

Syllabus for B.Sc. Engineering

Session 2017-2018

Examinations

2018 [Year-1, Term-1 & Term-2]

2019 [Year-2, Term-1 & Term-2]

2020 [Year-3, Term-1 & Term-2]

2021 [Year-4, Term-1 & Term-2]

DEPARTMENT AT A GLANCE

The Department of Computer Science and Engineering (CSE) was founded in 2008. The goal of CSE Department is to cultivate highly-motivated and well-trained professionals who will lead the IT area. The Department of Computer Science and Engineering offers various specialized educational programs to create many competent engineers with profound knowledge of academic theories and practical approaches for the development of our country and all human society, in general. The department offers both basic and advanced courses. In the Department of Computer Science and Engineering, students study basic and applied technologies related to CSE, information technology as well as information processing, information systems, and the diverse technologies upon which our IT society is based on. To become engineers with knowledge related to the construction and management of communication networks which serve as transmission media, software driven management, and the control of systems. They support these networks, and knowledge related to hardware design and manufacture. The department has a number of well-constructed laboratories, namely Software Laboratory, Electrical & Electronics laboratory, Communication laboratory. Well-equipped computers are provided for the students, faculty members as well as the researchers. The department has a seminar library. Students are encouraged for academic excellence by awarding various prizes, medals and certificates in per year performances. The department also arranges co-curriculum activities among the students such as programming contests, software exhibitions, cultural events, games competitions, debate etc. in every year.

1. PREAMBLE:

Pabna University of Science and Technology (PUST) have introduced B.Sc. Engineering degree from the session 2008-09 under the Faculty of Engineering and Technology. This program of study shall extend over a period of 04 (four) academic years which shall consist of 08 (eight) terms. The credit point system will be the deciding factor to assess this program. All the departments under this faculty will have full autonomy to develop guidelines and conduct all types of academic activities within it strictly observing this ordinance.

2. DEPARTMENTS UNDER THE FACULTY OF ENGINEERING AND TECHNOLOGY:

The followings are the departments under the Faculty of Engineering and Technology:

- Department of Computer Science and Engineering
- Department of Electrical and Electronic Engineering
- Department of Electronic and Telecommunication Engineering
- Department of Information and Communication Engineering
- Department of Civil Engineering
- Department of Architecture
- Department of Urban and Regional Planning

3. STUDENT ADMISSION

3.1 ADMISSION AND READMISSION:

The Admission Committee as per the rules of university will conduct the admission process for Bachelor's degree. The student will be admitted in the first semester of an academic year in the individual discipline of engineering faculty. A student will be eligible for readmission in the Year-1, Term-1 of the subsequent session if he/she was present in all classes at least for 15 (fifteen) consecutive working days after the starting of Year-1, Term-1 classes and also appeared at the semester final examination but failed to get required GPA. Readmitted students will be assigned the original registration number and a student shall not get chance for readmission more than twice during the entire programme as he/she shall have to complete the program within a maximum period of 7 (seven) academic years. If a student remains totally absent without any permission from all classes for 15 (fifteen) consecutive working days after the starting of Year-1, Term-1 classes, his/her admission may be cancelled on the recommendation of the chairman of the concerned department.

3.2 COURSE ADVISER:

After admission every student shall be assigned to a 'Course Adviser' from the teachers of his/her discipline to guide him/her throughout the Semester. He/she shall meet the students on a regular basis and advise them on all academic matters.

4. ACADEMIC CALENDAR

4.1 There will be two semester (Term-1 and Term-2) in an academic year. The Academic Calendar showing dates of beginning and closing classes, commencement of examinations and probable dates for publication of the result shall be published by the respective Departmental Academic Committee before commencement of each semester. The copy shall be sent to the Dean of the Faculty, Controller of Examinations and the respective University Authority.

4.2 DURATION OF SEMESTERS:

The duration of each semester will be as follows:

i.	Classes	= 14 weeks
ii.	Final Lab Examination	= 01 weeks
iii.	Recess before Term Final Examination	= 02 weeks
iv.	Term Final Examination	= 03 weeks
		Total = 21 Weeks

Normally 1 week break is provided after Term Final Examination.

5. COURSE PATTERN

5.1 The entire Bachelor's degree program is covered through a set of theoretical, practical, viva-voce, project courses etc and every course shall have a short representative course title and a number including total credit points and short

description of every course will be published by the Academic Committee of each department.

5.1.1 COURSE INSTRUCTION:

The course teacher has to supply a copy of the detailed plan of course instruction with information about the number of lectures per topic, number and type of assignments, number and dates of class test, suggested date of final examination and name of text materials.

5.2 ASSIGNMENT OF CREDITS

5.2.1 THEORETICAL: There shall be at least one (1) lecture hour for each credit point in a week for each theoretical course.

5.2.2 PRACTICAL: There shall be at least two contact hours for each credit point in a week for each practical course.

5.2.3 PROJECTS, FIELD WORKS, VIVA-VOCE, ETC: Required credits will be assigned by the respective discipline.

6. COURSE REGISTRATION

6.1 COURSE REGISTRATION

Any student who uses classroom or laboratory facilities or faculty time is required to register formally. Upon admission to the university each student is assigned to a student adviser with whose consent and advice the student can register for courses he intends to take during a given term.

6.2 REGISTRATION PROCEDURE

Students must register for each course in which they will participate. At the commencement of each term, each student has to fill up a course registration form in consultation with and under the guidance of his/her advisor. The date, time and venue of registration are announced in advance by the Registrar's Office. Much counseling and advising are accomplished at this time. It is absolutely essential that all the students be present for registration at the specified time. Late registration is, however, permitted during the first week on payment of a late registration fee.

6.3 LIMITS ON THE CREDIT TO BE TAKEN

A student must be enrolled for at least 15 credits. He may be allowed to enroll in up to a maximum of 24 credits if recommended by his/her Adviser. A student must enroll for the sessional/ laboratory courses prescribed in a particular term within the allowable credit limits.

In special cases where a student cannot be allotted for the minimum required 15 credit hours in a Term, the relevant authority may approve a lesser number of credit hours to suit individual requirements. Such cases shall only be applicable to students requiring less than 15 credit hours for graduation.

6.4 PRE-CONDITIONS FOR REGISTRATION

A student is allowed to register in a particular course subject to the class capacity constraints and satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any term, the concerned BUGS may allow him/her to register for

a course which depends upon the pre-requisite course provided that his/her attendance and performance in the continuous assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each term. The Registration program with dates and venue will be announced in advance. Late registration is, however, permitted during the first week on payment of a late registration fee. Students having outstanding dues to university or a hall of residence shall not be permitted to register. All students have, therefore, to clear their dues and get a clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Forms and complete the course registration procedure. Registration Forms will normally be available in the Registrar's Office. However, for the First Year students, prior department-wise enrolment/admission is mandatory. An orientation program will be conducted for them at the beginning of the first term when they will be handed over the registration package on producing enrollment slip/proof of admission.

6.5 PRE-REGISTRATION

Pre-registration for courses to be offered by the students in a particular term will be done on a specified dates before the end of the previous term. All students in consultation with their course adviser are required to complete the pre-registration formalities, failing which a fine of Tk. xxx.xx (amount may be decided by the authority) will have to be paid before registration in the next term. Further a student who does not pre-register may not get the courses desired by him subsequently.

6.6 REGISTRATION DEADLINE

Student must register for the courses to be taken before the commencement of each term and no late registration will be accepted after one week of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer of the university or some other academic commitments which precluded enrolling prior to the last date of registration.

6.7 PENALTY FOR LATE REGISTRATION

Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. xxx.xx (amount may be decided by the authority, currently the amount is Tk. 500.00 (Five hundred only)). This extra fee will not be waived whatever be the reason for late registration.

6.8 COURSE ADJUSTMENT PROCEDURE

A student will have some limited options to add or delete courses from his/her registration list, within the first two weeks from the beginning of the term. He/She may add courses only within the first two weeks of a regular Term and only the first week of Short Term. In case of dropping a course a student will be allowed to do so within four weeks after the commencement of a regular Term and two weeks after commencement of a short Term. Adjustment of initially registered courses in any term can be done by duly completing the Course Adjustment Form. These forms will normally be available in the Registrar's Office. For freshman students such forms can be included in the registration packet at the time of orientation.

Any student willing to add or drop courses will have to fill up a Course Adjustment Form in consultation with and under the guidance of his adviser. The original copy of the Course Adjustment Form will be submitted to the Registrar's Office, and then the requisite number of photo copies will be made by the Registrar's Office for distribution to the concerned adviser, Head, Dean, Controller of Examination and the student. All changes in course must be approved by the Adviser and the Head of the department concerned. The Course Adjustment Form will have to be submitted to the Registrar's Office after duly filled in and signed by the concerned persons. To add/drop a course respective teacher's consent will be required.

6.9 WITHDRAWAL FROM A TERM

If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the Term within a week after the end of the Term Final Examination. However, he/she may choose not to withdraw any laboratory/ sessional/ design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from the Chief Medical Officer of the University. The Academic Council will take the final decision about such application.

If a student obtains a grade lower than 'B' in a particular course he/she will be allowed to repeat the course only once for the purpose of grade improvement by forgoing his/her earlier grade. However, he/she will not be eligible to get a grade better than 'B' for an improvement course. A student will be permitted to repeat for grade improvement purposes a maximum of four courses in B. Sc. Engineering. If a student obtains a 'B' or a better grade in any course he/she will not be allowed to repeat the course for the purpose of grade improvement.

6.10 RULES FOR SPECIAL COURSES

A special course is a self-study course, but is amongst the regular courses listed in the course catalog. This type of course is offered only in exceptional cases. The following rules are applicable to all special courses.

- Whether a course is to be floated as a special course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Such a decision also has to be reported to the Academic Council.
- The special course is offered to a student in his/her last term if it helps him/her to graduate in that term.
- A special course may be offered in a particular term only if the course is not running in that term as a regular course.
- Normally no lecture will be delivered for a special course but laboratory/design classes may be held if they form part of a course.
- The course coordinator/course teacher will assign homework, administer quizzes, and final examination for giving assessments at the end of the term.

- A student is allowed to register for a maximum of two courses on a self-study basis.
- A special course cannot be utilized for grade improvement purposes.

6.11 RULES FOR COURSES OFFERED IN SHORT TERM

- The courses to be run during the Short Term shall be decided on the recommendations of departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constraints and satisfaction of prerequisites.
- Student will be allowed to register in a maximum of two courses during the Short Term.
- A course may be given a weight of up to 6 credits in any Short Term following a graduation/final term if he/she is short by a maximum of 6 earned credits only, on a self-study basis with no formal instruction. In a self-study course, there will be a final examination, beside the continuous assessment.
- A certain fee for each credit hour to be registered to be borne by the students who enroll during Short Term.

7. ACADEMIC PROGRESS, PROBATION AND SUSPENSION

7.1 EARNED CREDITS

The courses in which a student has earned a 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained an 'F' grade will not be counted towards his/her earned credits or GPA calculation. However, the 'F' grade will remain permanently on the Grade Sheet and the Transcript.

