PORT CITY INTERNATIONAL UNIVERSITY

Syllabus
of

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

Department of Computer Science & Engineering
(2018- present)

Bachelor of Science in Computer Science and Engineering

Department of Computer Science and Engineering will offer B. Sc. in Computer Science and Engineering program under the Faculty of Science & Engineering. Computer science and Computer engineering are fields of unparalleled excitement and opportunity, wand for the future fields where the smartest young men and women are choosing to study and work. If students' goal is graduate study and research, employment in the information technology industry, business leadership, or public service, PCIU Department of Computer Science and Engineering will be one of the few "short listed" and ranked among the top research programs in the nation along with BUET.

Computer science is the study of information and algorithms within the context of real and abstract computing devices. Computer scientists are interested in such topics as the representation and storage of information, algorithms to access, display, edit, and transform information, programming, languages to express algorithms, and hardware and software processors to execute algorithms. These concerns lead to practical developments in computer system software such as operating systems and compilers; in application areas such as artificial intelligence, computer graphics, and computational biology; and also lead to theoretical investigations of computers, algorithms and data.

Computer engineering is a closely related field that is concerned with the design and practical application of computer hardware and software systems to the solution of technological problems. The computer engineer analyzes a problem and selects from a variety of tools and technologies which are most appropriate for its solution. A computer engineer can expect to be involved in hardware design, software creation, and systems integration. The program provides an in depth education in computer engineering while retaining strong foundations in traditional electrical engineering and computer science.

The computer engineering program involves digital hardware, software, and architecture. Mathematics, engineering design, laboratory work, and communication-skills development are also emphasized. A major team project must be completed during the senior year. The objective of undergraduate education in computer engineering is to develop broadly educated and competent graduates for professional careers or graduate studies. Especially it is an important foundation that will endure technology advances and changes.

1.1 Degree Requirements

To earn a B. Sc. in CSE degree, a student must complete at least 156 credit hours with CGPA 2.50. The following is a description of how these credit hours are distributed among the courses.

SL#	Group	Theory	Sessional	Thesis	Total
1	General Education	18.00	1.50	-	19.50
2	Mathematics	27.00	-	-	27.00
3	Computer Science	45.00	22.50	-	67.50
4	Computer Engineering	30.00	9.00	-	39.00
5	Project and Thesis	-	-	3.00	3.00
6	Total	120.00	33.00	*3.00*	156

1.2 Program Details

Duration	: 12 Semesters (48 months)
Total No of Credit Courses	: 41 Courses
Normal Course load per semester	: 5 Courses (15 credits)
Duration of each semester	: 4 Months
Project & Thesis	: 3.0 Credits (minimum 3 months)
Total Credit Hours (Course & Internship)	: 156 (153+3) Credits
Cumulative Grade Point Average(CGPA)/Passing	2.50

1.3 Class Attendance Policy

The university expects all students to attend classes regularly. Students may not be allowed to sit for the examination if his/her percentage of class attendance falls below 70 percent.

1.4 Calculation of GPA

Grade Point Average (GPA) or Cumulative Grade Point Average (CGPA) is the average of the grade points obtained in all the courses passed/completed by a student. For example, if a student passes/completes four courses in a trimester having credit hours of C1, C2, C3, & C4 and his/her grade points in these courses are G1, G2, G3, & G4 respectively then

Suppose a student got grade point "4.0" in a 3 credit hours course and 3.0 in 1.5 credit hours course then his/her GPA/CGPA will be as follows:

$$GPA/CGPA = \frac{(3 \times 4) + (1.5 \times 3)}{3 + 1.5} = 3.67$$

1.5 Marks Distribution

Particulars	% of Marks
Class Attendance	10
Assignment/Project/Class Participation/Presentation	10
Class Tests/Quizzes	10
Mid Term Exam	30
Final Exam	40
Total	100

1.6 Grading System (UGC approved)

Department of Computer Science and Engineering follows University Grants Commission (UGC) approved grading system. This grading system is also used by the other departments of Port City International University. The performance of the students in the course work is evaluated by letter grading systems as described below:

Marks Range	Grade	Grade point	Interpretation
80% and above	A+	4.00	Outstanding
75% to below 80%	A	3.75	Excellent
70%to below 75 %	A-	3.50	Very Good
65% to below 70%	B+	3.25	Good
60% to below 65%	B	3.00	Satisfactory
55% to below 60%	B-	2.75	Above Average
50% to below 55%	C+	2.50	Average
45% to below 50%	C	2.25	Below Average
40% to below 45%	D	2.00	Pass
Less than 40%	F	0.00	Fail
	I	0.00	Incomplete

1.7 Applicant's Eligibility & Selection Procedures

All applicants must meet one of the following requirements to apply for admission in B. Sc. In Computer Science and Engineering program:

- Minimum GPA 2.5 both in S.S.C./equivalent and H.S.C./equivalent from science background with mathematics and physics or other fields of study.
- Minimum 5 subjects in O-Level and 2 subjects in A-Level with minimum grade of B in 4 subjects and minimum grade of C in 3 subjects from science background with mathematics and physics or other fields of study.

Applicants will be selected for admission through admission test which includes written exam as well as viva voce. Applicants who will score satisfactory marks in written test will be qualified for viva voce.

