Department of Computer Science and Engineering

BANGLADESH ARMY UNIVERSITY OF ENGINEERING & TECHNOLOGY

BAUET

KNOWLEDGE & TECHNOLOGY

Syllabus for Bachelor of Science in

Computer Science and Engineering

CSE

Department of Computer Science and Engineering

Faculty of Electrical and Electronic Engineering

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Sl.	Events	Durations
1.	Classes before Mid Semester	7 weeks
2.	Mid Semester Vacation	1 week
3.	Classes after Mid Semester Vacation	7 weeks
4.	Makeup Classes and Preparatory Leave	2 weeks
5.	Semester Final Examination	3 weeks
6.	Semester End Vacation	2 week
Total		**22 weeks**

The duration for Short Semester and Course Improvement will be as follows:

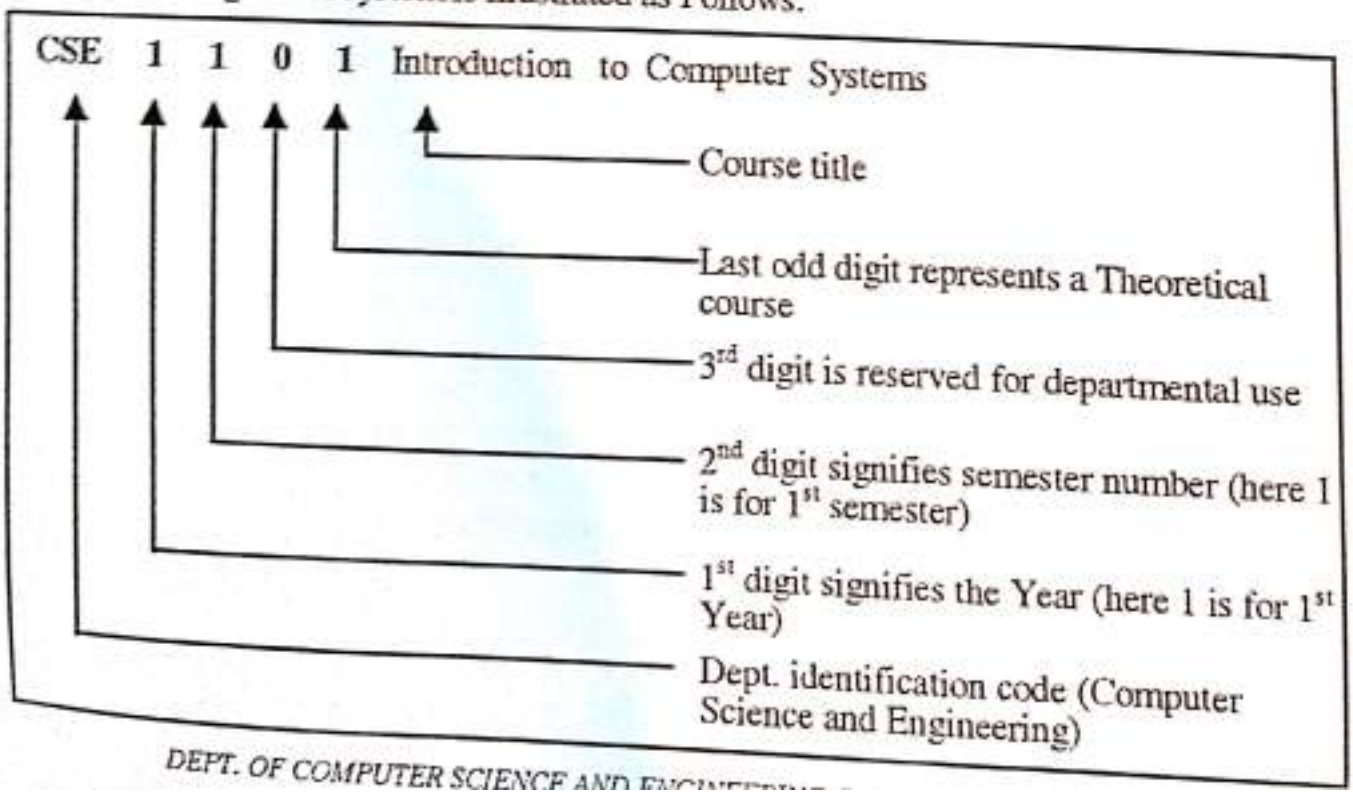
1.	Short Semester/ Preparatory Leave	6 weeks
2.	Examination	1 week
Total		**7 Weeks**

Course Designation System

Each course is designated by a maximum of four letter code identifying the department offering the course followed by a four-digit number having the following interpretation:

- The first digit will corresponds to the year in which the course is normally taken by the students.
- The second digit will corresponds to the semester (1 for 1st and 2 for 2nd) in which the course is normally taken by the students.
- The third digit will be reserved for departmental use. It usually identifies a specific area/group of study within the department.
- The last digit will be odd number for theoretical courses and even number for sessional courses.

The course designation system is illustrated as Follows:



Grading System

The letter grade system for assessing the performance of the students shall be as follows:

Numerical grade	Letter Grade (LG)	Grade Point (GP)
80% or 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%	D	2.00
less than 40%	F	0.00
Incomplete	I	0.00

A letter grade 'I (incomplete) shall be awarded for courses that could not be completed in one semester, which will continue through to the next semester.

Calculation of CGPA

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

$$GPA = \frac{\text{Grade points earned in the semester}}{\text{Credits completed in the semester}}$$

$$= \frac{\text{Summation of (Credit hours in a course x Grade point earned in that course)}}{\text{Total number of credit hours completed}}$$

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

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the semesters passed/completed by a student. For example, if a student passes/ completes n semesters having total credits of TC1, TC2, ... , TCn and his GPA in these semesters are GPA1, GPA2,... , GPAn, respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

Numerical Example

Suppose a student has completed nine courses in a semester and obtained the following grades:

Course	Credit Ci	Grade Points	Gi	Ci*Gi
EEE-163	3.00	A	3.75	11.25
EEE-164	0.75	A+	4.00	3.00
MATH-141	3.00	A-	3.50	10.5
PHY-103	3.00	B+	3.25	9.75
HUM-101	3.00	A	3.75	11.25
HUM-102	1.50	A	3.75	5.625
CSE-101	3.00	A	3.75	11.25
CSE-103	3.00	A-	3.50	10.5
CSE-104	1.5	B+	3.25	4.875
Total	**21.75**			**78**

$$GPA = \frac{78}{21.75} = 3.586$$

Suppose a student has completed four semester and obtained the following GPA:

Year	Semester	Earned Credit Hours	Earned GPA	TCi*GPAi
		Tci	GPAi	
1	I	21.75	3.75	81.5625
1	II	20.75	3.61	74.9075
2	I	19.50	3.21	62.5950
2	II	21.00	2.98	62.5800
Total		83.00		281.645

$$CGPA = \frac{281.645}{83} = 3.39$$

Undergraduate students of the Department of Computer Science and Engineering (CSE) have to follow a particular course schedule, the semester-wise distributions of which are given below:

1st Year 1st Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-1101	Introduction to Computer Systems	2.00	-	2.00	
2	CSE-1102	Introduction to Computer Systems Sessional	-	3.00	1.5	
3	EEE-1163	Electrical Circuit Analysis	3.00	-	3.00	
4	EEE-1164	Electrical Circuit Analysis Sessional	-	3.00	1.50	
5	MATH-1141	Mathematics-I(Differential Calculus and Integral Calculus)	3.00	-	3.00	
6	PHY-1103	Physics	3.00	-	3.00	
7	PHY-1104	Physics Sessional	-	3.00	1.50	
8	HUM-1101	English	3.00	-	3.00	
		Total	**14.00**	**9.00**	**18.50**	

1st Year 2nd Semester

Sl	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-1201	Discrete Mathematics	3.00	-	3.00	
2	CSE-1205	Structured Programming Language	3.00	-	3.00	CSE-1102
3	CSE-1206	Structured Programming Language Sessional	-	3.00	1.50	
4	EEE-1269	Electronic Devices and Circuits	3.00	-	3.00	EEE-1163
5	EEE-1270	Electronic Devices and CircuitsSessional	-	3.00	1.50	
6	MATH- 1243	Mathematics-II(Ordinary, Partial Differential quations and Coordinate Geometry)	3.00	-	3.00	
7	CHEM- 1201	Chemistry	3.00	-	3.00	
8	CHEM- 1202	Chemistry Sessional	-	1.50	0.75	
9	CE-1250	Engineering Drawing and CAD Sessional	-	3.00	1.50	
		Total	**15.00**	**10.50**	**20.25**	

2nd Year 1st Semester

Sl	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-2101	Digital Logic Design	3.00	-	3.00	
2	CSE-2102	Digital Logic Design Sessional	-	3.00	1.50	
3	CSE-2103	Data Structures	3.00	-	3.00	CSE-1205
4	CSE-2104	Data Structures Sessional	-	3.00	1.50	
5	CSE-2105	Object Oriented Programming Language	3.00	-	3.00	CSE-1205
6	CSE-2106	Object Oriented Programming Language Sessional- I	-	3.00	1.50	
7	EEE-2169	Electrical Drives and Instrumentation	3.00	-	3.00	EEE-1269
8	EEE-2170	Electrical Drives and Instrumentation Sessional	-	1.50	0.75	
9	MATH- 2145	Mathematics-III(Vector Analysis, Matrices and Fourier Analysis)	3.00	-	3.00	
		Total	**15.00**	**10.50**	**20.25**	

2nd Year 2nd Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-2211	Numerical Analysis	3.00	-	3.00	
2	CSE-2212	Numerical Analysis Sessional	-	1.50	0.75	
3	CSE-2213	Digital Electronics and Pulse Technique	3.00	-	3.00	EEE-1269 CSE-2101
4	CSE-2214	Digital Electronics and Pulse Technique Sessional	-	1.50	0.75	
5	CSE-2215	Computer Architecture	3.00	-	3.00	CSE-2101
6	CSE-2217	Algorithms	3.00	-	3.00	CSE-1201 CSE-2103
7	CSE-2218	Algorithms Sessional	-	3.00	1.50	
8	CSE-2222	Object Oriented Programming language Sessional-II	-	1.50	0.75	
9	MATH- 2247	Mathematics-IV(Complex Variable and Laplace Transform)	3.00	-	3.00	
10	HUM-2215	Engineering Economics & Managerial Accounting	3.00	-	3.00	
		Total	**18.00**	**9.00**	**22.50**	

3rd Year 1st Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-3101	Database Management Systems	3.00	-	3.00	
2	CSE-3102	Database Management Systems Sessional	-	3.00	1.50	
3	CSE-3103	Compiler	3.00	-	3.00	
4	CSE-3104	Compiler Sessional	-	1.50	0.75	
5	CSE-3105	Microprocessors and Micro-controller	3.00	-	3.00	CSE-2101
6	CSE-3106	Microprocessors and Micro-controllers Sessional	-	1.50	0.75	
7	CSE-3107	Theory of Computation	3.00	-	3.00	
8	CSE-3108	Assembly Language Programming Sessional	-	1.50	0.75	
9	CSE-3109	Computer Network	3.00	-	3.00	
10	CSE-3110	Computer Network Sessional	-	3.00	1.50	
		Total	**15.00**	**10.50**	**20.25**	

3rd Year 2nd Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-3211	Operating System	3.00	-	3.00	
2	CSE-3212	Operating System Sessional	-	3.00	1.50	
3	CSE-3213	Computer Graphics	3.00	-	3.00	
4	CSE-3214	Computer Graphics Sessional	-	1.50	0.75	
5	CSE-3215	Data Communication	3.00	-	3.00	
6	CSE-3216	Data Communication Sessional	-	1.50	0.75	
7	CSE-3217	Software Engineering	3.00	-	3.00	
8	CSE-3222	Software Development Sessional	-	1.50	0.75	
9	CSE-3219	Applied Statistics and Queuing Theory	3.00	-	3.00	
10	CSE-3220	Industrial Training*		4 Weeks	1.50	
11	HUM-3255	Sociology	2.00	-	2.00	
		Total	**17.00**	**7.50**	**22.25**	

***Note:** Evaluation report from industry is to be submitted at the end of the training and accordingly to be incorporated in the tabulation sheet.

