CHAPTER 1
GENERAL INFORMATION

1.1 History

Sylhet Engineering College, abbreviated as SEC, The total development process of a Country can not proceed without development of science and Technology. Today's world is coming foreword to meet the Challenge of the twenty first Century through rapid development of science and technology. In order to meet the Challenge of the 21st Century, it is essential for the Country to produce huge number of engineers and technologies.

There are five Universities of Engineering and Technology and some public and private Universities in the Country for providing engineering education at Degree level which is not sufficient.

In order to meet the present and future job market demand in the country and abroad, it is essential to establish new engineering colleges. It is also essential to expand Engineering/Technological education in order to ensure proper use of technology.

In the Sylhet Engineering College each year 180 Student will be graduated in three degree level Courses, Such as (i) B.Sc in Civil Engineering, (ii) B.Sc in Electrical and Electronics Engineering and (iii) B.Sc in Computer Science & Engineering. After obtaining graduation in Engineering the graduates will be able to get job in different industries and Business organizations in the Country and abroad and also they will be able to make themselves Capable for Self employment.

Sylhet Engineering College is established as a degree level Engineering College in the public Sector. The examination of the courses will be controlled by the Shahjalal University of Science and Engineering and the Students of Sylhet Engineering College will be awarded degree from Shahjalal University of Science and Engineering

1.2 Location

The Sylhet Engineering College campus is located at Tilagarh, Sylhet Sador. It is a nicely located place. There is a female student's dormitory for 80 female students, two male student hostel for 320 students. It is closed to Sylhet Agriculture University. The College Campus accommodates three Academic Buildings one Library Building, one Principle Quarters etc.

1.3 Undergraduate Studies

Undergraduate Courses are Computer Science & Engineering. Civil Engineering, Electrical and Electronic Engineering,

1.4 Postgraduate Studies and Research

At present Post Graduate studies and research are not included but in future college may be upgraded and will offer Master Degree. The expertise of the College teachers and the laboratory facilities of the Engineering College are also utilized to solve problems and to provide up-to-date engineering and technological knowledge to the various organizations of the country. In future government should make effort to improve its research facilities, staff position and coursed and curricula to meet the growing technological challenges confronting the country.

1.5 Faculties, Departments and Teachers

At present, Engineering College has four teaching departments including three Engineering departments offer B.Sc in Engineering Degree. A total of 40 full time and part time teachers are teaching in these Departments.

CHAPTER 2
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2.1 Historical Background

The Department of Computer Science and Engineering, the first department is going to be started from the academic year 2007-08. At the very beginning, the department will offer only B.Sc Engineering Degree in Computer Science & Engineering. At first, 60 students will be admitted each year for pursuing the B.Sc. Engineering Degree. The department has now active strength of 17 teachers with 2 Professors and 4 Associate Professor.

2.2 Location

The academic building of the Computer Science & Engineering is 4-stored. There are classrooms, different laboratories and the room for the teaching staff. There are also provisions for the departmental library.

2.3 Study Program

The Department of Computer Science and Engineering offers the degrees of B.Sc. Engineering. The courses and syllabus followed by this department for the above degrees are the most modern ones like that of advanced countries as well as appropriate to the local needs. The syllabus is so designed as to contain all the necessary study materials so that a graduate can face the engineering problems readily after graduation. The teachers of the department will meet periodically to review the courses and their contents: necessary changes are made to update the needs and trends from time to time.

2.4 Research Activities

CSE SEC provides the highest quality of research at the international level from Bangladesh. Faculties and Students of CSE SEC have strong research involvement. Government and private sectors prefer faculties of CSE SEC for the solutions to their technical and innovative operations.

2.5 Laboratory Facilities

At present there are five different laboratories in the department premises. A brief description of each of the laboratory facility follows.

2.5.1 Software Engineering Laboratory

This laboratory has a total number of 64 workstations and 2 servers with multimedia support. A multimedia projector belongs to this laboratory to facilitate presentation. All the work station provides windows and Linux platforms and has important software installed.

2.5.2 Microprocessor & Interfacing Laboratory

The digital laboratory is equipped with modem equipment, trainer to demonstrate, design and implement various microprocessor based circuit. This laboratory provides widespread opportunity to gain knowledge about assembler software, complier software and PLC trainer and other devices. This laboratory has a vast number of ICs in stock, starting from simple 74 series chips up to different types of microprocessors and their peripheral chips. There are various Microprocessor Trainer kits such as 8088 based MTS 88.C μkit and 8086 based μkit.

2.5.3 Networking Laboratory

The students will acquire knowledge of network management, establishment and maintenance by using the various networking devices present in this laboratory. The workstations in this laboratory

have been loaded with deferent networking software that allows the students to monitor and experiment with different aspects of computer networking.

2.5.4 Communication Laboratory

The communication laboratory is equipped with modem server with network multimedia player and other communication equipment like digital communication trainer, telecommunication trainer, microwave trainer, etc to demonstrate different theories. The communication laboratory provides widespread opportunity to gain knowledge about communication engineering. There is also two servers with 30 work station. All the workstations provide Windows XP and Linux platforms and have important software installed.

2.5.5 Image Processing & Artificial Intelligence Laboratory

This laboratory has 64 high performance workstations with multimedia support. The laboratory has two Flatbed Scanner, two color Digital Video Camera, All the stations are connected with the department LAN. They communicate with an 802.11g/2.4 GHz wireless Access point which is connected to the backbone LAN.

2.6 Library Facilities

There is a provision for small departmental library in the department. The library will be enriched day by day.

2.7 Co-curricular Activities

Students of this department will arrange different co-curricular activities like programming contests, software and hardware project competitions, software fair etc.

2.8 Training

CSE SEC offers professional trainings to students as well as industry personnel for their skill development.

2.9 Consultation Services

For consultation and research the expertise, its teachers and the laboratory facilities are available to other organizations of the country. SEC is not only contributing as the focal point for the development and dissemination of engineering and technological services within the country, but also it is involved to solve complicated practical problems of national importance faced by the planners, engineers and technologists of the country. Highly qualified and diversely experienced consultants of various fields of engineering have been involved in this endeavor. Wide ranges of quality control testing facilities are also available for materials used in various development activities. Expert consultancy services ranging from the analysis, design, evaluation, construction, rehabilitation, etc. are routinely carried out.

2.10 Teaching Staffs

Professors-	**02 Post**
Associate Professors-	**04 Posts**
Assistant Professors-	**05 Posts**
Lecturers-	**06 Posts**

CHAPTER 3
RULES AND RFGULATIONS FOR UNDERGRADUATE PROGRAM

3.1. Student Admission

3.1.1 Undergraduate Admission:
The admission committee of the university will conduct the admission process for Bachelor's degree as per the rules. The student will be admitted in the first semester of an academic year in the individual discipline of different schools. However the admission of foreign students will be subjected to the verification of academic records as per the university rule.

3.1.2 Student Status and Student Level:
Every student has to maintain his/her student status by getting admission paying necessary fees and register for required credits every semester. Unless a student graduate early by taking courses in advance, every student has to get admission in every semester successively. For book keeping purpose a student's level will be expressed by his/her year and semester. A student will be transferred to next level if he/she completes or appears in 80% of his designated courses at his/her present level. Once a student reaches 4th year 2nd (5th year 2nd for Architecture) semester he/she will be kept at this level until he/she graduates.

3.1.3. Re-Admission:
A student has to take re-admission if his/her student status is not maintained or one or more semesters were cancelled because of disciplinary action against him/her. In case of semester cancellation the student has to get re-admission in the same semester. The level (Year and Semester) of re-admission will be determined by his completed/appeared credits. A student will be eligible for re-admission in the first year first semester of the subsequent session if he/she was present in at least 25% of the classes of his/her major courses or appeared at the semester final examination and his/her admission/semester fees was clear in the past semester/session. Re-admitted students will always be assigned the original Registration Number.

3.1.4 Student's Advisor:
After admission every batch of student will be assigned to a student's Advisor from the teacher of his/her discipline to guide him/her through the semester system. Advisors will always be accessible to the students and will be ready to mentor them in their academic activities, career planning and if necessary, personal issues. There will be a prescribed guideline for the Advisors to follow.

3.2. Academic Calendar

3.2.1 Number of Semesters:
There will be two semesters in an academic year. The first semester will start on 1st January and end on 30th June, the Second semester will start on 1st July and end on 31st December. The routine of the final examination dates along with other academic deadlines will be announced in the academic calendar at the beginning of each semester.

3.2.2 Duration of Semesters:
The duration of each semester will be as follows:

Classes and Preparatory weeks	15 weeks
Final Examination	04 weeks
Total	19 weeks

These 19 weeks may not be contiguous to accommodate various holidays and the Recess before the final examination may coincide with holidays. The final grading will be completed before the beginning of the next semester.

3.3 Course Pattern

The entire Bachelor's degree program is covered through a set of theoretical, practical, project, viva and seminar courses. At the beginning of every academic session a short description of every available course will be published by the syllabus committee of each discipline.

3.3.1 Course Development:

3.3.1.1 Major and Non-Major Courses:

Syllabus committee of every discipline will develop all the courses that will be offered by that particular discipline and has to be approved by the respective school and the Academic Council. These include major courses for the respective discipline as well as non-major courses that will be offered to other disciplines. Non-major courses will be developed with close cooperation of the disciplines concerned keeping into consideration of the need of that discipline.

3.3.1.2 Syllabus:

(a) Major and Non-Major Courses: Syllabus committee will select and approve the courses from major courses of the discipline as well as non-major courses offered by other disciplines to complete the syllabus. The syllabus committee will also select a group of courses as core-courses and without these courses a student will not be allowed to graduate even if he completes the credit requirement. The committee may assign pre-requisite for any course if deemed necessary.
(b) Second Major Courses: The syllabus committee will select a set of courses of 28-36 credits from the major courses for a second major degree.

3.3.1.3 Course Instruction:

At the beginning of every semester the course instructor has to make a detailed plan of the course instruction in the prescribed form and supply it to the head of the discipline to make it available to the students. The course plan should have the information about the suggested text books, number of lectures per topic, number and type of assignments, number and approximate dates of mid-semester examinations and mandatory office hours reserved for the students of the course offered. If not otherwise mentioned the medium of instruction is always English.

3.3.2 Course Identification System:

Each course is designated by a three-letter symbol for discipline abbreviation followed by a three-digit number to characterize the course. To avoid confusion new or modified courses should never be identified by reusing a discontinued course number

3.3.2.1 Discipline Identification:

The three-letter symbol will identify a discipline offering the course as follows. If same course is offered to more than one discipline, if necessary, an extra letter shown in the list may be used after the three digits to specify the department receiving the non-major course.

		School of Applied Sciences and Technology:
1.	CSE	Computer Science and Engineering
2.	EEE	Electrical and Electronic Engineering
3.	CE	Civil Engineering

3.3.2.2 Course Number:

The three-digit number will be used as follows:
(a) First Digit: The first digit of the three digit number will correspond to the year intended for the course recipient.
(b) Second Digit: A discipline should use the number 0 and 1 for the second digit to identify non-major courses. The digits 2-9 are reserved for major courses to identify the different areas within a discipline.
(c) Third Digit: The third digit will be used to identify a course within a particular discipline. This digit can be used sequentially to indicate follow up courses. If possible even numbers will be used to identify laboratory courses.

3.3.2.3 Course Title and Credit:
Every course will have a short representative course title, declaration if it is core course, a number indicating the total credits as well as reference to prerequisite courses if any.

3.3.2.4 Theory and Lab Course:
If a single course has both Theory and Laboratory/Sessional part, then the course must be split into separate Theory and Lab courses and both should have separate course number. A student may not register for a lab course without registering or completing the corresponding theory course.

3.3.3 Assignment of Credits:

3.3.3.1 Theoretical:
One lecture per week (or 13 lectures in total) of 1 hour duration per semester will be considered as one credit. (There will be 10 minutes recess between theory classes). A theory course will have only integer number of credits.

3.3.3.2 Laboratory Classes:
Minimum two contact hours of a laboratory class per week (or 26 contact hours in total) per semester will be considered as one credit. A laboratory course may have half integer credits with a minimum of 1 credit.

3.3.3.3 Seminar, Thesis, Projects, Monographs, Fieldwork, Viva etc.:
Will be assigned by the respective discipline.

3.3.4 Classification of the Courses:
The Bachelor's degree courses will be classified into several groups and the syllabus committee will finalize the curricula selecting courses from the groups shown below.
3.3.4.1 Major Courses:
A student has to take at least 70% courses from his/her own discipline. Out of these courses a section will be identified as core courses and every student of a particular discipline will be required to take those courses.

3.3.4.2 Non-Major Courses:
Every student is required to take at least 20% (including mandatory) courses from related disciplines. If any Non-Major course is declared as Core course a student is required to take that course to graduate. The Non-Major courses will be designed, offered and graded by the offering disciplines.

3.3.4.3 Other Courses:
After completion of the required mandatory, major and non-major courses a student may take few other courses of his/her choice not directly related to his/her discipline to fulfill the total credit requirement.

3.3.4.4 Credit-Only Courses:
The credit of these Credit-Only courses will be added to the total credits if passed but will not affect the CGPA as there will be no grades for these courses.

3.4. Course Registration

3.4.1 Registration:
A student has to register for his/her courses and pay necessary dues within the first two weeks of every semester. Departmental student advisor will advise every student about his/her courses and monitor his/her performances. A student at any level is expected to register the courses at his level provided he/she does not have any incomplete courses from previous levels. A student will not be allowed to appear in the examination if his/her semester and examination fee is not cleared.

3.4.2 Minimum and Maximum Credits:
A student, if s/he is not a clearing graduate, has to register for at least 12 credits minimum and 30 credits maximum every semester.

3.4.3 Incomplete Courses:
(i) If a student has incomplete courses, he/she has to register his/her available incomplete courses from preceding levels before s/he can register courses from current or successive levels. If an incomplete course is not offered in a given semester the student has to take the courses when it is offered next time. A student with incomplete courses will not be eligible for Distinction.
(ii) A student to register his/her incomplete courses, if offered, from proceeding semesters before s/he can register courses from current or successive semester, otherwise s/he takes the courses when the desired course is offered next time. A student will not be allowed to take 100 and 300 level and 200 and 400 level courses simultaneously. 100 level courses mean courses of 1st and 2nd semesters, 200 level courses mean courses of 3rd and 4th semesters and so on.

3.4.4 Course Withdrawal:
A student can withdraw a course by a written application to the Controller of Examinations through the Head of the discipline on or before the last day of instruction. The Controller of Examinations will send the revised registration list to the disciplines before the examination. There will be no record of the course in transcript if the course is withdrawn.

3.4.5 Course Repetition:
If a student has to repeat a failed or incomplete course and that course is not offered any more, the discipline may allow him/her to take an equivalent course from the current syllabus. For clearing graduates if any incomplete course is not offered in the running semester, the discipline may suggest a suitable course to complete the credit requirement.

3.5. Graduation Criteria

3.5.1 Major Degree:

3.5.1.1 Total Credits:
School of Physical Sciences, School of Social Sciences and School of Management and Business Administration have a requirement of 140 credits to graduate from its disciplines. School of Applied Sciences and Technology, School of Life Sciences and School of Agriculture and Mineral Science have requirement of 160 (200 for Architecture) credits for graduation.

3.5.1.2 Total Years:
A regular student is expected to graduate in 8 semesters (4 years) or in 10 semesters (5 years) for the discipline of Architecture. A student may graduate in shorter time period if s/he is willing to take extra courses in a systematic way. A student will be given 4 (2 years) extra semesters in addition to 8/10 semesters to complete his/her degree. The regular examination year will be identified by the session and the end-month (June or December) of the semester the student graduates.

3.5.1.3 Early Graduation:
A student may graduate early by completing courses in advance, in that case he does not need to pay tuition or get admission in subsequent semesters. However a student will not be able to start master's degree one session earlier unless he graduates two semesters early.

3.5.1.4 Minimum Credit for a Clearing Graduate:
For a clearing graduate (8th and subsequent semesters) condition for maximum and minimum credit requirements is relaxed.

3.5.1.5 Break in study:
Those students who have not been able to achieve their degrees by participating in the ascertained 12th (for ARC department 14th) semester final exams will have the opportunity to do so by enrolling into 2 (two) running semesters back to back if after the publications of their results of the 12th (for ARC department 14th) semester final exam, it becomes evident that they have completed at least 80% of their total credits. In case of such students, on the tabulation sheet, result sheet, certificate, transcript, grade sheet, etc., number of total semesters shall be stated instead of the word “Irregular.” As for irregular students, studentship shall be annulled after the aforesaid 2 (two) semesters have come to an end.

3.5.2 Second Major Degree:

3.5.2.1 Total Credits:
A student may apply for a second major degree if he/she completes an extra 28-36 credit requirement designated by the offering discipline.

3.5.2.2 Total Semesters:
A student has to complete the credit requirement of second major degree within 8 regular and 4 extra semesters.

3.5.2.3 Requirement of Major Degree:
A student will not be given a second major degree if he/she fails to complete his regular major degree. A student will not be allowed to enroll in Masters program before completion of his/her second major degree even if he/she complete his/her major degree requirement.

3.5.2.4 Registration Criteria:
An offering discipline will decide on the number of seats for second major, enrollment criteria and get it approved from the academic council. Students willing to get a second major have to apply to the offering discipline for enrollment and the discipline will enroll them as per the admission criteria. During registration enrolled students have to get their courses approved from the offering department completing a separate registration form.

3.5.2.5 Class Routine:
After enrollment a regular student may start taking the second major courses starting 3rd semester. The class routine may be arranged to accommodate the student need.