1.8 Credit Transfer

A student may transfer of his/her credits from an educational institution/university with a system similar to Port City International University after his/her admission. Such candidates will have to apply to Registrar of PORT CITY through the Head of the department with required documents.

LIST OF THE COURSES:

General Educational Courses

SCIENCE

SI.No	Course Code	Title of the course	Credits	Prq.
01.	PHY 111	Physics	3.00	
	PHY 112	Physics Sessional	1.50	
02.	CHEM 111	Chemistry	3.00	

Option I: Any Three (HUM 100 compulsory)

HUMANITIES/ BUSINESS

03.	HUM 100	Bangladesh Studies	3.00	
04.	HIST 101	History of the Emergence of Independent	3.00	
05.	HUM 103	Introduction to Humanities	3.00	
06.	SOC 104	Introduction to Social Science	3.00	
07.	ACT 110	Principles of Accounting	3.00	
08.	ECO 213	Economics	3.00	
09.	MGT 215	Introduction to Management	3.00	
10.	BIO 218	Introduction to Biological Science	3.00	
11.	MKT 324	Principles of Marketing	3.00	
12.	MIS 435	Management Information Systems Bangladesh	3.00	

English (Students who are weak in English will have to complete ENG 101)

01.	ENG 101	Composition	3.00	
02.	ENG 106	Freshman English-II	3.00	

Mathematics

01.	MATH 115	Differential Calculus & Coordinate Geometry	3.00	
02.	MATH 125	Integral Calculus & Vector Analysis	3.00	
03.	MATH 135	Discrete Mathematics	3.00	
04.	MATH 215	Linear Algebra	3.00	
05.	STAT 235	Statistics	3.00	
06.	MATH 315	Complex Variable and Laplace Transformation	3.00	
07.	MATH 325	Differential Equation and Fourier Analysis	3.00	

| 08. | MATH 329 | Mathematical Analysis for Computer Science | 3.00 | |
| 09. | MATH 415 | Numerical Methods | 3.00 | MATH 215 |

COMPUTER SCIENCE COURSES

Computer Science and Information Technology

SI. No	Course Code	Title of the course	Credits	Preq.
01.	CSE 111	Computer Fundamentals & Programming Techniques	3.00	
	CSE 112	Computer Fundamentals Sessional	1.50	
02.	CSE 121	Structured Programming Language	3.00	CSE111
	CSE 122	Structured Programming Language Sessional	1.50	
03.	CSE 211	Object-Oriented Programming	3.00	
	CSE 212	Object- Oriented Programming Sessional	1.50	
04.	CSE 217	Data Structure	3.00	CSE 121
	CSE 218	Data Structure Sessional	1.50	
05.	CSE 221	Database Management Systems	3.00	
	CSE 222	Database Management Systems Sessional	1.50	
06.	CSE 227	Algorithms	3.00	
	CSE 228	Algorithms Sessional	1.50	
07.	CSE 231	Operating System Concepts	3.00	
	CSE 232	Operating System Concepts Sessional	1.50	
08.	CSE 317	Theory of Computing	3.00	
09.	CSE 321	Software Engineering	3.00	CSE 315
	CSE 322	Software Engineering Sessional	1.50	
10.	CSE 331	Pattern Recognition	3.00	CSE227,MATH135
	CSE 332	Pattern Recognition Sessional	1.50	
11.	CSE 341	Artificial Intelligence	3.00	
	CSE 342	Artificial Intelligence Sessional	1.50	
12.	CSE-434	Web Technology Sessional	1.50	

Option II: Any Four (CSE 411 & CSE 412 are compulsory)

SI. No	Course Code		Title of the course	Credits	Preq
1.	CSE	411	Compiler	3.00	CSE 317
	CSE	412	Compiler Sessional	1.50	
2.	CSE	421	Computer Graphics	3.00	
	CSE	422	Computer Graphics Sessional	1.50	
3.	CSE	423	Simulation & Modeling	3.00	
	CSE	424	Simulation & Modeling Sessional	1.50	
4.	CSE	447	Multimedia Systems Design	3.00	
	CSE	448	Multimedia Systems Design Sessional	1.50	
5.	CSE	453	Digital Image Processing	3.00	
	CSE	454	Digital Image Processing Sessional	1.50	

COMPUTER ENGINEERING COURSES

SI. No	Course Code		Title of the course	Credits	Preq
01.	CSE	113	Electrical Engineering	3.00	
	CSE	114	Electrical Engineering Sessional	1.50	
02.	CSE	123	Electronics	3.00	
	CSE	124	Electronics Sessional	1.50	
03.	CSE	213	Digital Logic Design	3.00	
	CSE	214	Digital Logic Design Sessional	1.50	
04.	CSE	233	Computer Organization and Architecture	3.00	
	CSE	234	Computer Organization and Architecture Sessional	1.50	
05.	CSE	323	Computer Networks	3.00	CSE 435
	CSE	324	Computer Networks Sessional	1.50	
06.	CSE	333	Computer Peripherals and Interfacing	3.00	
	CSE	334	Computer Peripherals and Interfacing Sessional	1.50	
07.	CSE	413	Microprocessor and Assembly Programming	3.00	CSE 213
	CSE	414	Microprocessor and Assembly Prog. Sessional	1.50	