A student who obtains an 'F' grade in a core course will have to repeat that particular course. However, if a student gets an 'F' in an optional course, he/she may choose to repeat that course or take a substitute course if available. When a student will repeat a course in which he/she has previously obtained an 'F', he/she will not be eligible to get a grade better than 'B' in that repeated course.

7.2 ACADEMIC PROGRESS:

Undergraduate students will be considered to be making normal progress toward a degree if their Cumulative Grade Point Average (CGPA) for all work attempted is not less than 2.20.

Probation and Suspension: Undergraduate students who fail to maintain the minimum rate of progress as mentioned before may be placed on academic probation. The objective of the academic probation is to remind or warn the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exists.

- The Term GPA falls below 2.20, or
- The Cumulative GPA falls below 2.20.

7.3 MINIMUM EARNED CREDIT AND GPA REQUIREMENT FOR OBTAINING DEGREE

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engg.) will be decided by the respective BUGS. However, at least 157 credit hours for engineering must be earned to be eligible for graduation, and this must include the specified core courses. The minimum GPA requirement for obtaining a Bachelor's degree in engineering and architecture is 2.20. A student may take additional courses with the consent of his/her Adviser in order to raise GPA, but he/she may take a maximum of 15 such additional credits in beyond respective credit-hour requirements for Bachelor's degree during his/her entire period of study.

8. EVALUATION SYSTEM

8.1 THEORETICAL: A student will be evaluated continuously in the semester by class participation assignment, quizzes, class tests and semester final examination.

8.2 PRACTICAL: For laboratory work he/she will be assessed by lab attendance, class performance and lab report, lab test & test report, Examination script, viva-voce etc.

8.3 VIVA-VOCE: Students shall appear at viva-voce examination (oral examination) having specified number of credit points at the end of each Semester-final examination.

8.4 DISTRIBUTION OF MARKS (THEORETICAL)

The marks of theoretical courses will be as follows:

Class Participation	10%
Class tests/Assignments/quizzes	20%
Final Examination (3 hours)	70%
Total	**100%**

8.5 DISTRIBUTION OF MARKS FOR LABORATORY SESSION

The marks of laboratory courses will be as follows:

Class Participation	10%
Lab Test/Lab Performance and Lab Report	30%
Final Lab Examination	60%
Total	**100%**

8.6 CLASS PARTICIPATION

The distribution of marks for class attendance (theoretical and practical) shall be as follows:

Attendance	Marks	Example
90% & above	100%	10 out of 10
85% to 89%	90%	09 out of 10
80% to 84%	80%	08 out of 10
75% to 79%	70%	07 out of 10
70% to 74%	60%	06 out of 10
65% to 69%	50%	05 out of 10
60% to 64%	40%	04 out of 10
Less than 60%	00%	00 out of 10

There shall be two question setters and examiners (internal and external) for each course of the semester final examination. The course teacher shall act as internal examiner. The examination committee shall select external examiner from inside or outside the university.

9. GRADING SYSTEM

9.1 LETTER GRADE AND GRADE POINT

Letter grade & corresponding grade point will be awarded as follows:

Grade	Letter Grade		Grade Point	Interpretation
80% and above	A+	(A plus)	4.00	Outstanding
75% to less than 80%	A	(A regular)	3.75	Excellent
70% to less than 75%	A-	(A minus)	3.50	Very Good
65% to less than 70%	B+	(B plus)	3.25	Good
60% to less than 65%	B	(B regular)	3.00	Satisfactory
55% to less than 60%	B-	(B minus)	2.75	Below Satisfactory
50% to less than 55%	C+	(C plus)	2.50	Average
45% to less than 50%	C	(C regular)	2.25	Pass
40% to less than 45%	D	....	2.00	Poor
less than 40%	F	...	0.00	Fail

9.2 CALCULATION OF GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed / completed by a student. For example, if a student passes / completes n courses in a term having credits of C1, C2, … , Cn and his grade points in these courses are G1, G2, … , Gn respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

10. DISTRIBUTION OF UNDERGRADUATE COURSES

Course Type	Credits	Percentage
Mathematics and Basic Sciences	21.00	12.72%
Humanities	11.75	7.12%
Electrical, Electronics, Communication and Mechanical Engineering	14.50	8.79%
Core Courses	117.75	71.37%
Total	165	100%

11. TERM-WISE CREDIT HOURS DISTRIBUTION FOR THE DEGREE OF B.SC. ENGINEERING:

Year	Semester	Credit(s)	
Year-1	Term-1	19.50	39.00
	Term-2	19.50	
Year-2	Term-1	20.25	39.50
	Term-2	19.25	
Year-3	Term-1	21.00	43.00
	Term-2	22.00	
Year-4	Term-1	21.00	43.50
	Term-2	22.50	
Total			**165**

12. COURSES OFFERED TO THE UNDERGRADUATE STUDENTS DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Year-1, Term-1 B.Sc. Engineering Courses					
S/N	Course No.	Course Title	Theory H/W	Lab H/W	Credit
1	CSE 1101	Computer Fundamentals	3	0	3
2	CSE 1102	Computer Fundamentals Sessional	0	3	1.5
3	CSE 1103	Structured Programming Language	3	0	3
4	CSE 1104	Structured Programming Language Sessional I	0	3	1.5
5	MATH 1101	Differential Calculus and Co-ordinate Geometry	3	0	3
6	PHY 1101	Physics	3	0	3
7	HUM 1101	Communicative English	3	0	3
8	HUM 1102	Communicative English Sessional	0	3/2	0.75
9	CSE 1150	Viva Voce			0.75
Total			15	9	19.50
Year-1 Term-1 Load = 15L+3.75P+0.75V=19.50 Credits					

Year-1, Term-2 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	ME 1200	Engineering Drawing		0	2	1
2	CSE 1200	Structured Programming Language Sessional II		0	3/2	0.75
3	CSE 1201	Object Oriented Programming	CSE 1103	3	0	3
4	CSE 1202	Object Oriented Programming Sessional		0	3	1.5
5	CSE 1203	Discrete Mathematics		3	0	3
6	EEE 1201	Basic Electrical Engineering		3	0	3
7	EEE 1202	Basic Electrical Engineering Sessional		0	3	1.5
8	MATH 1201	Integral Calculus, Differential Equation and Series Solutions		3	0	3
9	HUM 1201	Economics		2	0	2
10	CSE 1250	Viva Voce				0.75
Total				14	8	19.50
Year-1 Term-2 Load = 14L+4.75P+0.75V=19.50 Credits						

Year-2, Term-1 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 2101	Data Structures	CSE 1103	3	0	3
2	CSE 2102	Data Structures Sessional		0	3	1.5
3	CSE 2103	Design Pattern and Java Programming	CSE 1201	3	0	3
4	CSE 2104	Design Pattern and Java Programming Sessional		0	3	1.5
5	EEE 2101	Electronic Devices and Circuits		3	0	3
6	EEE 2102	Electronic Devices and Circuits Sessional		0	3	1.5
7	MATH 2101	Vector, Matrices and Linear Algebra		3	0	3
8	STAT 2101	Elementary Statistics and Probability		3	0	3
9	CSE 2150	Viva Voce				0.75
Total				15	9	20.25
Year-2 Term-1 Load = 15L+4.5P+0.75V=20.25 Credits						

Year-2, Term-2 B.Sc. Engineering Courses						
S/ N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 2200	Analytical Programming Sessional	CSE 1103 CSE 1201	0	3	1.5
2	CSE 2201	Algorithms	CSE 2101	3	0	3
3	CSE 2202	Algorithms Sessional		0	3	1.5
4	CSE 2203	Theory of Computation		2	0	2
5	CSE 2205	Digital Systems		3	0	3
6	CSE 2206	Digital Systems Sessional		0	3	1.5
7	MATH 2201	Complex analysis, Laplace and Fourier Transforms		3	0	3
8	STAT 2201	Theory of Statistics		3	0	3
9	CSE 2250	Viva Voce				0.75
Total				14	9	19.25
Year-2 Term-2 Load = 14L+4.5P+0.75V=19.25 Credits						

Year-3, Term-1 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 3101	Computer Architecture and Organization	CSE 2205	3	0	3
2	CSE 3103	Compiler Design	CSE 2203	3	0	3
3	CSE 3104	Compiler Design Sessional		0	3	1.5
4	CSE 3105	Numerical Methods		3	0	3
5	CSE 3106	Numerical Methods Sessional		0	3/2	0.75
6	CSE 3107	Database Management Systems		3	0	3
7	CSE 3108	Database Management Systems Sessional		0	3	1.5
8	ECE 3101	Data Communication		3	0	3
9	ECE 3102	Data Communication Sessional		0	3	1.5
10	CSE 3150	Viva Voce				0.75
Total				15	10.5	21
Year-3 Term-1 Load = 15L+5.25P+0.75V=21 Credits						

Year-3, Term-2 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 3200	Project		0	2	1
2	CSE 3201	System Analysis and Design		3	0	3
3	CSE 3203	Operating Systems		3	0	3
4	CSE 3204	Operating Systems Sessional		0	3	1.5
5	CSE 3205	Web Engineering		3	0	3
6	CSE 3206	Web Engineering Sessional		0	3	1.5
7	CSE 3207	Digital Signal Processing	MATH 2201	3	0	3
8	CSE 3208	Digital Signal Processing Sessional		0	3/2	0.75
9	CSE 3209	Microprocessors and Assembly Language	CSE 3101	3	0	3
10	CSE 3210	Microprocessors and Assembly Language Sessional		0	3	1.5
11	CSE 3250	Viva Voce				0.75
Total				15	12.5	22
Year-3 Term-2 Load = 15L+6.25P+0.75V=22 Credits						

Year-4, Term-1 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 4100	Project/Thesis		0	3	1.5
2	CSE 4101	Software Engineering		3	0	3
3	CSE 4102	Software Engineering Sessional		0	3/2	0.75
4	CSE 4103	Artificial Intelligence		3	0	3
5	CSE 4104	Artificial Intelligence Sessional		0	3	1.5
6	CSE 4105	Digital Image Processing		3	0	3
7	CSE 4106	Digital Image Processing Sessional		0	3	1.5
8		Optional - I		3	0	3
9	HUM 4101	Sociology and Bangladesh Studies		3	0	3
10	CSE 4150	Viva Voce				0.75
Total				15	10.5	21
Year-4 Term-1 Load = 15L+5.25P+0.75V=21 Credits						

NB: The Courses, CSE 4100 and CSE 4200, will be evaluated combined after completing CSE 4200

List of Optional Courses
Optional-I
Optional-I will be selected from the following courses:

S/N	Course No.	Course Title	Theory H/W	Lab H/W	Credit
1	CSE 4107	Computer Simulation and Modeling	3	0	3
2	CSE 4109	Multimedia Technology	3	0	3
3	CSE 4111	Basic Graph Theory	3	0	3
4	CSE 4113	Parallel and Distributed Processing	3	0	3

Year-4, Term-2 B.Sc. Engineering Courses						
S/N	Course No.	Course Title	Pre-Requisite	Theory H/W	Lab H/W	Credit
1	CSE 4200	Project/Thesis	CSE 4100	0	6	3
2	CSE 4201	Computer Networks		3	0	3
3	CSE 4202	Computer Networks Sessional		0	3	1.5
4	CSE 4203	Computer Graphics		3	0	3
5	CSE 4204	Computer Graphics Sessional		0	3	1.5
6	CSE 4205	Interfacing and Microcontrollers	CSE 3209	3	0	3
7	CSE 4206	Interfacing and Microcontrollers Sessional		0	3/2	0.75
8		Optional – II		3	0	3
9	HUM 4201	Industrial Management and Accounting		3	0	3
10	CSE 4250	Viva Voce				0.75
Total				15	13.5	22.5
Year-4 Term-2 Load = 15L+6.75P+0.75V=22.5 Credits						

NB: The Courses, CSE 4100 and CSE 4200, will be evaluated combined after completing CSE 4200.