4th Year 1st Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-4100	Project / Thesis**	-	6.00	3.00	
2	CSE-4101	System Analysis and Design	3.00	-	3.00	
3	CSE-4102	System Analysis and Design Sessional	-	1.50	0.75	
4	CSE-4103	Artificial Intelligence	3.00	-	3.00	
5	CSE-4104	Artificial Intelligence Sessional	-	1.50	0.75	
6	CSE-4106	Software Development for Web Apps Sessional	-	1.50	0.75	
7	CSE-4107	Digital Signal Processing	3.00	-	3.00	
8	CSE-4108	Digital Signal Processing Sessional	-	1.50	0.75	
9	CSE-41XO	Option-I	3.00	-	3.00	
10	HUM-4112	English Sessional		1.50	0.75	
		Total	**12.00**	**13.50**	**18.75**	

**Note: Each student has to complete one Project or Thesis in the combined duration of two semesters of 4th year. In course CSE- 4100 (Part-I), a student has to make a proposal defense at the end of the semester. The defensed project/thesis has to be completed in the continuation course CSE-4200 (Part-II) in next semester.

XO: Semester digit number depends on theory course offered.

Option-I

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-4119	Advanced Algorithms	3.00	-	3.00	
2	CSE-4121	Basic Graph Theory	3.00	-	3.00	
3	CSE-4123	Fault Tolerant System	3.00	-	3.00	
4	CSE-4125	Basic Multimedia Theory	3.00	-	3.00	
5	CSE-4127	Data and Network Security	3.00	-	3.00	
6	CSE-4129	Object Oriented Software Engineering	3.00	-	3.00	
7	CSE-4131	Artificial Neural Networks and Fuzzy Systems	3.00	-	3.00	
8	CSE-4133	Distributed Algorithms	3.00	-	3.00	
9	CSE-4135	Bioinformatics	3.00	-	3.00	
10	CSE-4137	Robotics	3.00	-	3.00	
11	CSE-4139	Machine Learning	3.00	-	3.00	

4th Year 2nd Semester

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-4200	Project / Thesis**	-	6.00	3.00	
2	CSE-4211	VLSI Design	3.00	-	3.00	
3	CSE-4213	Digital Image Processing	3.00	-	3.00	
4	CSE-4214	Digital Image Processing Sessional	-	1.50	0.75	
5	CSE-4215	Mobile and Ubiquitous Computing	3.00	-	3.00	
6	CSE-4216	Mobile and Ubiquitous Computing Sessional	-	1.50	0.75	
7	CSE-4217	Engineering Management	3.00	-	3.00	
8	CSE-42XO	Option-II	3.00	-	3.00	
9	CSE-42XE	Option-II Sessional	-	1.50	0.75	
		Total	**15.00**	**10.50**	**20.25**	

XE: Semester digit number depends on sessional course offered.

Option-II

Sl.	Course Code	Course Title	Hours/Week		Credits	Pre-requisite
			Theory	Sessional		
1	CSE-4243	Pattern Recognition	3.00	-	3.00	
2	CSE-4244	Pattern Recognition Sessional	-	1.50	0.75	
3	CSE-4245	Telecommunication Engineering	3.00	-	3.00	
4	CSE-4246	TelecommunicationEngineering Sessional	-	1.50	0.75	
5	CSE-4247	Simulation and Modeling	3.00	-	3.00	
6	CSE-4248	Simulation and Modeling Sessional	-	1.50	0.75	
7	CSE-4251	Data Mining and Data Ware-housing	3.00	-	3.00	
8	CSE-4252	Data Mining and Data Ware-housing Sessional	-	1.50	0.75	
9	CSE-4253	Distributed Database Management System	3.00	-	3.00	
10	CSE-4254	Distributed Database Management System Sessional	-	1.50	0.75	
11	CSE-4255	Internet Engineering	3.00	-	3.00	
12	CSE-4256	Internet Engineering Sessional	-	1.50	0.75	

Summary

Year and Semester	Hours/Week		Credits	No of Theory Courses
	Theory	Sessional		
1st Year 1st Semester	14.00	9.00	18.50	5
1st Year 2nd Semester	15.00	10.50	20.25	5
2nd Year 1st Semester	15.00	10.50	20.25	5
2nd Year 2nd Semester	18.00	9.00	22.50	6
3rd Year 1st Semester	15.00	10.50	20.25	5
3rd Year 2nd Semester	17.00	7.50	22.25	6
4th Year 1st Semester	12.00	13.50	18.75	4
4th Year 2nd Semester	15.00	10.50	20.25	5
Grand Total	**121.00**	**81.00**	**163.00**	**41**

DETAIL DESCRIPTION OF THE COURSES

1st YEAR 1st SEMESTER

CSE-1101: Introduction to Computer Systems

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

2 Credits, 2 Contact hours/week, Lecture: 28, Exam. Time: 3 hours

Computer Basics: Introduction to studying Computers, History and development of Computers, Generation of Computers, Types of Computers.

Computer Hardware and Peripherals: Basic units of Computer Hardware, Keyboard, Mouse, Internal structure of CPU, Functions of RAM, ROM and Cache memory, Basic functional mechanism of HDD and CD-ROM, Different types of Monitors, Impact and non-impact Printers, Scanner, Plotter, Typical Computer specifications.

Basic Number System: Different data type, Conversion, Standard.

Software: Classifications, System software, Operating system concepts and importance, components and basic functions of DOS, Windows operating system, Application software's and Utility programs, Computer virus.

Data Processing: Concepts of Data, Information, and Database, Traditional File Processing, and DBMS.

Computer Networks: Computer networks and its goals, Basic concepts on LAN, MAN, WAN and Internet systems, Internet services, Functions of Modem in internet.

Programming Language Basic: Programming languages, basic concepts of compiler, interpreter, algorithm and flowchart.

Simple C: Program structure in C, Program creating, compiling, debugging and running, Basic I/O functions, Identifiers and keywords, Simple data types, variables, constants, operators.

Books Recommended:

1. Peter Norton : **Introduction to Computer**, *McGraw-hill Publishers*
2. J. Stanley Warford : **Computer Systems**, *Jones & Bartlett Publishers*
3. P. Norton : **Inside the PC**, *Sam Publishers*
4. L. Rosch : **Hardware Bible**, *Braddy Publishing, Indianapolis*
5. Subramanian : **Introduction to Computers**, *Mcgraw-hill Inc*
6. V. K. Jain : **Switching Theory and Digital Electronics**, *Khanna Publishers*

CSE-1102: Introduction to Computer Systems Sessional

Laboratory works based on **CSE-1101.**

EEE-1163: Electrical Circuit Analysis

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Basic Knowledge of Electrical Circuit, Measuring the Quantities: Current, Voltage, Resistance.

Standards and Units of Electrical Technology, Network & Circuit Solution: Series, parallel, node and mesh analysis.

Instruments of Measurement: Series and parallel circuits; Network theorem and network analysis; Capacitors, Inductors, Basic of magnetic circuits.

AC Circuit Analysis: Instantaneous current, voltage and power for RLC circuits, Effective current and voltage, average power, Phasor representation of sinusoidal quantities , Single phase circuit, Introduction of three phase circuits; Power factor and power equation.

Books Recommended:

1. R.L. Boylestad : **Introductory Circuit Analysis,** *Prentice Hall of India Private Ltd*
2. C. K. Alexander : **Fundamentals of Electric Circuits,** *Mc Graw Hill*
3. Robert P. Ward. : **Introduction to Electrical Engineering**, *Prentice Hall of India Private Ltd*
4. Russsell M Kerchner and George F Corcoran : **Alternating- Current Circuits,** *John Wiley & Sons*
5. Richard C. Dorf & James A. Svoboda : **Introduction to Electric Circuits,** *John Wiley & Sons Inc*

EEE-1164: Electrical Circuit Analysis Sessional

Laboratory works based on **EEE-1163**

MATH-1141: Mathematics-I (Differential Calculus and Integral Calculus)

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Differential Calculus: Limits, continuity and differentiability, Differentiation of explicit and implicit function and parametric equations, Successive differentiation of various types of functions, Leibnitz's theorem, Rolle's theorem, Mean value theorem in finite and infinite forms, Taylor's theorem in finite and infinite forms Maclaurin's theorem in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder, Expansion of functions, Evaluation of indeterminate forms by L'Hospitals rule, Partial differentiation, Euler's theorem, Tangent and Normal, Subtangent and subnormal in Cartesian and Polar coordinates, Maximum and minimum values of functions of single variable, Points of inflexion, Curvature, radius of curvature and center of curvature, Asymptotes and Curve tracing.

Integral Calculus: Definition of integrations, Integration by the method of substitution, Integration by parts, Standard integrals, Integration by the method of successive reduction, Definite integrals and its properties and use in summing series, Walli's formula, improper integrals, Beta function and Gamma function, Multiple integral and its application, Area, Volume of solids of revolution, Area under a plane curve in Cartesian and polar coordinates, Area of the region enclosed by two curves in Cartesian and polar coordinates, Arc lengths of curves in Cartesian and polar coordinates.

Books Recommended

1.	B. C. Das and B.N.Mukherjee	:	**Differential Calculus,** *U. N. Dhur& Sons*
2.	B. C. Das and B.N.Mukherjee	:	**Integral Calculus,** *U. N. Dhur& Sons*
3.	F. Ayres and Elliot Mendelson	:	**Calculas (Schaum's Outline Series),** *McGraw-Hill*
4.	Howard Anton, IrlBivens and Stephen Davis	:	**Calculas,** *Wiley*
5.	Abu Yusuf	:	**Calculus-I,** *New Dilhi*
6.	A. K. Hazra	:	**Integral Calculus with Applications,** *Pragati Prakashan*

PHY-1103: Physics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Heat & 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 and disorder, Thermodynamic functions, Maxwell relations, Clausius-Clapeyron Equation, Gibbs Phase Rule, Third Law of thermodynamics.

Structure of Matter: Crystalline & non-crystalline solids, single crystal and polycrystalline solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, sodium chloride and CsCl structure, packing factor, Miller indices, relation between interlunar spacing and Miller indices, Bragg's Law, Methods of determination of interplanar spacing from diffraction patterns; Defects in solids: Point defects, line defects; Bonds in solids, interatomic distances, calculation of cohesive & bonding energy; Introduction to band theory: distinction between metal, semiconductor and insulator.

Waves & 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, resonance, two-body oscillations, Reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine's formula.

Physical Optics: Theories of light; Interference of light, Young's 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, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit & N-slits-diffraction grating; Polarization: Production and analysis of polarized light, Brewster's law, Malus law, Polarization by double refraction, Retardation plates, Nicol prism, Optical activity, Polarimeters, Polaroid.

Books Recommended:

1. N. Subrahmanyam, BrijLal : **A Text Book of Optics,** *S. Chand*
2. HoqRafiqullah and Roy : **Concepts of Electricity and Magnetism,** *Tata Mc Graw-Hill*
3. Brijlal and N Subrahmanyam : **A Text Book of Sound,** *S. Chand*
4. Brijlal and N Subrahmanyam : **Properties of Matter,** *S.Chand*
5. Halliday and R. Resnick : **Physics (part II),** *Wiley*
6. Brijlal and N Subrahmanyam : **Heat and Thermodynamics,** *S.Chand*

PHY-1104: Physics Sessional

Laboratory works based on **PHY-1103**

HUM-1101: English

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

General Discussion: Introduction, Various approaches to learning English.

Grammatical Problems: Parts of speech, Number, Gender, Articles, Sentence making rules, Tense, Right form of verbs, Correction of sentences, Punctuation & Capitalization, Appropriate prepositions, Idioms & Phrases, Vocabulary & Diction.

Speaking: Introduce yourself, Two-minute impromptu talks, Interviews, Informal debates, Conversation & dialogue, Group discussion, Different types of business communication, Storytelling.

Reading: Reading selective stories, Reading comprehension.

Writing: Principles of effective writing organization, Planning & development of writing, Paragraph writing, Essay writing, Letter writing, Story writing, Report Writing, Precis writing.

Books Recommended:

1. Ahsanul Haque, Sirajul Islam Chawdhury and M. Shamsuddoha : **Prose of Our Time,** *Nawroze Kitabistan Banglabazar*
2. S.M.Amanullah. : **A Guide to Correct Speech,** *Albatross Publications*
3. R.C. Sharma &Krisna Mohan : **Buisness Correspondence And Report Writing,** *Tata McGraw- Hill Publication Ltd*
4. Betty Schrampfer Azar : **Basic English Grammar,** *Prentice Hall*
5. Raymond Murphy : **English Grammar in Use.**

1st YEAR 2nd SEMESTER

CSE-1201: Discrete Mathematics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Logic and Proofs, Mathematical inductions, Sets, Equivalence relations, Language and recursive definitions.

Counting: Basic principles, sequences, Fibonacci, Eullerian, Bernoulli numbers, permutation, and Pascal's triangle.

Relation and Ordering: Relations, properties of Binary relation in a set, composition of binary relation, relation matrix and graph of a relation, partial ordering, path in relation and di-graph.