Option III: Any Three (CSE 435 is compulsory**)**

SI. No	Course Code		Title of the course	Credits	Preq.
8.	CSE	315	System Analysis and Design	3.00	
9.	CSE	427	VLSI Design	3.00	CSE 123,213
10.	CSE	435	Data Communication	3.00	
11.	CSE	441	Optic fiber Communication	3.00	CSE 323
12.	CSE	443	Mobile and Telecommunications	3.00	CSE 435
13.	CSE	449	Fault tolerance Systems	3.00	

PROJECT AND THESIS

1.	CSE	400	Project and Thesis	3.00	

Port City International University

SYLLABUS OF

BACHELOR OF COMPUTER SCIENCE & ENGINEERING

General Educational Courses

SCIENCE

PHY 111 Physics-1
Mechanics: Circular motion, Rotation of rigid bodies, Central force, Structure of matter, Mechanical properties of materials.
Properties of matter: Elasticity, stresses and strains, Young's modulus, Bulk modulus, Rigidity modulus, Elastic limit, Poisson's ratio, Relation among elastic constants, Bending of beams, Moment of inertia, Torque**.**
Fluid motion: Equation of continuity, Bernoulli's theorem, Viscosity, Stokes law, Surface energy and Surface tension, Capillary, Determination of surface tension by different methods.
Waves and Oscillation: Wave Motion & Propagation, Simple Harmonic Motion, Vibration Modes, Forced Vibrations, Vibration in Strings & Columns, Sound Wave & Its velocity, Doppler Effect, Elastic Waves, Ultrasonic, Practical Applications, Simple pendulum and Compound pendulum.
Optics: Theories of light, I-Iuygen's principle, Electromagnetic waves, velocity of light, Reflection, Refraction, Lenses, Interference,
Heat and Thermodynamics: Temperature and Zeroth, I t & 2nd Law of Thermodynamics, Calorimetry, Thermal equilibrium and thermal expansion. Specific heat, heat capacities, equation of state, change of phase, heat transfer, Carnot Cycle, Efficiency, Entropy, Kinetic theory of gases.
Electricity and Magnetism: Electric charges, Coulomb's law, the electric field calculation of the electric field strength, E; a dipole in an electric field, electric field, electric flux and Gauss's law, some application of Gauss's law; electric potential V, relation between E and V, electric potential energy. Capacitors; capacitance, dielectrics; an atomic view, dielectrics and Gauss's law; current and resistance; current and current density, ohm's law, resistivity: an atomic view, Ampere's law, Faraday's law, Lenz's law, self-inductance and mutual inductance. Magnetic properties of matter: magneto motive force, magnetic field intensity, permeability, susceptibility, and classifications of magnetic materials.

Text Book:
> 1**.** Fundamentals of Physics by D. Haliday, R. Resnick, Walker.

Reference books:
> 1. Concepts of Electricity & Magnetism by A.K. Rafiqullah, A.K. Roy, M.S. Huq.
> 2. Properties of matter by N. Subrahmanyam, Brij Lal.
> 3. A text book of optics by Subrahmanyam, Brij Lal.
> 4. Concepts of Modern Physics by Arthur Beiser.

PHY 112 Physics Sessional
Laboratory work based on PHY 111

CHEM 111 Chemistry

Inorganic Chemistry:
Structure of atom: (i) Nuclear structure: atomic and mass number, nuclear dimensions, isotopes, mass defect. Radioactivity, half-life of radioactive elements, nuclear binding energy. (ii) Electronic structure: Dalton's theory, Rutherford's atomic model, Bohr theory, Pauli exclusion principle, Aufbau principle or ($n+l$) and Hund principle, atomic spectra.
Quantum theory of atom: Historical development ofquantum theory: The photoelectric and compton effects,atomic spectra, dual nature of matter and radiation, quantum theory and orbital concept,the uncertainty principle.
Periodic Table: Periodic law, classification of elements based on electronic configuration [Properties of s-block, p-block, d-block and f-block elements]. Usefulness and limitations of periodic table; predictions of positions and properties of elements from their electronic configurations.
Chemical Bond: Origin of chemical bond; development of the electronic theory of valency; Lewis formula, ionic bond, covalent bond and coordination bond; Modern theories of chemical bond such as valency-bond theory (VBT) , VSEPR, Hybridization concepts and MOT. Properties of ionic and covalent compounds; Intermolecular forces, Chelate complexes.

Physical Chemistry:
Kinetic theory of gases: van der Waal's forces and equation.
Acids, Bases and Salts: Modern theories of acids and bases, pH, buffer solution, indicators.
Stoichiometry and calculations: Moles, Avogadro's number; formulas and analysis, limiting reactants; calculations for solutions and gases.
Thermodynamics: 1st Law and 2nd Law of Thermodynamics, Thermo-chemistry.
Chemical Equilibrium: Law of mass action, Thermodynamic derivation of law of mass action, Application of law of mass of action to chemical reactions. Heterogeneous equilibrium.

Text Book:

> 1. General Chemistry, By- Ebbing.