List of Optional Courses
Optional-II
Optional-II will be selected from the following courses:

S/N	Course No.	Course Title	Theory H/W	Lab H/W	Credit
1	CSE 4207	Cryptography and Network Security	3	0	3
2	CSE 4209	VLSI Design	3	0	3
3	CSE 4211	Wireless Communication	3	0	3
4	CSE 4213	Computational Geometry	3	0	3

CSE 1101: Computer Fundamentals	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Computer Basics: Introduction to Computers; History and development of Computers; Generation of Computers; Types of Computers.
Computer Hardware and Peripherals: Basic Units of Computer Hardware; Keyboard; Mouse; Internal structure of CPU; Functions of RAM; ROM and Cache memory; Basic functional mechanism of HDD and CD-ROM; Different types of Monitors; Impact and Non-impact Printers; Scanner; Plotter; Typical Computer specifications.
Software: Classifications; System software; Operating system concepts and importance; Components and basic functions of DOS; Windows operating system; Application software and Utility programs; Computer Virus;Application software: text processing (MS-WORD; etc); Spread sheet (MS-EXCEL etc).
Language: Machine language; Assembly language; High level language; Assembler;Translator; Interpreter and Compiler.
Computer Networks: Computer networks and its goals; Basic concepts on LAN; MAN; WAN and Internet systems; Internet services; Functions of Modem in Internet.
Computer Ethics: Computers in the workplace; Computer crime; Rules of communications;Privacy; Intellectual property.
Cyber Crime: Jurisdiction and Cyber Crime; Criminal Justice in Bangladesh and Implications on Cyber Crime; Hacking, Malicious Spreading in Viruses; Password fraud, Cheating; Cyber Pornography; Protection of Copyrights and Intellectual Property right, Unsolicited e-Mail, Defamation, Harassment and e-Mail Abuse, Present Legal Protection.
Cyber Law: Definition Nature, Scope, Utility of Cyber Law; Origin and Development of Cyber Law and Internet;

Recommended Books:

1. Deborah G. Johnson ; Computer Ethics
2. Sara Baase : Gift of Fire: Social, Legal and Ethical Issues for Computing Technology
3. V.Rajaraman : Fundamentals of Computer
4. Peter Norton : Computing Fundamentals
5. V. D. Dudej: Information Technology & Cyber Laws, *Commonwealth Publishers*
6. Vivck Sood: Cyber Law Simplified, *Tata McGraw Hill Publications*

CSE 1102: Computer Fundamentals Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/ Week**

Sessional works based on CSE 1101

CSE 1103: Structured Programming Language	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction to computer programming: Algorithm; Writing; debugging and running programs using C compiler.
C Basics: Different Data types and their range; Operator and operands and its precedence; Input/Output; Conditional operators; Loops nested structure; Error handling; Built-in functions.
Functions and Arrays: Writing & calling of User – defined functions; Recursive functions; Scope of variables; Introduction to one-dimensional arrays; Multi-dimensional arrays and array manipulation.
Pointers and Strings: Introduction to pointers; Pointers and array; Pointers and functions; String I/O; String-based built-in functions; String operations; Pointer and string.
Files: Introduction to files in C/C++; opening; closing and updating binary and sequential files.
Advanced topics: Operations on bits; Register variable; Pre-processors in C.

Recommended Books:

1. E. Balagurusamy: Programming with ANSI C, *Tata McGraw Hill*
2. Byron Gotfried : Programming with C
3. Robert Lafore : Programming with C
4. Herbert Schildt : Teach yourself C

CSE 1104: Structured Programming Language Sessional I	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 1103

MATH 1101: Differential Calculus and Co-Ordinate Geometry	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Differential Calculus: Limit; Continuity and differentiability; Differentiation of explicit and implicit function and parametric equations; Significance of derivatives; Differentials; Successive differentiation of various types of functions; Leibnitz's theorem; Rolle's theorem; Mean value theorems; Taylor's theorem in finite and infinite forms; Maclaurin's theorem in finite and infinite forms; Langrange's form of remainders; Cauehy's form of remainder; Expansion of functions by differentiation and integration; Partial differentiation; Euler's theorem; Tangent and Normal; Maxima and Minima; Points of inflection and their applications; Evaluation of indeterminate forms by L'Hospitals rule.

Co-ordinate Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous

equations of second degree; Angle between a pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves; circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes; Coaxial circles and limiting Department of Computer Science and Engineering points; Equations of parabola, ellipse and hyperbola in cartesian and polar co-ordinates.

Recommended Books:

1. Das and Mukharjee : Differential calculus
2. J.Edwards : Differential calculus
3.H.H.Ashwith : Analytic geometry of conic systems
4. M.L. Khanna : Solid Geometry

PHY 1101: Physics	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Structure of Matter: Structure of matter. Different types of bonds in solids: metallic, van dar waals'; Covalent and Ionic bond, Packing in solids: Inter atomic distances and forces of equilibrium, X-ray diffraction, Bragg's law.
Atomic Physics: Atom models: Thomson atom model, Rutherford atom model, Rutherford scattering formula, Electron orbits, Bohr atom model; Energy levels and spectra; Particle properties of waves.
Waves and Oscillations: Oscillations: Simple harmonic motion, Composition of simple harmonic motions and Lissajous' figures, Damped and Forced oscillations; Resonance; Waves: Wave properties of particle: de Broglie waves, Group velocity, Phase velocity; Travelling and Standing waves; Energy calculation of Traveling and Standing waves;Intensity of waves; Beats; Doppler effect.
Theories of Light: Wave theory: Huygens wave theory; Huygen's principle and construction; Superposition of light waves; Electromagnetic theory; Particle theory: Newton's corpuscular theory, Quantum theory of light.
Interference: Introduction; Conditions of Interference; Young's double slit experiment; Fresnel's biprism; Thin film Interference; Interference due to multiple reflection.
Diffraction: Fresnel's and Fraunhoper diffraction; Diffraction by single and double slit; Diffraction gratings.
Polarization: Introduction; Methods of producing polarized light; Polarization by reflection and refraction; Polarization by double refraction; Constrauvtion of Nicol prism; Production and analysis of polarized light; Optical activity; Optics of crystals; Polarimeters.

Recommended Books:

1. B.L. Theraja : Modern Physics
2. Kenneth Krane : Modern Physics
3. Brijlal : A textbook of Optics
4. by J Peatross & Michel ware : Physics of light and optics
5. S.P.Puri : Waves & Oscillations

HUM 1101: Communicative English	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Parts of Speech (Changing); Sentence making rules; Different types of sentences; Tense; Right forms of verbs; Verb conjugation.
Transformation of sentences: Different types of sentences; Converting degree; Appropriate preposition; Idioms & Phrase; Voice; Narration; Correction of sentences; WH Question; Completing sentences; Synonyms and Antonyms.
English in Communication: Introductions one-self; Conversation & Dialogue; Group Discussion; Notations & Functions.
Paragraph Writing: Amplification of Ideas; Structure and Classifications; Topic Sentence; Topic Developers; Topic Termination; Open-ended Paragraph; Close-ended Paragraph.
Essay Writing: A Hints given Essay; Without hints Essay; Free hand Essay writing on current Issues.
Reading Comprehension: Precise writing; Vocabulary building; Synonym & Antonym; Use of words in different Parts of Speech; True- False (Yes/No/ Not given); Fill in the Blanks; Tree Chart, Flow Chart.
Business Writing: Agenda; Notice; Memo; Meeting Minutes; Quotation; Tender; Letter Writing: Job application, Resume; Formal & Informal letter; Letter to Newspaper; Report writing: Technical Report, Lab Report, Newspaper Report.

Recommended Books:

1. Cambridge ESOL : Cambridge IELTS 1-9 Students Book with Answers
2. Philpot, Sarah, Curnick, Lesley : New Headway Academic Skills: Reading, Writingand Study Skill, Oxford University Press ELT
3. Martin Hewings : Cambridge Academic English, Cambridge UniversityPress
4. Collins Education : Collins English Skills
5. John Langan : College Writing Skills

HUM 1102: Communicative English Sessional	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Developing Reading Skill: Strategies of reading skimming, scanning, predicting, inferencing; Practicing comprehension from literary and non literary texts.

Developing Writing Skill: Sentence variety; Generating sentences; Clarity and correctness of sentences; Linking sentences for paragraphs; Writing paragraphs, essays, reports, formal and informal letters.

Developing Listening Skill: Listening to recorded texts, class lectures and learning to take notes.

Developing Speaking Skill: Oral skills including communicative expressions for personal identification, life at home; Giving advice and opinion; Instruction and

directions, requests, complains apologies; Describing people and places; Narrating events.

Recommended Books:

1. Cambridge ESOL : Cambridge IELTS 1-9 Students Book with Answers
2. Philpot, Sarah, Curnick, Lesley : New Headway Academic Skills: Reading, Writing and Study Skill, Oxford University Press ELT
3. Martin Hewings : Cambridge Academic English, Cambridge University Press
4. Collins Education : Collins English Skills
5. John Langan : College Writing Skills

CSE 1150: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

YEAR-1 TERM-2 B. Sc. ENGINEERING COURSES

ME 1200: Engineering Drawing	
Credits: 1.0	**Contact Hours: 0L+2P Hrs/Week**

Scale drawing, Isometric views, Orthographic view Missing line, Sectional view, Auxiliary view, Project on Engineering Drawing and CAD using Auto CAD.

CSE 1200: Structured Programming Language Sessional II	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Advanced sessional works based on Structured Programming Language.

CSE 1201: Object Oriented Programming	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Fundamentals of OOP: Introduction to Object Oriented Programming; Principles of Object Oriented Design;Advantages of OOP over structured programming.

Classes and Objects: Structure of classless; Public, private and protected members; Array of objects; Nested member class and their object; Pointer objects and pointer members; Static class member and static class; Friend function.

Constructor and destructors: Default constructor; Argumented constructor; Copy constructor; Dynamic constructor; Constructor function for derived class and their order of execution; Destructor.
Inheritance: Inheritance basics; Single inheritance vs. multiple inheritance; Mode of inheritance; Virtual inheritance.
Polymorphism: Abstract classes; run-time and compile time polymorphism; Virtual function overloading; Run Time Type Identification (RTTI); Unary and binary operator overloading.
Advanced Topics: Exception Handling; Template functions and classes, Namespace; Standard Template Library, Multi-threaded programming.