Ordered Relation and Structure: Partially ordered set, external element of P.O. set, Lattice, finite Boolean algebra, function on Boolean algebra, Boolean function as Boolean polynomial.

Graph: Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, shortest path problems, Graph colouring, matrix representation of graph.

Trees: Introduction of trees, application of trees, tree traversal, labeling trees, trees and sorting, spanning trees, minimal spanning tree, and undirected trees.

Algebraic Structure: Algebraic system, general properties, some simple algebraic system, ring, semiring, module, semi-module, Homomorphism of semigroups and monoid, Grammars and languages, Formal definition of a language, Definition and examples, homomorphism, product and quotients of group.

Books Recommended:

1. Kenneth H. Rosen : **Discrete Mathematics and Its Applications**, *McGraw-Hill*
2. J. P. Tremblay and R. Manohar : **Discrete Mathematics structures with applications to Computer Science**, *Mc-Graw Hill*
3. Seymour Lipschutz : **Theory and Problems of Discrete Mathematics,Schaum's Outline Series**, *McGraw-Hill*
4. Bernard Kolman, Robert Busby, Sharon C. Ross : **Discrete Mathematical Structures**, *Prentice Hall*

CSE-1205: Structured Programming Language

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Programming languages, Basic concepts of compiler, interpreter, algorithm and flowchart.

Simple C: Program structure in C. Program creating, compiling, debugging and running, Basic I/O functions, Identifiers and keywords, Simple data types, variables, constants,

operators, Bitwise operators, comments, Decision making statements with if and switch, Looping structures with for, while, do-while.

More Data Types: Array, Structures, Union, Pointes, Strings, Dynamic allocation, Static, global, external and registrar, User defined data types

Functions: C Functions and user defined function, Function types, parameters, prototypes, Recursive function.

File Handling: Concepts, Character and File I/O, Basics of simple File I/O, ANSI Standard Libraries.

Others: Pre-processor with define, include, macro, ifdef, Uses of graphics functions.

Books Recommended:

1. Kernighan and Ritchie : **The C Programming Language**, *Prentice Hall*
2. Gotfreid : **Programming with C, Schaum's Outline Series**, *Tata McGraw Hill*
3. D.E. Knuth : **The Art of Computer Programming**, *Addison-Wesley Professional*
4. E. Balagurusamy : **Programming with ANSI C**, *Tata McGraw Hill*
5. H. Schildt : **Teach yourself C**, *McGraw-Hill Publishers*

CSE-1206: Structured Programming Language Sessional

Laboratory works based on **CSE-1205.**

EEE-1269: Electronic Devices and Circuits

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: Half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode.

Bipolar Junction Transistor (BJT): Principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, h parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier. Field Effect Transistors (FET): Principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; Biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS.

Operational Amplifiers (OPAMP): Linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise. Introduction to feedback, Oscillators.

Silicon Controlled Rectifiers (SCR),TRIAC, DIAC and UJT: Characteristics and applications; Introduction to IC fabrication processes.

Books Recommended:

1. Jacob Millman and Christos C. Halkias : **Electronic Devices and Circuits,** *McGraw-Hill Inc*
2. V. K. Mehta : **Principles of Electronics,** *S. Chand*
3. A. Mottershead : **Electronic Devices and Circuits**: An Introduction, *Goodyear Pub*
4. Sedra / Smith : **Microelectronics Circuits** 5th Edition
5. Mehta, Rohit, V K Mehta : **Principles of Electronics**, *S. Chand Group*
6. R.L. Boylestad; : **Introductory Circuit Analysis**, *Prentice Hall of India Private Ltd*

EEE-1270: Electronic Devices and Circuits Sessional

Laboratory works based on **EEE-1269.**

MATH-1243: Mathematics-II (Ordinary, Partial Differential Equations and Coordinate Geometry)

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Ordinary Differential Equations: Degree and order of ordinary differential equations, Formation of differential equations, Solution of first order differential equations by various methods, Solution of first order but higher degree ordinary differential equations, Solution of general linear equations of second and higher order with constant coefficients, Solution of homogeneous linear equations and its applications, Solution of differential equations of higher order when dependent and independent variables are absent, Solution of differential equations by the method based on factorization of operators.

Partial Differential Equations (PDE): Introduction, Linear and nonlinear firstorder differential equations, Standard forms of linear equations of higherorder, Equation of second order with variable coefficients, Wave equations, Particular solutions with boundary and initial conditions, Integral surface passing through given curve, Nonlinear PDE of order One (Complete, particular, singular and general integrals), Charpit's method, Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables, Linear PDE with constant coefficients.

Coordinate Geometry: Transformation of coordinate 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 coordinates, Tangents and normal, pair of tangents, Chord of contact, Chord in terms of its middle points, Pole and polar, Parametric coordinates, Diameters, Conjugate diameters and their properties, Director circles and asymptotes.

Books Recommended:

1. M. D. Raisenghania : **Ordinary and Partial differential Equations,** *S. Chand*
2. Richard Bronson and Gabriel Costa : **Schaum's Outline of Differential Equations,** *Mc Graw-Hill*

3. M. M. K. Chowdhury : **Differential Equations with Applications**
4. M. L. Khanna : **Differential Equations,** *Jai prakashan*
5. Rene Dennemeyer : **Introduction to Partial Differential Equations and Boundary Value Problems,** *McGraw-Hill*
6. Bernard Epstein : **Partial Differential Equations,** *McGraw-Hill*
7. Rahman&Bhattacharjee : **A Text Book on Coordinate Geometry**
8. S. L. Loney : **The elements of coordinate geometry**

CHEM-1201: Chemistry

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Atomic Structure: The atom, Nuclear charge and atomic number, Rutherford's nuclear model of atoms, Bohr's model, Emission Spectrum, Hydrogen spectrum, Planck's Quantum theory, Quantum number, Electronic configuration and of elements, Aufbau principle,Pauli's exclusion principle, Hund's rule, Elementary idea about the wave electron, Shape of s, p, d and f orbitals.

Periodic Classification of Elements: Modern Periodic table, Ionization potential, Electron affinity, Electronegativity, Position of hydrogen, Transition element, Inert gases, Lanthanides and actinides in the periodic table.

Group Chemistry of Elements: Alkali metals, Alkaline earth metals, inert gases, Halogens, Chalcogens, Chemistry of interhalogens, Polyhalides and carbides.

Chemical Bonds: Electron theory of valences, different types of bonds, Hybridization, hybridization of atomic orbital, Bond energy, Bond angle, Bond length, Bond order, Different types of crystal according to bond nature and Lattice-energy.

Oxidation-Reduction Reaction: Oxidation, Reduction, Oxidizing and reducing agent, Oxidation state,Valency and oxidation number, balancing of REDOX reaction, Equivalent weight of oxidizing and reducing agents, Unusual Oxidation states, EMF series.

Acids and Bases: Theories and modern definition of acid and bases, Dissociation constant, Streanth, pH, Buffer solution.

Basic Concept of Organic Chemistry: Introduction, Classification and Nomenclature, Carbohydrates. Polymer.

Gaseous State: Kinetic theory of gases, Kinetic equation, Behavior of ideal and real gases, Vander waal's equation, critical state, Principles of corresponding state, Liquefaction of gases, Maxwell's law of distribution of velocities, Densities of gases: Dissociation and Association, Molecular weights of gases and vapors, Heat capacity of gases.

Liquid State: Vapor pressure, Surface tension and viscosity of liquids: Their measurement and variation with temperature, Molecular interpretation of surface tension and viscosity of liquid water, Refractive index, optical activity.

Thermodynamics and Thermochemistry: Thermodynamical terms, Thermodynamical processes, Reversible and irreversible processes, First law of Thermodynamics, Enthalpy, Heat capacity, Joule-Thomson effect, Adiabatic process, Thermochemistry, Thermochemical laws, Kirchofff's equation, Bond energy, Flame Temperature.

Solutions: Type of solutions, Henry's law, Vapor pressure of liquid mixtures, Ideal and non ideal solution, Nernst distribution law, Deviations and applications of the distribution law.

Colligative Properties of Solutions: Lowering of vapor pressure of a solvent due to dissolved nonvolatile solute, Roult's law, Elevation of Boiling point, Depression of freezing point, Osmosis and osmotic pressure, Thermodynamics derivation of colligative properties, abnormal colligative properties of solution.

Chemical Equilibria: Law of mass action, Chemical equilibrium and equilibrium Constants, Application of law of mass action to Homogeneous and heterogeneous Equilibrium, Le-Chatelier principle, Application of principle of mobile equilibrium to reaction of industrial importance.

Electrochemistry: Theories of electrolytic dissociation, Electrolytic conductance, Ionic mobility and ionic conductance, Debye-Huckel-Onsagor theory of electrolytic conductance, Law of independent migration of ions, Application of conductance measurement, Transport number, Theories of ionization, Ostwald's distribution law, Electrochemical cell.

Books Recommended:

1. S. Z. Haider : **Introduction to Modern Inorganic Chemistry**
2. R. D. Madan : **Modern Inorganic Chemistry,** *S. CHAND & Company Ltd*
3. B. S. Bahl &ArunBahl : **Advanced Organic Chemistry,** *S. CHAND & Company Ltd*
4. S. Gilreath : **Fundamental concepts of Inorganic Chemistry**
5. S. Prakash & G. Tuli : **Advanced Inorganic Chemistry**
6. B. S. Bahl &ArunBahl : **A Text Book of Organic Chemistry**
7. G. M. Barrow : **Physical Chemistry**
8. B. S. Bahl and G. D. Tuli : **Essentials of Physical Chemistry,** *S. CHAND & Company Ltd*
9. M. M. Haque and M. A. Nawab : **Principle of Physical chemistry**
10. W. J. Moore : **Physical Chemistry**
11. S Glasstone : **A text book of Physical Chemistry**
12. S. Glsstone and D. Lewis : **Introduction to Electrochemistry**

CHEM-1202: Chemistry Sessional

Laboratory works based on **CHEM-1201.**

Books Recommended:

1. A. I. Vogel : **Text book of Inorganic Quantitative analysis,** *S. CHAND & Company Ltd*
2. R. M. Verma : **Analytical Chemistry(Theory and Practice)**

CE-1250: Engineering Drawing and CAD Sessional

Introduction: Lettering, Numbering and Heading, Instrument and their use, Sectional views and isometric views of solid geometric figures; Plan, elevation and section of multistoried buildings; Building services drawing; Use of AutoCAD software.

Books Recommended:

1. Gurucharan Singh &Subash Chandra : **Civil Engineering Drawing,** *Standard Publishers*
2. Harnonto Kumar Bhattacharjo : **Prathomic Engineering Drawing**

2nd YEAR 1st SEMESTER

CSE-2101: Digital Logic Design

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Fundamentals of Digital Logic System: Number systems, Weighted and non-weighted codes, Error detection code, Binary addition and subtraction, 2's compliment methods.

Logic Gates and Boolean Algebra: Logic circuit design, Adder, Substractor, Minimization techniques: Algebraic simplification, Karnaugh Map method, Quine-McCluskey method, Consensus method.

Switching Devices, Switching Characteristics of Diodes: Transistor and FETs.

Integrated Circuit Logic Families: DTL & TTL logic family, standard TTL series characteristics, other TTL series, TTL loading rules, TTL open-collector outputs, tristate TTL. The ECL family. Digital MOSFET circuits, characteristics, CMOS circuits, CMOS tristate logic, TTL driving CMOS, CMOS driving TTL.

Flip-Flops (FF) and Related Devices: Transistor latch, NAND gate latch, NOR gate latch, D latch.

Clock Signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, timing diagram of different FFs, Edge-triggered and level-triggered timing diagrams.

555 Timer: Architecture of 555 Timer, different application of 555 timer, 555 as Monostable, Bistable and Astable Multivibrators

A/D and D/A Converter: Sample and hold circuit, Weighted resistor and R-2 R ladder D/A Converters, specifications for D/A converters. A/D converters; Quantization, parallel-comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

* Digital Electronics → R.P Jain.

Books Recommended:

1. Ronald J. Tocci : **Digital Systems: Principles and Applications,** *Prentice Hall*
2. V. K. Jain : **An Introduction to Switching Theory and Digital Electronics,** *Khanna Publishers, New Delhi*
3. M. Morris Mano : **Digital Logic and Computer Design,** *Prentice Hall*
4. William H. Gothmann : **Digital Electronics,** *Prentice Hall*
5. A. Mottershead : **Electronic Devices and Circuits:** An Introduction, *Goodyear Pub*
6. Mehta, Rohit, V K Mehta : **Principles of Electronics,** *S. Chand Group*

CSE-2102: Digital Logic Design Sessional

Laboratory works based on **CSE-2101**

CSE-2103: Data Structures

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Data Representation: Internal data representation, Abstract data types; Ideas on linear and non linear data structures, Elementary data structures.