3.5.2.6 Certificate and Mark sheet:
A student completing the requirement will be given an additional certificate and grade sheet for his second major degree.

3.6. Examination System

A student will be evaluated continuously in the courses system, for theoretical classes s/he will be assessed by class participation, assignments, quizzes, mid-semester examinations and final examination. For laboratory work s/he will be assessed by observation of the student at work, viva-voce during laboratory works, from his/her written reports and grades of examinations designed by the respective course teacher and the examination committee.

3.6.1 Distribution of Marks:
The marks of a given course will be as follows:

Class Attendance	10%
Quiz abd Assignments	10%
Mid-Semester Examinations	20%
Final Examination	60%

3.6.1.1 Class Participation:
The marks for class participation will be as follows:

Attendance (Percentage)	Marks	Attendance (Percentage)	Marks	Attendance (Percentage)	Marks
95 and above	10	80 to 84	7	65 to 69	4
90 to 94	9	75 to 79	6	60 to 64	3
85 to 89	8	70 to 74	5	Less than 60	0

A student will not be allowed to appear at the examination of a course if his/her class attendance in that course is less than 50%.

3.6.1.2 Assignments and Mid-Semester Examinations:
There should be at least two mid-semester examinations for every course. The course teacher may decide the relative marks distribution between the assignments, tutorial and mid-semester examinations, however at least 50% contribution should come from the mid-semester examinations. The answer script should be returned to the students as it is valuable to their learning process.

3.6.1.3 Final Examination:
The final examination will be conducted as per the Semester Examination Ordinance.
(a) Duration of the Final Examination: There will be a 3-hour final examination for every course of 3 credits or more after the 13th week from the beginning of the semester. Courses less than 3 credits will have final examination of duration 2 hours.
(b) Evaluation of Answer Script: The students of the School of Applied Science and Technology and the School of Agriculture and Mineral Sciences will have two answer scripts to answer separate questions during final examination. Two separate examiner will grade the two scripts separately and the marks will be added together to get the final mark. For the students of the other schools there will be a single answer script which will be evaluated by two examiners. The two marks will be averaged and if the marks by the two examiners differ by 20% or more the concerned answer scripts will be examined by a third examiner and the two closest marks among the three will be averaged to get the final mark.

3.7. Grading System

3.7.1 Letter Grade and Grade Point:
Letter Grade and corresponding Grade-Point for a course will be awarded from the roundup marks of individual courses as follows:

Numerical Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	C-	2.00
Less than 40%	F	0.00

3.7.2 Calculation of Grades

3.7.2.1 GPA:
Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses completed by a student in a semester.

3.7.2.2 CGPA:
Cumulative Grade Point Average (CGPA) of only major and both major and second major degree will be calculated by the weighted average of every course of previous semesters along with the present semester.

For clearing graduates if the roundup value of the third digit after decimal is nonzero the second digit will be incremented by one. A student will also receive a separate CGPA for his second major courses.

3.7.2.3 F Grades:
A student is given an 'F' grade if he fails or is absent in the final examination of a course. If a student obtains an 'F' grade his grade will not be counted for GPA and s/he has to repeat the course. An 'F' grade will be in his/her record and s/he will not be eligible for Distinction.

3.8. Distinction

3.8.1 Distinction:
Candidates for four-year Bachelor degree will be awarded the degree with Distinction if his/her overall CGPA is 3.75 or above. However, a student will not be considered for Distinction if (a) s/he is not a regular student (has semester drop, incomplete courses in any semester or break of study) (b) has 'F' grade in one or more courses.

CHAPTER 4
COURSE REQUIREMENTS FOR UNDERGRADUATE COMPUTER SCIENCE AND ENGINEERING STUDENTS

Vision Statement

The Department of Computer Science and Engineering, SEC intends to provide an excellent educational environment in order to develop professionals with strong technical and research backgrounds

Mission

M1. To provide quality education in both theoretical and applied foundations of Computer Science and Engineering.

M2. To create highly skilled computer engineers, capable of doing research and also develop solutions for the betterment of the nation.

M3. To inculcate professional and ethical values among students.

M4. To support society by participating in and encouraging technology transfer

Program Name: B.Sc. (Engg.) in Computer Science and Engineering

Program Educational Objectives (PEO)

Program Educational Objectives (PEOs) are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies.

The entity has set the following PEOs for the B.Sc. (Engg.) program in Computer Science and Engineering major.

PEO1. To provide students with a strong foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning.

PEO2. To develop an ability to analyze the requirements of the software, understand the technical specifications, design and provide novel engineering solutions and efficient product designs.

PEO3. To provide exposure to emerging cutting edge technologies, adequate training opportunities to work as teams on multidisciplinary projects with effective communication skills and leadership qualities.

PEO4. To prepare the students for a successful career and work with values and social concerns bridging the digital divide and meeting the requirements of local and multinational companies.

PEO5. To promote student awareness on life-long learning and to introduce them to professional ethics and codes of professional practice.

PEO to Mission Statement Mapping

Mission/PEO	PEO1	PEO2	PEO3	PEO4	PEO5
M1	X	X	X		
M2	X	X	X	X	
M3				X	X
M4			X		X

Program Learning Outcome (PLO)

After graduation from this program in CSE, the graduates will be able to:

PLO1. Apply knowledge of science, technology, computing andengineering in different aspects of their lifelong activities.

PLO2. Analyze a problem, identify and define the computing requirements appropriate to its solution.

PLO3. Design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

PLO4. Use current techniques, skills, and tools necessary for computing practice.
PLO5. Apply mathematical foundations, algorithmic principles and computer science theory in modeling systems demonstrating tradeoffs and complexities involved in a design choice.
PLO6. Function effectively on teams to accomplish a common goal and communicate effectively with a range of audiences.
PLO7. Understand professional, ethical, legal, security and social issues and responsibilities.
PLO8. Analyze the local and global impact of computing on individuals, organizations and society.
PLO9. Engage in lifelong learning and grow capabilities of critical thinking and research

Program Objectives (PEO/PO) to Program Learning Outcome (PLO) Mapping

PLO/PEO	PEO1	PEO2	PEO3	PEO4	PEO5
PLO 1	X	X	X		
PLO 2	X	X			
PLO 3	X	X		X	
PLO 4			X	X	X
PLO 5	X	X			
PLO 6			X	X	
PLO 7				X	X
PLO 8				X	
PLO 9	X				X

Graduate Profile:
Graduate profiles are descriptions of attributes, or knowledge, skills and attitudes, which a university community intends its graduates will develop through their study to equip them for their future education or employment. Students graduating from the department of CSE, SUST should have gained the following attributes.

a. Intellectual skills in Science and Engineering
b. Practical and problem solving skills
c. Numeracy and analytical skills
d. Entrepreneurship and innovation skills
e. Communication skills
f. Interpersonal, teamwork and leadership skill
g. Self-management & personal development skills
h. Commitment to community, country and humanity

Semester wise Curriculum Breakdown:
One-semester credit hour represents one class hour or two laboratory hours per week. An academic semester represents 13 weeks of classes exclusive to final exams. Semester wise breakdown of the curriculum structure for 2022-23 session are shown.

Undergraduate students of the Department of Computer Science and Engineering have to follow a particular course schedule which is given in this chapter according to semester-wise distribution of the courses:

SEMESTER-I

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 133	Structured Programming Language	2.00	---	2.00	
CSE 134	Structured Programming Language Sessional	--	4.00	2.00	
CSE 143	Discrete Mathematics	3.00	---	3.00	
EEE 109	Introduction to Electrical Engineering	3.00	---	3.00	
EEE 110	Introduction to Electrical Engineering Sessional	---	3.00	1.50	
MATH 101	Co-ordinate Geometry and Linear Algebra	3.00	---	3.00	
PHY 101	Physics	3.00	---	3.00	
PHY 102	Physics Sessional	---	3.00	1.50	
SSS 101	History of the Emergence of Independent Bangladesh	3.00	---	3.00	
	Total	**17.00**	**10.00**	**22.00**	

***N.B.: SSS 101 Course is mandatory to fulfill the requirement of completing Bachelor's degree.**

SEMESTER-II

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 137	Data Structures	3.00		3.00	
CSE 138	Data Structures Sessional		3.00	1.50	
CSE 140	Computer Engineering Drawing Sessional	---	3.00	1.50	
CSE 141	Theory of Computation	2.00	----	2.00	
CHEM 101	Chemistry	2.00	---	2.00	
CHEM 102	Chemistry Sessional		2.00	1.00	
MATH 111	Calculus	3.00	---	3.00	
ENG 101	English Language	2.00	---	2.00	
ENG 102	Communication in English (Practice)	---	2.00	1.00	
SS 101	Managerial Economics	2.00	---	2.00	
CSE 100	Software Development I		4.00	2.00	
	Total	**14.00**	**14.00**	**21.00**	

SEMESTER-III

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 233	Object Oriented Programming Language	3.00	---	3.00	
CSE 234	Object Oriented Programming Language Sessional	---	3.00	1.50	
CSE 235	Numerical Methods	2.00	---	2.00	
CSE 236	Numerical Methods Sessional	---	2.00	1.00	
CSE 237	Engineering Ethics and Cyber Law	2.00	---	2.00	
CSE 240	Introduction to Competitive programming	---	3.00	1.50	
EEE 207	Electronic Devices and Circuits	3.00	---	3.00	
EEE 208	Electronic Devices and Circuits Sessional	---	3.00	1.50	
STAT 201	Statistics for Engineers	3.00	---	3.00	
IPE 201	Management for Engineers	2.00	---	2.00	
	Total	**15.00**	**11.00**	**20.50**	

SEMESTER-IV

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 243	Algorithms	3.00	---	3.00	
CSE 244	Algorithms Sessional	---	3.00	1.50	
CSE 245	Digital Logic Design	3.00	---	3.00	
CSE 246	Digital Logic Design Sessional	---	3.00	1.50	
CSE 247	Computer Architecture	3.00	---	3.00	
BUS 201	Cost and Management Accounting	2.00	---	2.00	
MATH 201	Complex Variables, Laplace's Transforms and Fourier Series	3.00	---	3.00	
CSE 200	Software Development II		4.00	2.00	
CSE 230	Viva Voce		1.00	1.00	
	Total	**14.00**	**11.00**	**20.00**	

SEMESTER-V

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 333	Database Management System	3.00	---	3.00	
CSE 334	Database Management System Sessional	---	3.00	1.50	
CSE 335	Artificial Intelligence	3.00		3.00	
CSE 336	Artificial Intelligence Sessional		3.00	1.50	
CSE 337	Web Technologies	2.00	---	2.00	
CSE 338	Web Technologies Sessional	---	3.00	1.50	
CSE 339	Microprocessors and Microcontrollers	3.00	---	3.00	
CSE 340	Microprocessors and Microcontrollers Sessional	---	3.00	1.50	
CSE 341	Data Communication	3.00		3.00	
CSE 342	Data Communication Sessional	---	3.00	1.50	
	Total	**14.00**	**15.00**	**21.50**	

SEMESTER-VI

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 343	Machine Learning	3.00	---	3.00	
CSE 344	Machine Learning Sessional	---	3.00	1.50	
CSE 345	Operating System	3.00	---	3.00	
CSE 346	Operating System Sessional	---	3.00	1.50	
CSE 347	Digital Signal Processing	3.00	---	3.00	
CSE 348	Digital Signal Processing Sessional	---	3.00	1.50	
CSE 349	Software Engineering and Design Patterns	3.00	---	3.00	
CSE 350	Software Engineering and Design Patterns Sessional	---	3.00	1.50	
CSE 352	Technical Writing and Presentation	---	3.00	1.50	
CSE 300	Software Development III	---	4.00	2.00	
CSE 330	Viva Voce		1.00	1.00	
	Total	**12.00**	**20.00**	**22.50**	

SEMESTER-VII

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 420	Thesis I	---	4.00	2.00	
Or					
CSE 422	Project I		4.00	2.00	
CSE 433	Cryptography and Network Security	3.00	---	3.00	
CSE 434	Cryptography and Network Security Sessional	---	3.00	1.50	
CSE 435	Computer Graphics	3.00	---	3.00	
CSE 436	Computer Graphics Sessional	---	3.00	1.50	
CSE 437	Computer Networks	3.00		3.00	
CSE 438	Computer Networks Sessional		3.00	1.50	
Optional					
CSE 439	Simulation and Modeling	3.00	---	3.00	
CSE 440	Simulation and Modeling Sessional		3.00	1.50	
Or					
CSE 441	Deep Learning	3.00	---	3.00	
CSE 442	Deep Learning Sessional		3.00	1.50	
Or					
CSE 443	Cloud Computing	3.00	---	3.00	
CSE 444	Cloud Computing Sessional		3.00	1.50	
Or					
CSE 445	Introduction to Quantum Computing	3.00	---	3.00	
CSE 446	Introduction to Quantum Computing Sessional		3.00	1.50	
Or					
CSE 447	Internet of Things	3.00	---	3.00	
CSE 448	Internet of Things Sessional		3.00	1.50	
	Total	**12.00**	**16.00**	**20.00**	

SEMESTER-VIII

Course Number	Course Title	Hours/Week		Credit	Pre-requisite
		Theory	Practical/ Sessional		
CSE 450	Thesis II	---	8.00	4.00	
Or					
CSE 452	Project II	---	8.00	4.00	
CSE 453	Compiler Design	3.00	---	3.00	
CSE 454	Compiler Design Sessional	---	3.00	1.50	
CSE 440	Viva Voce	---	1.00	1.00	
Optional					
CSE 457	Digital Image Processing	3.00	---	3.00	
CSE 458	Digital Image Processing Sessional	---	3.00	1.50	
Or					
CSE 459	Wireless & Mobile Communication	3.00	---	3.00	
CSE 460	Wireless & Mobile Communication Sessional	---	3.00	1.50	
Or					
CSE 461	Advanced Algorithm Engineering	3.00	---	3.00	
CSE 462	Advanced Algorithm Engineering Sessional	---	3.00	1.50	
Or					
CSE 463	Bio-informatics	3.00	---	3.00	
CSE 464	Bio-informatics Sessional	---	3.00	1.50	
Or					
CSE 465	VLSI Design	3.00	---	3.00	
CSE 466	VLSI Design Sessional	---	3.00	1.50	
Or					
CSE 467	Natural Language Processing	3.00	---	3.00	
CSE 468	Natural Language Processing Sessional	---	3.00	1.50	
Or					
CSE 469	Distributed and Parallel Computing	3.00	---	3.00	
CSE 470	Distributed and Parallel Computing Sessional	---	3.00	1.50	
	Total	**6.00**	**15.00**	**14.00**	

Summary

Semester	Hours/Week		Credit	Pre-requisite
	Theory	Sessional		
Semester-1	17.00	10.00	22.00	
Semester-2	14.00	14.00	21.00	
Semester-3	15.00	11.00	20.50	
Semester-4	14.00	11.00	20.00	
Semester-5	14.00	15.00	21.50	
Semester-6	12.00	20.00	22.50	
Semester-7	12.00	16.00	20.00	
Semester-8	6.00	15.00	14.00	
Total	**104.00**	**112.00**	**161.50**	

Departmental subjects	:	121.00	credits
Science and other subjects	:	40.50	credits
Total	:	161.50	credits

CHAPTER 5
DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER-I

CSE 133: Structured Programming Language
3 hours in a week, 3.00 Credit
Rationale:

To familiarize the student with basic concepts of computer programming and developer tools. To present the syntax and semantics of the "C" language as well as data types offered by the language. To allow the students to write their own programs using standard language infrastructure regardless of the hardware or software platform.

Objectives:

- To facilitate students with necessary knowledge about basic understanding of computer hardware and how a computer works.
- To make the students understand the basic terminology used in computer programming
- Helping the students to develop ability in how to write, compile and debug programs in C language
- Helping the students to develop ability in writing programs involving decision structures, loops, functions and pointers
- To make the students understand the basic data structures and their implementation
- To enhancing the skill on implementing different searching and sorting techniques
- To enhancing the skill on building up their own logics and implementing them while solving real-world problems

Course Contents:
Programming Language: Basic concept, Overview of programming languages, Problem Solving Techniques and Data Flow-Diagram. **Language:** Preliminaries, Program constructs, variables and data types in C. Input and output. Character and formatted I/O; Arithmetic Expressions and Assignment statements; Control statement, Loops and Nested loops; break, continue, goto, Decision making; Arrays, Functions; Arguments and local variables, Calling Functions and arrays. Recursion and Recursive functions; Structures within structure. Automatic, external, static variable, Files; File functions for sequential and Random I/O. Pointers; Pointers and structures, union; Pointer and functions; Pointer and arrays; Operation and Pointer; Pointer and memory addresses; Operations on Bits; Bit Operation; Bit field; Advanced features; Preprocessor and Macros, enumeration, Standard library. **Recursion:** Basic idea of recursion (3 laws-base case, call itself, move towards base case by state change), tracing output of a recursive function, applications: factorial, Fibonacci, tower of Hanoi, merge sort, permutation, combination. **Sorting:** Insertion sort, selection sort, bubble sort, merge sort, quick sort, distribution sort (counting sort, radix sort, bucket sort). **Searching:** Linear search, binary Search, application of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations. **Stack and Queue:** Basic stack operations (push/pop/peek), stack-class implementation using Array and linked list, in-fix to postfix expressions conversion and evaluation, balancing parentheses using stack, basic queue operations (enqueue, dequeue), circular queue/ dequeue, queue-class implementation using array and linked list, application- Josephus problem, palindrome checker using stack and queue.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Understand the concepts of computer hardware and how it works.
CLO 2	Recall the basic terminology used in computer programming
CLO 3	Construct, compile and debug programs in C language
CLO 4	Apply control-flow tools such as loop, if-else, etc.
CLO 5	Understand the usage of pointers
CLO 6	Understand basic data structures, their implementation, and application
CLO 7	Apply different searching and sorting techniques
CLO 8	Evaluate real-life problems using programming terminologies

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X		X			X			
CLO2	X	X	X			X			
CLO3		X	X	X		X			
CLO4		X	X	X		X			
CLO5		X	X	X		X			
CLO6		X	X	X		X			
CLO7		X	X	X		X			
CLO8	X	X				X			

Textbook

1. Schaum's Outline of Programming with C by Byron S. Gottfried
2. C: The Complete Reference by Herbert Schildt

CSE 134: Structured Programming Language Sessional

3 hours in a week, 1.50 Credit

Laboratory works based on CSE 101

Rationale:

To familiarize the student with basic concepts of computer programming and developer tools. To present the syntax and semantics of the "C" language as well as data types offered by the language. To allow students to write their own programs using standard language infrastructure regardless of the hardware or software platform.