Reference books:
> 1. Concise Inorganic Chemistry, By-J.D.Lee
> 2. Essential Physical Chemistry, By- B.S. Bahl, G.D.Tuli, A. Bahl
> 3. Modern Inorganic Chemistry, By- S.Z. Haider
> 4. Modern Inorganic Chemistry, By- R.D. Madan

Option I:

HUM 100 Bangladesh Studies

History of Bangladesh (in brief): Origin of people, terrestrial area, colonial rule in Indian subcontinent, the Pakistan movement and the birth of Pakistan; Language movement (1948-1052), six-point movement (1966), Election of 1970 and Liberation war of Bangladesh.

Physical and natural resources of Bangladesh: Physical features of Bangladesh: Location, climate, and major physiographic units; Surface water inflow and river systems of Bangladesh; Pattern of agriculture and types of forest in Bangladesh; Mineral resources and industrial setup in Bangladesh and recent development; Density and distribution of population in Bangladesh.

Political Administrative and Legal Environment of Bangladesh: Forms of government and state mechanisms (executive, legislature, judiciary) of Bangladesh; Constitution of Bangladesh and its amendments; Administrative structure of Bangladesh; Political parties of Bangladesh; Different political regimes of Bangladesh, Foreign policy of Bangladesh (aim and objectives); Foreign relations of Bangladesh (relations with neighbors, India, Myanmar, Nepal, Bhutan; USA, China, Middle East, Europe).

Socio–economic Environment: Social structure and social stratification in Bangladesh; Population migration from rural to urban areas in Bangladesh; Ethnic minorities in Bangladesh; Social problems of Bangladesh; Microeconomic trends of Bangladesh economy: GDP, savings, investment and employment; Thrust areas of Bangladesh economy: poverty alleviation and private sector development.

References Books:
1. History of Bangladesh: Social and cultural history, political history, economical history by *Sirajul Islam*
2. Banglapedia: National Encyclopedia of Bangladesh (Asiatic Society)
3. Bangladesh Foreign policy by Harun Ur Rashid
4. Bangladesh Judicial service by Abdul Halim
5. Political Parties in Bangladesh: Challenges of Democratization by Rounaq Jahan

HIST 101 History of the Emergence of Independent Bangladesh

Description of the country and its people. Geographical features and theirinfluence, Ethnic composition, Language, Cultural syncretism and religious tolerance, Distinctive identity of Bangladesh in the context of undivided Bangladesh.
Partition of Bengal–1905: Reasons of partition, impact of partition/people's reaction, Swadeshi Movement, Significance of the partition.
Proposal for undivided sovereign Bengal and the partition of the Sub Continent, 1947.

Rise of communalism under the colonial rule, Lahore Resolution 1940, The proposal of Suhrawardi and Sarat Bose for undivided Bengal: consequences**,** The creation of Pakistan 1947.

Pakistan: Structure of the state and disparity.

Central and provincial structure, Influence of Military and Civil bureaucracy, Economic, social and cultural disparity.

Language Movement and quest for Bengali identity.

Misrule by Muslim League and Struggle for democratic politics, The Language Movement: context and phases, United front of Haque–Vasani–Suhrawardi:election of 1954, consequences.

Military rule: the regimes of Ayub Khan and Yahia Khan (1958-1971).

Definition of military rules and its characteristics, Ayub Khan's rise to power and characteristics of his rule (Political repression, Basic democracy, Islamisation), Fall of Ayub Khan and Yahia Khan's rule (Abolition of one unit, universal suffrage, the Legal FrameworkOrder).

Rise of nationalism and the Movement for self-determination.

Resistance against cultura l aggression and resurgence of Bengali culture, Sheikh Mujibur Rahman and the six point movement, Reactions: Importance and significance, The Agortola Case 1968.

The mass- upsurge of 1969 and 11 point movement: background, programme and significance.

Election of 1970 and the Declaration of Independence by Bangobondhu

Election result and centres refusal to comply, The non-co-operation movement, the 7th March, Operation Searchlight, Declaration of Independence by Bangobondhu and his arrest.

The war of Liberation 1971:

a. Genocide, repression of women, refugees

b. Formation of Bangladesh government and proclamation of Independence

c. The spontaneous early resistance and subsequent organized resistance (Mukti Fouz, Mukti Bahini, guerillas and the frontal warfare)

d. Publicity Campaign in the war of Liberation (Shadhin Bangla Betar Kendra, the Campaigns abroad and formation of public opinion)

e. Contribution of students, women and the masses (Peoples war)

f. The Anti-liberation activities of the occupation army, the Peace Committee, Al-Badar, Al-Shams, Rajakars, pro Pakistan political parties and Pakistani Collaborators, killing of the intellectuals.

g. Trial of Bangabondhu and reaction of the World Community.

i. Formation of joint command and the Victory

j. The overall contribution of Bangabondhu in the Independence struggle.

The role of super powers and the Muslim states in the Liberation war, Unsolved issues between Bangladesh and Pakistan.

The contribution of India in the Liberation War, Role of USA, USSR and China in the liberation war of Bangladesh.