Arrays: Maximization, Ordered lists, Sparse matrices, Representation of arrays.

Stacks, Queues and Recursion: Different types of stacks and queues: Circular, dequeues, etc; Evaluation of expressions, Multiple stacks and queues.

Recursion: Direct and indirect recursion, Depth of recursion; Simulation of recursion, Removal of recursion; Towers of Hanoi.

Links Lists: Singly linked lists, Linked stacks and queues, The storage pool, Polynomial addition, Equivalence relations, Sparse matrices, Doubly linked lists and dynamic storage management, Generalized lists, Garbage collection and compaction.

Trees: Basic terminology, Binary trees, Binary tree representations, Binary tree traversal; Extended binary trees: 2-trees, Internal and external path lengths, Huffman codes/algorithms; Threaded binary trees, Binary tree representation of trees; Application of trees: Set representation, decision trees, games trees: Counting binary trees.

Graphs: Introduction, definitions and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure, activity networks, topological sort and critical paths, enumerating all paths.

Symbol Tables: Static tree tables, dynamic tree tables; Hash tables: Hashing functions overflow handling, Theoretical evaluation of overflow techniques.

Files: File, queries and sequential organizations: Indexing techniques: Cylinder-surface indexing hashed indexes, Tree indexing-B-trees; Tree indexing.

Books Recommended:

1. E. Horowitz and S. Sahni : **Fundamentals of Data Structures,** *Galgotia*
2. Edward M. Reingold &Wilfred J. Hansen : **Data Structures,** *Addison Wesley Publishers*
3. Niklaus Wirth : **Algorithms + Data Structures = Programs,** *Prentice Hall*
4. Robert L. Kruse : **Data Structures and Program Design,** *Prentice Hall*
5. Seymour Lipshultz : **Data Structures (Schaum's Outline Series),** *Tata McGraw-Hill*
6. E. Horowitz and S. Sahni : **Computer Algorithms,** *Galgotia*
7. Seymour E. Goodman & S. T. Hedetniemi : **Introduction to Design and Analysis of Algorithms,** *McGraw-Hill*

CSE-2104: Data Structure Sessional

Laboratory works based on **CSE-2103.**

CSE-2105: Object Oriented Programming Language

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Object oriented programming and procedural oriented programming. Encapsulation, Inheritance, Polymorphism, Data abstraction, Data binding, Static and dynamic binding, Message passing.

C++ As An Object Oriented Language: Declaration and constants, Expression and Statements, Data types, Operator, Functions.

Classes: Structure of classless. Public, Private and Protected members, Array of object, Argumented member function, and non-augmented objects, Nested member class and their object, Pointer objects and pointer members, Object a argument of function, Static class member and static class. Friend function, friend class.

Inheritance: Mode of inheritance, Classifications of inheritance, Virtual inheritance, Array of objects of derived class.

Constructor and Destructors: Default constructor, Argumented constructor, Copy constructor, Dynamic constructor, Constructor function for derived class and their order of execution, Destructor.

Operator and Function Overloading, Unary and binary operator overloading, Run-time and compile time polymorphism, Object pointer and pointer to an object, Virtual function, Dynamic binding.

C++ Data File: C++ file stream classes, Input and output file, Mode of files, File pointer, Random file accessing.

Template and Exception Handling: Function template and class template, Exception Handling.

Books Recommended:

1. H. Schidt : **C++: A Beginner's Guide,** *McGraw Hill*
2. H. Schidt : **C++: The Complete Reference**, *McGraw Hill*
3. N. Barkakati : **Object Oriented Programming with C++,** *Prentice Hall India*

CSE-2106: Object Oriented Programming Language Sessional-I

Laboratory works based on **CSE-2105**

EEE-2169: Electrical Drives and Instrumentation

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Transformers: Transformation ratio equations, Losses, Ideal Transformer, Voltage regulation, Matching Transformer.

Alternators: Faradays Law, Dynamo, Generated voltage equation, Voltage regulation, DC Generator; Synchronous motor and Induction motor; DC motor; Stepper motors; Thyristor and Microprocessor based speed control of motors.

Instrumentation Amplifiers: Differential, logarithmic and chopper amplifiers; Frequency and voltage measurements using digital techniques; Recorders and display devices; Spectrum analyzers and Logic analyzers; Data acquisition and Interfacing IO microprocessor based systems.

Transducers: Types, principles and application of photovoltaic, piezoelectric, thermoelectric, variable reactance and opto-electronic transducers; Noise reduction in instrumentation.

Books Recommended: (Vol-2)

1. B.L Theraja : A Text Book of Electrical Technology, *S.Chand*
2. Irving L. Kossow : Electrical Machinery and Transformers, *Prentice Hall*
3. A.K. Sawhney : A Course in Electrical and Electronic Measurements and Instrumentation, *Dhanpat Rai Publications*
4. David A. Bell : Electronic Instrumentation and Measurements, *Oxford University Press*

EEE-2170: Electrical Drives and Instrumentation Sessional

Laboratory works based on **EEE-2169**

MATH-2145: Mathematics-III (Vector Analysis, Matrices and Fourier Analysis)

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Vector Analysis: Scalars and vectors, equality of vectors, Addition and subtraction of vectors, Multiplication of vectors by scalars, Scalar and vector product of two vectors and their geometrical interpretation, Triple product and multiple product, Linear dependence and independence of vectors, Differentiation and integration of vectors together with elementary applications, Definition of line, surface and volume integrals, Gradient, divergence and curl of point functions, Various formulae: Gauss's theorem, Stokes' theorem and Green's theorem.

Matrices: Definition of matrix, Different types of matrices, Algebra of matrices. Adjoint and inverse of a matrix, Elementary transformations of matrices, Matrix polynomials, Cayley-Hamilton theorem with uses of rank and nullity, Normal and canonical forms, Eigenvalues and eigenvectors.

Fourier Analysis: Real and complex form of Fourier series, Finite Fourier transform, Fourier integrals, Fourier transforms and their uses in solving boundary value problems of wave equations.

Books Recommended:

1. Murray R.Spiegel : **Schaum's Outline of Theory and Problems of Vector Analysis,** *S. Chand*
2. V.O'Neil : **Advanced Engineering Mathematics,** *Global Engineering*

3. Howard Anton and Chris Rorres : **Elementary Linear Algebra: Applications Version,** *John Wiley*

4. Frank Ayres, Jr : **Schaum's Outline of Theory and Problems of Matrices,** *McGraw-Hill*

5. A.R Vasishtha : **Matrices**

6. Murray R. Spiegel. : **Schaum's Outline of Fourier Analysis with Applications to Boundary Value Problems,** *McGraw-Hill*

7. Ruel V. Churchill and James Ward Brown : **Fourier Series and Boundary Value Problems**

2nd YEAR 2nd SEMESTER

CSE-2211: Numerical Analysis

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Floating-point Arithmetic: Floating-point representations, General properties, Floating-point exception handling, Rounding methods, Floating-point operations (+, -, ×, /)

Approximations and Errors: Accuracy and Precision, Error definitions, Round-off errors, Truncation errors.

Roots of Equations: Graphical methods, The Bisection method, The False-Position method, Simple One-Point iteration, The Newton-Raphson method, The Secant method.

Systems of Linear Algebraic Equations: Gauss elimination, Solving small numbers of equations, Naive gauss elimination, Pitfalls of elimination methods, Matrix inversion and Gauss–Seidel, The Matrix inverse, Error analysis.

Curve Fitting: Linear regression, Polynomial regression, Multiple linear regression, Newton's divided-Difference Interpolating Polynomials.

Numerical Differentiation and Integration : The Trapezoidal rule, Simpson's rules, Integration with unequal segments, Romberg integration, Gauss quadrature, High-accuracy differentiation formulas, Richardson extrapolation, Derivatives of unequally spaced data.

Finite-difference Methods for Ordinary Differential Equations: Stability analysis of finite-difference methods: Euler, backward euler, midpoint, trapezoidal, midpoint-trapezoidal predictor-corrector, Runge-Kutta methods.

Books Recommended:

1. Steven C. Chapra, Raymond P. Canale : **Numerical Methods for Engineers,** *McGraw-Hill*

2. S. S. Kuo : **Computer Applications of Numerical Methods,** *Addison-Wesley*

3. S. S. Sastry : **Introductory Methods of Numerical Analysis,**

Prentice-Hall of India Pvt. Ltd

4. Cantrell : **Modern Mathematical Methods for Physicists and Engineers**, *Cambridge University Press*
5. Press, Teukolsky, Vetterling and Flannery : ***Numerical Recipes* in C: The Art of Scientific Computing,** *Cambridge University Press.*
6. V. Rajaraman : **Computer Oriented Numerical Method**, *Prentice-Hall of India Pvt. Ltd*

CSE-2212: Numerical Analysis Sessional

Laboratory works based on **CSE-2211.**

CSE-2213: Digital Electronics and Pulse Technique

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Diode logic gates, Transistor switches, Transistor gates, Open collector and High impedance Gates, MOS Gates.

Digital Logic Families: TTL, ECL, IIL and CMOS logic with operation details.

Characteristics of Digital ICs: Propagation delay, Power dissipation, Figure of merit, Fan out, and Noise immunity; Electronic circuits for Flip Flops, Counters and Register, Memory systems, PLAs; S/H circuits, A/D and D/A converters with applications.

Wave Shaping: Linear wave shaping, Diode wave shaping techniques, Comparator circuits, Switching circuits; Pulse transformers, Pulse transmission, Pulse generation; Monostable, Bi-stable and Astable multivibrator; Schmitt trigger; Optically coupled oscillators; Blocking oscillators and Time-base circuit; Timing circuits; Simple voltage sweeps, linear current sweeps.

Books Recommended:

1. Jacob Millman and Herbert Taub. : **Pulse, Digital and Switching waveforms,** *McGraw -Hill*
2. Jacob Millman : **Microelectronics: Digital and Analog Circuits and Systems,** *McGraw -Hill*
3. Robert Coughlin : **Operational Amplifier and Linear Integrated Circuits,** *Pearson*

CSE-2214: Digital Electronics and Pulse Technique Sessional

Laboratory works based on **CSE-2213.**

CSE-2215: Computer Architecture

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Concepts and Terminology: Digital computer components Hardware & Software and their dual nature, recent development, Role of Operating Systems (OS).

Processor Design: Processor organization, information representation, number formats; Fixed Point Arithmetic: Addition, subtraction, multiplication, division; ALU Design: Basic ALU organization, floating point arithmetic.

Control Design: Hardwired control: Design methods, multiplier control unit, CPU control unit; Basic concept of Micro programmed control, Control memory optimization.

Memory Devices and its Organization: Different types of semiconductor memory, magnetic memory, optical memory, virtual memory, memory hierarchies; High-speed memories: Interleaved memories, caches, associative memories.

System Organization: Communications; Bus control; I/O Systems: Programmed I/O, DMA and interrupts, I/O processors.

Application HDL for Microcomputer Design: Description of Adder, ALU by using HDL, Implementation of a simple microcomputer system using HDL.

Books Recommended:

1. John P. Hayes : **Computer Architecture and Organization,** *McGraw-Hill*
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky : **Computer Organization,** *McGraw-Hill*
3. Kai Hwang and Faye A. Briggs : **Computer Architecture and Parallel Processing,** *McGraw-Hill*
4. William Stallings : **Computer Organization and Architecture: Designing for Performance,** *Prentice Hall*

CSE-2217: Algorithms

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Basics of Algorithm: Algorithms as a technology, Analyzing algorithms, Designing algorithms, Time and space analysis of algorithms, Average, best and worst case analysis, Different notations.

Sorting: Insertion sort, Heap sort, Quicksort, Counting sort, Radix sort, Bucket sort.

Dynamic Programming: Assembly-line scheduling, Matrix-chain multiplication, Longest common subsequence, Optimal binary search trees.

Greedy Method: An activity-selection problem, Elements of the greedy strategy, Huffman codes.

Graph Algorithms: Depth-first search, Breadth-first search, Topological sort, Minimum spanning tree, Kruskal's and Prim's algorithm, Bellman-Ford algorithm, Dijkstra's algorithm, Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, Ford-Fulkerson method.

Computational Geometry: Line-segment properties, Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points.

Backtracking: 8 queen's problem, Sum of subsets, Graph coloring problem, and Hamilton cycles.

Branch and Bound: Lest cost search, 15-puzzle problem, Knapsack problem, Traveling salesman problem.

NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete problems.