Objectives:

- To facilitate students with necessary knowledge about basic understanding of computer hardware and how a computer works.
- To make the students understand the basic terminology used in computer programming
- Helping the students to develop ability in how to write, compile and debug programs in C language
- Helping the students to develop ability in writing programs involving decision structures, loops, functions and pointers
- To make the students understand the basic data structures and their implementation
- To enhancing the skill on implementing different searching and sorting techniques
- To enhancing the skill on building up their own logics and implementing them while solving real-world problems

Course Contents:

Programming Language: Basic concept, Overview of programming languages, Problem Solving Techniques and Data Flow-Diagram. **Language:** Preliminaries, Program constructs, variables and data types in C. Input and output. Character and formatted I/O; Arithmetic Expressions and Assignment statements; Control statement, Loops and Nested loops; break, continue, goto, Decision making; Arrays, Functions; Arguments and local variables, Calling Functions and arrays. Recursion and Recursive functions; Structures within structure. Automatic, external, static variable, Files; File functions for sequential and Random I/O. Pointers; Pointers and structures, union; Pointer and functions; Pointer and arrays; Operation and Pointer; Pointer and memory addresses; Operations on Bits; Bit Operation; Bit field; Advanced features; Preprocessor and Macros, enumeration, Standard library. **Recursion:** Basic idea of recursion (3 laws-base case, call itself, move towards base case by state change), tracing output of a recursive function, applications: factorial, Fibonacci, tower of Hanoi, merge sort, permutation, combination. **Sorting:** Insertion sort, selection sort, bubble sort, merge sort, quick sort, distribution sort (counting sort, radix sort, bucket sort). **Searching:** Linear search, binary Search, application of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations. **Stack and Queue:** Basic stack operations (push/pop/peek), stack-class implementation using Array and linked list, in-fix to postfix expressions conversion and evaluation, balancing parentheses using stack, basic queue operations (enqueue, dequeue), circular queue/ dequeue, queue-class implementation using array and linked list, application- Josephus problem, palindrome checker using stack and queue.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Understand the concepts of computer hardware and how it works.
CLO 2	Recall the basic terminology used in computer programming
CLO 3	Construct, compile and debug programs in C language
CLO 4	Apply control-flow tools such as loop, if-else, etc.
CLO 5	Understand the usage of pointers
CLO 6	Understand basic data structures, their implementation, and application
CLO 7	Apply different searching and sorting techniques
CLO 8	Evaluate real-life problems using programming terminologies

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X		X			X			
CLO2	X	X	X			X			
CLO3		X	X	X		X			
CLO4		X	X	X		X			
CLO5		X	X	X		X			
CLO6		X	X	X		X			
CLO7		X	X	X		X			
CLO8	X	X				X			

Textbook

1.Schaum's Outline of Programming with C by Byron S. Gottfried
2.C: The Complete Reference by Herbert Schildt

CSE 143 Discrete Mathematics
3 hours in a week, 3.00 Credit

Rationale:

CSE students need to have a very strong logical and mathematical background and a course of discrete math is essential for that. This course also works as the mathematical foundation for future courses like data structure, algorithm, digital electronics and theory of computation.

Objectives:

- Help them conceptualize basic theories in mathematical reasoning and appreciate the precision of language and rigor required for mathematics.
- Help them conceptualize basic theories in combinatorial analysis to be able to solve counting problems.
- To facilitate necessary knowledge about how to work with discrete data structures like graphs and trees.
- To facilitate necessary knowledge about algorithmic techniques and to be able to implement in computer programs.
- Apply the knowledge of discrete mathematics in real life problems using modeling.

Course Contents:

Set, Relations, Functions: Set, Function, Representing Relations, Equivalence Relations.
Propositional Calculus: Propositions, Predicate and Quantifier.
Algorithms: Complexity, Divisions, Algorithm, Application of Number Theory.
Recursion: Sequences and summations, Recursive Definition and algorithm.
Combinatorial Analysis: Permutation and Combination, Divide and Conquer Algorithms, Generating Functions.
Graphs: Representation, Isomorphism, Connectivity, Euler and Hamilton path, Shortest path, Planer, Coloring.
Trees: Spanning trees, Rooted Trees, Binary Trees, Huffman Trees.

Boolean Algebra: Number System, Boolean Function, representing Boolean Function, Logic gate, Minimization of Circuits.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Memorize the basic concepts of sets, permutations, relations, graphs, trees
CLO 2	Represent discrete objects and relationships using abstract mathematical structures
CLO 3	Apply basic concepts of mathematical logic and proof
CLO 4	Employ mathematical reasoning in order to read, comprehend, and construct mathematical arguments
CLO 5	Evaluate whether an algorithm works well and perform analysis in terms of memory and time
CLO 6	Formulate and model problems with the concepts and techniques of discrete mathematics

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X	X			X				
CLO2	X	X			X				
CLO3	X	X			X				
CLO4	X	X			X				
CLO5	X	X			X				
CLO6	X	X			X				

Textbook

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen

EEE 109: Introduction to Electrical Engineering
3 hours in a week, 3.00 Credit

Rationale

This course endeavors to build on this knowledge and further expand students' skill in analyzing and designing analogue circuits involving transistors and diodes. The course covers: the basic principles of operation and device characteristics of diodes, Bipolar Junction Transistors (BJT), Junction Filed Effect Transistors (JFET) and Metal Oxide Semiconductor Field Effect Transistors (MOSFET) that underpin the analysis, design and implementation of analogue circuits. Multi-stage amplifiers using BJT and FETs further enhanced the course. Upon completion, students should be able to construct, analyze, verify, and troubleshoot analog circuits using appropriate techniques and test equipment.

Course Objectives:

- To introduce the basic principle operations, device and circuit characteristics of diodes, BJT, JFET, MOSFET and Op-Amp.
- To further develop skill and knowledge in analysis and design of analogue circuits such as amplifiers.
- To introduce the idea about DC and AC analysis of different amplifier circuits.
- To make the students interpret semiconductor theory.

Course Contents:

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, clamping and clipping circuits. **Bipolar Junction Transistor (BJT) as a circuit element:** current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch. **Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element:** structure and physical operation of an enhancement MOSFET, threshold voltage, Body

effect, current-voltage characteristics of an enhancement MOSFET, and biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter. **Operational amplifiers (Op-Amp):** Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits. Introduction to photodiode, Laser, Solar cell, Photo detector, LED.

.**Course Learning Outcomes:**

After the successful completion of the course, the student will be able to-

CLO 1	Interpret the basic semiconductor theory
CLO 2	Explain the basis operation of diode, and diode circuits
CLO 3	Design BJT amplifier circuits and perform DC and AC analysis.
CLO 4	Design JFET amplifier circuits and perform DC and AC analysis.
CLO 5	Identify different MOSFET circuits
CLO 6	Formulate an understanding for special purpose MOSFET
CLO 7	Differentiate between switching network of BJT and MOSFETs

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X	X	X	X					
CLO2	X	X	X	X					
CLO3	X	X	X				X		
CLO4	X	X	X				X		
CLO5	X	X							
CLO6	X			X			X	X	
CLO7	X	X		X			X	X	

Recommended Books

1. Electronic Devices and Circuit Theory by Robert L. Boylestad and Louis Nashlesky
2. Microelectronic Circuits- Sedra/Smith
3. Digital logic and Computer Design – M. Morris Mano

EEE 110: Introduction to Electrical Engineering Sessional

3 hours in a week, 1.50 Credit

In this course students will perform experiments to verify practically the theories and concepts learned in EEE-106. Theoretical knowledge is incomplete without hands on experiments using the basic components and measuring devices. This is an introductory experimental laboratory that explores the design, construction, and debugging of analog electronic circuits. Lectures and two laboratory projects investigate the performance characteristics of diodes, transistors, JFETs, and MOSFETS, including the construction of a small audio amplifier and preamplifier. The course provides opportunity to simulate real-world problems (as given as assignment) and solutions that involve tradeoffs and the use of engineering judgment.

Course objectives:

- Acquaint students with the basic idea about implementing different types diode circuits and investigates the voltage, current relationships.
- To help them develop skills for calculating voltage gain, current gain, overall gain in a multistage BJT, JFET and MOSFET amplifiers.
- To provide the students with capability of implementing different real life analog electronic circuits.

Course Contents:

- To familiarize students with electronics devices and Laboratory Equipment.
- To study of V-l Characteristics curve of P-N junction diode.
- To study of Half-Wave Rectification circuit.
- To study of Full-Wave Rectification circuit (Bridge &Center- tap).

- To study of Clipping and clamping circuit.
- To study MOSFET and BJT characteristics.
- Speech/ Audio amplification using NPN/PNP Transistor.
- MOSFET as an amplifier and switch.
- Different operational amplifier circuits.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Explain operation of diodes.
CLO 2	Design types of diode circuits.
CLO 3	Distinguish and interpret operation of BJT, JFET and MOSFET
CLO 4	Calculating operating point and perform DC analysis.
CLO 5	Differentiate between BJT, JFET and MOSFET amplifier circuits.
CLO 6	Differentiate between BJT and MOSFET switching circuits
CLO 7	Demonstrate team-based communication skills, magnify their moral standards and apply these in practical life

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X	X	X						
CLO2	X	X	X	X			X		
CLO3	X	X					X	X	
CLO4	X	X	X						
CLO5	X	X							
CLO6	X	X		X					
CLO7						X	X		

Recommended Books

1. Fundamental of Electric Circuits – Charles K. Alexander and Matthew N.O. Sadiku
2. Introductory Circuit Analysis by Robert L.Boylestad
3. Electronic Devices and Circuit Theory by Robert L. Boylestad and Louis Nashlesky
4. Microelectronic Circuits- Sedra/Smith

MATH 101 Co-ordinate Geometry & Linear Algebra
3 hours in a week, 3.00 Credit

Rationale: Mathematics is the language of science which develops thinking and critical problem solving skills. Differential calculus deals with the calculation of instantaneous rate of change and integral calculus deals with finding out the limit of a summation of the infinitely many small factors. The calculus has wide applications in science, engineering, economics, finance, statistics etc. The content of the course comprises functions, limits, continuity, derivatives, tangent and normal, different theorems such as Rolle's, Mean value, Taylor's, Leibnitz's and Euler's theorem etc, indefinite and definite integrals and their applications in real life situations. The course also contain the solution of different types of ordinary differential equations which helps to solve complex engineering problems.

Course Objectives:

- Know the basic concept of function and its applications to real – life problems.
- Explore the concepts, properties, and aspects of the differential and integral calculus of single variable functions.
- Learn the concepts of limits, continuity and derivative.
- Learn to finding out the derivative of different type of functions applying the formulae of derivatives.
- Know the application of derivatives to solve maximum and minimum value problems.

- Study various types of integrations for different cases.
- Apply the techniques of integration to solve the real-life oriented problems such as length, areas and volumes etc.
- Learn the solution of different types of ordinary differential equations and their applications.

Course Contents:

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 points; Equations of parabola; ellipse and hyperbola in Cartesian and polar co-ordinates; Tangents and normals, pair of tangents; Chord of contact; Chord in terms of its middle points; Pole and polar parametric co-ordinates; Diameters; conjugate diameters and their properties; Director circles and asymptotes.

Linear Algebra: Introduction to systems of linear equations; Gaussian elimination; Inverse of a matrix; Eigen values and eigen vectors; Cayley-Hamilton theorem; Euclidean n-space; Linear transformations from IRn to IRm; Properties of linear transformations from IRn to IRm; Real vector spaces and subspaces; Basis and Dimension, Change of basis, Rank and Nullity; Inner product spaces; Diagonalization; Linear transformations: Kernel and Range.Matrix: Matrix and matrix operations; different types of matrices; algebraic operations on matrices; cofactors and minors; determinant of a square matrix; adjoint and inverse of a matrix; elementary transformation of matrices; normal and canonical form of a matrix; rank of a matrix; the row-reduced form of a matrix and rank; equivalent systems of linear equations; the general solution of a system of linear equations; homogeneous systems; eigenvalues and eigenvectors; diagonalization of matrices. Vector space: Vector spaces and subspaces; linear dependence and independence; spanning set and basis; coordinates and dimension; null space, row space and column space; change of basis. Linear transformations: Linear transformations; composition of transformations; matrix representation; change of basis; diagonalization representation of a linear transformation by a diagonal matrix; the eigenvalues and eigenvectors of a symmetric matrix; quadratic form; functions of a square matrix. Inner product spaces: Definition and examples; Cauchy-Schwartz inequality; orthogonality; orthonormal basis and Gram-Schmidt process. **Series Solution:** Solution of differential equations in series by the method of Frobenius; Bessel's functions, Legendre's polynomials and their properties.

Course Learning Outcomes (CLO):

After completing the course the students will be able to

CLO 1. Understand the fundamental ideas and principles as well as geometrical meaning of differential and integral calculus of single valued functions.

CLO 2. Evaluate limits, derivatives, limits in indeterminate forms and apply the derivatives to analyze and sketch the graph of various types of functions.

CLO 3. Find maxima and minima, critical points and inflection points of functions.

CLO 4. Know standard indefinite integrals and evaluate integrals by substitution, by partial fractions and by parts.

CLO 5. Understand the concept of definite integral and evaluating definite integrals including the evaluation of improper integrals.

CLO 6. Calculate the area of regions in the plane, the volume and surface area of solids of revolution.

CLO 7. Solve ordinary differential equations which will help to make the complex engineering problems easier.

Mapping of CLO with PLO:

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X	X		X					X
CLO2	X	X		X					X
CLO3	X	X		X					X
CLO4	X	X		X					X

CLO5	X	X		X					X
CLO6	X	X		X					X
CLO7	X	X		X					X

Books Recommended:

1. Thomas Finney: Calculus and Analytic Geometry.
2. Howard Anton and Chris Rorres: Elementary linear algebra applications
3. Steven J. Leon: Linear algebra with applications, Prentice Hall, 1998

PHY 101 Physics
3 hours in a week, 3.00 Credit

Rationale:
In this course, Students will be able to gather knowledge of thermal properties of materials and apply The knowledge in different thermal situations. This course will also provide basic knowledge in structure Of matter, wave and oscillations. Physical optics will covered by this course through which students will be familiar with interference, Bi-prism and diffraction.

Objectives

- To learn about thermometer and its construction.
- To learn basic principles of thermodynamics.
- To know wave behavior and Lissajous figure.
- To learn physical optics and problem solving technique.

Course Content:

Heat and Thermodynamics: Principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; Kinetic theory of gases: Maxwell's distribution of molecular Speeds, mean free path, equipartition of energy, Brownian motion, Van der Waal's Equation of state, Review of the First Law of thermodynamics and its application, reversible and irreversible processes, Second Law of thermodynamics, Carnot cycle; Efficiency of heat engines, Carnot's Theorem, entropy of reversible and irreversible process.

Structure of Matter: Crystalline and non-crystalline solids, single crystal and polycrystalline solids, unit Cell, crystal systems, co-ordinations number, crystal planes and directions, NaCl and CsCl Structure, packing factor, Miller indices, relation between inter-planar spacing and Miller indices, Bragg's Law.

Waves and Oscillations: Differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient, forced oscillation.

Physical Optics : Theories of light; Interference of light, Young's law, double slit experiment; Displacements of fringes and its uses; Fresnel Bi-prism, interference at wedge shaped films, Newton's rings, interferometers, Diffraction of light: Fresnel and Fraunhoffer diffraction, diffraction by single slit.

Course Learning outcomes

After the successful completion of the course, students will be able to:

CLO1: Explain thermometer, kinetic theory of gases, mean free path, Brownian motion, van der walls equation and related problems.

CLO2: Learn basic law of thermodynamics and solve related problems.

CLO3: Understand structure of matter.

CLO4: Learn wave behaviour and calculate wave properties for different situations.

CLO5: Know physical optics and related problems.

Mapping of the CLOs with PLOs

CLO/ PLO	PLO 1	PL0 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CLO1	X	X	X		X		X		X
CLO2	X	X	X		X		X		X
CLO3	X		X				X		X
CLO4	X	X					X		X
CLO5	X	X	X				X	X	X

Recommended Books

1. Physics for Engineers .Dr.Giasuddin Ahmed

2. Halliday, D. and Resnick, R: physics (Vol.I and Vol II)

PHY 102 Physics Sessional
3 hours in a week, 1.50 Credit
Laboratory works based on PHY 101.

Rationale:

In this course students will perform some laboratory experiments that will help to visualize some fundamental concepts of physics.