The Bangabondhu Regime 1972-1975

Homecoming, Making of the constitution, Reconstruction of the war ravagedcountry BAKSAL. The murder of Bangabondhu and his family and the ideological turn-around

Reference Books:

1. Harun-or-Roshid, *The Foreshadowing of Bangladesh: Bengal Muslim League and Muslim Politics,*
2. *1906-1947,*
3. Rounaq Jahan, *Pakistan: Failure in National Integration,*
4. TalukderManiruzzaman, *Radical Politics and the Emergence of Bangladesh,*
5. R. C. Majumdar, *History of Bengal, Vol. 1*
6. Shyamal Ghosh, *The Awami League.*
7. M. B. Nair, *Politics of Bangladesh*
8. A M AMuhith, *Emergence of a Nation*

HUM 103 Introduction to Humanities

Literature: Appreciation of literatures: poetry, prose, drama, novel; Contemporary thoughts on literatures;Study. of the contemporary literary work.

History: Introduction; renaissance, reformation, and the beginning of the Modem World; The Scientific Revolution; The industrial Revolution, the age of Democratic Revolution; Nineteenth century Europe; Asia-Pacific region;' Africa; World Wars; South Asia: Colonization, decolonization after; Contemporary world: Cold War and after.

Philosophy: Concept of Philosophy; Science and Philosophy; Science and Philosophy; Science and Philosophy; Region, Literature and Philosophy; Sources of Knowledge; Empiricism, Rationalism Criticism; Concept of value, ethics and Sources of ethical standards.

SOC 104 Introduction to Social Science

Scope and nature sociology: Society, social evolution and techniques of production. industrial revolution, political system, social control, society and population, standard, of living, nature of social change, urbanization and industrialization in Bangladesh, urban ecology, society and environment and tribal people of Bangladesh.

ACT 110 Principles of Accounting

Accounting in action & conceptual framework for financial accounting: Orientation& purpose and nature of accounting, Language of business,Uses of accounting information, Accounting as an information science,Basic objectives and qualitative characteristics of accounting information, Basic elements of financial statements,GAAP- basic assumptions, Principles & constraints.

Accounting Process and cycle: Double entry processing system and accounting equation, Effects of transaction on the accounting equation, Steps in accounting cycle, Identification and recording of transaction, Posting to the ledger, Preparation of the trial balance.

Preparation of worksheet and financial statements for merchandise operation: Unadjusted trial balance and adjustments, A worksheet to prepare financial statements, recordingcost of goods purchased, Determining cost of goods on hand, Computing cost of goods sold and gross profit.

Bank Reconciliation statement and plant assets: The necessity of the statement and different methods for preparation of the statement, the concept and reasons of depreciation, Different methods of charging depreciation, Calculating depreciation under different methods.

Text Books:

1. Wwygandt,kieso& Kimmel:Accounting Principles, vol. 6.

ECO 213 Economics

Definition and Subject matter of Economics: Distinction between micro & macroeconomics-some basic economic concepts- Alternative economics systems- Capitalism, Socialism and Islamic economics.

The Theory of demand and supply and their uses- Elasticity of demand and supply & their measurement. Difference between demand and supply of agricultural and industrial products. The Law of diminishing marginal utility & the law of equimarginal utility consumer'ssurplus.

The Indifference Curve analysis- Properties of Indifference Curve. Consumer's equilibrium-Income, substitution & price effects.

The Theory of Production- factors of production, returns to scale—production functions-ISO-product and Iso-cost curves- producer's equilibrium.

Market structure- Perfect, imperfect and monopoly-concepts of cost & revenue. short run and long run, cost curves-producer's equilibrium.

The Pricing of the factors of Production- The marginal productivity of distribution-determination of rent, wages, interest and profit.

National Income & its different concepts- methods of computing National Income-problems of computing National Income-Uses of National Income.

The Theory of income determination- Keynesian approach-consumption function, Investment function- Multiplier.

Banking- The commercial banks-functions of commercial banks. Principles of commercial banks and balance sheet-Multiple credit and credit creation-Specialized financial institutions. The Central Bank-functions of Central Bank, various instruments of credit control & their limitations- Monetary policy. Islamic banking systems.

Public Finance- Private Vs. public finance-Sources of revenue & heads of expenditure of the governments. Public expenditure & Public borrowing budgets-capital & revenue. Taxation-Principles of taxation-type of taxation-Incidence of taxation-zaket public debt: Internal vs. external debt- Burden of public debt- fiscal policy.

MGT 215 Introduction to Management

Meaning and Evolution of Management Thought:
Meaning, Nature, Purpose and Principles, Functions of management, Managerial functions at different organizational management roles, concepts of productivity, effectiveness and efficiency, Concept of management and administration: Evolution of Management Thought; Scientific management, administrative management, Bureaucratic management approach.Hawthorn experiment, Theory "X" and theory "Y",System theory.

Environment, Planning and decision making process in Management:
Internal and External Environment, Components of Internal and external environment: Planning; Meaning, nature of planning,types of planning,steps of planning, tools and techniques in planning, the planning process, Management by Objectives(MBO), Strategic Management, Strategic Planning Process; Decision Making; Meaning of Decision Making, types of decision making, Decision making conditions,Decision Making Process, Problems and Opportunities of decision making. Nature of managerial decision making, decision support system.