Books Recommended:

1. Thomas H. Kormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein : **Introduction to Algorithms,** *The MIT Press*
2. D. E. Knuth : **The Art of Computer Programming, Vol. 1, 2, 3,** *Addison-Wesley*
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran : **Fundamentals of Computer Algorithms,** *Galgotia Publications*

CSE-2218: Algorithms Sessional

Laboratory works based on **CSE-2217.**

CSE-2222: Object Oriented Programming Language Sessional-II

Laboratory works based on **CSE-2105 (JAVA).**

MATH-2247 Mathematics-IV(Complex Variable and Laplace Transform)

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Complex Variable: Complex number system. General functions of a complex variable, Limits and continuity of functions of complex variables and related theorems, Complex differentiation and the Cauchy-Riemann equations. Mapping by elementary functions, Line integral of complex functions, Cauchy's integral theorem, Cauchy's integral formula, Liouville's theorem, Taylor's theorem and Laurent's theorem, Singular points, Residues and Cauchy's Residue theorem, Evaluation of residues, Contour integration, Conformal mapping.

Laplace Transforms: Definition, Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transformation, Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic functions, Some special theorems on Laplace transforms, Partial fraction, Solutions of differential equations by Laplace transforms, Evaluation of improper integrals.

Books Recommended:

1. Murray R. Spiegel : **Schaum's Outline of Theory and Problems of Complex Variables**
2. James Ward Brown and Ruel V. Churchill : **Complex Variables and Applications**
3. Murray R. Spiegel : **Schaum's Outline of Laplace Transforms**

HUM-2215: Engineering Economics & Managerial Accounting

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Microeconomics: Definition of economics; Fundamentals of economics; Market and government in amodern economy; Basic elements of supply and demand; Choice and

utility; Indifference curve technique; Analysis of cost; Short run long run theory of production.

Macroeconomics: Key concept of macroeconomics; Saving, consumption, investment; Nationalincome analysis; Inflation, Unemployment.

Development: Theories of developments; Banking system of Bangladesh, National Budget, Development partners (World Bank, Asian Development Bank, World Trade Organization, International Monetary Fund)

Managerial Accounting: Cost concepts and classification; Overhead cost: Meaning and classification; Distribution of overhead cost: Overhead recover method/rate; Job order costing: Preparation of job cost sheet and question price, Inventory valuation: Absorption costing and marginal/variable costing technique; Cost-Volume-Pro fit analysis: Meaning, breakeven analysis, contribution margin analysis sensitivity analysis. Short-term investment decisions; Relevant and differential cost analysis. Long-term investment decisions: Capital budgeting, various techniques of evaluation of investments.

Books Recommended:

1. Paul Samuelson : **Economics,** *McGraw-Hill*
2. John Sloman : **Economics,** *Pearson*
3. Michael P. Todaro : **Economics Development,** *Pearson*
4. Dudly G luckett : **Money and Banking**
5. Garrison : **Managerial Accounting**
6. Kieso : **Accounting Principal**

3rd YEAR 1st SEMESTER

CSE 3101: Database Management Systems

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Database system applications, Purpose of database systems, View of data, Database languages, Relational databases, Database design, Data storage and querying, Transaction management, Database architecture, Data mining and information, Retrieval, Specialty databases, Database users and administrators.

Introduction to the Relational Model: Structure of relational databases, Database schema, Keys, Schema, Diagrams, Relational query languages, Relational operations.

Introduction to SQL: Overview of the SQL query, Language, SQL data definition, Basic structure of SQL, Queries, Null values, Aggregate functions, Modification of the database.

Intermediate SQL: Join expressions, Views, Transactions, Integrity constraints, SQL data types and schemas.

Advanced SQL: Accessing SQL from a programming language, Functions and procedures, Triggers, Recursive Queries, Advanced aggregation features.

Formal Relational Query Languages: The relational algebra, The tuple relational calculus, The domain relational calculus.

Database Design and the E-R Model: Overview of the design process, Entity-Relationship model, Constraints, Removing redundant attributes in entity sets, Entity-Relationship diagrams.

Relational Database Design: Features of good relational designs, Atomic domains and First normal form, Decomposition using functional dependencies, Functional-Dependency theory, Decomposition using multivalued dependencies, More normal forms, Domain-Key normal form.

Object-Based Databases: Complex data types, Structured types and inheritance in SQL, Object-Relational mapping, Object-Oriented versus object-relational.

XML: Structure of XML Data, XML document schema, Querying and transformation, Application program interfaces to XML, Storage of XML data, XML applications.

Books Recommended:

1. A. Silberschatz : **Database System Concepts,** *Mcgraw-Hill.*
2. R. Ramakrishnan, Johannes Gehrke : **Database Management System,** *McGraw-Hill Higher Education*
3. James Martin : **Principles of Database Management**, *Prentice-hall*
4. Ullman : **Database Management systems**, *Prentice-Hall Publication.*
5. Abey : **Oracle 8i a Beginners Guide**, *McGraw Hill*

CSE-3102: Database Management Systems Sessional

Laboratory works based on **CSE-3101.**

CSE-3103: Compiler

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to compiler, compiler and translator, the structure of a compiler.

Grammars: Notation and concepts for languages and Grammars, sets and string, Discussion and classification of Grammars, Scanner regular expression, regular definition, finite automata, LL and LR Grammars, ambiguous grammar.

Parsing: Basic parsing technique, parsers, shift reduce parsing, operator-procedure parsing, top-down parsing, bottom up parsing, predictive parsing.

Syntax: Syntax directed translation, intermediate code generation, polish notation, parse tree and syntax trees, quadruples, triples, Boolean expression.

Symbol Table: Perspective and motivation of symbol table. Symbol table content, operation on symbol table, organization of symbol table.

Code Optimization: Code optimization, sources of optimization, basic blocks, folding, loop optimization, flowgraph, induction variable elimination, reduction in strength, code motion.

Error Handling: Compile time error handling, error detection, error recovery, error repair.

Coding: Code generation, object programs, problems in code generation, a machine model, a simple code generator, register allocation and assignment peephole optimization.

Books Recommended:

1. Alfred V. Aho and Jeffrey D. Ullman : **Principles of Compiler Design**, *Addison-Wesley Publication*
2. A.J. Holub : **Compiler design in C**, *Prentice-Hall of India*
3. Trembly and Sorensen : **Theory and Practices of Compiler Writing**, *McGraw-Hill computer science series*
4. Hopcroft and Ulman : **Introduction to Automata Theory, Languages and Computation**, *University of Toronto*
5. Adamek : **Automata and Algebra**, *Kluwer Academic Publishers Norwell, MA, USA*

CSE-3104: Compiler Sessional

Laboratory works based on **CSE-3103.**

CSE-3105: Microprocessors and Micro-controller

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Microprocessor Fundamentals: Architecture of a microprocessor: Data bus, address bus, control bus, I/O units and memory.

Architecture: Architecture of Intel 8086 Microprocessor, its execution unit and bus-interface unit, its registers and flags.

Programming Model: Programming model of 8086 processor, segment-offset address and physical address calculations, even and odd addressing, introduction of different addressing modes, Operating systems and BIOS, Memory organization of -PC. Architectural overview of Intel Family, Microprocessor and its operation, Common instruction types, addressing modes, timings, interrupts controllers and DMA interfacing ICs.

Intel 8086 Microprocessor : Internal architecture, register structure, programming model, addressing modes, instruction set; I/O Pin diagram and Control signals; I/O port organization and accessing; Cache memory, TLB structure; Memory management in Intel 80X86 Family; Segmentation and Real Mode Memory Management. Intel 80386 and 80486 segment register formats, Paged memory operation, Linear to physical address translation; Interrupts and Exception in Intel 80X86 families of processors, type of Interrupts, Interrupts in real mode and protected mode, Interrupt descriptor tables, Interrupts priorities.

Input and Output : I/O address spaces, Port organization, Memory mapped I/O, Hand-shaking I/O instruction, Protection issues in Intel 80X86 family-privilege levels; An overview of Pentium and alpha RISC processors.

Books Recommended:

1. Yuha Yu and CharlersMarut : **Assembly Language Programming and Organization of the IBM PC**, *McGraw-Hill*
2. Rafiquzzaman : **Microprocessor and Microcomputer based System**

Design, *Crc Press Publication*

3. D. V. Hall : **Microprocessors and Interfacing**, *McGraw-Hill*
4. Y. Liu and G. A. Gibson : **Microcomputer Systems: 8086/8088 Family**, *Prentice-Hall*
5. Artwick : **Microcomputer Interfacing**, *Prentice-Hall series*
6. Ramesh Goanker : **Microcomputer Interfacing**, *McGraw-Hill*

CSE-3106: Microprocessors and Micro- controllers Sessional

Laboratory works based on **CSE-3105.**

CSE-3107: Theory of Computation

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Logic and Proofs, Mathematical inductions, Sets, Equivalence relations, Language and recursive definitions.

Languages and Grammars: Finite Automata - accepting languages, strings, string search algorithm, distinguishing strings, integers, lexical analysis, decision problems and languages, minimizing finite automata.

Regular Languages and Expression: Non-deterministic finite automata, Kleene's theorem. Contex-free languages, regular languages and grammars. Simplified forms and normal forms. Push-Down Automata- deterministic PDA and non-deterministic PDA, top-down and bottom-up PDA. Parsing - top down and bottom-up parsers. Decision problems and CFL.

Computational Models: Computational tasks - search and decision problems, General model of computation, Turing machines - definition of Turing machine, Turing machine and regular languages, computing partial functions with Turing machine, composite and multi-tape Turing machines, non-deterministic Turing machines, universal Turing machine. Boolean circuits. Parallel random access machines.

Decision Problems: Undecidable problems, Reduction and halting problem, Undecidable problems and context-free languages. Decision trees. Satisfiability problem.

Computational Complexity: Introduction to complexity theory, Time complexity of a turing machine, Polynomial-time reductions and NP completeness, NP-hard and NP-complete languages, the Cook-Levin theorem. Space complexity-time vs. space, logarithmic space, non-deterministic space complexity. Communication complexity.

Books Recommended:

1. John C. Martin : **Introduction to Languages and The Theory of Computation.** *McGraw Hill 2011*
2. Sanjeev Arora and Boa Barak : **Computational Complexity: A Modern Approach**
3. Oded Goldreich : **Complexity of Algorithms - A Conceptual Perspective**
4. Peter Gacs and Laszlo Lovasz : **Complexity Algorithms**

CSE-3108: Assembly Language Programming Sessional

Introduction: System Architecture for Assembly language; Assembly programming basics.

Assembly Instruction Types and Their Formats: Arithmetic, Logical, Transfer control and conditional processing, Stacks, Branches, String processing, subroutine and parameter passing, macros, Input/Output; Interrupts; Procedures, file system and file I/O handling.

Books Recommended:

1. Ytha Yu, Charles Marut : Assembly Language Programming and Organization of the IBM PC

CSE-3109: Computer Network

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Computer networks and applications, OSI reference model, TCP/IP model and terminology, Connectionless and Connection Oriented services, Service primitives, The ARPANET

Physical Layer: Circuit switching and Packet switching, X-25 protocol, Frame relay and Cell relay, ATM reference model.

Medium Access Sub Layer: Pure and slotted ALOHA, Persistent and non persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet.

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

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

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

Presentation Layer: Data Compression techniques, Frequency dependent coding, Context dependent encoding.

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

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

Books Recommended:

1. Behrouz A. Forouzan : **TCP/IP Protocol Suite**, *McGraw-Hill*
2. Andrew S. Tanenbaum : **Computer Networks**, *Prentice Hall*

3. William Stallings : **Data and Computer Communications,** *Prentice Hall*
4. Behrouz A. Forouzan : **Data Communications and Networking,** *McGraw-Hill*

CSE-3110: Computer Network Sessional

Laboratory works based on **CSE-3109.**

3rd YEAR 2nd SEMESTER

CSE-3211: Operating System

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to OS. Operating system functions, evaluation of O.S., Different types of O.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

Process Management: Concept of processes, process scheduling, operations on processes, co-operating processes, interprocess communication.

Threads: Overview, benefits of threads, user and kernel threads.

CPU Scheduling: Scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Process Synchronization: Background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.

Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management: Memory Management: Background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: Background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems: File concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, and indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: Disk reliability, disk formatting, boot block, bad blocks.