Course objectives:

- To enable the students to carry out some fundamental experiments for finding out the numerical values of some physical parameters based on various laws, principles and theorems of physics.

Course contents:
1. Determination of the value of 'g' gravity by using compound pendulum.
2. Determination of the spring constant and effective mass of a spiral spring.
3. Determination of the focal length of a convex lens.
4. Determination of the mechanical equivalent of heat by electrical method.
5. Determination of the velocity of sound by water tube and tuning fork.
6. Calculation of the Planck's constant using LED.
7. Determination of angle of rotation of a sugar solution using half-shade Polarimeter.
8. Determination of the radius of curvature of a plano-convex lens by Newtons ring method.
9. Determination of specific heat of a liquid by the method of cooling.
10. Comparison of e.m.f of two cells by potentiometer.
11. Determination of Frequency of tuning fork by Melde's apparatus.
12. Determination of refractive index of a prism.

Course learning outcomes

After successfully completion of the course, the student will be able to-
CLO1: Determine the value of 'g' gravity by using compound pendulum.
CLO2: Determine the spring constant and effective mass of a spiral spring.
CLO3: Determine the focal length of a convex lens.
CLO3: Determine the focal length of a convex lens.
CLO4: Determine the mechanical equivalent of heat by electrical method.
CLO5: Determine the velocity of sound by water tube and tuning fork.
CLO6: Calculate the Planck's constant using LED.
CLO7: Determine angle of rotation of a sugar solution using half-shade polarimeter.
CLO8: Determine the radius of curvature of a Plano-convex lens by Newton's ring method.

CLO9: Determine specific heat of a liquid by the method of cooling.
CLO10: Compare e.m.f of two cells by potentiometer.
CLO11: Determine Frequency of tuning fork by Melde's apparatus.
CLO12: Determine refractive index of a prism.

Mapping of the CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X	X	X	X	X	X	X
CLO2	X		X	X	X	X		X	
CLO3	X	X	X	X	X	X	X	X	X
CLO4		X		X	X		X		X
CLO5	X		X		X	X		X	
CLO6	X	X	X	X		X	X	X	X
CLO7		X	X	X	X	X		X	X
CLO8	X		X	X	X		X		
CLO9	X	X				X		X	X
CLO10	X	X		X	X	X	X	X	
CLO11		X	X	X	X	X	X	X	X
CLO12		X	X		X	X		X	X

Recommended Books

1. Practical Physics: Dr.Giasuddinahmed & Md.Shahabuddin

SSS 101 History of the Emergence of Independent Bangladesh
3 hours in a week, 3.00 Credit

Rationale:

This is a special compulsory course for all students of Bachelor program of Shahjalal University of Science and Technology, Sylhet. This course deals with the interrelated themes and topics that are essential to understand the emergence of Bangladesh.

Objectives:

- To give an outline about the concept of liberation war and freedom fighter
- To clarify the role of different people in the liberation war.
- To explain the role of Bangabandhu in liberation war
- To develop an insight about the value of the sacrifice of martyrs for motherland.

Course Contents:

This course deals with the following interrelated themes and topics that are essential to understand the emergence of Bangladesh. These themes include land and people, politics, economy, governance, society, religion and culture, global connections as well as the basic topics on the freedom struggle and War of Liberation. Issues under each of the broad themes will be discussed from the perspective of historical evolution and contemporary significance.

Description of the country and its people: Impact of Geographical features, Ethnic composition of Bangladesh, Development of Bengali Language and its impact, Cultural syncretism and religious tolerance, Distinctive identity of Bangladesh in the context of undivided Bangladesh. **Proposal for undivided sovereign Bengal, the partition of the Subcontinent, 1947 and Foreshadowing Bangladesh:** Rise of communalism under the colonial rule, Lahore Resolution 1940, The proposal of Suhrawardi and Sarat Bose for undivided Bengal: consequences, The creation of Pakistan 1947, Foundation of Awami Muslim League and Foreshadowing Bangladesh. **Pakistan: Structure of the state and disparity;** Central and provincial structure, Influence of Military and Civil bureaucracy, Economic, social and cultural disparity. **Language Movement and quest for Bengali identity:** Misrule by Muslim League and Struggle for democratic politics, The Language Movement: context, phases and International Recognition of Bengali Language, United front of Haque – Vasani – Suhrawardi: election of 1954, consequences. **Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971):** Definition of military rules and its characteristics, Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, slamisation), Fall of Ayub Khan and Yahia Khan's rule. **Rise of nationalism and the Movement for self-determination:** Resistance against cultural aggression and resurgence of Bengali culture, Sheikh Mujibur Rahman and the 6 points movement, Reactions: Importance and significance, The Agortola Case 1968. **The mass-**

upsurge of 1969 and 11 point movement: Background, Program, Significance. **Election of 1970 and its Impact:** Legal Framework Order (LFO), Programs of different political parties, Election result and centers refusal to comply **Non-cooperation Movement and 7th March Speech, 1971:** The non-cooperation movement, Speech of 7th March: Background of the speech, major characteristics of the speech, impact of this speech, International recognition of 7th March Speech as part of world heritage. **Declaration of Independence of Bangladesh:** Operation Searchlight, Declaration of Independence of Bangladesh by Bangobondhu, Beginning of the Liberation War of Bangladesh. **The war of Liberation 1971:** Genocide, repression of women, refugees, Formation of Bangladesh government and proclamation of Independence, The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas and the frontal warfare), Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion), Contribution of students, women and the masses (Peoples war) and different political parties, The role of Great powers and the United Nations in the Liberation war, The contribution of India in the Liberation War, The Anti-liberation activities of the occupation army, the Peace Committee, Al-Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators , killing of the intellectuals, Trial of Bangabandhu and reaction of the World Community, Formation of joint command and the Victory, The overall contribution of Bangabandhu in the Independence struggle. **The Bangabandhu Regime 1972-1975:** Homecoming; Speech of 10 January, Making of the constitution, Reconstruction of the war-ravaged country, Foreign Policy of Bangabandhu; Bangabandhu's First Speech in the United Nations, The murder of Bangabandhu and his family and the ideological turn-around.

Course Learning Outcomes**:** After the successful completion of the course, the student will be able to-

CLO 1	Know liberation war of Bangladesh and role of freedom fighters
CLO 2	Know the causes of developing movement and nationalism
CLO 3	Know different disparities and deprivation of Bangladesh by Pakistan
CLO 4	Know the declaration and continuing breathtaking moments of liberation war.
CLO 5	Know the lifelong contributions of Bangabandhu Sheikh Mujibor Rahman in the creation of independent Bangladesh.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1							X		X
CLO2							X		X
CLO3							X		X
CLO4							X		X
CLO5							X		X

Recommended texts:

1. Ahmed, Salahuddin and Bazlul Mobin Chowdhury (eds.), *Bangladesh: National Culture and Heritage: An Introductory Reader* (Dhaka: Independent University Bangladesh, 2004)
2. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics, 1906-1947* (Dhaka : The University Press Limited, 2012)
3. Jahan Rounaq, *Pakistan: Failure in National Integration,(Dhaka :* The University Press Limited, 1977)
4. Maniruzzaman Talukder, *Radical Politics and the Emergence of Bangladesh, (Dhaka :* Mowla,Brothers, 2003)
5. Muhith, A M A, *History of Bangladesh: A Subcontinental Civilization*, (Dhaka: UPL, 2016)
6. Samad Abdus, *History of Liberation War of Bangladesh*, (Dhaka : Aparajeyo Bangla Prakashani, 2019)
7. Milton Kumar Dev, Md. Abdus Samad, *History of Bangladesh* (Dhaka : Biswabidyalya Prokasoni, 2014)
8. Schendel, Willem van : *A History of Bangladesh* (Cambridge: Cambridge University Press, 2009)

৯. শেখ মুজিবুর রহমান : *অসমাপ্ত আত্মজীবনী*, (ঢাকা : দি ইউনিভার্সিটি প্রেসলিমিটেড, ২০১২)

১০. নীহাররঞ্জনরায় : *বাঙালীর ইতিহাস*, (কলকাতা : দে' জ পাবলিশিং, ১৪০২ সাল)

১১. সালাহ্ উদ্দিন আহমেদ ও অন্যান্য (সম্পাদিত), *বাংলাদেশের মুক্তি সংগ্রামের ইতিহাস* ১৯৪৭-১৯৭১, (ঢাকা : আগামী প্রকাশনী, ২০০২)

১২. আবুল মাল আবদুল মুহিত : *বাংলাদেশ: জাতিরাষ্ট্রের উদ্ভব, (ঢাকা :* সাহিত্য প্রকাশ, ২০০০)
১৩. সিরাজুল ইসলাম (সম্পাদিত), *বাংলাদেশের ইতিহাস ১৭০৪-১৯৭১*, ৩ খন্ড, (ঢাকা : এশিয়াটিক সোসাইটি অব বাংলাদেশ, ১৯৯২)
১৪. হারুন-অর-রশিদ : *বঙ্গীয় মুসলিম লীগ পাকিস্তান আন্দোলন বাঙালির রাষ্ট্রভাবনা ও বঙ্গবন্ধু*, (ঢাকা : অন্য প্রকাশন, ২০১৮)
১৫. হাসান হাফিজুর রহমান :বাংলাদেশের স্বাধীনতাযুদ্ধ দলিলপত্র, (সম্পাদিত), (ঢাকা:গণপ্রজাতন্ত্রী বাংলাদেশ সরকার, ১৯৮৫)

SEMESTER-II

CSE 137 Data Structures
3 hours in a week, 3.00 Credit

Rationale:
To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. To teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter and showing the correctness of algorithms and studying their computational complexities.

Objectives:
- To explain the purpose and mathematical background of algorithm analysis
- To facilitate necessary knowledge about the abstract data types of stacks, queues and deqeues
- To familiarize with variety of ways that linearly and weakly ordered data can be stored, accessed, and manipulated
- To facilitate necessary knowledge about the characteristics and optimal behavior of hash tables for access and retrieval
- To provide the knowledge of various sorting algorithms and the run-time analysis required to determine their efficiencies
- To help them understand various tree traversal techniques and graph algorithms

Course Contents:
Internal Data Representation: Specification, representation, Asymptotic analysis: Recurrences, Substitution method and manipulation of basic data structures: arrays, records and pointers, linked lists, stacks, queues, recursion, trees, optimal search trees, heaps, disjoint sets. **Recursion:** permutation, combination. **Sorting:** merge sort, quick sort (randomized quick sort), distribution sort (counting sort, radix sort, bucket sort), lower bounds for sorting, external sort. **Binary Tree:** Binary tree representation using array and pointers, traversal of Binary Tree (in-order, pre-order and post-order). **Ternary tree, Binary Search Tree:** BST representation, basic operations on BST (creation, insertion, deletion, querying and traversing), application- searching, sets. Ternary search tree, Binary Index tree, Segment tree, RMQ (Range Minimum Query). **Searching: A**pplication of Binary Search- finding element in a sorted array, finding nth root of a real number, solving equations. **Heap:** Min-heap, max-heap, Fibonacci-heap, applications-priority queue, heap sort. **Set Operations& Disjoint Set:** Union find, path compression. **Huffman Coding Graph:** Graph representation (adjacency matrix/adjacency list), basic operations on graph (node/edge insertion and deletion), **Traversing a graph:**Review of Breadth first search (BFS), Depth first search (DFS), Topological Sort, Strongly Connected Components, Euler Path, Articulation Point, Bridge, Bi-connected Components, graph-bicoloring, Floodfill, Dijkstra's Shortest Path Algorithm, Bellman –Ford algorithm and negative cycle detection, Floyd-Warshall all pair shortest path algorithm, Johnson's algorithm, shortest path in Directed Acyclic Graph. **Minimum spanning tree:** Prim's algorithm and Kruskal's algorithm. **Self-Balancing Binary Search Tree:** AVL tree (rotation, insertion). **Set Operations:** Set representation using bitmask, set/clear bit, querying the status of a bit, toggling bit values, LSB, application of set operations. **String ADT:** The concatenation of two strings, the extraction of substrings, searching a string for a matching substring, parsing, Suffix tree, Suffix array.
Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Interpret the examples of relationships between data.
CLO 2	Analyze computational and memory complexities of algorithms that are used to manipulate data using standard data structures.
CLO 3	Apply stacks/queues/deques to store and extract sequential data.
CLO 4	Apply recursions to divide a problem and conquer the solution.
CLO 5	Decide when to use which data structure.

CLO 6	Differentiate between graphs and trees and make graphs/trees when these are best suited for manipulating the data.
CLO 7	Demonstrate efficiency in inserting data to a data structure and searching/retrieving data from a data structure.
CLO8	Design data structures to store and manipulate data while solving real life problems.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X		X				X
CLO2	X	X	X		X				X
CLO3	X	X	X		X				X
CLO4	X	X	X		X				X
CLO5	X	X	X		X				X
CLO6	X	X	X		X				X
CLO7	X	X	X		X				X
CLO8	X	X	X		X				X

Textbook

1. Advanced Data Structures, Peter Brass
2. Data Structures – Seymour Lipschutz, Schaum's Outlines Series.
3. Introduction to Algorithms Thomas H. Cormen , Charles E. Leiserson

CSE 138 Data Structures Sessional

3 hours in a week, 1.50 Credit

Laboratory works based on CSE 137.

Rationale:

To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. To teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter and showing the correctness of algorithms and studying their computational complexities.

Objectives:

- To explain the purpose and mathematical background of algorithm analysis
- To facilitate necessary knowledge about the abstract data types of stacks, queues and deques
- To familiarize with variety of ways that linearly and weakly ordered data can be stored, accessed, and manipulated
- To facilitate necessary knowledge about the characteristics and optimal behavior of hash tables for access and retrieval
- To provide the knowledge of various sorting algorithms and the run-time analysis required to determine their efficiencies
- To help them understand various tree traversal techniques and graph algorithms

Course Contents:

Creation and Manipulation of linear data structures: linked list, stacks and queues. **Creation and Manipulation of non-linear data structures**: B-trees and heaps, disjoint sets. Implementing sorting, searching and hashing techniques, string processing.

Implement all the Contents related to the coursework CSE 138.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Interpret the examples of relationships between data.
CLO 2	Analyze computational and memory complexities of algorithms that are used to manipulate data using standard data structures.
CLO 3	Apply stacks/queues/dequeues to store and extract sequential data.
CLO 4	Apply recursions to divide a problem and conquer the solution.
CLO 5	Decide when to use which data structure.
CLO 6	Differentiate between graphs and trees and make graphs/trees when these are best suited for manipulating the data.

CLO 7	Demonstrate efficiency in inserting data to a data structure and searching/retrieving data from a data structure.
CLO8	Design data structures to store and manipulate data while solving real life problems.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X			X			
CLO2	X	X	X			X			
CLO3	X	X	X			X			
CLO4	X	X	X			X			
CLO5	X	X	X			X			
CLO6	X	X	X			X			
CLO7	X	X	X			X			
CLO8	X	X	X			X			

Textbook

1. Advanced Data Structures, Peter Brass
2. Data Structures – Seymour Lipschutz, Schaum's Outlines Series.
3. Introduction to Algorithms Thomas H. Cormen , Charles E. Leiserson

CSE 140: Computer Engineering Drawing Sessional
3 hours in a week, 1.50 Credit

Rationale:

Engineering drawing is the language of the engineers and technicians. Therefore, it is the intent of this course to equip students with the fundamentals of this unique language and to give them the skills necessary to prepare complete, concise, and accurate communications through engineering drawings using Inventor Professional. Pictorial presentation by means of geometric shapes, lines, and dimensions is a must for engineering students. All engineering students need the basic engineering graphics knowledge to express their thoughts and ideas precisely and accurately.

Course Objectives:

- provide the students with necessary skill to read, understand, and create computer engineering drawing
- students can also develop an understanding of 2D and 3D computer aided drafting with the requirements of good engineering drawings and be able to apply them to their work.
- familiarize the students to acquire and use engineering drawing skills on creating accurate, clear sketches of different mechanical objects following the information and instructions
- make students able to draw different types of angle projections, orthographic views, auxiliary, sectional views, isometric views, etc.
- enable students to acquire requisite knowledge required for advanced study of engineering drawing
- apply the drawing and drafting skills as problem-solving tools to resolve the primary design issues

Course Content:

Computer Engineering Drwaing:Introduction, Introduction to Graphics Drawing with Microsoft Visio.,Communication, Instruments and their uses, Sketching, Engineering Geometry, Multiviews and Visualization, Auxiliary Views, Pictorial Projections, Dimensioning and Tolerancing Practices, Working Drawings and Assemblies ,First angle and third angle projections, Orthographic drawing, Sectional views. Isometric views, Missing lines and views. **Data Visualization**: Introduction to data visualization, Visualization Tools,Basic Plotting(Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts - Sub Plots - Matplotlib, Searborn, Plotly - Seaborn Styles), Applied Visualizations(Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks), Principles for data visualization(Visual Perception and Cognition - Gestalt's Principles - Tufte's Principles - Applications of Principles of Information Visualization - Dashboard Design), Interactive Visualizations and Animations(Dynamic charts -

Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations), Introduction to Tableau

Course Learning Outcomes

Upon successful completion of this course, student have reliably demonstrated the ability to

CLO 1	Understand the basic tools and techniques for making engineering drawings, and apply them to a wide range of engineering fields
CLO 2	Create freehand sketches of visual expressions of technical ideas and can interpret common types of engineering drawings
CLO 3	Understand the purpose of geometric shapes, signs and symbols, abbreviations and dimensional values found on engineering drawings
CLO 4	Utilize graphic techniques to understand the relationships between real-world components and views of the components (orthographic, auxiliary, sectional, isometric views, etc.)
CLO 5	Use python and R libraries for data visualization and conduct exploratory data analysis using Python
CLO 6	Interpret results of exploratory data analysis and Paraphrase the results for documentation

Mapping of CLOs with PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X					X			
CLO2	X					X			
CLO3	X					X			
CLO4	X					X			
CLO5	X					X			
CLO6	X					X			

Books Recommended:

1. Bertoline & Wiebe, Fundamentals of Graphics Communication, , 6th Edition, McGraw-Hill International Edition
2. William McKinney ,Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython
3. Garrett Grolemund & Hadley Wickham, R for Data Science
4. K.V. Reddy, Textbook of Engineering Drawing, BS Publications, India.
5. Thomas E. French, Charles J. Vierck, Robert J. Foster ,Engineering Drawing and Graphic Technology-International Edition, , McGraw-Hill, Inc.1993 ISBN 0-07-022347-5
6. M.B. Shah and B. C. Rana, Engineering Drawing, Dorling Kindersley (India) Pvt Ltd.