Organizing and Managing Human Resources:
Meaning, Organizational structure, Division of work, Span of management, Departmentalization, delegation of authority, centralization and decentralization, co-ordination, Line and staff function: Managing Human Resources; Concepts of HRM, functions, roles, importance, model.

Leading and Controlling
Motivation-meaning, motivation framework, motivation and satisfaction, motivation theories: Leadership- Meaning, Types of power, Leadership behaviors. Leadership Theories, types of Leadership: Controlling; Meaning and importance of controlling, Types of control, Controlling process, Requirements of effective control, Methods of controlling.

Text books:

1. Management- Griffin, Latest Edition
2. Management- Stoner, Latest Edition.

Reference books:
1. Management II: Koontz, 10th Edition
2. Management- Kritner, Latest edition
3. Principles of Management- Martin and Bartol, International edition
4. Human Resource Management- DeCenzo and Robbins, Latest Edition.

BlO 218 Introduction to Biological Science

Origin of life: Cell, genetic bases of life, evolution and diversity, plant structure and functions, heredity -and evolution, animal structure functions, behavior and ecology, basic human anatomy and physiology, microbiology, nutrition and dietetics and biological industries.

MKT 324 Principles of Marketing

This course deals with the study of concepts, principles and problems involved in the transfer of goods and services from' produces to the ultimate consumer. Contents covered include buyer behavior, demand measurement, segmentation, targeting, product life cycle and positioning, product development, pricing, distribution, sales promotion, marketing institutions, marketing strategy and marketing management process. Marketing is the social and managerial process by which individual and group obtains what they need and want, through creating offering, and exchanging product of value with others. Principles of Marketing course is design to present marketing environment which includes marketing and changing world, the identification of market. developing the marketing mix, marketing in special field, international marketing, marketing and society, marketing appraisal and prospects, factor affecting the efficiency of marketing

MIS 435 Management Information Systems

This study highlights the effective use of information systems in management builds on a vision-an idea, often not fully articulated, of where a company can go: perhaps new services or unique products it can offer, ways of serving customers better, or ways to help employees be more effective and more satisfied with their work. A vision also means knowing about how things arc at the present time. Information describing current events, trends, and likely occurrences help from an image of what could be - opportunities and challenges.

English

ENG 101 Composition

The course aims at developing proficiency in speaking, listening, reading, and writing of English. It I is generalized as a remedial course for students whose English need considerable repair and as a foundation courses for ENG 106. The contents include parts of speech, count and uncountable nouns and articles, agreement between subject and verb, adverbs of frequency, term and the sequence of tenses, active arid passive voices, types of sentences, prepositions: time, place, action, directions, questions forms, multi-word verbs, capitalization.

ENG 106 Freshman English-Il

A course to provide solid foundation on study skills in English reading writing, listening comprehension and speaking. The course emphasizes the practice of pronunciation, speed-reading, and effective Writing and listening. The course contents include the grammar parts of revision of tenses, use of idioms, prepositions, modals, conditional sentence, use of linking words, use of suffixes and prefixes, synonyms and antonyms, words with multi names, reading parts include the skills in skimming, scanning, selecting information, writing parts include planning, outlining, organizing ideas, topic sentences, paragraph writing, essay writing, job applications, writing reports, writing research -report.

Mathematics

MATH 115 Differential Calculus and Coordinate Geometry

Differential Calculus: Limit, Continuity and differentiability, Successive Differentiation of various types of function, Liebnitz's theorem, Roile's theorem, Mean value theorem, Taylor's theorem in finite and infinite form, Mac laurine's theorem's in finite and infinite form, Lagrange's form of remainders, Cauchy's form's of remainder's, Expansion of function, Evaluation of function - of Hospitals rule, Partial- Differentiation, Euler's theorem, Tangent & Normal, Suhtangent and abnormal in Cartesian and polar co-ordinates, Determination of minimum and maximum values of 'unction and point of inflexion, Applications, Curvature, Radius of Curvature, Center of curvature.

Coordinate geometry: Changes of axes, Pair of straight line, System of circle, Ellipse Parabola.

Text Book:
>   1. Differential Calculus by B.C. Das and B.N. Mukherjee.

Reference books:
>   1. Differential Calculus by Howard Anton.
>   2. Differential Calculus by Hari Kishan
>   3. The Elements of Co-ordinate Geometry, S.L. Loney.

MATH 125 Integral Calculus & Vector Analysis

Integral Calculus: Definitions of integration, integration of method of substitution, integration by parts, Standard integrals, Integration by the method of successive reduction, Definite integrals, its properties and use in summing series, Walli's formula, Improper integrals, Beta function and Gamma function, Area under a plane curve in Cartesian and polar co-ordinates, Trapezoidal rule, Simpson's rule, arc lengths of curves in Cartesian and polar co-ordinates, parametric and pedal equation, Intrinsic equation, Volumes. of solids of revolutions by shell method, Area of surface revolution.

Vectors Analysis: Scalars and vectors, equality of vectors, Addition and subtraction of vectors, Multiplication of vectors by scalars, Scalar and vectors product of two vectors and their geometrical interpretation, Triple products and multiple products, Linear dependence and independence of vectors together with elementary application, definition of line, surface and volume integrals, Gradient, divergence and curl of point function, -Various formulae, Gauss's theorem, Stroke's , theorem, Green's theorem.