Protection & Security: Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Books Recommended:

1. Abraham Silberschatz and Peter Baer Galvin : **Operating Systems Concepts**, *Wiley Publisher*
2. Tanenbaum : **Operating Systems**, *Prentice-Hall*
3. Madnick and J. Donovon : **Operating systems**, *McGraw-Hill*
4. B. Hausen : **Operating System Principles**, *Prentice-Hall of India*
5. Donovan : **Systems Programming**, *McGraw-Hill*
6. Maurice. J. Bach : **The design of the Unix operating system**, *Prentice-Hall*
7. M. MilenKovic : **Operating System Concept and Design**, *Tata McGraw Hill*
8. Terrence : **Unix System Programming in C++**, *Prentice Hall Publication*

CSE-3212: Operating System Sessional

Laboratory works based on **CSE-3211.**

CSE-3213: Computer Graphics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction to Computer Graphics and Graphics Systems: Overview of computer graphics, representing pictures, preparing, presenting and interacting with pictures for presentations; Visualization and image processing; RGB color model, direct coding, lookup table; Storage tube graphics display, Raster scan display, 3D viewing devices, plotters, printers, digitizers, light pens etc.; Active and Passive graphics devices; Computer graphics software.

Scan Conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; Scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

2D Transformation and viewing: Basic transformations: translation, rotation, scaling; Matrix representations and homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D transformation and Viewing: 3D transformations: Translation, rotation, scaling and other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; Clipping, view port clipping, 3D viewing.

Curves: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic Bspline curves, rational B-spline curves.

Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

Color and Shading Models: Light & color model; Interpolative shading model; Texture.

Books Recommended:

1. Donald Hearn and M. Pauline Baker : **Computer Graphics**, *Prentice Hall*
2. Steven Harrington : **Computer Graphics: A Programming Approach**, *McGraw-Hill College*
3. F. S. Hill : **Fundamentals of Computer Graphics**, *Prentice Hall*
4. Plastock and Kalley : **Computer Graphics**, *Mcgraw-hill*
5. Zhigang Xiang & Roy Plastock : **Computer Graphics**, *Mcgraw-hill*

CSE-3214: Computer Graphics Sessional

Laboratory works based on **CSE-3213.**

CSE-3215: Data Communication

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Fundamentals: Communication engineering fundamentals, Waveforms spectra, Periodic waveforms and its properties, Fourier series, Noise and its different types.

Amplitude Modulation: Amplitude modulation, Amplitude modulation index, Frequency spectrum for sinusoidal AM, AM broadcast transmitter.

Frequency Modulation: Frequency modulation, Sinusoidal FM, Frequency spectrum for Sinusoidal FM, FM transmitter. FM receiver, Phase modulation.

Pulse Modulation: Pulse Codes Modulation (PCM), Quantization, Compression, PCM Receiver, Differential PCM, Delta modulation, Sigma-Delta A/D conversion, Pulse Frequency Modulation (PFM), Pulse Time Modulation (PTM), Pulse Position Modulation (PPM).

Digital Communication: Digital communication, Basic digital communication system, Synchronization, Asynchronous transmission, Probability of Bit Error in base band transmission, Matched filter, Eye diagrams, Digital carrier systems, Amplitude shift keying, Frequency shift Keying, Phase shift keying, Carrier recovery circuits, Differential phase shift keying, Error control coding, Block control, Repetition encoding, Parity encoding, Convolution encoding.

Propagation: Radio wave propagation, Mode of propagation, Microwave systems, Tropospheric propagation, VHF/UHF Radio systems.

Satellite Communication: Satellite communication, Kepler's First and Second Law, Orbits, Geostationary orbits, Power system.

Fiber Optic Communication: Fiber optic communication, Propagation within a fiber, Modes of propagation, Losses in fibers, Light sources for fiber optics, Photo detectors.

Books Recommended:

1. Behrouz A. Forouzan : **Data Communications and Networking,** *Tata McGraw-Hill Edition*
2. William Stallings : **Data and Computer Communications,** *Prentice Hall International, Inc*
3. John M. Senior : **Optical Fiber Communications** , *Prentice-Hall of India Pvt Ltd*
4. F. Halsall : **Data Communication, Computer Network and open systems,** *Addison Wesly*
5. Andrew S. Tanenbaum : **Computer Networks,** *Prentice Hall of India Pvt. Ltd*

CSE-3216: Data Communication Sessional

Laboratory works based on CSE-3215.

CSE-3217: Software Engineering

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to software engineering, Importance of software, The Software evolution, Software characteristics, Software components, Software applications, Crisis-Problem and causes.

Software Development Life-Cycle: Requirement analysis, software design, coding, testing and maintenance etc.

Software Requirement Specification: Water fall model, prototyping interactive enhancement, spiral model role of management in software development, role of matrices and measurement, Problem analysis, requirement specification, validation, matrices, monitoring and control.

System Design: Problem partitioning, abstraction, top down and bottom up–design, structured approach, functional versus object oriented approach, design specification and verification matrices, monitoring and control, cohesiveness, coupling, 4 GL. Visio, DFD, Rational Rose, Visio, VS architectural design.

Coding: TOP-DOWN and BOTTOM-UP structure programming, information hiding, programming style, and internal documentation, verification, metrics, monitoring and control, Subversion, Team System, Source Safe

Testing: Levels of testing, functional testing, structural testing, test plane, test class specification, reliability assessment, Software testing strategies, Verification and validation, Unit, Integration testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. NUnit for unit testing, Selenium, WebLoad

Software Project Management: Cost estimation, project scheduling, staffing, software configuration management, structured vs unstructured maintenance, quality assurance, project monitoring, risk management. Agile-XP, scrum, Rally, Version One, Bugzilla, Visual Studio Team System. Agile project management, comparison with traditional process, Next generation software engineering

Function Oriented and Object Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams, extending DFD to real time

systems, Object oriented design, Graphical representation of OOD, Generic OO development paradigm.

Software Reliability and Quality Assurance: Reliability issues, reliability metrics, reliability growth modeling, software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM, NANT, Cruise control. Net for automated build.

Books Recommended:

1. Roger S. Pressman : **Software Engineering, A practitioner's Approach,** *McGraw-Hill*
2. Ian Sommerville : **Software Engineering**, *Pearson Education*
3. Richard Fairley : **Software Engineering Concepts**, *McGraw-Hill*
4. Robert N. Charette : **Software Engineering Environments,** *McGraw-Hill*
5. S. L. Pfleeger and J.M. Atlee : **Software Engineering Theory and Practice**, *Pearson Education*

CSE-3222: Software Development Sessional

Students will develop complete software in group/individually using an object oriented programming Language. Theoretical concept will be taken from **CSE-2105.**

CSE-3219: Applied Statistics and Queuing Theory

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 contact hours/week, Lecture: 42, Exam. Time: 3 hours

Applied Statistics: Introduction; Frequency distribution, mean, median, mode and other measure of central tendency standard deviation and other measure of dispersion, Moments, Skewness and kurtosis, Elementary probability theory, Characteristics of distributions, elementary sampling theory, Estimation, Hypothesis testing and regression analysis. Probability distribution and expectations, discontinuous probability distribution, e.g. binomial, position and negative binomial. Continuous probability distributions, e.g. normal and exponential.

Queuing Theory: Stochastic processes, Discrete time Markov chain and continuous time Markov Chain. Birth-death process in queuing.

Queuing Models: M/M/1,M/M/C,M/G/1,M/D/1,G/M/1 solution of network of queue-closed queuing models and approximate models. Application of queuing models in Computer Science.

Books Recommended:

1. Rebecca (Becky) M. (Margaret) Warner : **Applied Statistics**
2. Jay L. Devore and Nicholas R. Farnum : **Applied Statistics for Engineers and Scientists**
3. U. Narayan Bhat : **An Introduction to Queuing Theory**
4. William J. Stewart : **Probability, Markov Chains, Queues, and Simulation: The Mathematical Basis of Performance Modeling**
5. S. L. Pfleeger and J.M. Atlee : **Software Engineering Theory and Practice**, *Pearson Education*

CSE-3220: Industrial Training

Evaluation report from industry is to be submitted at the end of the training and accordingly to be incorporated in the tabulation sheet.

HUM-3255: Sociology

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

2 Credits, 2 Contact hours/week, Lecture: 28, Exam. Time: 3 hours

Introducing Sociology: Meaning and scope of Sociology, The Socio-cultural context of the emergence of Sociology: Industrial revolution, French revolution (1789), Colonial to anti-colonial revolution in Asia, The development of Sociological thinking: Theoretical approaches, Early theories, Modern theoretical approaches.

Globalization and the Changing World: Types of Societies: Pre-modern Societies, Modern Societies, Post-modern societies and global development, Social changes in Society, Globalization: Debate and the impacts of all over the World.

Theoretical Thinking Briefly: Karl Marx, Emile durkheim, Weber, Ulrick beck.

Socialization Processin Everyday Life: The Study of daily life: .Non-Verbal communication through face, Gesture and Emotion, Culture and Society: Child development, Peer relationship, Gender socialization: Family, School and Public life.

Family, Marriage and Intimate Relationship: Types of family: Nuclear, Extended, Types of marriage: Monogamy, Polygamy, Factors of changes in family pattern: Westernization, Large scale rural-urban Migration, non-farm employment opportunities.

Recommended Books:

1. Bourdieu, Pierre : **The Social Structure of the Economy**, *Cambridge: Polity Press*
2. Castle, Manuel. : **The Rise of the Network Society (Vol.1); The Power Identity (Vol.2), and End of Millenium,** *Oxford: Blackwell*
3. Giddens, Anthony : **Sociology,** *London: The Polity press*
4. Haralambos and Holborn : **Sociology: Themes and Perspectives**, Fifth Edition, *Collins*
5. MaCionis, John : **Sociology,** *New Jersey: Pearson*
6. Rao,Shanker : **Sociology-Primary Principles,**

4th YEAR 1st SEMESTER

CSE-4100: Project/Thesis

Each student has to complete one Project or Thesis in the combined duration of two semesters of 4th year. In course CSE 4100 (Part-I), a student has to make a proposal defense at the end of the semester. The defensed project has to be completed in the continuation course CSE 4200 (Part-II) in next semester.

CSE-4101: System Analysis and Design

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to information systems, general design consideration of information systems.

Overview: system concepts and the information systems environment, information needs, the concepts of MIS, the system development life cycle, the role of the systems analysis.

Systems Analysis: Systems planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost benefit analysis.

Systems Design: The process and stages of systems design, input/output and forms design, file organization and data base design.

System Implementation: System testing and quality assurance, implementation and software maintenance, hardware/software selection, project scheduling and software, security, disaster/recovery, and ethics in system development.

Case Study: Case studies of various information systems such as: Library management system, inventory system, voter identity management system, payroll system, etc.

Books Recommended:

1. E.M. Awad : **System Analysis and Design**, *Galgotia Publication Ltd*
2. P. Edwards : **System Analysis & Design,** *McGraw-Hill*
3. J.G. Burch Jr., F.R. Strater and G. Grundnitski : **Information Systems: Theory and Practice,** *John Wiley & Sons*
4. G. Scott. : **Principles of Management Information Systems,** *McGraw-Hill*
5. A. Daniels and D. Yeates : **Basic System Analysis,** *Galgottia*

CSE-4102: System Analysis and Design Sessional

Laboratory works based on **CSE-4101.**

CSE-4103: Artificial Intelligence

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: History of Artificial Intelligence, Intelligent agents, Structure of agents and its functions, Problem spaces and search, Heuristic search techniques, Best-first search, Problem reduction, Constraint satisfaction, Means ends analysis.

Knowledge Representation: Approaches and issues in knowledge representation, Knowledge, Based agent, Propositional Logic, Predicate logic, Unification, Resolution, Weak slot, Filler structure, Strong slot, filler structure.

Reasoning Under Uncertainty: Logics of non-monotonic reasoning, Implementation, Basic probability notation, Bayes rule, Certainty factors and rule based systems, Bayesian networks, Dempster, Shafer theory, Fuzzy logic.

Planning and Learning: Planning with state space search, conditional planning,continuous planning, Multi-agent planning. Forms of learning, inductive learning, Reinforcement learning, learning decision trees, Neural net learning and Genetic learning

AI Programming Languages: Introduction to PROLOG, knowledge representation, domain, predicate, clauses, database, back tracking, unification, list, and compound object using prolog.

Introduction to Selected Topics in AI: Neural Networks, Expert system, Robotics and Fuzzy logic.

Books Recommended:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair : **Artificial Intelligence,** *Tata McGraw-Hill*
2. Staurt J. Russel and Peter Norvig : **Artificial Intelligence: A modern Approach,** *Pearson Education Asia*
3. D. W. Patterson : **Introduction to Artificial Intelligence and Expert System,** *Prentice-Hall of India*
4. Patrick Henry Winston : **Artificial intelligence,** *Pearson Education Inc.*
5. N. P. Padhy : **Artificial Intelligence and Intelligent System,** *Oxford University Press*
6. Carl Townsend : **Introduction to Turbo Prolog,** *Sybex Inc*
7. Bratko, I : **Prolog Programming for Artificial Intelligence,** *Addison Wesley*
8. Clocksin, W.F. and Mellish, C.S. : **Programming in Prolog: Using the ISO Standard,** *Springer*

CSE-4104: Artificial Intelligence Sessional

Laboratory works based on **CSE-4103.**

CSE-4106: Software Development for Web Apps Sessional

Introduction: Internet, History of the TCT/IP protocol, World Wide Web.