Reference Language**:** C++.

Recommended Books:

1. Matt Weisfeld : The Object-Oriented Thought Process.
2. Brett D. McLaughlin, Gary Pollice, Dave West: Head First Object-Oriented Analysis and Design.
3. Martin Fowler : Refactoring: Improving the Design of Existing Code.
4. Herbert Schildt : Teach Yourself C++.

CSE 1202: Object Oriented Programming Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 1201

CSE 1203: Discrete Mathematics	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Logic and Proofs: Propositional Logic; Propositional Equivalences; Predicates and Quantifiers; Nested Quantifiers; Rules of Inference; Introduction to Proofs; Proof Methods and Strategy.
Sets and Functions: Sets; Set Representations; Subsets; Power set; Cartesian Products; Set Identities; Operations on sets; Laws of set operation; Properties and laws of various set numbers; Functions; One-to-One and Onto functions; Inverse functions; Compositions of functions; Floor and ceiling functions.
Induction and Recursion: Mathematical Induction; Strong Induction and Well-Ordering; Recursive Definitions and Structural Induction; Recursive Algorithms.
Counting: Basics of counting; Pigeonhole Principle; Permutations and Combinations; Advanced Counting Techniques.
Relations: Introduction to Relations; Functions as Relations; Properties of Relations; Combining Relations; Representing Relations: Matrices and Digraphs; Closures of Relations.

Graph: Graphs and Graph models; Graph terminology and special types of Graphs; Representing Graphs; Isomorphism of Graphs; Connectivity; Graph Algorithms; Planner Graph; Graph Colouring.
Trees: Introduction to trees; Properties of trees; Different types of trees; Application of trees; Tree traversal algorithms; Infix, Prefix and Postfix Notations ; Spanning trees.

Recommended Books:

1. Kenneth H. Rosen: Discrete Mathematics and its Applications, Tata McGraw-Hill.
2. Donald F. Stanat and David F. McAllister: Discrete Mathematics in Computer Science, Prentice Hall College Div.
3. C. L. Liu: Elements of Discrete Mathematics, Tata McGraw-Hill.
4. Norman L. Biggs: Discrete Mathematics, Oxford University Press.
5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier.

EEE 1201: Basic Electrical Engineering	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Electric current and Ohm's law: Fundamental electrical concepts and measuring units; Electron drift velocity; Charge velocity and velocity of field propagation; Electric potential; Conductance and conductivity; Variation of resistivity with temperature; Ohm's law; Resistors in series and parallel; Voltage divider rule; Short and open circuits; Kirchoff's current law (KCL) and Kirchoff's voltage law (KVL); Problems solved by these law.

Networks Theorems: Independent and dependent sources**;** Superposition theorem; Millman's theorem; Reciprocity theorem; Thevenin's theorem; Norton's theorem; Maximum power transfer theorem; Mesh and Node circuit analysis; Reduction of complicated networks; T and π-section network.

Alternating Current: General AC theory; AC power; Average and RMS value of AC voltage and current; Use of complex quantities in AC circuits; Resonant circuits; Q-value and bandwidth.

DC Generator: Principles; construction; classification; armature winding; voltage build up; armature reactions and commutation; losses of efficiency; parallel operation of DC generators.

DC Motor: Operation; types; losses and efficiency; starting; separately excited DC motor; permanent magnet DC motor; speed-torque characteristics; methods of starting and speed control; applications of DC motors.

Transformer: Principle; construction; vector diagrams and voltage regulations; equivalent circuits; losses and efficiency.

Recommended Books:

1. Charles K. Alexander, Matthew N.O. Sadiku : Fundamentals of Electric Circuits.
2. Robert L. Boylestad : Introductory Circuit Analysis
3. Rosenblatt,FRIEDMAN :Direct and Alternating Current Machinery
4. B.L. Theraja :Textbook of Electrical Technology
5. A. K. Sawhney : A Course in Electrical

EEE 1202: Basic Electrical Engineering Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on EEE 1201

MATH 1201: Integral Calculus and Ordinary Differential Equations and Series Solutions	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Integral Calculus: Anti-derivative and Techniques of Indefinite integrals; Definite integrals**:** Geometric interpretation of definite integrals; Fundamental theorem of calculus I and II; General properties; Evaluation of definite integrals. Reduction formulas; Applications of definite integrals to find area and arc-length of 2-curves; Solid revolutions; Volume and surface area of hollow and solids bodies; Improper integrals; Convergence of improper integrals; Beta and gamma functions, their properties and applications to solve integrals.

Ordinary Differential Equation: Degree and order of ordinary differential equations; Formation of differential equations; Solutions of first order differential equations by various methods; Solutions of general linear differential equations of second and higher orders with constant coefficients; Solution of homogeneous linear differential equations; Solution of higher order differential equations when the dependent of independent variables are absent; Solution of differential equation with constant coefficients by operator method; Differential equations with variable coefficients.

Series Solution: Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties.

Recommended Books:

1. Das and Mukharjee : Integral Calculus
2. A.K.Hazra : Integral Calculus
3. S L Ross : Differential Equations
4. Frank Ayres : Differential Equations

HUM 1201: Economics	
Credits: 2.0	**Contact Hours: 2L+0P Hrs/Week**

Basic Concepts of Economics: Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.

Theory of Demand, Supply and Consumer Behavior: Law of Demand; Demand schedule and demand curve; Supply law, Supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply

Production and Costs and Theory of the Firm: Meaning of production; Factors of production; Concepts of total, average and marginal costs, fixed and variable costs.

Basic Concepts of Macroeconomics: Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics.

National Income accounting and determination: Concepts of GNP, GDP and national income; Methods of national income accounting; Problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model.

Budgets of Bangladesh: The revenue at the capital budget; Income, expenditure of the government; direct and indirect taxes.

Recommended Books:

1. K. K. Dewett: Modern Economic Theory
2. H.L Ahuja: Advanced Economic Theory
3. A. Asimakopulos: An Introduction To Economic Theory
4. A. Koutsoyiannis: Modern Microeconomics

CSE 1250: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

CSE 2101: Data Structures	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Concepts and Examples of Elementary Data Objects; Necessity of Structured Data; Types of Data Structure; Ideas on Linear and Nonlinear Data Structure.

Linear Array: Linear Array& its representation in memory; Traversing LA; Insertion & Deletion in LA; Bubble Sort, Linear Search and binary Search; Multidimensional Array and its representation in memory; Algebra of matrices; Sparse matrices; Stack: Stack representation and applications; PUSH and POP operation on stack; Polish Notation, reverse polish notation; Evaluation of a postfix expression; Transforming infix expression into postfix expression.
Queue: Its representation; Insertion & deletion in Queue; Priority Queues; Recursion [Factorial function, Fibonacci sequence, Ackermann function, Towers of Hanoi].
Linked List: Linked list and its representation in memory; Traversing, Searching, Insertion and Deletion operation on Linked list; Circular List; Header linked lists; Two way lists.
Complexity: Algorithm and flow chart; Complexity of algorithms; Rate of growth; Big O notation; Complexity of Linear Search; Binary search and Bubble sort algorithm.
Sorting: Insertion sort, selection sort, quick sort, merge sort; Searching and data modification; Hash function; Collision resolution, Chaining.
Graphs: Introduction, Definitions and terminology, Graph representations, Traversals, Shortest path and transitive closure, Activity networks, Topological sort and critical paths, Graph Algorithms- Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal and Prims Algorithm.
Tree: Tree terminology; Representation of binary trees in memory; Traversing binary tree; Binary search tree; Insertion and deletion on binary search tree; Insertion and deletion on heap; Heap sort; B trees; General tree.

Recommended Books:

1. Seymour Lipschetz : Data Structure
2. Y. Langsam, Augenstein, A. M.Tanenbaum: Data Structures Using C and C++
3. Edward M. Reingold : Data structures
4. Robert Sedgwick : Algorithms in C
5. Niklaus wirth : Algorithms and Data Structures Program

CSE 2102: Data Structures Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 2101

CSE 2103: Design Pattern and Java Programming	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Java Programming Environment, Fundamental Programming Structures in Java, Object and Classes, Inheritance, Interfaces, Exceptions, Streams and I/O Programming, Polymorphism, Multi-threaded Programming.
Design Tools: Introduction to UML, Identification of Scenarios and UML Use Case Diagrams, UML Interaction Diagram, Scenario Elements in terms of CRC Models.
Design Patterns: Introduction, Creational Patterns - Abstract Factory, Builder, Factory Method, Prototype, Singleton; Structural Patterns - Adapter, Bridge, Composite, Decoder, Proxy, Facade, Flyweight; Behavioral Patterns- Chain, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Visitor, Template Method.
Java GUI Programming: Creating Windows, Events Handling, User Interface Components with Swing, Applets, Java Server Pages, Java Servlets, Java Beans, JDBC Programming.
Java Network Programming: Client-Server Model, Socket Programming, Distributed Computing, RMI-based Application.

Recommended Books:

1. Rajkumar Buyya, S. T. Selvi and X. Chu: Object –Oriented Programming with Java: Essentials and Applications, McGraw Hill
2. Deitel & Deitel: Java How To Program, Prentice Hall
3. McConnell: Code Complete: a practical handbook of software construction.
4. E. Gamma (aka Gang Of Four): Design Patterns: Elements of Reusable OO Software.
5. Cay S. Horstmann: Object-Oriented Design and Patterns

CSE 2104: Design Pattern and Java Programming Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 2103

EEE 2101: Electronic Devices and Circuits	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Semiconductor Diodes: Energy bands in solids; Valence and conduction band; Classification of solids in terms of energy bands; Work function, Electron emission; Intrinsic and Extrinsic semiconductors, n-type and p-type semiconductors, P-N junction diodes and their V-I characteristics; Zener diode; Tunnel diode; Varactor diode; Thermistor; Photodiode and LDR; Transition and Diffusion capacity.
Diode Circuits: Ideal rectifier concept; Half wave and Full wave rectifiers; High Precision rectifiers; Filters; Voltage regulators; Voltage doubler; Clippers; Clampers.

Bipolar Junction Transistors: Working principle of PNP and NPN transistor; Transistor as an amplifier, Common-base, Common-emitter and Common Collector Configurations; Input and output characteristics of CB, CE, and CC transistor connections; Load line analysis; Operating point; Performance of transistor operation; Cutoff and Saturation points.
Field-Effect Transistors (FET): Construction and classification; Principle of operation; Characteristic curves; Channel ohmic and pinch-off region; Characteristic parameters of the FET; Effect of temperature on FET, MOSFET, Classification of MOSFET, CMOS.
Operational Amplifier: Difference amplifier CMRR, Ideal operational amplifier; Inverting amplifier, Non-inverting amplifier; Summing Amplifier, Integrator, Differentiator, Linear and non-linear applications of operational amplifier; Comparator and Converter; 741 monostable and bistable multivibrator.
Oscillators: Positive feedback; Condition of oscillation; RC phase shift oscillator; Wein bridge oscillator; Resonant circuit oscillators; Crystal oscillator and Waveform generators.
Others: Diode logic gates; Transistor switches; Transistor gates; MOS gates; Logic Families: TTL, ECL, IIL and CMOS logic with operation details; Propagation delay, product and noise immunity; Open collector and high impedance gates.