Text Book:

    1. Integral Calculus by B.C. Das and B.N. Mukherjee.

Reference books:

    1. Integral Calculus by Hari Krishan.
    2. Integral Calculus with Applications by A.K. Hazra.
    3. Vector Calculus by Jerrold E. Masden.

MATH 135 Discrete Mathematics

Set, Functions, Relations: Set, Set Operation, Functions, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Propositional Calculus: Propositions, Predicate and Quantifier.

Algorithms: Complexity, Divisions, Algorithm, Application of Number Theory.

Recursion: Sequences and summations, Recursive Definition and algorithm.

Combinatorial Analysis: Permutation and Combination, Divide and Conquer Algorithms, Generating Functions, Inclusion-Exclusion.

Graphs: Representation, Isomorphism, Connectivity, Euler and Hamilton path, shortest path, Planarity, Coloring.

Trees: Introduction to Trees, Application of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

Mathematical Induction: Mathematical Induction, Recursive Definitions and structural Induction, Strong Induction.

Text Book:

    1. Kenneth Rosen: Discrete Mathematics and its Applications.

Reference Books:

    1. P. Trembly &R.Monohar: Discrete Mathematics Structure with Applications to Computer Science.
    2. J.C. Abbott: Sets, Lattice and Boolean Algebra.
    3. Alan Doer: Introduction to Discrete Mathematics.
    4. O. Nicodemi: Discrete Mathematics.

MATH 215 Linear Algebra
Systems of Linear Equations: Introduction to systems of linear equations, Gaussian elimination,
Vector Spaces:Introduction,Vector Spaces, Examples of Vector Spaces, Linear Combinations, Spanning Sets, Subspaces, Linear Spans, Row Space of a Matrix, Linear Dependence and Independence,Basis and Dimension,Application to matrices, Rank of a matrix, Sums and direct sums, coordinates
Linear Mappings and Matrices: Introduction,Matrix Representation of a Linear Operator,Change of Basis,Similarity,Matrices and General Linear Mappings.
Diagonalization: Eigenvalues and Eigenvectors: Introduction,Polynomials of Matrices, Eigenvalues and Eigenvectors,Computing Eigenvalues and Eigenvectors.

Text book:
1. Linear Algebra, 4th edition by Schaum's Outline.

STAT 235 Statistics

Introduction: Introduction to Statistics, Important concepts, Frequency Distribution, Measures of Central Frequency, Measures of Dispersion.

Correlation: Correlations, Simple correlation, Scatter Diagram, Karl-Pearson correlation coefficient, Rank correlation, Rank correlation for tied observations.

Regression: Simple linear regression model, Estimation of the regression parameters, Method of least squares, Error of random variable, Coefficient of determination.

Probability: Sets and probability, random variable and its probability distribution, Discrete probability distribution, Continuous probability distribution.

Test of Hypothesis: Test concerning the mean of a normal population, Testing Equality of Means of Two Normal Populations, Test concerning the variance of normal population, Statistical significance, T-Tests, Chi-Square Tests, Chi-Square Test of goodness-of-fit.

Parameter Estimation: Estimation of population mean, Interval estimators & lower upper bounds of population mean using known and unknown variance.

Sampling Methods: Different types of probability and non-probability sampling methods.

Analysis of Variance: One way analysis of variance and two factor analysis of variance.

Text Book:
1. Sheldon Ross: Introduction to Probability Models.

Reference books:

1. Sheldon Ross: A first course in probability.
2. Papoulis: Probability, random Variables and Stochastic Process.
3. Sheldon Ross: Probability Models for Computer Science.

MATH 315 Complex Variable and Laplace Transformation

Complex Variable: Complex number system, General functions of a complex variable, Limit and continuity of a function of complex variable and related theorems, Complex differentiation & the Cauchy-Rieman equations, Mapping by elementary functions, Line integral of a complex function, Cauchy's integral theorem, Tailor's &Laurrent's theorems, Singular points, Residue, Cauchy"s residue theorem, Evaluation of residue, Contour integration, Conformal mapping.

Laplace transform: Definition, Laplace of some elementary functions, Sufficient conditions for istence of laplace transforms, Inverse laplace transforms, laplace transforms of derivatives, the nth step function, Periodic function, Somespecial theorems of laplace transforms, Partial fraction, iolution of differential equation by laplacetransform, Evaluation of improper integral.

Text Book:

1. A First course in Complex Analysis with Applications by Dennis G. Zill. Jones and Bartlett.

Reference books:

1. Complex Analysis by V. Karunakaran.
2. Laplace Transform by Murray R. Spigel.
3. The Laplace Transform by David V. Widder.

MATH 325 Differential Equations and Fourier Analysis
Differential Equations: Degree and order of ordinary differential equation, Formation of differential equation, Solution of first order differential equation by various methods, Solution 'of general linear equations of second and higher order with constant co-efficient, Solution of homogenous linear equations. Solution of differential' equations of the higher order when the dependent and independent variables are absent. Solution of differential equation by the method based on the factorization of the operations.
Fourier Analysis: Fourier series and co-efficient, Convergence of Fourier series, Real and complex form, Finite transform, Fourier integral, Fourier transform and their uses in solving boundary value problems.