Web servers: Case of Apache, other web servers.

Webpage Design: HTML, JavaScript; XML Schemas, their validation and transformation; dynamic webpages with CGI, PHP or JSP and database access.

Webservices: SOAP,WSDL (Web Service Description Language), XML-RPC protocol; configuration, maintenance, monitoring and security.

Books Recommended:

1. Purewal, Semmy : **Learning Web App Development,** *O'Reilly Media*

CSE-4107: Digital Signal Processing

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Signals, systems and signal processing, classification of signals, the concept of frequency in continuous time and discrete time signals, analog to digital and digital to analog conversion, Sampling and quantization.

Discrete Time Signals and Systems: Discrete time signals, discrete time systems, analysis of discrete time linear time invariant systems. Discrete time systems described by difference equations, implementation of discrete time systems, correlation and convolution of discrete time signals.

The z-transform: Introduction, definition of the z-transform, z-transform and ROC of infinite duration sequence, properties of z-transform inversion of the z-transform, the one-sided z-transform.

Frequency Analysis of Signals and Systems: Frequency analysis of continuous time signals, Frequency analysis of discrete time signals, Properties of Fourier transform of discrete time signals, Frequency domain characteristics of linear time invariant system, linear time invariant systems as frequency selective filters, Inverse systems and deconvolution.

The Discrete Fourier Transform: The DFT, Properties of the DFT, Filtering method based on the DFT, Frequency analysis of signals using the DFT.

Fast Fourier Transform Algorithms: FFT algorithms, applications of FFT algorithm.

Digital Filters: Design of FIR and IIR filters.

Adaptive filters: Adaptive system, kalman filters, RLS adaptive filters, the steepest-descent method, the LMS filters.

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

Books Recommended:

1. J. G. Prokis : **Digital Signal Processing**, *Prentice-hall Of India*
2. Defatta : **Digital Signal Processing,** *Wiley India Pvt Ltd*
3. R. G. Lyon : **Understanding Digital Signal Processing,** *Orling Kindersley India*
4. P. R. Babu. : **Digital Signal Processing**, *Scitech Publication..*

CSE-4108: Digital Signal Processing Sessional

Laboratory works based on **CSE-4107.**

HUM-4112: English Sessional

Laboratory works based on **HUM-1101.**

Option-I

Option I Should be selected from the Following Courses.
CSE-4119, CSE-4121, CSE-4123, CSE-4125, CSE-4127, CSE-4129, CSE-4131, CSE-4133, CSE-4135, CSE-4137, CSE-4139

CSE-4119: Advanced Algorithms

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Randomized Algorithms: Las Vegas and Monte carlo algorithms.

Randomized Data Structures: Skip lists.

Amortized Analysis: Different methods, Applications in fibonacci heaps.

Lower Bounds: Decision trees, Information theoretic Lower bounds, Adversary arguments.

Approximation Algorithms: Approximation schemes, Hardness of approximation.

Fixed Parameter Tractability: Parameterized complexity, Techniques of designing fixed parameter algorithms, Examples.

Online Algorithms: Competitive analysis, Online paging problem, K-server problem; External memory algorithms; Advanced data structures: Linear and non-linear methods.

Books Recommended:

1. Michael J. Kearns , Umesh Vazirani : **An Introduction to Computational Learning Theory,** *MIT Press*
2. Jon Kleinberg, Éva Tardos : **Algorithm Design,** *Pearson Education*
3. Rajeev Motwani ,Prabhakar Raghavan : **Randomized Algorithms,** *Cambridge University Press*
4. Michael Mitzenmacher , Eli Upfal : **Probability and Computing: Randomized Algorithms and Probabilistic Analysis,** *Cambridge University Press*
5. Vijay V. Vazirani : **Approximation Algorithms,** *Springer and business Media*

CSE-4121: Basic Graph Theory

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Graphs and their applications; Basic graph terminologies; Basic operations on graphs; Graph representations; Degree sequence and graphic sequence; Paths, cycles and connectivity; Euler tours; Hamiltonian cycles; Ear decomposition; Trees and counting of trees; Distance in graphs and trees; Graceful labeling; Matching and covering; Planar graphs; Digraphs; Graph coloring; Special classes of graphs.

Books Recommended:

1. Douglas B West : **Introduction to Graph Theory,** *Prentice Hall*
2. Robin J. Wilson : **Introduction to Graph Theory,** 4th Edition Peterson Eduction Asia

CSE-4123: Fault Tolerant System

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Fault Tolerant systems and architectures.

Goal and Application: Fault Tolerant computing, Fundamental definitions.

Design Techniques: Achieve fault Tolerance, Fault detection and location in combinational and sequential circuits; Fault test generation for combinational and sequential circuits; Digital simulation as a diagnostic tool; Automatic test pattern generator; Fault modeling; Automatic test equipment, Faults in memory, Memory test pattern and reliability.

Performance monitoring: Self checking circuits, burst error correction and triple modular redundancy; Maintenance processors.

Books Recommended:

1. Barry W. Johnson : **Design and Analysis of Fault Tolerant Digital System,** *Prentice Hall*
2. Israel Koren, C. Mani Krishna : **Fault-Tolerant Systems,** *Denise Penrose*

CSE-4125: Basic Multimedia Theory

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction : Multimedia system; Coding and compression standards; Architecture issue multimedia.

Operating Systems Issues in Multimedia: Real-time OS issues, synchronization, interrupt handling.

Database issues in multimedia: Indexing and storing multimedia data, disk placement, disk scheduling, searching for multimedia document; Networking issues in multimedia, Quality of service guarantees, resource reservation traffic specification, happing, and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions; Security issues in multimedia, digital water, making partial encryption schemes for video streams.

Multimedia Applications: Audio and video conferencing, video on demand, voice over IP.

Books Recommended:

1.Steinmetz R.,Nahrstadt K : **Multimedia: Computing, Communications & Applications,** *Prentice Hall*

CSE-4127: Data and Network Security

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Overview, Symmetric cipher, Classical encryption technique, Block cipher

and the data encryption standard (DES), Triple DES.

Introduction to Finite Fields: Advanced Encryption Standard, Contemporary Symmetric Ciphers, confidentiality using symmetric encryption public, Key encryption and Hash functions, Public-key Cryptography, RSA algorithm, Key management, Diffie-Hellman key exchange, Other Public Key Cryptosystem, Message Authentication and Hash function, Hash Algorithm, Digital Signatures and Authentication protocols, Network Security practice, Authentication application, Wireless network security, Electrical Mail security, IP security, Web security, System security, Intruders, Malicious software and Firewall, Legal and Ethical Aspects.

Books Recommended:

1. William Stallings : **Cryptography and Network Security,** *Pearson Education*
2. Behrouz A. Forouzan : **Cryptography and Network Security,** *McGraw-Hill*

CSE-4129: Object Oriented Software Engineering

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: The object-oriented approach within the context of software engineering, the language.

Basic (Procedural) Elements of Language: What an Eiffel program is, what the instruction set is, and how to declare and use entities (variables) and routines.

The Concepts Underlying the Object-Oriented Approach: Modularity, inheritance, and dynamic binding, case study from the management information-system domain.

Environment Matters: System configuration, interfacing with external software, and garbage collection. Advanced issues involving exception handling, repeated inheritance, typing problems, and parallelism; object-oriented software engineering process, concentrating on specific guidelines facilitate the translation OOAD to a maintainable Addresses verification and validation (V&V) issues of Eiffel software systems built in a software engineering context; Building reusable libraries; The building of a parallel linear algebra library (Paladin).

Books Recommended:

1. Stephen Schach : **Object-Oriented Software Engineering,** *McGraw-Hill*
2. Ivar Jacobson : **Object-Oriented Software Engineering: A Use Case Driven Approach,** *Addison-Wiley Longman*
3. Timothy Lethbridge, Robert Laganiere : **Object-Oriented Software Engineering: Practical Software Development using UML and Java,** *McGraw-Hill*

CSE-4131: Artificial Neural Networks and Fuzzy Systems

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Biological Nervous System: Brain and neurons, Introduction to artificial neural network

and fuzzy systems, Theory and application of Artificial neural networks and fuzzy logic.

Multi-layer Perception: Back propagation algorithm, Self organization map, Radial basis network, Hop field network, Recurrent network, Fuzzy set theory, Failing Adaptive Linear (ADALINE) and Multiple Adaptive Linear (MADALINE) networks, Generating internal representation, Cascade correlation and counter propagation networks, Higher order and bi-directional associated memory, Lyapunov energy function, attraction basin.

Probabilistic Updates: Simulated annealing, Boltzmann machine, Adaptive Resonance Theory (ART) network. ARTI. ART2. Fuzzy ART mapping (ARTMAF) networks. Kohonen's feature .I\Learning Vector Quantization (LVQ) networks.

Logic Control: Adaptive fuzzy neural network; Genetic algorithm and evolution compacting, Applications to control; Pattern recognition; Nonlinear system modeling, Speech and image processing.

Books Recommended:

1. Jacek M. Zurada : **Introduction to Artificial Neural Systems,** *West Publishing Co*
2. Patrick K. Simpson : **Artificial neural systems: foundations, paradigms, applications, and implementations,** *McGraw-Hill*

CSE-4133: Distributed Algorithms

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Models of distributed computing, Synchrony, communication and failure concerns, Synchronous message-passing distributed systems.

Algorithms: Algorithms in systems with no failures, Leader Election and Breadth, First Search algorithms, The atomic commit problem, Consensus problems, The Byzantine Generals Problem, Asynchronous message, passing distributed systems, Failure detectors, Logical time and vector clocks, Routing algorithms.

Books Recommended:

1. S. Mullender : **Distributed Systems,** *Addison-Wesley, 1993*
2. G. Tel. : **Introduction to Distributed Algorithms,** *Cambridge Univ. Press, 2000*

CSE-4135: Bioinformatics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Sequence similarity, Homology, and Alignment.

Pairwise alignment: Scoring model, Dynamic programming algorithms, Heuristic alignment, and Pairwise alignment using Hidden Markov Models.

Multiple Alignment: Scoring model, Local alignment gapped and ungapped global

alignment. Motif finding: Motif models, finding occurrence of known sites, discovering new sites.

Gene Finding: Predicting reading frames, Maximal dependence decomposition. Analysis of DNA microarray data using hierarchical clustering, model-based clustering, Expectation-maximization clustering, Bayesian model selection.

Books Recommended:

1. Neil C. Jones, Pavel A. Pevzner : **An Introduction to Bioinformatics Algorithm,** *MIT Press*

CSE-4137: Robotics

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Introduction to robotics, Overview of robot mechanisms, Dynamics, and Intelligent controls, Planar and spatial kinematics, and motion planning.

Mechanism Design : Manipulators and mobile robots, Multi-rigid-body dynamics, 3D graphic simulation.

Control Design: Actuators, and sensors; Wireless networking, Task modeling, Human-machine interface, and Embedded software mechanical design, Rigid body velocity, Jacobean, inverse kinematics, Redundant and parallel robots, Trajectory control, Face control and hap tics, Micro and nan-robotics, Mobile robots.

Books Recommended:

1. Saeed B. Niku : **Introduction to Robotics: Analysis, Control, Applications,** *Wiley*
2. John J. Craig : **Introduction to Robotics: Mechanics and Control,** *Prentice Hall*

CSE-4139: Machine Learning

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Machine learning, Supervised, unsupervised and reinforcement learning, Unsupervised learning algorithms.

Concept Learning: Decision tree learning, Attribute based and relational supervised learning algorithms, Artificial Neural network based learning algorithms, Bayesian learning, Evaluating Hypothesis, Genetic algorithm and genetic programming, Reinforcement learning algorithms, Computational learning theory.

Books Recommended:

1. Tom Michael Mitchell : **Machine Learning,** *McGraw-Hill*
2. Ethem Alpaydin : **Introduction to Machine Learning,** *MIT Press*

4th YEAR 2nd SEMESTER

CSE-4200: Project/Thesis

This course is a continuation of the course CSE-4100 (Part-I) from the previous semester. A student has to complete the defensed research proposal, submit it by the end of the semester and make an oral defense of the project/thesis.