Recommended Books:

1. Jacob Millman and Christos C. Halkias: Electronic Devices and Circuits.
2. Albert D. Helfrick and William David Cooper: Modern Electronics Instrumentation and Measurement Techniques.
3. Albert Paul Malvino: Electronic Principles.

EEE 2102: Electronic Devices and Circuits Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on EEE 2101

MATH 2101: Vector, Matrices and Linear Algebra	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Vector Analysis: Vectors and scalars: definitions and fundamental laws, product of vectors, geometrical and physical interpretations, reciprocal vectors. Vector Geometry: equation of planes, straight lines and spheres. Vector differentiation**,** Vector differential operators, gradient, divergence, curl and their physical interpretations. Vector integration**,** Green's theorem, Gauss' theorem and Stokes' theorem and their applications. Curvilinear co-ordinates.
Matrices and Linear Algebra: Definitions and properties of different types of Matrices, operations for matrices and related theorems. Transpose of a matrix and

inverse matrix, rank of a matrix. Matrix Decompositions: Introduction, LU decomposition, QR decomposition, Cholesky decomposition, Jordan Decomposition, Spectral decomposition, Singular value decomposition, Applications. System of linear equations: Echelon, normal and canonical forms of matrices. Consistency and solutions of homogeneous and non-homogeneous systems of linear equations by matrix methods. Vector spaces and subspaces, sum and direct sum, linear dependence and independence, basis and dimension. Liner transformation, kernel, image, nullity, rank. Matrix representation of linear operator, change of basis, similarity, matrices and linear mapping. Characteristic roots and characteristic vectors of linear transformations and applications.

Recommended Books:

1. M.R.Spigel : Vector and Tensor Analysis
2. Frank Ayres : Matrices
3. M. R. Spiegel : Linear Algebra
4. Seymour Lipschutz, Marc Lipson : Linear Algebra, Schaum's Outline Series, McGraw-Hill

STAT 2101: Elementary Statistics and Probability	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Statistics: Meaning and Scope, Variables and Attributes. Collections and presentation of statistical data. Frequency distribution and Graphical Representation.
Analysis of Statistical Data: Location, Dispersion and their measures. Skewness, Kurtosis and their measures; Moment and cumulants.
Elements of Probability: Sample Space, Events, Union and Intersection of Events. Probability of Events. Loss of probability. Frequency limit and probabilities. Addition law of probability. Application to Occupancy problems, Bose-Einstein statistics, Fermi-Dirac statistics, Conditional probabilities. Bayes probability, Chebysev's Inequality.
Random Variables and Probability Distribution: Basic concepts. Discrete and continuous random variables. Density and distributional functions. Mathematical expectation and variance. conditional expectation and conditional variance, expected values and variance of the density distributions. Moments and cumulants generating functions, Characteristics function. Study of Binomial, Poisson, Normal, Geometric, Negative binomial, Hypergeometric, Multinomial, Cauchy and Wibul distribution.

Recommended Books:

1. S.C. Gupta and V.K. Kapoor : Fundamentals of Mathematical Statistics
2. R.N. Shill & S.C. Debnath : An introduction to the theory of Statistics
3. M.G. Mostafa : Methods of Statistics
4. Dr Manindra Kumar Roy : An Introduction to the theory of Probability

CSE 2150: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

YEAR-2 TERM-2 B. Sc. ENGINEERING COURSES

CSE 2200: Analytical Programming Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Student will solve at least 30 problems (ACM-ICPC, NCPC, ICFP, UVA like) using C, C++ or Java. Among them at least three problems should be submitted from Geometry, Mathematics, String Processing, Tree, Graph and Sorting Techniques.

CSE 2201: Algorithms	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Asymptotic notations: Complexity analysis of algorithms, worst case, best case and average case.
Sorting algorithms: Divide and Conquer approach, Merge Sort and Quick Sort Algorithm, complexity analysis, worst and average case analysis, Heap Construction Algorithm, Heap sort, Application of Heap: Priority Queue, Decision tree model and (worst case) lower bound on sorting, Sorting in linear time - radix sort, bucket sort, counting sort, etc.
Graph algorithms: Representation of Graphs, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal and Prims Algorithm.
Shortest Path algorithms: Dijkstra‟s Algorithm, Bellman-Ford Algorithm. Floyd Warshall Algorithm.
Searching algorithms: Binary search trees, balanced binary search trees, AVL trees and redblacktrees, B-trees, skip lists, hashing. Priority queues, heaps, Interval trees.
Dynamic Programming: Longest Common Subsequence (LCS), Matrix ChainMultiplication (MCM).
Greedy Algorithm: Greedy Algorithm, Activity Selection Problem, Huffman Codes and its application, Knapsack problem, Traveling Salesperson Problem.
Recurrences and Backtracking: Recurrences, *NP*-Hard and *NP*-Complete Problems,Backtracking, *n*-Queen Problem, Branch and Bounds.
Reducibility between problems and NP-completeness: Lower bound theory, Discussion of different NP-complete problems like satisfiability, clique, vertex cover, independent set, Hamiltonian cycle, TSP, knapsack, set cover, bin packing,

etc. Computational Geometry, Line Segment Properties, Convex Hull, Graham Scan Algorithm of Convex Hull.

Recommended Books:

1. Cormen : Introduction to Algorithms
2. Horowitz, Shanny : Computer Algorithms
3. D. E. Knuth : The art of Computer Programming
4. M. Allen : Data Structure and Algorithm analysis in C++.

CSE 2202: Algorithms Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 2201

CSE 2203: Theory of Computation	
Credits: 2.0	**Contact Hours: 2L+0P Hrs/Week**

Finite State Machine: Fundamental of finite state machine, state equivalence and minimization of machine, incompletely specified machine and minimal machine, merger graph and compatibility graph, finite memory and definite memory machine, information lossless machine and inverse machine.

Finite Automata: Introduction to finite automata, structural representations, automata and complexity, An informal picture of finite automata, Deterministic finite automata, nondeterministic finite automata**,** an application (i.e. text search or other), finite automata with Epsilon-Transitions.

Regular Expressions and Languages: Regular expressions, finite automata and regular expression, application of regular expressions, algebraic laws for regular expressions; Closure properties of regular language, Decision properties of regular languages, equivalence and minimization of automata.

Context-Free Grammar and Languages: Context-free grammars, parse trees, application of context-free grammars, ambiguity in grammars and languages, Normal forma for contextfree grammars, the pumping lemma for context-free languages, closure properties of contextfree languages, decision properties of CFL's.

Pushdown Automata: Definition of the pushdown automata, the languages of a PDA, equivalence of PDA's and CFG's, deterministic pushdown automata.

Introduction to Turing Machines: The turing machine, programming techniques for turing machines, Extensions to the basic turing machine, restricted turing machines, turing machines and computers.

Recommended Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrt D. Ullman : Introduction to Automata Theory, Languages, and Computation, *Pearson/Addison Wesley*
2. Shyamalendu Kandar : Express Learning: Automata Theory and Formal Languages, *Pearson Education India*
3. Zvi Kohavi : Switching and Finite Automata

CSE 2205: Digital Systems	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Information and digital Systems: Introduction to digital systems, Number Systems, weighted and non-weighted codes, error detection code, Binary addition and subtraction, 2's compliment methods.

Boolean Algebra and Combinational Logic Circuits: Digital logic, Boolean algebra, Boolean function, Canonical forms, Karnaugh Maps, Minimization of Boolean functions, Logic gates and their truth tables, Design methodologies, Combinational logic circuit design, Arithmetic and data handling logic circuits. Decoders, Encoders, Multiplexer, Demultiplexer.

Flip Flop and Sequential Logic Circuits: Transistor Latch, NAND gate latch, NOR gate latch, D latch. Clock signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, timing diagram of different FFs, Edge-triggered and level-triggered timing diagrams. , Counters, registers, memory devices and their applications.

Counters and registers: asynchronous counters and synchronous counters and their applications. Synchronous and asynchronous logic circuit design, State diagram; Mealy and Moor machines, State minimization and assignments, Pulse mode logic, Fundamental mode logic, Races and Hazards in sequential circuits. Memory unit.

555 Timer: Architecture of 555 Timer, different application of 555 timer, 555 as monostable and bistable Multivibrators.

Recommended Books:

1. Ronald J. Tocci, Neal S. Widmer and Gregory L. Moss : Digital Systems.
2. M. Morris Mano : Digital Logic and Computer Design.
3. V. K. Jain : An Introduction to Switching Theory and Digital Electronics, Khanna Publishers, New Delhi

CSE 2206: Digital Systems Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 2205

MATH 2201: Complex Analysis, Laplace and Fourier Transforms	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Complex Analysis: Complex number system: Complex plane, the extended plane and its spherical representation (Riemann sphere). Complex function: Single and many valued function, Branch point, limit, continuity and differentiability of complex functions. Analytic functions: Necessary and sufficient conditions, Mobius transformation, Power series. Harmonic function. Complex Integration: Power series representation of analytic functions, zeros of analytic functions, Cauchy's theorem, Morera's theorem, Cauchy integral formula, Singularities and its

classifications. Maximum modulus theorem, the homotopic version of cauchy's theorem and simple connectivity, the open Mapping theorem, Taylor's and Laurent series, Fundamental theorem of algebra, Rouches theorem. The argument principle, The Residue Theorem Contour integration. Conformal mapping, bilinear mapping. The application of the conformal mapping, Riemann Mapping theorem, Riemann zeta function, Analytic continuation, Riemann surface.

Laplace Transform: Definition, existence and basic properties and related theorems. Inverse Laplace transform and convolution, Solution of linear differential equations with constant coefficients and linear systems**.**

Fourier Series: Fourier integrals and applications. Fourier sine and cosine transforms, Complex Fourier transform, convolution theorem, Applications to boundary value problem.

Recommended Books:

1. 5. J. B. Conway : Functions of one complex variable
2. M. R. Spigel : Theory and problems of Complex variables
3. Rajput: Mathematical physics
4.Spigel: Laplace Transforms

STAT 2201: Theory of Statistics	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Sampling Distribution: Fisher's Lemma, Study of 2-Distribution, T-Distribution and F-Distribution, Properties, uses and Applications, Distribution of sample correlation coefficient in the null case, Sampling Distribution of the Medians and Range.

Elements of Point Estimations: Basic Concepts, Consistent estimates, unbiased estimates, Mean and variance of estimated Ideas of Efficiency, Principle of Maximum Likelihood, Illustration from Binomial, Poisson and Normal Distributions.

Decision Rules: Statistical decisions, Statistical hypothesis: Critical region, best critical region, two types of errors, Procedure of test of hypothesis, most powerful test, and standard Errors.

Test of Significance: Test of single mean and single variance, Comparison of two sample Means, proportions and variances, Bartlett's test for homogeneity of variances, Test for correlation and Regression coefficients, Exact test for 2×2 tables, Test for r×c tables, Three-way contingency tables, Large Sample Test of Significance, Non-Parametric Test, One Sample and two Sample Sign Test, Run Test and Rank Sum Test.