CSE 141 Theory of Computation
2 hours in a week, 2.00 Credit

Rationale:

Theory of computation lays a strong foundation for a lot of abstract areas of computer science. It is used in Artificial Intelligence, Natural Language Processing, Probability or Computer vision, in certain areas of mathematics like Number theory. So Students wishing to build up their career in such a field of CSE need to achieve a better understanding of this topic.

Objectives:

- To familiarize with the formalization of the notion of problems via formal languages
- To familiarize with the formalization of the notion of computation using "abstract computing devices" called automata
- To help them understanding a hierarchy of classes of problems or formal languages (regular, context-free, context-sensitive)

- To help them understanding a hierarchy of classes of automata (finite automata, pushdown automata, and Turing machines)
- To facilitate with the knowledge about complexity classes P and NP, and Intractability (NP-completeness)
- To facilitate with the knowledge about space complexity: NL-completeness and PSPACE-completeness

Course Contents:
Introduction to Theory of Computation.
Automata and Language Theory: Finite automata: Deterministic and nondeterministic finite automata and their equivalence, regular expressions, Closure properties, push-down automata, context free grammars, pumping lemmas and applications. **Context-free Grammars:** Definitions. Parse trees. The pumping lemma for CFLs and applications. Normal forms. General parsing. Sketch of equivalence with pushdown automata.
Computability Theory: Turing machines: Designing simple TMs. Variations in the basic model (multi-tape, multi-head, nondeterminism), Church-Turing thesis and evidence to support it through the study of other models, decidability, halting problem, reducibility, recursion theorem. **Complexity Theory:** Time and space measures, hierarchy theorems, complexity classes P, NP, L, NL, PSPACE, BPP and IP, complete problems, P versus NP conjecture, quantifiers and games, provably hard problems, relativized computation and oracles, probabilistic computation, interactive proof systems.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Describe the fundamental elements and branches of theory of computation and its features
CLO 2	Design grammar for a language
CLO 3	Design regular expression to generalize all the elements of a language
CLO 4	Design deterministic and nondeterministic state diagrams to find out acceptable and non-acceptable elements for a specific language
CLO 5	Analyze and evaluate grammars to prevent ambiguities in language components
CLO 6	Decide which problems are solvable and not solvable by a system
CLO 7	Apply transformation of grammar to meet different conditions
CLO 8	Analyze time complexity of an algorithm
CLO 9	Analyze space complexity of an algorithm

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X			X				
CLO2	X	X			X				
CLO3	X	X			X				
CLO4	X	X			X				
CLO5	X	X			X				
CLO6	X	X			X				

Textbook
1. Introduction to the Theory of Computation by Michael Sipser, (Latest Edition).
2. Introduction to Languages and the Theory of Computation, by J. C. Martin.

CHEM 101: Chemistry
2 hours in a week, 2.00 Credit
Rationale
In order to create global leaders in computer sectors the graduates will be knowledgeable about basic chemistry to perceive engineering materials and their applications. The student with the proficiency of basic phenomenon of chemistry, they will understand and explain scientifically the various chemistry related problems in the engineering field. As this is a support course taken usually in the first year, it will be helpful for the improvement of skill levels pertaining to the use of technology and communication in device fabrication.

Objectives:

- To compare the chemical behavior and physical properties of common substances.
- To solve quantitative problems (stoichiometric) involving chemical formulas and equations.
- To impart knowledge of green chemical technology and its applications.
- To analyze chemical processes involved in engineering arena.
- To evaluate quality of engineering products.
- To enhance the thinking capabilities in line with the modern trends in engineering and technology for pursuing further research.

Course Content:
Atomic structure, Quantum numbers, Electronic configuration, Periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, Phase diagram of monocomponent system; Properties of dilute solutions; Thermochemistry, Chemical kinetics, Chemical equilibria; Ionization of water and pH concept; Electrical properties of solution.

Course Learning Outcomes:
After the successful completion of the course, the student will be able to-

CLO 1	Illustrate modern concepts of atomic structure and their limitations, correlation of atomic models, demonstration of orbit and orbitals, electron distribution and energy levels, hydrogen spectral lines etc.
CLO 2	Explain the development of the periodic table, comparison of periodic trends in physical and chemical properties of elements in the periodic table.
CLO 3	Calculate the percent composition of a compound and derive empirical formulas from experimental data with the concept and use of different concentration unit, limiting reactant and percent of yield.
CLO 4	Describe different types of chemical bonds and their properties, draw molecular structures of various compounds.
CLO 5	Differentiate organic compounds (alkane, alkene, alkyne etc.) and discuss their properties and reactions.
CLO 6	Identify different types of solutions and their properties, Interpret phase rule and phase diagram of mono-component system.
CLO 7	Asses all the thermochemical laws: Zeroth, 1^{st}, 2^{nd} and 3^{rd} law, Laplace-Lavoisier's law and Hess's law with their criticism.
CLO 8	Analyze chemical kinetics for various chemical reactions in terms of order, molecularity, rate constant etc. with their graphical representation, relate chemical equilibrium constants.
CLO 9	Review the modern concepts of acids and bases and measure their strength, predict the acidic and basic properties of species with pH concept.
CLO 10	Develop different types of cell diagram and deduce cell emf.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

CLO/PLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO8	PLO9
CLO 1	X	X	X						
CLO 2	X	X							
CLO 3	X	X							
CLO 4	X	X	X						
CLO 5	X	X			X				

CLO 6	X	X							
CLO 7	X	X							
CLO 8	X	X		X					
CLO 9	X	X		X			X		
CLO 10	X	X				X			

Books Recommended:

1. General Chemistry; Author: Darrell. D. Ebbing.
2. Physical Chemistry; Author: Peter Atkins.
3. Introduction to Modern Inorganic Chemistry; Author: S.Z. Haider.
4. Organic Chemistry; Author: Morrison and Boyd.

CHEM 102: Chemistry Sessional

2 hours in a week, 1.00 Credit

Rationale

In order to create global leaders in computer sectors the graduates will be knowledgeable about basic chemistry to perceive engineering materials and their applications. The student with the proficiency of basic phenomenon of chemistry, they will understand and explain scientifically the various chemistry related problems in the engineering field. As this is a support course taken usually in the first year, it will be helpful for the improvement of skill levels pertaining to the use of technology and communication in device fabrication.

Objectives:

- To compare the chemical behavior and physical properties of common substances.
- To solve quantitative problems (stoichiometric) involving chemical formulas and equations.
- To impart knowledge of green chemical technology and its applications.
- To analyze chemical processes involved in engineering arena.
- To evaluate quality of engineering products.
- To enhance the thinking capabilities in line with the modern trends in engineering and technology for pursuing further research.

Course Content:

Atomic structure, Quantum numbers, Electronic configuration, Periodic table; Properties and uses of noble gases; Different types of chemical bonds and their properties; Molecular structure of compounds; Selective organic reactions; Different types of solutions and their compositions; Phase rule, Phase diagram of monocomponent system; Properties of dilute solutions; Thermochemistry, Chemical kinetics, Chemical equilibria; Ionization of water and pH concept; Electrical properties of solution.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Illustrate modern concepts of atomic structure and their limitations, correlation of atomic models, demonstration of orbit and orbitals, electron distribution and energy levels, hydrogen spectral lines etc.
CLO 2	Explain the development of the periodic table, comparison of periodic trends in physical and chemical properties of elements in the periodic table.
CLO 3	Calculate the percent composition of a compound and derive empirical formulas from experimental data with the concept and use of different concentration unit, limiting reactant and percent of yield.
CLO 4	Describe different types of chemical bonds and their properties, draw molecular structures of various compounds.
CLO 5	Differentiate organic compounds (alkane, alkene, alkyne etc.) and discuss their properties and reactions.
CLO 6	Identify different types of solutions and their properties, Interpret phase rule and phase diagram of mono-component system.
CLO 7	Asses all the thermochemical laws: Zeroth, 1^{st}, 2^{nd} and 3^{rd} law, Laplace-Lavoisier's law and Hess's law with their criticism.
CLO 8	Analyze chemical kinetics for various chemical reactions in terms of order, molecularity, rate constant etc. with their graphical representation, relate chemical equilibrium constants.

CLO 9	Review the modern concepts of acids and bases and measure their strength, predict the acidic and basic properties of species with pH concept.
CLO 10	Develop different types of cell diagram and deduce cell emf.

Mapping of Course Learning Outcomes to Program Learning Outcomes:

CLO/PLO	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO8	PLO9
CLO 1	X	X	X						
CLO 2	X	X							
CLO 3	X	X							
CLO 4	X	X	X						
CLO 5	X	X			X				
CLO 6	X	X							
CLO 7	X	X							
CLO 8	X	X		X					
CLO 9	X	X		X			X		
CLO 10	X	X				X			

Books Recommended:

1. General Chemistry; Author: Darrell. D. Ebbing.
2. Physical Chemistry; Author: Peter Atkins.
3. Introduction to Modern Inorganic Chemistry; Author: S.Z. Haider.
4. Organic Chemistry; Author: Morrison and Boyd

MATH 111 Calculus

3 hours in a week, 3.00 Credit

Rationale:

In an increasingly complex world, mathematical thinking, understanding, and skill are more important than ever. **MATH 111** will show students how to simplify many types of complex problems using matrix algebra and vector geometry. Students who major in the sciences or engineering are often required to study linear algebra. This course provides a solid foundation for further study in mathematics, the sciences, and engineering.

Course Objectives:

- Engage students in sound mathematical thinking and reasoning
- Provide a setting that prepares students to read and learn mathematics on their own
- Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate

Course Contents:

Differential Calculus: Functions of a real variables and their plots; limit; continuity and derivatives; physical meaning of derivative of a function; Leibnitz Theorem; Rolle's Theorem; mean value theorem and Taylor's theorem (statement only).Taylor's and Maclaurin's series and expansion of functions; maximum and minimum values of functions; functions of two or three variables; partial and total derivatives. Maximum and minimum values of functions of single variable; Points of inflexion; Curvature, radius of curvature, center of curvature; Asymptotes, curve tracing.**Integral Calculus:** Physical meaning of integration of a function; integration as an inverse process of differentiation; different techniques of integrations; definite integrate as the limit of a sum and as an area; definition of Riemann integrals; fundamental theorem of integral calculus and its application to definite integrals; reduction formula; improper integrals; double integration; evaluation of area and volume by integration.**Differential Equations:** Definition and solution of ordinary differential equation; first order ordinary differential equation; second order ordinary linear differential equation with constant coefficients; initial value problems.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Interpret quantitative data verbally, graphically, symbolically and numerically
CLO 2	Determine the size, transpose, inverse, rank, and LU-factorization of a matrix

CLO 3	Perform matrix operations and solve matrix equations
CLO 4	Perform vector operations for vectors in n R
CLO 5	Apply geometric and algebraic properties of vectors in R^n to compute vector additions and scalar multiplications
CLO 6	Use mathematical concepts in problem-solving through integration of new material and modeling

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X				X				
CLO2	X				X				
CLO3	X				X				
CLO4	X				X				
CLO5	X				X				
CLO6	X				X				

Recommended Books

1. Das and Mukherjee: Differential Calculus
2. Das and Mukherjee: Integral Calculus
3. Abu Yousuf: Differential Equations.

ENG 101 English Language
2 hours in a week, 2.00 Credit

Rationale:
This course will develop two basic skills i.e. reading and writing. A variety of reading strategies and texts will be used to effectively develop first year students' academic reading skills thereby facilitating their future study. Also, the course focuses on developing the writing skills of students by familiarizing them with grammar rules, providing them with practice thereby enabling them to demonstrate the accurate use of grammar in their writing.

Course Objectives:

- To enable students to write with accuracy
- To facilitate effective and comprehensible writing
- To raise awareness of common errors that occur in writing
- To develop student's ability to understand write-ups on issues of general concern.
- To improve the vocabulary of learners for effective communication

Course Content:

a) Reading

- Different Reading Strategies
- Guessing Meaning from the Context
- Critical Reading (Analyze)
- Critical Reading (Synthesize)
- Critical Reading (Evaluate)
- Annotation
- Summary Writing

Material

- A selection of 08-10 editorials and reports from newspapers/magazines/journals,etc
- Reading texts in New Headway Upper Intermediate Student's Book (Current edition)
- Selected passages from recommended books
- A selection of other material may be supplied as handouts as deemed necessary by the instructor

b) Writing

- Forms and functions of different word categories (Noun, verb, adjective, etc.)
- Aspects and uses of tense

- Subject-verb agreement
- Use of infinitive, gerund, present participle, past participle, modals, causatives, conditionals, subjunctives, modals.
- Use of sentence connectors/ cohesion markers/ punctuation
- Effective combination of sentences (simple, complex, compound)
- Developing a paragraph

Course Learning Outcomes
At the end of the course, students will be able to

CLO 1	Apply grammar rules
CLO 2	Produce grammatically correct meaningful sentences
CLO 3	Express oneself correctly by using appropriate words, phrases, sentences or ideas
CLO 4	Critically reflect on a text (grasp abstract ideas and interpret them effectively, arrive at well reasoned conclusions and solutions).
CLO 5	Extract information from passages accurately

Mapping CLOs to PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1									X
CLO2									X
CLO3									X
CLO4									X
CLO5									X

Books Recommended
1. Tibbits, E. E. ed. *Exercises in Reading Comprehension*. Longman
2. Liz and John Soars. (Current edition). *New Headway Upper Intermediate Student's Book*.
3. Oxford : Oxford University Press
4. Cliff's TOEFL

ENG 102 Communication in English (Practice)
2 hours in a week, 1.00 Credit

Course Rationale
This course is designed to improve the speaking and listening skills of students in the English language. Emphasis is laid on proper pronunciation for accurate articulation and recognition of speech sounds as well as correct stress, intonation and language use in varied situations.

Course Objectives
1. To enable students' understanding of the variations in pronunciation
2. To teach proper pronunciation and accurate articulation.
3. To facilitate appropriate stress and intonation in speech.
4. To encourage use of English effectively in everyday situations.
5. To ensure overall improvement of oral communication through listening and speaking.

Course Content
Grammar: Tense, article, preposition, subject-verb agreement, clause, conditional and sentence structure.

Vocabulary building: Correct and precise diction, affixes, level of appropriateness. Colloquial and standard. informal and formal.

(a) Speaking

- Articulators
- English Phonetic Alphabet (British and American) and International Phonetic Alphabet (IPA)
- Stress rules of English
- Intonation rules and functions of intonation
- Communication Styles and Cultural Context
- Fluency, mistakes, misunderstandings, audience, taboos, self-esteem, confidence
- Activities: dialogue, debate, extempore speech, interview, role-play

(b) Listening

- Basics of listening
- Various types of Pronunciation
- IPA, RP, Transcription
- Different accents and intonation patterns
- Activities for Meaning-focused Listening, Information Transfer Strategies,
- Listening Practice through selection of audio clips.

Course Learning Outcomes

At the end of the course, students will be able to

CLO 1	read the symbols of the International Phonetic Alphabet used to represent the sounds of the English language.
CLO 2	understand all that is being said in English in varied accents
CLO 3	interpret information accurately
CLO 4	apply appropriate intonation and stress patterns in English words and sentences.
CLO 5	produce continuous speech clearly and convincingly.

Mapping CLOs to PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1									X
CLO2									X
CLO3									X
CLO4									X
CLO5									X

Books Recommended

1. Anderson, A. & Lynch, T. Listening. Oxford: Oxford University Press. 1988
2. Hancock, Mark. English Pronunciation in Use. New York: Cambridge University Press. 2004
3. Anderson, Kenneth, et al. Study Speaking. Cambridge University Press, 2007
4. Hancock, Mark. English Pronunciation in Use. Cambridge University Press, 2004
5. Jones, Daniel. Cambridge English Pronunciation Dictionary. Cambridge University Press, 2011
6. Richards J, et al. Person to Person. Oxford University Press, 2007
7. Richards, Jack C, and David Bohlke. Speak Now: 1. Oxford University Press, 2013
8. Roach, Peter. English Phonetics and Phonology. Cambridge University Press, 2009

SS 101 Managerial Economics
2 hours in a week, 2.00 Credit

This course provides an introduction to the main ideas and concepts involved in modern economics and attempts to provide students with an understanding of how the economy works, what type of problems economists attempt to solve, and how they set about trying to solve them. The course is primarily concerned with the analysis of individual decision-making agents, the behaviour of firms and industries in the economy (microeconomics), on the economy as a whole (macroeconomics) and the inherent problems facing underdeveloped and developing countries (economic development).