CSE-4211: VLSI Design

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

VLSI Design Methodology: Top-down design approach, Technology trends.

MOS Technology: Introduction to MOS technology, Operation of MOS transistor as a switch and amplifier, MOS, NMOS, CMOS inverters, pass transistor and Pass gates, DC and transient characteristics.

Overview of Fabrication Process: NMOS, CMOS, Bi-CMOS process.

NMOS and CMOS Layout: Stick diagram, and design rules.

CMOS Circuit Characteristics: Resistance and capacitance, Rise and fall time, Power estimation.

Introduction to Bi-CMOS Circuits: Shifter, Adder, Counter, Multipliers. Data path and memory structures, Buffer circuit design.

Design style: FPGA and PLDs.

Books Recommended:

1. K. Eshraghian & D. A. Pucknell : **Basic VLSI design: System & Circuit**, *Prentice-Hall*
2. R. K. Brayton : **Logic Minimization Algorithms for VLSI Synthesis**, *Kluwer Academic Publishers Norwell, MA, USA*
3. F. Lombardi and M. G. Sami : **Testing and Diagnosable Design of VLSI and ULSI**, *Springer*
4. C. A. Mead and L. A. Conway : **Introduction to VLSI Systems**, *Addison-Wesley*

CSE-4213: Digital Image Processing

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction and Fundamental to Digital Image Processing: What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

Image Enhancement in the Spatial Domain & Frequency Domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening spatial filters, Introduction to Fourier Transform and the frequency domain, Discrete Fourier Transform. Smoothing and Sharpening frequency-domain filters.

Image Restoration: Image Degradation/Restoration process, Noise models, Restoration in presence of noise, Inverse filtering, Minimum mean square filtering, Geometric mean filter, Geometric transformations.

Color Image Processing: Color Fundamentals, Color models, Basis of full color image processing, Color transformations.

Image Compression: Fundamentals, Image compression models, Error free compression, Lossy compression.

Morphological Image Processing: Preliminaries, Dilations and erosion, opening and closing, Some basic morphological algorithms.

Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

Books Recommended:

1.	Rafeal C. Gonzalez & Richard E. Woods	:	**Digital Image Processing,** *Prentice-Hall Publication*
2.	A. K. Jain	:	**Fundamentals of Digital Image Processing,** *Academic Press*
3.	Mark S. Nixon & Albert S. Aguado	:	**Feature Extraction and Image Processing,** *Academic Press*
4	William K. Pratt	:	**Digital Image Processing**, *Wiley-Interscience*

CSE-4214: Digital Image Processing Sessional

Laboratory works based on **CSE-4213.**

CSE-4215: Mobile and Ubiquitous Computing

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Overview: Network and transport protocol for wireless networks, Mobile IP and variants of TCP; Distributed systems platforms for mobile Computing, Proxy based architectures, Service discovery, Interaction platforms; Local and Wide area technologies (Bluetooth, 802.11, GSM); File system support for mobile computing; Development in context-aware and ubiquitous computing; Smart embedded devices, Information appliance and wearable computers; Sensing and context acquisition in ubiquitous computing; New trends in networking and communication, Proximity-based networking, Communication protocol for wireless sensor networks; Human interaction in ubiquitous computing environments, Tangible user interfaces.

Privacy and Security: Technological component of Location Based Service (LBS)-WAP, GPS, Cell Based Location, 3G wireless, VXML, SMS-MMS, Personal Area Networks

(802.11, Bluetooth, IRFIDs), Micro-Electro-Mechanical System (MEMES), Recommender systems (Collaborative Filtering, Intelligent Agents).

Books Recommended:

1. Dragan Stojanovic : **Context-Aware Mobile and Ubiquitous Computing for Enhanced Usability: Adaptive Technologies and Applications,** *Information Science*
2. Damien Sauveron, Konstantinos Markantonakis, Angelos Bilas and Jean-Jacques Quisquater. : **Information Security Theory and Practices. Smart Cards, Mobile and Ubiquitous Computing Systems,** *Springer*
3. Laurence T. Yang, Evi Syukur and Seng W. Loke : **Handbook on Mobile and Ubiquitous Computing: Status and Perspective ,** *CRC Press*

CSE-4216: Mobile and Ubiquitous Computing Sessional

Laboratory works based on **CSE-4215.**

CSE-4217: Engineering Management

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Principles: Principles of Management, Financial principles, Management of innovation, Technology strategy, Best management practices, Sales and Marketing, Ratio analysis, Prelude lobster, Designing and Building yachts, Commoditization vs. differentiation, Total quality Management, Entrepreneurship.

Planning and Management: Strategic Planning and Management of technology, Teradyne business plan, MIS: Introduction, Decision support systems, MIS in decision making, Development of communication skills.

Books Recommended:

1. Harold E. Roland , Brian Moriarty : **System Safety Engineering and Management,** *Wiley*
2. Albert Lester : **Project Management, Planning and Control,** *Butterworth-Heinemann*
3. John V. Chelsom, Andrew C. Payne, Lawrence R. P. Reavill : **Management for Engineers, Scientists and Technologists,** *J. Wiley*
4. Uma G. Gupta : **Management Information Systems – A Managerial Perspective,** *West Publishing Company*

Option-II

Option II Should be Selected from the Following Courses.
CSE-4243, CSE-4244, CSE-4245, CSE-4246, CSE-4247, CSE-4248, CSE-4251, CSE-4252, CSE-4253, CSE-4254, CSE-4255, CSE-4256

CSE-4243: Pattern Recognition

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Pattern Recognition: Introduction, Importance.

Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminate functions and decision surfaces, Bayesian classifier for normal distribution, Linear classifiers: discriminate functions and decision hyper planes, perception algorithm, least squares methods; Kessler's construction.

Nonlinear Classifiers: Two and three layer perceptions, Back propagation algorithm.

Template Matching: Optimal path searching techniques. Dynamic programming methods, Correlation methods.

Context Dependent Classification: Observable and hidden Markov models and Viterbi algorithm. Three problems of HMM and their application in Speech Recognition, Syntactic Pattern Recognition, Clustering algorithms.

Books Recommended:

1. Sergios Theodoridis, Konstantinos Koutroumbas : **Pattern Recognition,** *Academic Press*
2. William Gibson : **Pattern Recognition,** *Berkley*

CSE-4244: Pattern Recognition Sessional

Laboratory works based on **CSE-4243.**

CSE-4245: Telecommunication Engineering

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Overview of Telecommunication: History, evolution, convergence of telecommunication and data networks.

Transmission Media: Characteristics and applications of twisted pairs, coaxial cables and optical fibers, Terrestrial and satellite microwave, radio waves, VSAT.

Telephone Operating Principles: Telephone equipment, Description of the modern phone; Telephone switching systems: PSTN, PBX, Centrex, standards; Basics of communication systems: modulation, multiplexing.

Switching System: Circuit switching, packet switching; Voice over Internet Protocol (VoIP), Fax over IP network, voice over frame relay, and ATM, ACDs, call centers, computer integration.

Data Communication Equipment: Introduction to terminals, modems, RS-232 and other interfaces, modem types; Tele-Traffic analysis.

Cellular Telephony: Frequency reuse, frequency management, channel alignment, handoff strategies, FDMA, TDMA, CDMA and GSM, Introduction to satellite communication, Optical fiber communication, Submarine cables, Digital Radio Microwave, etc.

Books Recommended:

1. Cole : **Introduction to Telecommunication,** *Pearson*
2. John M Senior : **Optical Fiber Communication Principles and Practice,** *Pearson*
3. B P Lathi : **Modern Digital and Analog Communication System,** *Oxford University Press*

CSE-4246: Telecommunication Engineering Sessional

Laboratory works based on **CSE-4245.**

CSE-4247: Simulation and Modeling

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Simulation Modeling Basics: Systems, Models and Simulation; Classification of simulation model; Steps in a simulation study.

Concepts in Discreet-event Simulation: Event scheduling vs. process interaction approaches, Time-advance mechanism, organization of a discreet-event simulation model; Continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems.

Building Valid and Credible Simulation Models: Validation principles and techniques, statistical procedures (or comparing real-world observations and simulation outputs, input modeling; Generating random numbers and random variants; Output analysis. Simulation languages; Analysis and modeling of some practical systems, Random number generator, Random variables, Probability distribution.

Books Recommended:

1. Law A. M., Kelton W. D. : **Simulation Modeling and Analysis,** *McGraw-Hill*
2. J. A. Spriet : **Computer Aided Modeling & simulation,** *Woods*
3. R. S. Lehman : **Computer Simulation and Modeling,** *Kluwer Academic*
4. G. Cordon : **System Simulation,** *McGraw-Hill*

CSE-4248: Simulation and Modeling Sessional

Laboratory works based on **CSE-4247.**

CSE-4251: Data Mining and Data Ware-housing

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Data warehousing and OLAP technology for data mining: Data preprocessing; Data mining primitives, languages and systems.

Descriptive Data Mining: Characterization and comparison; Association analysis; Classification and prediction; Cluster analysis; Mining complex types of data; Applications and trends in data mining.

Books Recommended:

1. Bharat Bhushan Agarwal, Sumit Prakash Tayal : **Data Mining and Data Warehousing,** *University Science Press*
2. Alex Berson and Stephen J. Smith : **Data Warehousing, Data Mining, and OLAP,** *McGraw-Hill*

CSE-4252: Data Mining and Data ware-housing Sessional

Laboratory works based on **CSE-4251.**

CSE-4253: Distributed Database Management System

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Introduction: Distributed data processing, Distributed database system (DDBMSS), Promises of DDBMSs, Complicating factors and problem areas in DDBMSs, Overview of relational DBMS, Relational database concepts, Normalization, Integrity rules, Relational data languages, Relational DBMS

Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture .

Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation.

Semantic Data Control: View Management, Data security, Semantic Integrity Control

Overview of Query Processing: Query processing problem, Objectives of query Processing, Complexity of relational algebra operations, Characterization of Query processors, Layers of Query Processing.

Introduction to transaction management: Definition of transaction, Properties of transaction, types of transaction.

Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.

Parallel database systems: Database servers, Parallel architecture, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture.

Distributed Object Database Management Systems: Fundamental object concepts and object models, Object distribution design. Architectural issues, Object management, Distributed object storage, Object query processing. Transaction management.

Database interoperability: Database integration, Query processing.

Books Recommended:

1. M.T. Ozsu and P. Valduriez : **Principles of Distributed Database Systems,** *Pearson*

2. S. Ceri and G. Pelagatti : **Distributed Databases principles and systems,** *Tata McGraw Hill*
3. Andrew S. Tanenbaum : **Distributed Database,** *Pearson*

CSE-4254: Distributed Database Management System Sessional

Laboratory works based on CSE-4253.

CSE-4255: Internet Engineering

100 Marks [70% Exam, 20% Quizzes/Class Tests, 5% Class Attendance, 5% Class Observation]

3 Credits, 3 Contact hours/week, Lecture: 42, Exam. Time: 3 hours

Intra- and Inter-networking: Internet, Internet architecture, Internet service providers (ISP), Tier architecture of the Internet, Internet core, Access networks (DSL, cable, Wireless etc.).

Internet Routing: Interior and Exterior routing protocols – RIP, IGRP, EIGRP, Autonomous system, OSPF, BGP – iBGP, eBGP; NAT, PAT, Proxy service, and IP Masquerading; IPv6 – IPv6 features, IPv6 addressing, Tunneling, address auto-configuration, Transition from IPv4 to IPv6; Tunneling; Mobile IP, Mobile IPv6, Proxy mobile IPv6, and Network mobility; Multicast protocols – Multicasting and IGMP, and Multicast Routing Protocols.

Transport Layer: SCTP – SCTP features, SCTP services, SCTP flow control and error control; TCP variants - TCP Tahoe, TCP Reno, TCP New Reno, TCP Vegas, and TCP SACK.

Internet Applications – Voice Over IP (VoIP), Video on Demand (VoD), IPTV, and other multimedia and real time applications.

Quality of Service (QoS): QoS definition and its parameters, queue management and fair scheduling, integrated service, differentiated service, CBQ and RSVP.

Network Security: Basic security mechanisms, Encryption and Decryption, Standard encryption algorithms – RSA, MD5, Diffie-Hellman algorithm and IPSec.

Books Recommended:

1. Behrouz A Forouzan : **TCP/IP Protocol Suite,** *Global*
2. James F. Kurose, Keith W. Ross : **Computer Networking A Top-Down Approach Featuring the Internet,** *Pearson*
3. Steven Richard : **TCP/IP Illustrated, Volume 1: The Protocols,** *AddisonWesley*

CSE-4256: Internet Engineering Sessional

Laboratory works based on CSE-4255.