Recommended Books:

1. R.N. Shill & S.C. Debnath : An introduction to the theory of Statistics
2. M.G. Mostafa :Methods of Statistics
3. Murry R. Spiegel : Theory and problems of Statistics
4. S.P. Gupta : Advanced Practical Statistics

CSE 2250: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

YEAR-3 TERM-1 B. Sc. ENGINEERING COURSES

CSE 3101: Computer Architecture and Organization	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Concepts and Terminology: Digital computer components Hardware & Software and their dual nature, recent development, Role of Operating Systems (OS).
Processor Design: Introduction: Processor organization, information representation, number formats; Fixed Point Arithmetic: Addition, subtraction, multiplication, division; ALU Design: Basic ALU organization, floating point arithmetic.
Control Design: Hardwired control: Design methods, multiplier control unit, CPU control unit; Basic concept of Micro programmed Control, Control memory optimization.
Memory Devices and its Organization: Different types of semiconductor memory, magnetic memory, optical memory, virtual memory, memory hierarchies; High-speed Memories: Interleaved memories, caches, associative memories.
System Organization: Communications: Introduction, bus control; IO Systems: Programmed IO, DMA and interrupts, IO processors.
Application HDL for microcomputer design: Description of Adder, ALU by using HDL, implementation of a simple microcomputer system using HDL.

Recommended Books:

1. John P. Hayes: Computer Architecture and Organization
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky: Computer Organization
3. William Stallings: Computer Organization and Architecture: Designing for Performance

CSE 3103: Compiler Design	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Introduction to Compiler, Compiler and Translator, Compiler Structure, Applications of Compiler Technology.
Lexical Analysis: Token, Patterns and Lexeme, Parser and Symbol Table, Difficulties in Lexical Analysis, Error Reporting, Regular Expression and Regular Definition, Transition Diagrams, LEX.

Syntax Analysis: CFGs, Ambiguity, Associativity, Precedence, Top Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing, Bottom up Parsing, LR Parsers, YACC.
Intermediate Code Generation: Intermediate Representations, Three-Address Code –Quadruples, Triples; Translation of Expressions, Type Checking, Control Flow – Short-Circuit Code, Jumping Code; Procedure Calls.
Run Time Environments: Storage Organization, Activation Tree, Activation Record, Heap Storage Management, Garbage Collection.
Code Generation: Issues, Basic Blocks and Flow graphs, Optimization of Basic Blocks, Register Allocation, DAG Representation of Programs, Code Generation from DAGs, Code Generation Algorithm, Peephole Optimization, Instruction Selection.
Optimization: Sources of Optimization – Redundancy, Dead Code Elimination, Code Motion, Induction Variables; Data-Flow Analysis, Instruction-Level Parallelism.

Recommended Books :

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman : Compilers: Principles, Techniques, & Tools, *Pearson Education*.
2. Allen I. Holub: Compiler Design in C, *Prentice-Hall*.
3. Keith Cooper (Author), Linda Torczon: Engineering a Compiler, *Morgan Kaufman, Elsevier*.
4. Ronald Mak: Writing Compilers and Interpreters: A Software Engineering Approach, *Wiley Publishing.*

CSE 3104: Compiler Design Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional work based on CSE 3103

CSE 3105: Numerical Methods	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors. Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.
Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss –Seidel, The Matrix Inverse, Error Analysis and System Condition.
Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton's Divided-Difference Interpolating Polynomials, Lagrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Curve Fitting with sinusoidal Functions.

Numerical Differentiation and Integration : The Trapezoidal Rule, Simpson's Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data.
Numerical Solutions of Ordinary Differential Equations: Euler's Method, Modifications and Improvements of Euler's Methods, Runge-Kutta Methods, Adaptive Runge-Kutta Methods. Introductory concept of eigen value and eigen vector.

Recommended Books:

1. Steven C. Chapra, Raymond P. Canale : Numerical methods for engineers.
2. S.S.Sastry : Numerical Differentiation and Integration of Introductory Methods of Numerical Analysis.

CSE 3106: Numerical Methods Sessional	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Sessional work based on CSE 3105

CSE 3107: Database Management Systems	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Concepts of database systems: Files and Databases, Database Management Systems; Transaction management, Structure of a DBMS, Applications.
Entity-Relationship concepts: Entity types, Entity set, Attribute and key, Relationships, Relation types, Entity relationship, ER modeling, ER diagrams, Database design using ER diagrams, Enhanced Entity-Relationship (EER) model.
Normalization: Normal forms, Normalized Relations and Database performance; Denormalization.
Relational model: Structure of relational databases, Relational algebra, Relational algebra operations, Modification of the database, Introduction to views, Pitfalls in relational database design.
SQL: Data Definition Language, Data Manipulation Language, Basics of SQL, Query designing in SQL using aggregate functions and nested queries, Embedded SQL, Triggers, Procedures; Indexes; Declarative Constrains and Database Triggers.
Concurrency control: Lock based protocols, Timestamp based protocols, Validation based protocols, Deadlock.
Recovery system: Failure classification, Storage structure, Recovery and atomicity, Logbased recovery, Recovery with concurrent transactions, Advanced recovery techniques, RAID model.

Advanced database management systems: No SQL Systems, distributed systems, objectoriented System, Temporal, Database Security, Data Warehousing and Data Mining, Database Administration and Tuning.

Recommended Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan : Database System Concepts
2. Morgan Kaufmann, Elsevier : Database Design – Know it all
3. Eric Redmond, Jim R. Wilson : Seven Databases in Seven Weeks - A Guide to Modern Databases and the NoSQL Movement
4. Thomas M. Connolly, Carolyn E. Begg. : Database Systems - A Practical Approach to Design, Implementation and Management

CSE 3108: Database Management Systems Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 3107

ECE 3101: Data Communication	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Data communication concept, Analog and digital data, spectrum and bandwidth, Transmission requirements, Data rate and channel capacity, Asynchronous and synchronous data transmission techniques, Error detection and correcting codes, Data compression algorithms,
Transmission Media: Characteristics and applications of Twisted pairs coaxial cables and optical fibers,.
Noise: Definition, Classification of noise, Noise due to several sources, Signal to noise ratio
Data Encoding: Data and signal, RZL, NRZL, Manchester and differential Manchester encoding, ASK, FSK, PSK, QPSK, modems, sampling theorem, pulse Code modulation techniques, Delta modulation.
Modulation Theory: Definition, Types of modulation: AM, FM, Comparison of FM and AM.
Data transmission technique: Frequency division multiplexing, time division multiplexing, wavelength division multiplexing, Circuit switching, Packet switching, Hybrid switching.
Optical fiber communication: Introduction, principle of light transmission in a fiber, modulation techniques.

Recommended Books:

1. William Stallings : Data & Computer Communications, Prentic Hall Publication
2. Behrouz A. Forouzan : Data Communications and Networking, McGraw-Hill
3. John M. Senior : Optical Fiber Communications , Prentice-Hall of India Pvt Ltd

ECE 3102: Data Communication Sessional	
Credits:1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on ECE 3101

CSE 3150: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

YEAR-3 TERM-2 B. Sc. ENGINEERING COURSE

CSE 3200: Project	
Credits: 1	**Contact Hours: 0L+2P Hrs/Week**

Students will develop projects with proper documentation as assigned by teacher.

CSE 3201: System Analysis and Design	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Introduction to information systems, general design consideration of information systems.
Overview: system concepts and the information systems environment, information needs, the concepts of MIS, the system development life cycle, the role of the systems analysis.
Systems Analysis: Systems planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost benefit analysis.
Systems Design: The process and stages of systems design, input/output and forms design, file organization and data base design.
System Implementation: system testing and quality assurance, implementation and software maintenance, hardware/software selection, project scheduling and software, Security, disaster/recovery, and ethics in system development.
Case study: Case studies of various information systems such as: Library management system, inventory system, voter identity management system, payroll system, etc.

Recommended Books:

1. E.M. Awad: System Analysis and Design
2. P. Edwards: System Analysis & Design
3. J.G. Burch Jr., F.R. Strater and G. Grundnitski: Information Systems: Theory and Practice
4. G. Scott.: Principles of Management Information Systems

CSE 3203: Operating Systems	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Introduction to Operating System, Evaluation of Operating Systems and Computer Architectures, Operating System Structure, Virtualization, System Boot Process.
Process management: Concept of Process and Thread, Operations on Processes, Inter-Process Communication, Process Scheduling, CPU Scheduling, Process and Thread Synchronization, Concepts of Deadlock.
Memory Management: Background, Logical vs. Physical Address Space, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Demand Paging, Page Replacement, Thrashing.
Storage Management: Concepts of File and File System, Directory and File System Structure, Directory and File System Implementation, Storage Allocation Methods to File, Free Space Management, Disk Management.
I/O Management: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Performance.
Protection and Security: Basics of Protection and Security Problem, Access Rights, Access Matrix, Program Threats, System Threats.
Case study: Case studies of Some Modern Operating Systems.

Recommended Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne: Operating Systems Concepts, *Wiley Publisher.*
2. Andrew S. Tanenbaum : Modern Operating Systems, *Prentice-Hall.*
3. Thomas Anderson and Michael Dahlin: Operating Systems: Principles and Practice, *Recursive Books.*
4. Silberschatz, Abraham and Peter Baer Galvin and Greg Gagne: Operating system concepts with Java, *Wiley Publisher.*

CSE 3204: Operating Systems Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 3203

CSE 3205: Web Engineering	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Principles and techniques: Introduction and perspective: Evaluation of the web, Categories of web application, Evaluation of Web engineering, Web development process, Knowledge and skills for web development, Web engineering resources portal (WEP):A reference model.

Web Application Development Methodologies: Web Applications, Web Application Components, Challenges of Web Application Development, Web Development Methodologies, the Advantages and Disadvantages. Relationship Analysis: A Technique to Enhance Systems Analysis for Web Development: Generic Relationship Taxonomy, Conducting a Relationship Analysis, Relationship Analysis Model: Theoretical Basis, Relationship Analysis Process, Web Maintenance and Evolution, Techniques and Methodologies.
Internet and World Wide Web application, HTML, SGML, XML, DTD,PHP, Java Script, CGI Programming etc.
E-Commerce Basics: E-Commerce Definition, Internet History and E-Commerce Development, Classification of E-Commerce, E-Commerce Challenges, E-Commerce Opportunities, Payment Processing- Electronic Payment Issues, E-Cash, Credit Card Issues, Merchant Accounts, Online Payment Services, Transaction Processing.