Course Objectives

- To provide a brief and simple introduction to the subject matter and scope of Economics.
- To provide a brief and simple introduction to the subject matter and scope of Macroeconomics.
- To provide students with an understanding of economic theories and analysis in the field of development economics.

Course Contents:

Introduction to Microeconomics: Definition and scope; basic concepts and tools—PPF and circular flow model; fundamental economic problems and solution systems; Concepts of demand, supply and equilibrium; Concepts of elasticity, different types of elasticities, their applications; Concepts of total and marginal utility; Concepts of production, cost and profit, characteristics of different types of markets. **Introduction to Macroeconomics**: Key macroeconomic indicators and their performance measurement - GNP, GDP, inflation, unemployment; money, functions of money, function of commercial and central bank, monetary policy; fiscal policy and structure of govt. budget. **Development and related issues:** Growth and development; concept of poverty and poverty measures; HDI; key human-socio-economic development indicators of Bangladesh, Sustainable Development Goals (SDG).

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Understand the analysis of individual decision-making agents, the behaviour of firms and industries in the economy
CLO 2	Understand the concept of elasticity quantitatively and qualitatively in economic analysis and know differences between different types of markets
CLO 3	Explain macroeconomic concepts and use simple economic models to interpret the behaviour of key macroeconomic variables
CLO 4	Understand monetary and fiscal policy and Government budget
CLO 5	Understand the main issues confronting underdeveloped and developing countries

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X				X				
CLO2	X				X				
CLO3	X				X				
CLO4	X				X				
CLO5	X				X				

Recommended Books

1. Arnold, R. A. (2014): Economics, South Western Publishing Company, Eleventh Edition
2. Bangladesh Economic Review relevant issues.
3. Mankiw, N. G. (2012): Principles of Economics, Thomson South Western Publishing, Sixth Edition
4. Samuelson, P. A. and Nordhaus,W. D. (2009): Economics, McGraw-Hill USA, Nineteenth Edition.
5. Todaro, M. P. and Smith,S. C. (2012): Economics of Development in the Third World, Longman, Eleventh Edition

CSE 100: Software Development I

4 hours in a week, 2.00 Credit

Rationale:

This is a project which enables the freshmen to apply their novel acquired knowledge to some of the basic real world problem solving.

Objectives:

- Helping the students to develop ability in real life problem solving
- To enhance skill on problem solving
- To help them apply the knowledge of programming, data structure and algorithm

Course Contents:

Any project based on C language including implementation of Data Structure is acceptable. Gaming project using the graphics.h library in C is preferable. Teachers must have to ensure every project is unique. Innovative project ideas should get extra weight to prevent imitating old projects.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO1	Apply programming knowledge to create visible products
CLO2	Enhance problem solving capability
CLO3	Outline and design logical platforms to divide a problem and solve it with scientific and technical knowledge
CLO4	Habituate to work as an efficient team member
CLO5	Present ideas and projects in front of audience

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1		X	X	X		X			
CLO2		X	X	X		X			
CLO3		X	X	X		X			
CLO4		X	X	X		X			
CLO5		X	X	X		X			

SEMESTER -III

CSE 233: Object Oriented Programming
3 hours in a week, 3.00 Credit

Rationale:
Students wishing to build up their career in CSE need to develop software to solve problems and this course will help them learn the basics of OOP and OOP programming using JAVA.

Objectives:
- To help students conceptualize basic theories and principles of object-oriented programming;
- Helping the students to develop ability in applying the concepts of data encapsulation, inheritance and polymorphism to large-scale software
- To facilitate necessary knowledge about good programming practices and how to write modular codes with the help of OOP concepts.
- To provide the knowledge of packages, how to work with them. Also give students a training to code reusable programs with JAVA.
- To make students understand how to work with JAVA generic templates to design Classes and data structures that can work with different data types.

Course Contents:
Introduction to Java: History of Java**,** Java Class Libraries**,** Introduction to Java Programming**,** A simple Program**. Developing Java Application:** Introduction, Algorithms, Pseudo code, Control Structure, The If /Else Selection Structure, The While Repetition Structure, Assignment Operators, Increment and Decrement Operators, Primitive Data Types, Common Escape Sequence, Logical Operator. **Control Structure:** Introduction with the 'for' structure, the 'switch' structure, the 'do/while' structure, the 'break' and 'continue' structure. **Methods:** Introduction, Program Module in Java, Math Class Methods, Method Definitions, Java API Packages, Automatic Variables, Recursion, Method Overloading, Method of the Applet Class**. Arrays:** Introduction, Arrays, Declaring and Allocating Arrays, Passing Arrays to Methods, Sorting Arrays, Searching Arrays, Multiple-Subscripted Arrays. **Object-Based Programming:** Introduction, Implementing a Time Abstract Data Type with a Class, Class Scope, Controlling Access to Members, Utility Methods, Constructors, Using Overload Constructor, Using Set and Get Method, Software Reusability, Friendly Members, Finalizers, Static Class Members, Data Abstraction and Information Hiding. **Object-Oriented Programming:** Introduction, Super classes and Subclasses, Protected Members, Using Constructor and Finalizers in Subclasses, Composition vs. Inheritance, Introduction to polymorphism, Dynamic method building, Final Methods and Classes, Abstract Superclasses and Concrete Classes**. String and Characters, Graphics, Exception. Handling, Files and Stream, Java API, Utility Classes, 2D Graphics, GUI, Swing, Events.**

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Understand the principles of object-oriented programming
CLO 2	Understand how to apply OOP in real world large problems
CLO 3	Design modular codes with the help of OOP concepts
CLO 4	Identify how to integrate robustness, reusability, and portability into large-scale software development.
CLO 5	Understand how to write reusable codes

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X		X	X					X
CLO2	X		X	X					X
CLO3	X		X	X					X
CLO4	X		X	X					X
CLO5	X		X	X					X

Textbook

1. Intro**d**uction to Programming in Java**,** Robert Sedgewick & Kevin Wayne.
2. An Introduction to Object-Oriented Programming, Timothy Budd.
3. Java-How to Program by Deitel & Deitel.
4. Programming with Java by E Balagurusamy

CSE 234 Object Oriented Programming Sessional

3 hours in a week. 1.50 Credit

Laboratory works based on CSE 233.

Rationale:

Students wishing to build up their career in CSE need to develop software to solve problems and this course will help them learn the basics of OOP and OOP programming using JAVA.

Objectives:

- To give students hands-on training to help them understand OOP concepts with the help of JAVA.
- Helping the students to develop ability in applying the concepts of data encapsulation, inheritance and polymorphism to large-scale software
- To facilitate necessary knowledge about good programming practices and how to write modular codes with the help of OOP concepts.
- To provide the knowledge of packages, how to work with them. Also give students a training to code reusable programs with JAVA.
- To make students understand how to work with JAVA generic templates to design Classes and data structures that can work with different data types.
- To enable students to debug their codes by giving them an in-depth idea about different syntax errors, exceptions, and how to fix them.
- To enable students to develop a usable project (software, game, etc) with the help of OOP concepts.

Course Contents:

Object-Oriented Programming: Classes and objects, Constructors and destructors, Encapsulation of class members and methods, manipulating objects. **Dynamic Memory Allocation:** Pointers to objects, Pointers and arrays, Call-by-reference and call-by-value. **Concept of Inheritance, Interface and Polymorphism:** Direct and indirect inheritance, Private and protected members of inherited class, Constructors and destructors under inheritance, Polymorphism, Abstract base classes. **Exceptions:** Error handling in program, Creating own exception. **Handing Files:** Input/Output streams, Processing files, Random access files. **Thread Programming:** Introduction to threads, Using threads to solve multi-tasking problems, Thread synchronization. **Client-Server programming:** Applet and Servlets, Introduction to JSP, Socket programming. GUI: Basic user interface design using Java swing. **Understanding Java Enterprise Level Works.**

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Understand OOP concepts and implement them with the help of JAVA
CLO 2	Understand how to apply OOP in real world large problems.
CLO 3	Implement programming practices and write modular codes with the help of OOP concepts.
CLO 4	Employ reusable codes.
CLO 5	Design Class and data structures effectively
CLO 6	Point out basic syntax errors and exceptions, and identify how to fix them
CLO 7	Develop a usable project (software, game, etc) with the help of OOP concepts.
CLO 8	Understand threading and work with them.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X		X	X		X			X
CLO2	X		X	X		X			X
CLO3	X		X	X		X			X

CLO4	X		X	X		X			X
CLO5	X		X	X		X			X
CLO6	X		X	X		X			X
CLO7	X		X	X		X			X
CLO8	X		X	X		X			X

Textbook

1. Intro**d**uction to Programming in Java**,** Robert Sedgewick & Kevin Wayne.
2. An Introduction to Object-Oriented Programming, Timothy Budd.
3. Java-How to Program by Deitel & Deitel.
4. Programming with Java by E Balagurusamy

CSE 235 Numerical Methods
3 hours in a week, 3 Credit

Rationale:

There are many interesting or economically pressing problems that "closed form algebraic solutions" are not available. Numerical methods are the answer to that. This course helps us to know how fast errors cause problems and to find better algorithms that cause less error. Therefore, this course is indispensable for all students in almost all disciplines.

Objectives:

- To develop skills to derive appropriate numerical methods to solve algebraic and transcendental equations
- To facilitate with necessary knowledge about performing an error analysis for various numerical methods
- To provide basic knowledge of coding various numerical methods in a modern computer language like Matlab, Python

Course Contents:

Numerical analysis: Errors in numerical calculations. Error: Definitions, sources, examples. Propagation of Error. A general error formula. Taylor series and reminders. **Root finding:** The bisection method and the iteration method, the method of false position. Newton-raphson method. Roots of polynomials. **Methods of approximation theory:** Polynomial interpolation: Lagrange form, divided formula for interpolation. **Solution of systems of Linear equations:** Gaussian elimination. The pivoting strategy, Iteration method solution of tridiagonal systems. LU decomposition, matrix inverse. **Numerical solution of ordinary differential equations:** Euler's method (including modified form), Runge-Kutta method. **Numerical Integration:** Trapezoidal method. Simpson's method. Weddle's method; Eigenvalue problems for matrices, Use of computer to implement projects in numerical methods.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Perform an error analysis for a given numerical method by going through the stages (mathematical modeling, solving and implementation) of solving a particular physical problem
CLO 2	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
CLO 3	Apply numerical methods to obtain approximate solutions to mathematical problems.
CLO 4	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
CLO 5	Analyze and evaluate the accuracy of common numerical methods.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X		X				
CLO2	X	X	X		X				
CLO3	X	X	X		X				
CLO4	X	X	X		X				
CLO5	X	X	X		X				

Textbook

1. Numerical Methods for Engineers by Steven C. Chapra, Raymond P. Canale.
2. Introduction to Numerical Analysis by F.B. Hildebrand.

CSE 236 Numerical Methods Sessional

3 hours in a week, 1.50 Credit

Laboratory works based on CSE 305.

Rationale:

This course introduces students to numerical methods for the solution of basic mathematical problems that cannot be solved by hand. The course aims to introduce students to the toolbox of widely-used numerical methods in computational science. Students will be able to apply these methods to problems in a variety of sciences.

Objectives:

- To familiarize with the numerical methods used in computational science
- To help to develop skills to apply numerical methods to problems in practice.
- To familiarize with, use, and understand software which uses numerical methods
- To facilitate with the knowledge about the role of numerical methods in science
- To provide basic knowledge of coding various numerical methods in a modern computer language like Matlab, Python

Course Contents:

The material presented in this course is intended to acquaint students with some of the elementary numerical methods found useful in the fields of computing and applied mathematics.

Tasks:

1. Utilize numerical techniques to find the roots of an equation.
2. Set up a difference table and use it to interpolate and extrapolate data, determine the algebraic equation which will approximate the data, and perform numerical differentiations.
3. Perform linear and non-linear regression analysis of a set of data points using the method of least squares.
4. Calculate definite integrals using numerical integration methods and comparing those methods.
5. Solve systems of equations using matrix computations on the computer.
6. Use number theory to develop a solution better than the sieve of Eratosthenes prime algorithm.
7. Solve Josephus problem and Tower of Hanoi problem.
8. Using summation factors to solve different recurrence problems.
9. Compute the probabilities of events using summation for some calculations of probabilities and averages.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Perform an error analysis for a given numerical method by going through the stages (mathematical modeling, solving and implementation) of solving a particular physical problem
CLO 2	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.
CLO 3	Apply numerical methods to obtain approximate solutions to mathematical problems.
CLO 4	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of

	differential equations.
CLO 5	Analyze and evaluate the accuracy of common numerical methods.
CLO 6	Implement numerical methods using contemporary technology
CLO 7	Construct efficient, well-documented code and present numerical results in an informative way.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X	X	X				
CLO2	X	X	X	X	X				
CLO3	X	X	X	X	X				
CLO4	X	X	X	X	X				
CLO5	X	X	X	X	X				
CLO6	X	X	X	X	X				
CLO7	X	X	X	X	X				

Textbook

1. Numerical Methods for Engineers by Steven C. Chapra, Raymond P. Canale.
2. Introduction to Numerical Analysis by F.B. Hildebrand

CSE 237 Engineering Ethics and Cyber Law
2 hours in a week, 2 Credit

Rationale: This course consists of a sustained study of ethical and legal issues that arise in relation to employment in the public and private sectors, including allocation of resources, corporate and social responsibility, relationships, and discrimination. A main focus of this course will be on the ethical and legal standards governing information technology. New technology creates ethical challenges for individuals around the globe, and applies to most persons regardless of whether they are employed in the information technology field or a more traditional occupation. The study of Cyber Ethics provides a framework for making ethical decisions that professionals are likely to encounter in the workplace. This course will not only focus on ethics but on the legal, economic, social, cultural and global impacts of decisions that are made in the context of professional occupations.

Objectives:

- To make students explore and understand ethics and boundaries of morality and technology.
- To help them understand, explore, and acquire a critical understanding of cyber law.
- To facilitate necessary knowledge about different rules for legal bindings.

Course Contents:

Ethics: Introduction. Meta Ethics: Objectivism and Relativism, Non-naturalism, Cognitivism and Non-Cognitivism, The epistemic problem for cognitivism, Moral relativism, Cross-cultural differences and similarities, Different Psychological Issues in Meta-ethics: Egoism and Altruism, Emotion and Reason, Male and Female morality. Normative Ethics: Goodness, Rightness, Consequentialism, Utilitarianism. Applied Ethics: Business Ethics, Environmental Ethics and Social Ethics, Computer and Information Ethics. Developing the ethical analysis skills and professional values.

Cyber Law: Module I: Introduction: Computers, Internet and their Impacts in Society; Need for Cyber Law in Social and International Perspectives; Overview of Cyber Law, Cyberspace; Building blocks of CyberSpace; Cyber Jurisprudence at International and National Level; Jurisdictional Aspects in Cyber Law. **Module II: Cyber Crimes & Legal Framework:** Cyber Crimes against Individuals, Institution and State; Hacking; Digital Forgery; Cyber Stalking/Harassment; Cyber Pornography; Identity Theft & Fraud; Cyber terrorism; Cyber Defamation; Different offences under ICT Act, 2006. **Module III: Intellectual Property Issues in CyberSpace:** Interface with Copyright Law; Interface with Patent Law; Trademarks & Domain Names Related issues. **Module IV: E Commerce:** Concept; E-commerce-Salient Features; Online approaches like B2B, B2C & C2C; Online contracts; Click Wrap Contracts; Applicability of Contract Act, 1872. **Module V:** Cyber Tribunal: Establishment of Cyber Tribunal, Trial Procedure of Cyber Tribunal, Bail Rules, Time Limit, Power of Investigation etc.; Cyber Appellate Tribunal: Establishment of Cyber Appellate

Tribunal, Procedure and Power Cyber Appellate Tribunal, Appeal Procedure in case of not establishing Cyber Appellate Tribunal.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO1	Apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions
CLO2	Identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional
CLO3	Locate and apply case law and common law to current legal dilemmas in the technology field
CLO4	Distinguish enforceable contracts from non-enforceable contracts

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1							X	X	
CLO2							X	X	
CLO3							X	X	
CLO4							X	X	

CSE: 240 Introduction to Competitive programming
3 hours in a week, 3 Credit

Rationale:
This course is intended to facilitate students with advanced knowledge on advanced data structure and algorithms.

Objectives:
- To facilitate necessary knowledge about advanced data structures and algorithms
- To enhance the skill on problem solving
- To help to improve thinking process

Course Contents:
Data Structure: Trie Tree, BIT, Segment Tree, Splay Tree, MO's Algorithm, Square Root Decomposition, Heavy Light Decomposition, Persistent Data Structure (Segment Tree, Trie), DSU on Tree, Treap, K-D Tree, KNN Tree, Sparse Table. **String Processing:** KMP, Suffix Array, Suffix Automata, Suffix Tree, Palindromic Tree, Aho-Corasick, Manacher Algorithm, Extended KMP, Hashing (Rolling Hash). **Game Theory:** Nim Game, Sprague-Grundy Value, Green Hackenbush, Blue Red Hackenbush, Blue Red Green Hackenbush, Colon Principle, Fusion Principle. **Combinatorics & Probability:** Burnside Lemma, Inclusion Exclusion, Combination, Permutation, Catalan Number, Stirling Number, Probability, Expected Value. **Number Theory:** Chinese Remainder Theorem, Euler Phi, Extended Euclid, Prime Factorization, Mobius Function, Primitive Prime, Huge Mod. **Basic Math:** FFT, DFT, NTT, Gaussian Elimination, Matrix Exponentiation. **Basic Geometry:** Fundamental Concepts of Geometry, Closest Pair of Point, Convex Hull, Rectangle Union, Circle Union, Polygon Clipping, Line Sweep, Line Intersection.
Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Apply advanced data structures and algorithms
CLO 2	Improve problem solving skills
CLO 3	Design and interpret complex logics to solve complicated problems
CLO 4	Prepare themselves to deal with competitive environments by attending frequent problem solving contests

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X		X		X			X
CLO2	X	X		X		X			X
CLO3	X	X		X		X			X
CLO4	X	X		X		X			X

Textbook

1. Competitive Programming 3 by Steven Halim.
2. 102 Combinatorial Problems by Titu Andreescu & Zuming Feng.
3. Problem-Solving Methods in Combinatoricsby Pablo Soberón.
4. Art of Programming Contest by Ahmed ShamsulArefin.
5. Programming Challenges: The Programming Contest Training Manual bySteven S Skiena, Miguel A. Revilla.