Recommended Books:

1.*Web Engineering: Roger Pressman*
2. Achyut S Godbole & Atul Kahate : Web Technologies
3. David Kosiur: Understanding Electronic Commerce
4. Dave W. Mercer, Allan Kent, Steven D. Nowicki: Beginning PHP 5

CSE 3206: Web Engineering Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 3205

CSE 3207: Digital Signal Processing	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Signals, systems and signal processing, classification of signals, the concept of frequency in continuous time and discrete time signals, analog to digital and digital to analog conversion. Discrete time signals and systems: Discrete time signals, discrete time systems, analysis of discrete time linear time invariant systems. Discrete time systems described by difference equations. Sampling and Reconstruction of signals: Sampling, A-D conversion, D-A conversion.
The z-transform: Introduction, definition of the z-transform, z-transform and ROC of infinite duration sequence, properties of z-transform inversion of the z-transform, Frequencyanalysis of signals and systems: Frequency analysis of continuous time signals, Frequency analysis of discrete time signals, Properties of Fourier transform of discrete time signals.
The Discrete Fourier Transform: The DFT, Properties of the DFT, Filtering method based on the DFT, Frequency analysis of signals using the DFT. Study of various types of filter.
Fast Fourier Transform Algorithms: FFT algorithms, applications of FFT algorithm.

Application of DSP: Speech processing, analysis and coding, Mat lab application to DSP.

Recommended Books:

1. S Poornachandra, B Sasikala : Digital Signal Processing
2. S salivahana: Digital Signal Processing
3. Sanjit k. Mitra: Digital Signal Processing (A computer based approach)
4. J. G. Prokis: Digital Signal Processing

CSE 3208: Digital Signal Processing Sessional	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Sessional works based on CSE 3207

CSE 3209: Microprocessors and Assembly Languages	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Microcomputer System: Microprocessors and Microcomputers, Evolution of microprocessors, Microprocessors applications. Intel 8086 Microprocessor: Internal architecture, register structure, programming model, addressing modes, instruction set, assembly language programming, condition tests, branches; control structures; subroutine and parameter passage; macros I/O. Control signals; I/O port organization and accessing; 8086 family of chips, interrupts and interrupt Handling; Coprocessors. System design using 8086; on overview of Intel 80186, 80286, 80386, 80486 and Pentium microprocessors. RISC processors, 6800 and 68000 processors.

Introduction of Assembly Language: Program structure and it components, few basic instruction, input/output instruction.

Flag Register and Flow Control: The flag register, flow control instructions, conditional and unconditional jumps, branching and looping structures.

Logic and Arithmetic Operation: Logic, Shift and Rotate Instruction, multiplication and division Instructions.

Arrays and Data Structure: Arrays and related addressing modes, DUP operator, register indirect modes, Based and Indexed addressing modes, basic stack operations, procedures declaration, communication between procedures, calling a procedure.

String Manipulation: The string instructions, director flag, moving a string, storing a string, Loading a string, scanning a string, comparing strings, substring operation.

Recommended Books :

1. Ytha Yu and CharlersMarut: Assembly Language Programming and Organization of theIBM PC, McGraw-Hill
2. Rafiquzzaman : Microprocessor and Microcomputer based System Design,Crc Press Publication
3. D. V. Hall : Microprocessors and Interfacing, McGraw-Hill
4. Y. Liu and G. A.Gibson: Microcomputer Systems: 8086/8088 Family, Prentice-Hall

CSE 3210: Microprocessors and Assembly Languages Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 3209

CSE 3250: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

YEAR-4 TERM-1 B. SC. ENGINEERING COURSES

CSE 4100: Project / Thesis	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Study and solution of problems in the field of Computer Science and Engineering.

N.B.: The project / thesis topic selected in this course is to be continued in the CSE 4200 course.

CSE 4101: Software Engineering	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Introduction to software and its nature, software engineering methods, professional and ethical responsibility of a software engineer.
Software Process Model: Different types of software process model and their implementations, costs of software engineering.
Software Requirement Analysis: Software Requirements analysis and their applications, software Prototyping, Basic concepts of different formal software specification.
Design of Software: Software Design and its different techniques, Software configuration managements. System structuring, control models, modular decomposition, domain-specific architecture.
Software Testing: Software Validation and Verification: Verification and validation planning, Software's testing strategies and different type of testing techniques, Art of debugging.
Software Quality Assurance: Management and its quality assurance, Software Cognitive fundamentals, Concepts of software reengineering and Web engineering.
Advance Topics: 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.

Recommended Books:

1. Ian Sommerville : Software Engineering
2. Roger S. pressman : Software Engineering –A practitioner Approach

CSE 4102: Software Engineering Sessional	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Sessional works based on CSE 4101

CSE 4103: Artificial Intelligence	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: History of AI - Intelligent agents – Structure of agents and its functions - Problem spaces and search - Heuristic Search techniques – Best-first search - Problem reduction - Constraint satisfaction - Means Ends Analysis.
Knowledge Representation: Approaches and issues in knowledge representation- Knowledge - Based Agent- Propositional Logic – Predicate logic – Unification – Resolution - Weak slot - filler structure – Strong slot - filler structure.
Reasoning under uncertainty: Logics of non-monotonic reasoning - Implementation- Basic probability notation - Bayes rule – Certainty factors and rule based systems-Bayesian networks – Dempster - Shafer Theory - Fuzzy Logic.
Planning and Learning: Planning with state space search - conditional planning- continuous planning - Multi-Agent planning. Forms of learning - inductive learning - Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning
AI programming languages: Introduction to PROLOG, knowledge representation, domain, predicate, clauses, database, back tracking, unification, list, and compound object using prolog.
Introduction to selected topics in AI: Neural Networks, Expert system, Robotics and Fuzzy logic

Recommended Books:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair : Artificial Intelligence, Tata McGraw-Hill
2. Staurt J. Russel and Peter Norvig : Artificial Intelligence: A modern Approach, PearsonEducation Asia
3. Nils J. Nilsson : Principles of Artificial Intelligence, Narosa Publishing House
4. L. H. Tsoukalas and R. E. Uhrig : Fuzzy and Neural Approches in Engineering

CSE 4104: Artificial Intelligence Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional work based on CSE 4103

CSE 4105: Digital Image Processing	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction and Fundamental to Digital Image Processing: What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.
Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.
Image Restoration: Image Degradation/Restoration Process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations.
Color Image Processing: Color Fundamentals, Color models, Basis of full color image processing, Color transformations.
Image Compression: Fundamentals, Image compression models, Error free compression, Lossy compression.
Morphological image processing: Preliminaries, Dilations and Erosion, opening and closing, Some basic morphological algorithms.
Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.
Representation, Description and Recognition: Representation-chain codes, polygonal approximation and **skeletons**, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

Recommended Books:

1. Rafeal C. Gonzalez & Richard E. Woods : Digital Image Processing
2. A. K. Jain: Fundamentals of Digital Image Processing
3. Mark S. Nixon & Albert S. Aguado: Feature Extraction and Image Processing
4. William K. Pratt: Digital Image Processing

CSE 4106: Digital Image Processing Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 4105

HUM 4101 Sociology and Bangladesh Studies	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Sociology: Sociological perspective: definition, nature, scope and importance of sociology; Sociology and scientific approach: methods of social research, stages of social research; Primary concepts of sociology: society, community, association, institution, group; Social evolution: stages in the evolution of human civilization; Culture: definition, characteristics, culture contents (material and non-material), cultural lag, culture and civilization; Industrial revolution: the growth of capitalism, features and social consequences, socialism; Some current social problems: crime, deviance, juvenile delinquency, youth unrest; Technology and society: effects of technological factors on social life.

The Emergence of Bangladesh: Origin of the name 'Bangladesh', Language Movement (1948-1952), The United Front 1954: The Rise of the Bengali Nationalism, Quest for autonomy and Self-determination: Six Point Programme**,** Prelude to the War of Liberation in 1971: Anti-Ayub Movement and Mass upsurge in 1969, Election of 1970.

The Liberation War of Bangladesh 1971: The great speech of Bangabandhu Sheikh Mujibur Rahman on 7th March 1971, Military crackdown and genocide, Formation of Bangladesh (Mujibnagar) Government and the Proclamation of Independence Order, significance of the PIO**,** The Liberation War : March 26, 1971 – Dec 16, 1971, Regional and Global reactions: Role of India, the USA, the USSR and the UN.

Government of Bangladesh: Constitution of the people's republic of the Bangladesh 1972, Power and functions of the president and prime minister, Judiciary system of Bangladesh: power and functions of the High court and Appeal division, Administrative system of Bangladesh: historical background and emphasis on local government system.

Recommended Books:

1. F.R.Khan : Principles of Sociology
2. Anthony Giddens : Sociology
3. R. C. Majumdar (ed.), The History of Bengal, vol. I
4. Jadunath Sarkar (ed.), The History of Bengal, vol. II
5. Sirajul Islam (ed.), History of Bangladesh 1704-1971, vols. I & II
6. Government of Bangladesh, Constitution of Bangladesh

CSE 4150: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

OPTIONAL-I COURSES

CSE 4107: Computer Simulation and Modeling	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study.
Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discreet continuous models; Monte Carlo simulation; Simulation of queuing systems.
Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variates; Output analysis. Simulation languages; Analysis and modeling of some practical systems.

Recommended Books:

1. Raj Jain : The Art of Computer Systems Performance Analysis
2. Trivedi, K.S : Probability and Statistics with Reliability, Queueing and computer science Applications
3. Law A.M, and Kelton, W.D : Simulation Modeling and Analysis

CSE 4109: Multimedia Technology	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Multimedia systems: introduction; Coding and compression standards; Architecture issues in multimedia.
Operating systems issues in multimedia: real-time OS issues, synchronization, interrupt handling. **Database issues in multimedia:** indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document.
Networking issues in multimedia: Quality-of-service guarantees, resource reservation, traffic specification, haping and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions;
Security issues in multimedia: digital water-marking, partial encryption schemes for video streams. **Multimedia applications:** audio and video conferencing, video on demand, voice over IP.
Networked virtual environment(NVE): Networked virtual environment overview; forms of distributed interaction; example systems; NVE technologies and challenges; origins of NVE.

Recommended Books:

1. Ze-Nian Li and Mark S. Drew: Fundamentals of Multimedia
2. John Villamil-Casanova and Louis Molina: Multimedia: An Introduction
3. Tay Vaughan: Multimedia: Making It Work,

CSE 4111: Basic Graph Theory	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, chromatic polynomials, chromatic index, Vizing's theorem, planar graphs, perfect graphs.

Recommended Books:

1. Russell Merris: Graph Theory
2. Reinhard Diestel: *Graph Theory*(Graduate Texts in Mathematics)

CSE 4113: Parallel and Distributed Processing	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Parallel Processing: Importance, architecture, Hardware and software issues; Architectures for parallel processing - Classifications,
Comparative Study of Different Architectures: hardware issues in parallel processing, parallel programming.
Distributed Processing: Definition, Impact of distributed processing on organizations, pitfalls in distributed processing.
Forms of Distributed Processing : Function distribution, Hierarchical distributed systems, Horizontal distributed systems, Strategy : strategies for distributed data processing, control of complexity, problem of incompatibility, centralization vs. decentralization, cost and benefit analysis;
Design of Distributed Data: distributed data, location of data, multiple copies data, conflict analysis, database management, distributed databases and applications;
Software and Network Strategy: Software strategy, the ISO seven layers, architectural interfaces, physical link control, network management etc.