EEE 207 Electronic Devices and Circuits
3 hours in a week, 3.00 Credit

Rationale:
This is an introductory course in Electrical and Electronic Engineering, introducing simple electrical DC circuits as well as the technical skills To facilitate necessary knowledge to analyze such simple and complex circuits. It is a course suitable for students pursuing further studies in electrical, electronic or telecommunications engineering as well as some other related engineering disciplines. It gives the through idea about different types of circuit analysis techniques. It also gives a broad idea of single and three phase power systems with various resistive and reactive loads. It contains the relationship between real, apparent and reactive power - including the use of phasor and impedance diagrams, methods of measuring power, calculation of power factor. This course deals with all of this.

Course Objectives:

- To disseminate knowledge about electrical charge, voltage, current and power.
- To give the idea of basic concepts of DC circuit behavior.
- Help the students to conceptualize with the basic theorems of circuit analysis.
- To help the students develop skills to solve mathematical problems of simple and complex electrical circuits.
- To familiarize the students with the basics of AC networks.
- To teach the modeling and analysis of single phase RLC circuits for impedances, voltages, currents, powers and phase shift.

Course Contents:
Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, and resistance. **Basic laws:** Ohm's law, Kirchhoff's current and voltage laws. **Simple resistive circuits**: Series and parallel circuits, voltage and current division, wye-delta transformation. **Techniques of circuit analysis:** Nodal and mesh analysis including super node and super mesh. **Network theorems:** Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. **Energy storage elements:** Inductors and capacitors, series parallel combination of inductors and capacitors. **Responses of RL and RC circuits:** Natural and step responses. **Sinusoidal functions:** Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, real and reactive power, power factor. **Analysis of single-phase AC circuits:** Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Explain charge, current, voltage and power, resistance etc.
CLO 2	Interpret the basic circuit laws and circuit analysis techniques.
CLO 3	Design DC circuits and analyze them.
CLO 4	Apply different Network Theorems.
CLO 5	Explain the basics of energy storage elements.
CLO 6	Explain basic AC circuit concepts and responses.

CLO 7	Design RLC circuits and analyze them.
CLO 8	Apply network techniques to AC circuits and networks

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X							
CLO2	X	X							
CLO3	X	X	X				X	X	
CLO4	X	X							
CLO5	X						X		
CLO6	X	X							
CLO7	X	X							
CLO8	X	X					X	X	

Recommended Books

1. Fundamental of Electric Circuits – Charles K. Alexander and Matthew N.O. Sadiku
2. Introductory Circuit Analysis by Robert L.Boylestad.

EEE 208 Electronic Devices and Circuits Sessional

3 hours in a week, 1.50 Credit

Laboratory works based on EEE 207.

Rationale

In this course students will perform experiments to verify practically the theories and concepts learned in EEE-109D. Theoretical knowledge is incomplete without hands on experiments using the basic components and measuring devices used in electrical circuits' analysis. This course teaches the fundamentals of electrical circuits, application of circuit laws, theorems and measuring techniques for DC circuits. It contains broad idea of single-phase power systems with various resistive and reactive loads. It also makes familiar about the relationship between real, apparent and reactive power - including the use of phasor and impedance diagrams, methods of measuring power, calculation of power factor.

Course Objectives

- To provide the students with capability of implementing different real-life dc circuits.
- To provide the students with the techniques of solving of different types of circuits by network theorem.
- To teach the voltage, current and load relationship in a network.
- To facilitate necessary knowledge about transient analysis and steady state analysis of a capacitor and inductor network.
- Helping the students to develop ability in building AC electrical circuits and perform experiments on them.

Course Contents:

In this course students will perform experiments to verify practically the theories and concepts learned in EEE-109.

- To familiarize students with the operation of different electrical instruments.
- To verify the following theorems:
- KCL and KVL theorem,
- Superposition theorem,
- Thevenin's theorem,
- Norton's theorem and
- Maximum power transfer theorem
- RL and RC response.
- Study the frequency response of an RLC circuit and find its resonant frequency.
- Basic electrical element like fan, bulb, calling bell etc connection from 220v AC single phase supply.
- Relevant application based on EEE 109D.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Differentiate different types of electrical instruments and measuring devices.
CLO 2	Experiment different types of circuit analysis theorem and laws
CLO 3	Impart the idea about complex circuit network.
CLO 4	Interpret transient response about capacitor and inductor circuits
CLO 5	Design AC electrical circuits on breadboard and perform measurements with electronic test equipment.
CLO 6	Demonstrate team-based communication skills, magnify their moral standards and apply these in practical life

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X					X	X	
CLO2	X	X	X						
CLO3	X	X	X						
CLO4	X	X	X						
CLO5	X	X	X				X		
CLO6						X	X	X	

Recommended Books

1. Fundamental of Electric Circuits – Charles K. Alexander and Matthew N.O. Sadiku
2. Introductory Circuit Analysis by Robert L.Boylestad

STAT 201 Statistics for Engineers
3 hours in a week, 3.00 Credit

Rationale:

Acquiring knowledge on the statistical tools and techniques for exploring and analyzing the data.

Course Objectives

- Provide the knowledge on fundamental concepts of statistical methods
- Acquaint students with the basic tools of exploratory data analysis,
- Facilitate necessary knowledge about bivariate data analysis
- Make students understand the basic concepts of probability and probability distribution,
- Help the students conceptualize basic theories in Stochastic processes including Markov chain and queuing theory

Content of Course

Frequency distribution of data: population and sample. Collection and representation of statistical data. Tabulation of data. Class intervals. Frequency distribution, discrete, continuous and cumulative distributions. Histograms and frequency polygons. Graphical representation of data. Statistical measures: measures of central tendency - arithmetic mean, median, mode, geometric mean, weighted average, harmonic mean. Measures of dispersion - range, standard deviation, variance, coefficient of variation, moments, skewness, kurtosis. Correlation theory: linear correlation. Measures of correlation and its significance. Regression and curve fitting: linear and non-linear regression. Methods of least squares. Curve fitting. Probability: definition of probability and related concepts. Laws of probability. Discrete and continuous random variables. Mathematical expectations. Conditional probability. Probability distributions: binomial, Poisson and normal distributions and their properties. Stochastic process. Markov chain (discrete and continuous). Queuing

theory – birth and death process in queuing. Examples from computer science. Queuing models – elementary concepts.

Course Learning Outcomes

After the successful completion of the course, the student will be able to-

CLO 1	Explain basic concepts of statistics and describe various statistical tools
CLO 2	Construct frequency distribution and present data graphically
CLO 3	Compute and interpret different measures of central tendency, location, dispersion, and shape characteristics
CLO 4	Analyze bivariate data and interpret the results
CLO 5	Calculate probability of an event and derive probability distribution of a random variable
CLO 6	Explain stochastic processes and apply Markov chain and queuing theory

Mapping CLOs to PLOs

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X			X					
CLO2	X			X					
CLO3	X			X					
CLO4	X			X					
CLO5	X			X					
CLO6	X			X					

Text Books

1. Devore J., (2009), Probability and Statistics for Engineering and the Sciences, 8th Edition, Brooks/Cole, Cengage Learning, California
2. Montgomery, D.C., Runger, G.C., (2003), Applied Statistics and Probability for Engineers, 3rd Edition, John Wiley & Sons, Inc., NY
3. Ross, S.M., (2007), Introduction to Probability Models, 9th Edition, Academic Press, NY

Reference Books:

1. Barlow R J, Statistics: A Guide to the Use of Statistical Methods in the Physical Sciences, Wiley, NY
2. Chisholm J S R & Morris R M, Mathematical Methods in Physics, North Holland
3. Hoel P G, Elementary Statistics, 3rd Ed, John Wiley, NY
4. Loveday R, Practical Statistics and Probability, Cambridge University Press, London
5. Mostafa M G, Methods of Statistics, Bangladesh

IPE 201 Management for Engineers
2 hours in a week, 2 Credit

Rationale

This subject contributes to the program outcome by expanding students' skill technically through the analysing of different costing method which is preferable for every stakeholder.

Course Objectives

- To acquaint with the cost concepts, cost behavior, and cost accounting techniques that are applied to manufacturing and service businesses.
- To make students capable to interpret cost accounting statements
- To provide the students with the capability to apply theoretical knowledge in decision making
- To help them be able to analyze and evaluate information for cost ascertainment, planning, control of business operations
- To develop to skill to discuss the various techniques available to measure managerial performance and to motivate employees toward organizational goals

- To develop skill to identify and analyze both qualitative and quantitative standards to formulate best control methods

Course Contents:

Introduction to Cost Accounting: Definition of Cost Accounting, Comparison of Cost Accounting and Financial Accounting; The role of Cost Accounting; Methods and Techniques of Cost Accounting; Characteristics of an Ideal Cost Accounting System; **Cost Concepts, Classifications and Statements:** Cost Object; Expenditures, Cost, Expense and Loss; Cost Classifications; Cost Data and Uses; The Chart of Accounts; Statement of Cost of Goods Manufactured and Sold; Cost Statement or Cost Sheet; **Costing and Control of Materials:** Classification of Materials; Accounting for Materials; Store ledger(FIFO & WAM) method; Inventory Planning; Ordering Cost, Holding Cost and EOQ; Effect of Quantity Discounts on EOQ; Safety Stock and Reorder Point; Material Control Methods; Materials Requirement Planning System. Practical problem; **Costing and Control of Labor**: Productivity and Labor Costs; Costs included in Labour; Accounting for Labour; Time Keeping, Computation of total payroll and Allocation of Payroll costs; Different incentive plan; Labour cost Control, Labor Turnover and Control of Labour Turnover; Learning Curve Theory. Practical problem & solution; **Costing and Control of Manufacturing Overhead**: Manufacturing Overhead Costs; Actual Vs. Normal Costing of Manufacturing Overhead; Production Capacity, Predetermined Overhead Rates; Departmental vs. Plant-wise Overhead Rates; Separating Mixed Costs. Scatter-graph; High-low Method and Regression Analysis; Accounting for Manufacturing Overhead; Analysis and Disposition of Under-applied-and Over-applied Overhead; **Contract Costing** : Determination of profit of completed and incomplete contracts; **Introduction of Management Accounting** :Definition-process of Management Accounting, characteristics of Management Accounting, scope of Management Accounting, purpose and objectives of Management Accounting, Comparison of Management Accounting and Financial Accounting; **Cost Terms, Concepts and Classifications:** Cost Behavior (Analysis and Use):General cost classifications- product costs versus period costs- cost classifications on Financial Statements. Types of cost behavior patterns- the Analysis of Mixed Costs, High-low method; **Cost-Volume-Profit Relationships:** The basics of CVP analysis- Break -even analysis- Break-even chart- Sales Mix. Business application and mathematical problem of CVP analysis; **Budget:** Define Budget, Types of Budget, Cash budget, purchase budget, sales budget, flexible budget and Related problems; **Standard Costing:** Meaning and Objectives- Types of ratios. Standard Costing and its uses for making business decision. Variance calculation, Decision making process from these calculations.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Discuss about how cost accounting is used for decision making and performance evaluation
CLO 2	Competent to demonstrate how materials, labor and overhead costs are added to a product at each stage of the production cycle
CLO 3	Express the place and role of cost accounting in the modern economic environment
CLO 4	Recognize and apply the skills necessary for carrying out effective management decision-making and strategic management planning
CLO 5	Select the costs according to their impact on business and society
CLO 6	Interpret the impact of the selected costs method
CLO 7	Design management control process in different business areas

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X						X		X
CLO2	X						X		X
CLO3	X						X		X
CLO4	X						X		X

CLO5	X						X		X
CLO6	X						X		X
CLO7	X						X		X

Recommended Books:

1. Cost Accounting –Volume-1 by Basu and Das;
2. Managerial Accounting by Ray H. Garrison, Eric W. Noreen

SEMESTER -IV

CSE 243 Algorithms
3 hours in a week, 3 Credit

Rationale:
To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. To teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter and showing the correctness of algorithms and studying their computational complexities.

Objectives:

- To familiarize with the asymptotic performance of algorithms
- To familiarize with rigorous correctness proofs for algorithms
- To demonstrate a familiarity with major algorithms and data structures
- To facilitate with necessary knowledge about important algorithmic design paradigms and methods of analysis
- To develop skills to synthesize efficient algorithms in common engineering design situations

Course Contents:
Analysis of Algorithm: Asymptotic analysis: Recurrences, Substitution method, Recurrence tree method, Master method **Hash Table:** Hash tables, hash function, open addressing, perfect hashing, single and multi probehasing. **Greedy Algorithms:** Elements and properties of Greedy algorithms, fractional knapsack, job scheduling with deadline. **Dynamic Programming:** Elements of DP (Optimal substructure, Overlapping sub problem), Coin change related problem, 0-1 knapsack, Longest Common Subsequence finding problem, LCS and LIS/LDS variations, Matrix Chain Multiplication.**Red black Tree and Binomial Heaps, Stassen's algorithm Network Flow:** Flow Networks, Max-Flow Min-cut theorem, Ford Fulkerson method and its limitation, Edmonds Karp algorithm, Maximum bipartite matching, minimum path cover, edge cover. **Backtracking/Branch-and-Bound:** Permutation, Combination, 8-queen problem, 15-puzzle problem, Graph Coloring, N-queen problem, Hamiltonian cycle, Branch and Bound in backtracking. For example in traveling salesman problems. **Geometric algorithm:** Segment-segment intersection, Convex-hull, Closest pair problem. **Number Theory:** Chinese Remainder Theorem, Euler phi, extended Euclid, application of prime factorization application of phi. **RSA public key generation,** NP Completeness, NP hard and NPcomplete problems. **String Matching Algorithms:** Naïve string matching algorithm, Rabin Karp algorithm, String matching with finite automata, Knuth Morris Pratt (KMP) algorithm, Trie, Suffix tree and Suffix Array. Basic combinatorics, Probability and Game theory. Least Common Ancestor, Range Minimum Query, Polynomials, DFT and FFT

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Analyze the computational and memory complexities of algorithms
CLO 2	Prove the correctness of algorithms
CLO 3	Explain how and why the algorithms work
CLO 4	Apply the algorithms to solve real life problems
CLO 5	Decide when to use which algorithm
CLO 6	Synthesize algorithms to design complex solutions
CLO 7	Explain why one algorithm works better than others in different scenarios

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X						X
CLO2	X	X	X						X
CLO3	X	X	X						X
CLO4	X	X	X						X
CLO5	X	X	X						X
CLO6	X	X	X						X
CLO7	X	X	X						X

Textbook

1.Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson.
2.Algorithms by Robert Sedgewick and Kevin Wayne.

CSE 244 Algorithms Sessional
3 hours in a week, 1.50 Credit
Laboratory work based on CSE 243.

Rationale:

To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. To teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter and showing the correctness of algorithms and studying their computational complexities.

Objectives:

- To familiarize with the asymptotic performance of algorithms.
- To familiarize with rigorous correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To facilitate with necessary knowledge about important algorithmic design paradigms and methods of analysis.
- To develop skills to synthesize efficient algorithms in common engineering design situations.

Course Contents:

Hash Table: Hash tables, hash function, open addressing, perfect hashing, single and multi probehasing. **Greedy Algorithms:** Elements and properties of Greedy algorithms, fractional knapsack, job scheduling with deadline. **Dynamic Programming:** Elements of DP (Optimal substructure, Overlapping sub problem), Coin change related problem, 0-1 knapsack, Longest Common Subsequence finding problem, LCS and LIS/LDS variations, Matrix Chain Multiplication. **Red black Tree and Binomial Heaps, Stassen's algorithm Network Flow:** Flow Networks, Max-Flow Min-cut theorem, Ford Fulkerson method and its limitation, Edmonds Karp

algorithm, Maximum bipartite matching, minimum path cover, edge cover. **Backtracking/Branch-and-Bound:** Permutation, Combination, 8-queen problem, 15-puzzle problem, Graph Coloring, N-queen problem, Hamiltonian cycle, Branch and Bound in backtracking. For example in traveling salesman problems. **Geometric algorithm:** Segment-segment intersection, Convex-hull, Closest pair problem. **Number Theory:** Chinese Remainder Theorem, Euler phi, extended Euclid, application of prime factorization application of phi. **RSA public key generation,** NP Completeness, NP hard and NPcomplete problems.**String Matching Algorithms:** Naïve string matching algorithm, Rabin Karp algorithm, String matching with finite automata, Knuth Morris Pratt (KMP) algorithm, Trie, Suffix tree and Suffix Array. Basic combinatorics, Probability and Game theory. Least Common Ancestor, Range Minimum Query, Polynomials, DFT and FFT.
Implement all the Contents related to the coursework CSE 237.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Implement all the listed algorithms.
CLO 2	Construct bug free and efficient codes for the algorithms.
CLO 3	Construct efficient solution of complex problems using suitable algorithms
CLO 4	Analyze the computational and memory complexities of algorithms.
CLO 5	Prove the correctness of algorithms.
CLO 6	Explain how and why the algorithms work.
CLO 7	Apply the algorithms to solve real life problems.
CLO 8	Decide when to use which algorithm.
CLO 9	Synthesize algorithms to design complex solutions.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X	X					X
CLO2	X	X	X	X					X
CLO3	X	X	X	X					X
CLO4	X	X	X	X					X
CLO5	X	X	X	X					X
CLO6	X	X	X	X					X
CLO7	X	X	X	X					X
CLO8	X	X	X	X					X
CLO9	X	X	X	X					X

Textbook

1.Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson.
2.Algorithms by Robert Sedgewick and Kevin Wayne.

CSE 245 Digital Logic Design
3 hours in a week, 3 Credit

Rationale

The main aim of this course is to provide sound knowledge of the principles and practices of digital systems, both at the device and circuit level. The course covers topics in digital electronics including: Number Theory, Boolean Algebra, Logic Circuits, Logic Minimization Techniques, Multiplexers, Adders, Flip-Flops, Counters, Registers, State Machines, Memory Circuits, Digital / Analog Conversion, Programmable

Logic Circuits and Microcomputer Bus Architecture. Upon completion, students should be able to construct, analyze, verify, and troubleshoot digital circuits using appropriate techniques and test equipment.

Course Objectives:

- To make students understand the fundamental principles in design and implementation of digital logic circuits including combinational circuits, sequential circuits, and finite state machines.
- To develop skills to perform decimal, octal, hexadecimal, and binary conversions.
- To provide the knowledge to apply Boolean algebra to solve logic functions.
- To help students in learning the analysis of pulse circuits.
- To help students in learning the analysis of digital multiplexing circuits.
- To help students in learning the analysis of logic family interfaces.
- To help students in learning the analysis of logic switching circuits.

Course Contents:

Logic Families: TTL, CMOS, ECL, Tristate
Logic Gates: AND, OR, NAND, NOR, X-OR, X-NOR, Circuit Design
Flip flops: SR, JK, D, Master Slave, Application, and Synchronization
Logic Circuits: Coder, Decoder, Mux, Dmux
Counters: Synchronous, Asynchronous, Up/Down, Ripple, Cascading
Registers: Shift registers
Memory Devices: ROM, RAM, Static, Dynamic, Memory Operation
Arithmetic Circuits: Adder, Carry, Look Ahead, ALU
PAL: Micro-program Control, FPGA, HDLA

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Perform simple arithmetic in binary, octal, hexadecimal, BCD number systems
CLO 2	Manipulate logic expressions using binary Boolean algebra
CLO 3	Generate the prime implicates of logic functions of 5 or fewer variables using graphical (Karnaugh map) method, and to obtain their minimal two-level implementations with and without don't cares.
CLO 4	Analyze combinational circuits
CLO 5	Use basic functional & timing (clocking) properties of latches & flip-flops.
CLO 6	Analyze synchronous sequential circuits to extract next state/output functions
CLO 7	Translate a word statement specifying the desired behavior of a simple sequential system into a finite state machine (FSM), to simplify and build the architecture that consists of state register and next state/output logic
CLO 8	Implement simple digital systems using controller and basic data path components such as registers, memories, counters, multiplexers, ALUs, etc.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X		X					
CLO2	X	X	X	X					
CLO3	X	X	X	X	X				
CLO4	X	X	X	X	X				
CLO5	X	X	X	X	X				
CLO6	X	X	X	X					
CLO7	X	X	X	X			X		
CLO8	X	X		X			X		

Recommended Books

1. Digital Logic Design by Morris Mano
2. Digital Systems by Ronald Tocci, Neal Widmer, Greg Moss
3. Digital Principles and Applications by Donald P Lech, Albert Paul Malvino and Goutam Saha

CSE 246 Digital Logic Design Sessional
3 hours in a week, 1.50 Credit
Laboratory works based on CSE 245.

Rationale
The main aim of this course is to provide practical knowledge of the principles and practices of digital systems, both at the device and circuit level. The course covers practical experiments of the topics of digital electronics including: Number Theory, Boolean Algebra, Logic Circuits, Logic Minimization Techniques, Multiplexers, Adders, Flip-Flops, Counters, Registers, State Machines, Memory Circuits, Digital / Analog Conversion, Programmable Logic Circuits and Microcomputer Bus Architecture. Upon completion, students should be able to construct, analyze, verify, and troubleshoot digital circuits using appropriate techniques and test equipment

Course Objectives
- Help students to conceptualize the fundamental principles in design and implementation of digital logic circuits including combinational circuits, sequential circuits, and finite state machines.
- To develop skills to perform decimal, octal, hexadecimal, and binary conversions.
- To provide the knowledge to apply Boolean algebra to solve logic functions.
- To help students in learning the analysis of pulse circuits.
- To help students in learning the analysis of digital multiplexing circuits.
- To help students in learning the analysis of logic family interfaces.

Course Contents:
- Logic circuits using combination of gates
- To construct and study the following logic gates: AND, OR, NOT. NAND, NOR, EXOR
- Verify the DE Morgan's Law: Law(I) and Law (II)
- To verify different kind of applications of Boolean algebra.
- To construct an AND gate by diode resistors and observe its characteristics.
- To verify the characteristics of Exclusive OR and Exclusive NOR using basic logic gate.
- Verification of De-Morgan's Theorem for 2 input Variable.
- To simplify the given Boolean function by using K-map and implement it with logic Diagram.
- ABCD to 7 Segment Decoder
- Study of 4-bit BCD adder.
- Study of Asynchronous & Synchronous R-S Flip-Flop.
- Study of J-K Flip-Flop.
- Study of 4-bit binary Ripple Counter.
- Verilog HDL Basics.
- Project with PAL/FPGA/Microcontroller

Course Learning Outcomes:
After the successful completion of the course, the student will be able to-

CLO 1	Manipulate logic expressions using binary Boolean algebra
CLO 2	Generate the prime implicates of logic functions of 5 or fewer variables using graphical (Karnaugh map) method, and to obtain their minimal two-level implementations with and without don't cares.
CLO 3	Understand and analyze combinational circuits
CLO 4	Use basic functional & timing (clocking) properties of latches & flip-flops.
CLO 5	Analyze synchronous sequential circuits to extract next state/output functions
CLO 6	Translate a word statement specifying the desired behavior of a simple sequential system into a finite state machine (FSM), to simplify and build the architecture that consists of state register and next state/output logic
CLO 7	Implementing simple digital systems using controller and basic data path components such as registers, memories, counters, multiplexers, ALUs, etc.
CLO 8	Demonstrate team-based communication skills, magnify their moral standards and apply these in practical life

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X	X	X	X					
CLO2	X	X	X	X	X				
CLO3	X	X	X	X					
CLO4	X	X	X	X	X				
CLO5	X	X	X	X					
CLO6	X	X	X	X			X		
CLO7	X	X	X				X		
CLO8						X	X		

Recommended Books

1. Digital Logic Design by Morris Mano
2. Digital Systems by Ronald Tocci, Neal Widmer, Greg Moss
3. Digital Principles and Applications by Donald P Lech, Albert Paul Malvino and Goutam Saha

CSE 247 Computer Architecture

3 hours in a week, 3.00 Credit

Rationale:

Students wishing to build up their career in CSE need to know architecture about computers and this course will help them learn the basics of computer systems and latest hardware architectures.

Objectives:

- To make the students understand the fundamental technologies and performance evaluation of different computer systems;
- To help them know what is the instruction set architecture of a system and variations of ISA in different systems;
- To describe how computer performs arithmetic operations;
- To facilitate necessary knowledge about internal architecture of a processor;
- To provide knowledge on different levels of memory hierarchy and their management in a system.
- To accumulate basic ideas about fundamental technologies on multicore and multiprocessing system and their application

Course Contents:

Introduction to Computer Architecture: Overview and history; Cost factor; Performance metrics and evaluating computer designs. **Instruction set design:** Von Neumann machine cycle, Memory addressing, Classifying instruction set architectures, RISC versus CISC, Microprogrammed vs. hardwired control unit. **Memory System Design:** Cache memory; Basic cache structure and design; Fully associative, direct, and set associative mapping; Analyzing cache effectiveness; Replacement policies; Writing to a cache; Multiple caches; Upgrading a cache; Main Memory; Virtual memory structure, and design; Paging; Replacement strategies. **Pipelining:** General considerations; Comparison of pipelined and non pipelined computers; Instruction and arithmetic pipelines, Structural, Data and Branch hazards. **Multiprocessors and Multi-core Computers:** SISD, SIMD, and MIMD architectures; Centralized and distributed shared memory-architectures; Multi-core Processor architecture. **Input/output Devices:** Performance measure, Types of I/O device, Buses and interface to CPU, RAID. **Pipelining:** Basic pipelining, Pipeline Hazards. Parallel Processing.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Describe the fundamental technologies related to SISD, SIMD, and MIMD architectures
CLO 2	Understand and develop logic for instruction set architecture
CLO 3	Discuss organization, hierarchy and management of different levels of memory and I/O systems
CLO 4	Understand design and architecture of processor,

	multiprocessor, multi-core processor, distributed systems
CLO5	Differentiate between Basic Pipelining, Pipelining Hazards and Parallel Processing
CLO6	Evaluate performance of cache memory management, replacement policies and cache writing
CLO7	Analyze cache effectiveness of memory structure.

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X		X						
CLO2	X		X						
CLO3	X		X						
CLO4	X		X						
CLO5	X		X						
CLO6	X		X						
CLO7	X		X						

Textbook

1. Computer Architecture and Organization by John P.Hayes.
2. Computer Organization and Design: The hardware / software interface by David A.Patterson and John L.Hennessy.

BUS 201 Cost and Management Accounting

3 hours in a week, 3.00 Credit

Rationale

This subject contributes to the program outcome by expanding students' skill technically through the analysing of different costing method which is preferable for every stakeholder.

Course Objectives

- To acquaint with the cost concepts, cost behavior, and cost accounting techniques that are applied to manufacturing and service businesses.
- To make students capable to interpret cost accounting statements
- To provide the students with the capability to apply theoretical knowledge in decision making
- To help them be able to analyze and evaluate information for cost ascertainment, planning, control of business operations
- To develop to skill to discuss the various techniques available to measure managerial performance and to motivate employees toward organizational goals
- To develop skill to identify and analyze both qualitative and quantitative standards to formulate best control methods

Course Contents:

Introduction to Cost Accounting: Definition of Cost Accounting, Comparison of Cost Accounting and Financial Accounting; The role of Cost Accounting; Methods and Techniques of Cost Accounting; Characteristics of an Ideal Cost Accounting System; **Cost Concepts, Classifications and Statements:** Cost Object; Expenditures, Cost, Expense and Loss; Cost Classifications; Cost Data and Uses; The Chart of Accounts; Statement of Cost of Goods Manufactured and Sold; Cost Statement or Cost Sheet; **Costing and Control of Materials:** Classification of Materials; Accounting for Materials; Store ledger(FIFO & WAM) method; Inventory Planning; Ordering Cost, Holding Cost and EOQ; Effect of Quantity Discounts on EOQ; Safety Stock and Reorder Point; Material Control Methods; Materials Requirement Planning System. Practical problem; **Costing and Control of Labor**: Productivity and Labor Costs; Costs included in Labour; Accounting for Labour; Time Keeping, Computation of total payroll and Allocation of Payroll

costs; Different incentive plan; Labour cost Control, Labor Turnover and Control of Labour Turnover; Learning Curve Theory. Practical problem & solution; **Costing and Control of Manufacturing Overhead**: Manufacturing Overhead Costs; Actual Vs. Normal Costing of Manufacturing Overhead; Production Capacity, Predetermined Overhead Rates; Departmental vs. Plant-wise Overhead Rates; Separating Mixed Costs. Scatter-graph; High-low Method and Regression Analysis; Accounting for Manufacturing Overhead; Analysis and Disposition of Under-applied-and Over-applied Overhead; **Contract Costing** : Determination of profit of completed and incomplete contracts; **Introduction of Management Accounting** :Definition-process of Management Accounting, characteristics of Management Accounting, scope of Management Accounting, purpose and objectives of Management Accounting, Comparison of Management Accounting and Financial Accounting; **Cost Terms, Concepts and Classifications:** Cost Behavior (Analysis and Use):General cost classifications- product costs versus period costs- cost classifications on Financial Statements. Types of cost behavior patterns- the Analysis of Mixed Costs, High-low method; **Cost-Volume-Profit Relationships:** The basics of CVP analysis- Break -even analysis- Break-even chart- Sales Mix. Business application and mathematical problem of CVP analysis; **Budget:** Define Budget, Types of Budget, Cash budget, purchase budget, sales budget, flexible budget and Related problems; **Standard Costing:** Meaning and Objectives- Types of ratios. Standard Costing and its uses for making business decision. Variance calculation, Decision making process from these calculations.

Course Learning Outcomes:

After the successful completion of the course, the student will be able to-

CLO 1	Discuss about how cost accounting is used for decision making and performance evaluation
CLO 2	Competent to demonstrate how materials, labor and overhead costs are added to a product at each stage of the production cycle
CLO 3	Express the place and role of cost accounting in the modern economic environment
CLO 4	Recognize and apply the skills necessary for carrying out effective management decision-making and strategic management planning
CLO 5	Select the costs according to their impact on business and society
CLO 6	Interpret the impact of the selected costs method
CLO 7	Design management control process in different business areas

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X						X		X
CLO2	X						X		X
CLO3	X						X		X
CLO4	X						X		X
CLO5	X						X		X
CLO6	X						X		X
CLO7	X						X		X

Recommended Books:

1. Cost Accounting –Volume-1 by Basu and Das;
2. Managerial Accounting by Ray H. Garrison, Eric W. Noreen

MATH 201 Complex Variables, Laplace's Transforms and Fourier Series
3 hours in a week, 3.00 Credit

Rationale

The course gives the students a sound knowledge of Fourier transforms along with Fourier integrals, Laplace Transformation and complex variables.

Course Objectives

- To facilitate with basic ideas about complex variables
- To provide knowledge on Laplace transformation
- To acquaint with Fourier series and analysis

Course Contents:
Complex Variables: Complex numbers and their properties; De Moivre's theorem and its application; locus problem; functions of a complex variable; limit and continuity of a function of complex variable; analytical functions; the Cauchy-Riemann equations; Cauchy's theorem; singularity and poles; residues; simple contour integration and their uses in solving boundary value problems. Laplace Transformations: Definition of Laplace transform; Laplace transform of different functions; first shift theorem; inverse Laplace transform; linearity property; use of first shift theorem and partial functions; Laplace transform of derivatives; Laplace transform of an integral; the Heaviside unit function; the unit impulse function; the second shift theorem; periodic functions; convolutions; solution of ordinary differential equations by Laplace transform. Fourier Series: Fourier series; convergence of Fourier series; Fourier analysis; Fourier transforms

Course Learning Outcomes:
After the successful completion of the course, the student will be able to-

CLO 1	Define the complex number system, complex functions and integrals of complex functions
CLO 2	Apply the results/theorems in complex analysis to complex valued functions
CLO 3	Understand Laplace transforms
CLO 4	Discuss about analytic function and how to check analyticity based on Cauchy – Riemann equation
CLO 5	Compute Fourier and Laplace transforms
CLO 6	Represent periodic functions using Fourier series

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	**X**				**X**				
CLO2	**X**				**X**				
CLO3	**X**				**X**				
CLO4	**X**				**X**				
CLO5	**X**				**X**				
CLO6	**X**				**X**				

Recommended Books

1. KK Kodaira: Introduction to Complex analysis
2. H Jaffreys and B Jaffreys: Methods of Mathematical Physics
3. Spiegel, M. R.: Laplace Transform
4. Khanna, M. L.: Laplace Transforms

CSE 200: Software Development II
4 hours in a week, 2.00 Credit

Rationale:
This course is based on project work. Target of this course is to involve students in real life software development which will help to increase their skill to reach the requirements of the software industry. Also this course will help students to improve their communication skill and to present their work in front of an audience.

Objectives:
- To facilitate necessary knowledge about latest technology
- To develop skills on software development
- To develop skills on teamwork and presentation

Course Contents:
Project focusing on an Object oriented programming approach and using standard algorithms is preferable. Every project should maintain a goal so that it can be used as a useful tool in the IT fields. Also innovative

project ideas that require different types of scripting/programming languages or programming tools can be accepted with respect to the consent of the corresponding project supervisor.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Apply latest state of the art technologies
CLO 2	Design and implement ideas for complete software
CLO 3	Evaluate existing computer and mobile applications
CLO 4	Explain ideas to groups and present their noble findings

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X		X	X	X	X			X
CLO2	X		X	X					X
CLO3		X	X	X					X
CLO4		X	X	X	X	X			X

CSE 230 Viva Voce
1 hours in a week, 1.00 Credit

Rationale:
This course objects to prepare students for their upcoming real life interviews based on Departmental Subjects of Semester 3 to Semester 4

Objectives:
- To make students get mentally prepared for real life interviews
- To make them recall all the important and fundamental knowledge they have acquired during the full undergrad session

Course Contents:
Viva based on studied major courses.

Course Learning Outcomes: After the successful completion of the course, the student will be able to-

CLO 1	Present skills on facing verbal sessions.
CLO 2	Recall fundamental information they acquired in their undergrad life
CLO 3	Argue logically and defend their answer

Mapping of Course Learning Outcomes to Program Learning Outcomes

CLO/PLO	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
CLO1	X								X
CLO2	X								X
CLO3	X								X