Recommended Books:

1. Timothy G. Mattson, Beverly A. Sanders, and Berna L. Massingill : Patterns for Parallel Programming.
2. Shaobai Zhang , Xiefeng Cheng : *Parallel distributed processing*

YEAR-4 TERM-2 B. Sc. ENGINEERING COURSES

CSE 4200: Project / Thesis	
Credits: 3.0	**Contact Hours: 0L+6P Hrs/Week**

Continuation of project / thesis topic undertaken in CSE 4100

CSE 4201: Computer Networks	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Definition, uses of computer networks, network topology, network media, network devices, different types of network: LAN, MAN, WAN etc.
IP addressing: Classification of IP addressing, subnet mask, CIDR, private IP Address, public IP address, sub netting, VLSM etc.
Network Model: OSI Reference Model, TCP/IT Reference Model, ATM Reference Model, functions of the layers of different models, Network Protocols working at different layers.
Data Link Layer Design Issues and Framing: Character count, byte stuffing, bit stuffing, error detection: cyclic redundancy check, parity bit checking and correction: Hamming code, windowing protocols: go back N ARQ, selective repeat ARQ, elementary data link protocols, high-level data link control, point to point protocol, the medium access control sub-layer.
Multiple Access: Random Access; ALOHA, CSMA, CSMA/CD, CSMA/CA, channelized access, CDMA, TDMA, FDMA, controlled access, reservation, poling, token passing, Ethernet, wireless LANs and Bluetooth.
Switching: Circuit switching, packet switching, message switching, routing algorithms, virtual circuit and datagram, congestion control algorithms, quality of service, internetworking, internetworking devices etc.
Network Layer Protocols: Address resolution protocol, internet protocol, internet control, message protocol, ipv6, routing information protocol, open shortest path first, border gateway protocol, user datagram protocol, transmission control protocol.
Transport Layer: Services provided to the Session layer, Quality of service, Transmission Controls protocols, Connection management, Addressing, Establishing and Releasing Connection, Flow control and Buffering, Multiplexing, Transport layer in Public network and ARPANET.
Session Layer: Services provided to the Presentation layer, Data exchange, Synchronization, Dialog and Activity management, OSI session service primitives.
Presentation Layer: Data Compression techniques, Data Encryption Standard, Public key cryptography,
Application Layer: File transfer Access and management, Electronic Mail, Client Server, Internet**:** Introduction to internet and intranets, internet protocols, Internet services and goals, Domain Name System (DNS) and Addresses, FTP, Telnet, World Wide Web (WWW), Internet Relay Chat (IRC), DHCP and BOOTP.

Recommended Books:

1. William Stallings : Data & Computer Communications, Prentic Hall Publication
2. Behrouz A. Forouzan : Data Communications and Networking, McGraw-Hill
3. Andrew S. Tanenbaum : Computer Networks, Prentice Hall of India Pvt. Ltd

CSE 4202: Computer Networks Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional works based on CSE 4201

CSE 4203: Computer Graphics	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: History, Application of Computer Graphics, Graphics I/O Devices and Types.
Graphics Software Design: Survey of Desired Function, Toward a Universal Graphic Language, Display Files, Databases for Pictorial Applications.
Graphics Techniques: Point-Plotting Techniques, Line Drawing, Geometric Transformations, Windowing and Clipping, Raster Graphics.
Hardware for Computer Graphics: Typical Small and Large System, Graphic Terminals, Plotters, Graphic Display Processors, Device Independent Graphics Systems.
Graphics Software: A Simple Graphic Package, Segmented Display Files, Geometric Models, Picture Structure.
Interactive Graphics: Input Techniques, Event Handling, Three-Dimensional Graphics, Curves and Surfaces, 3-D Transformation.
Hidden Surface Problem: Back Face Removal, Hidden-Line Removal Curved Surfaces, Describing Points, Lines And Polygons, Some Hints For Building Polygonal Models, Color Perception, RGBA and Color Index Mode, Dithering, Blending, 3-D Blending With The Depth Buffer, Antialiasing, Fog, Fog Equations, The OpenGL ARB.
API Specifies: Data Types, Function Naming Conventions, Platform Independence, Drawing Shapes With OpenGL and DirectX.
Drawing in Space: Points, Lines, Circle and Polygons.
Co-ordinate Transformations: Understanding Transformations, Matrix Munching Projections, Matrix Manipulation Color Lighting and Materials, Texture Mapping.

Recommended Books:

1. Donald Hearn, M. Pauline Baker: Computer Graphics with OpenGL
2. Zhigang Xiang, Roy A. Plastock, : Theory and Problems of Computer Graphics
3. James D. Foley , Andries van Dam , Steven K.. : Computer Graphics: Principles and Practice in C

CSE 4204: Computer Graphics Sessional	
Credits: 1.5	**Contact Hours: 0L+3P Hrs/Week**

Sessional work based on CSE 4203

CSE 4205: Interfacing and Microcontrollers	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Microprocessor Based System Design: Hardware and software interfacing in microcomputer system design, hardware and I/O design, building, debugging, testing and linking program modules, programming EPROM.
Interfacing Components: 8284A programmable timer, bus architecture, bus timing, 8286 transceiver device, 8282 latches, 8288 bus controller, characteristics of memory and I/O interface, synchronous and asynchronous communication, serial I/O interface, 8251A communication interface, 8255A Programmable peripheral Interface.
Interrupt System: Sources of interrupt, types of interrupt, handling interrupt request, interrupt vector and table, 8259A priority interrupt controller, daisy chain.
I/O Controller and Peripheral Components: Interfacing ICs of I/O Devices, I/O ports, Programmable peripheral interface, DMA controller i.e. 8237A DMA Controller, interrupt controller, communication interface, interval timer, etc.
Memory Device: Memory Terminology, CPU-Memory Connections, ROM Architectures and Time Diagram, Different type of ROM, Flash Memory, RAM Architectures and Time Diagram, Different type o RAM and Read/Write Cycle, Programmable Logic Device Architectures.
Multi-processor configurations: co-processor configurations, Numeric data processor, I/O Processors.
Analog and Digital Interface: Sensors, Transducers, D/A interface, A/D interface, AD and DA converters related chips, High power devices.
Microcontrollers: Microcontroller basics, Introduction to microcontroller architecture, Microcontroller operations, Microcontroller families, 8051 microcontroller, microcontroller Programming, Arduino.

Recommended Books :

1. Ytha Yu and Charlers Marut : Assembly Language Programming and Organization of the IBM PC, *McGraw-Hill*
2. Barry B. Brey : The Intel Microprocessors 8086/8088, 80186/80188,80286,80386,80486, Pentium, and Pentium Pro Processor, Architecture, Programming, And Interfacing, *Pentic-Hall*
3. D. V. Hall : Microprocessors and Interfacing, *McGraw-Hill*
4. Y. Liu and G. A. Gibson : Microcomputer Systems: 8086/8088 Family, *Prentice-Hall*

CSE 4206: Interfacing and Microcontrollers Sessional	
Credits: 0.75	**Contact Hours: 0L+3/2P Hrs/Week**

Sessional works based on CSE 4205 (Interfacing, Microcontroller, Arduino)

HUM 4201: Industrial Management and Accounting	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Industrial management: Administration, Management and organization, Authority and responsibility, Scientific management, Organization structure, organization chart, Span of control, Selection and recruitment of employees; training and its types, promotion, wage system and incentive; job-evaluation and merit rating, Plant layout, layout of physical facilities, Transportation and storage, Material handling, Maintenance, Maintenance policy, Production control in intermittent and continuous manufacturing industry, functions of production control, Purchasing procedures : Inventory-need and methods of control, Factors affecting inventory building-up, Economic lot size and reorder point.
Accounting: Basic accounting principles, Objectives of Accounting, Transaction, Double Entry systems, Accounts and it's classification, Journals Cash book, Ledger, Trial Balance, Financial statement. Cost Accounts & objectives; Costs; Classification, Preparation of cost sheet, Cost volume profit (CVP) analysis, Standard costing, Process costing.

Recommended Books:

1. Kiseso : Accounting Principles
2. Basu & Dus : Practice in accounting (Volume I)
3. Garrison : Managerial Accounting

CSE 4250: Viva-Voce	
Credits: 0.75	**Contact Hours: 0L+0P Hrs/Week**

OPTIONAL-II COURSES

CSE 4207: Cryptography and Network Security	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function - Traffic Confidentiality.

Public key cryptography: Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography - Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA.

Authentication and hash function: Authentication requirements - Authentication functions, Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm -

RIPEMD - HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard.

Network security: Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security. System level security: Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

Recommended Books :

1. William Stallings : Cryptography and Network Security, *Prentice Hall Inc.*
2. Wadlow : Process of Network Security, The Designing and Managing a Safe Network, *Addison-Wesley*

CSE 4209: VLSI Design	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

VLSI design methodology: top-down design approach, technology trends.
MOS technology: Introduction to Microelectronics and MOS Technology, Basic Electrical Properties and Circuit Design Processes of MOS and Bi CMOS Circuits,, MOS, NMOS, CMOS inverters, pass transistor and pass gates, DC and transient characteristics.
Overview of fabrication process: NMOS, PMOS, CMOS, Bi-CMOS process.
NMOS and CMOS layout: Color plate Stick diagram, and design rules.
CMOS circuit characteristics: Resistance and capacitance, rise and fall time, power estimation.
Introduction to Bi-CMOS circuits: Shifter, an ALU Sub-System, adder, counter, multipliers, multiplexer. Data Path and memory structures, Buffer circuit design, DCVS Logic.
Design and Test-Ability: Circuit partitioning, Floor planning and placement, Routing, Practical Aspects of Design Tools and Test-Ability MOS Design, Behavioral Description, Structural Description, Physical Description and Design Verification.

Recommended Books:

1. Douglas A. Pucknell, Kamran Eshraghian : Basic VLSI Design
2. Linda E. M. Brackendury : Design of VLSI Systems A Practical Introduction

CSE 4211: Wireless Communication	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction To Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless

telephone systems, comparison of various wireless systems. Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Introduction to Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems. Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks. Wireless LAN Technogy - IEEE 802.11 Wireless LAN Standard - Bluetooth.

Intelligent Cell Concept And Application: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

Recommended Books :

1. William Stallings : Wireless Communications and Networks
2. Theodore S. Rappaport : Wireless Communications

CSE 4213: Computational Geometry	
Credits: 3.0	**Contact Hours: 3L+0P Hrs/Week**

Introduction: Historical perspective, algorithmic background, geometric preliminaries, models of Computation, Geometric searching, point location problem and range searching problems, Divide and conquer, amortization, multi-dimensional search, space sweep, duality and randomization. Convex hulls. Proximity, Closest pair problem, Intersection and union of rectangles, Voronoi and Delaunay diagrams, arrangements of lines and points, Geometry of rectangles, hidden surface removal, polygon triangulation, art gallery theorems, shortest paths, and lower-bounds.putation.

Recommended Books:

1. M. d. Berg, O. Schwarzkopf, M. v. Kreveld and M. Overmars: Computational Geometry: Algorithms and Applications
2. F. P. Preparata and M. I. Shamos: Computational Geometry: An Introduction
3. J. O. Rourke: Computational Geometry in C

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