Text Book:

1. Theory of Ordinary Differential equations by E.A. Coddington and N. Levinson

Reference books:
1. Partial Differential Equations by Walter A. Strauss.
2. Introduction to Partial Differential Equations by Peter J. Olver
3. Fourier Analysis by T.W. Korner.

MATH 329 Mathematical Analysis for Computer Science

Recurrent Problems: The Tower of Hanoi, Lines in the Plane, The Josephus Problem.

Sums: Notation, Sums and Recurrences, Manipulation of Sums, Multiple Sums, General Methods, Finite and Infinite Calculus, Infinite Sums.

Number theory: Divisibility, Primes, Prime Examples, Factorial Factors, Relative Primality, 'mod': The Congruence Relation, Independent Residues, Additional Applications, Phi and Mu

Binomial Co-efficient: Basic Identities, Basic Practice, Tricks of the Trade, Generating Functions, Hypergeometric Functions, Hypergeometric Transformations, Partial Hypergeometric Sums, Mechanical Summation.

Special Numbers: Stirling Numbers, Eulerian Numbers, Harmonic Numbers, Harmonic Summation, Bernoulli Numbers, Fibonacci Numbers, Continuants

Generating Functions: Domino Theory and Change, Basic Maneuvers, Solving Recurrences, Special Generating Functions, Convolutions, Exponential Generating Functions, Dirichlet Generating Functions

Random Variables: Discrete Random Variables, Continuous Random Variables, Expectation of a Random Variable, Jointly Distributed Random Variables, Moment Generating Functions, The Distribution of the Number of Events that Occur, Limit Theorems, Stochastic Processes.

Markov Chains: Introduction, Chapman–Kolmogorov Equations, Classification of States, Limiting Probabilities, Mean Time Spent in Transient States, Branching Processes, Reversible Markov Chains, Markov Chain Monte Carlo Methods, Markov Decision Processes, Hidden Markov Chains

Queuing Theory: Queuing models, open and closed Queuing network, Application of Queuing model.

Text Books:
1. Concrete Mathematics, 2nd Edition, *byRonald L. Graham, Donald E. Knuth and Oren Patashnik*
2. Introduction to Probability Model*, by Sheldon M. Ross, 10th Edition.*

Reference Books:
1. The Art of Computer Programming, Volume 1, 3rd Edition, *by Donald E. Knuth*
2. Principles of Mathematical Analysis, by *Walter Rudin*

MATH 415 Numerical Methods

Empirical laws and Curve Fitting: Principles of least squares, fitting a straight a line, parabola and exponential curve.

Solution to Numerical, Algebraic and Transcendental equations: Bisection Method, Method of False Position, Newton's Iteration Method, Convergence of Newton.

Simultaneous Linear Algebraic Equations: Gauss Elimination Method, Gauss Jordan Method, Inverse of a matrix using Gauss Elimination Method.

Finite Differences: Forward and Backward Differences, Central Differences.Interpolation with equal and unequal intervals.Numerical Differentiation and Integration.

(Pre-requisite MATH 215)

Reference book:
1. Numerical Methods By Dr. V. N. Vedamurthy *and Dr. N. Ch. N. Iyengar*.

Computer Science Courses

CSE 111 Computer Fundamentals & Programming Techniques

Introduction to computations: Early History of Computing Devices, Computers, Different Types of Computers, Major Components of a Computer.

Hardware: I/O devices, Memory Devices, Storage Devices, Processor

Software: Operating System, Application Software, Basic Architecture of a Computer, Basic Information Technology, The Internet.

Number system: Binary, Octal, Hexadecimal, Binary Arithmetic Operation, r's and (r- 1)'s Compliment Operations.

Networking Basics: LAN, MAN, WAN, Topology, Switch, Router

Programming Language: Basic Concept, Overview of Programming Languages, Problem Solving Techniques and Data Flow Diagram.

C-Language: Preliminaries, Program Constructs Variables and Data Types in C. Input and Output. Character and Formatted I/O, Arithmetic Expressions and Assignment Statements, Loops and Nested Loops, Decision Making, Arrays

Text Book:
1. M. Lutfur Rahman: Computer Fundamentals.
2. L. Balagurushami: Programming in ANSI C.

Reference Books:
1. Peter Norton: Introduction to Computers
2. C.S. French: Computer Science
3. Warford: Computer Science

CSE 112 Computer Fundamentals & Programming Techniques Sessional

Laboratory work based on CSE Ill

CSE 121 Structured Programming Language

Data Types: Data Type Qualifier, 1/0 Functions-Character 110, formatted 110, Character Set, Identifiers, Keywords and Contents, Variables, Expressions, Statement and Symbolic Constants, Arithmetic operators, Relational Operators and Logical Operators, Assignment Operators, increments Decrement Operators, Unary Operator and Conditional Operator., Bit-wise Operators, Comma Operator, Precedence and Associatively, Branching: The If' statement (break and continue statement).

Branching: SWITCH statement, GOTO statement arid operator, Looping: FOR statement (break and continue), Looping: WHILE and DO WHILE statement, Storage class: Automatic, Static, Register and Extern. Functions: Access, Prototype, Argument Passing and Value Receiving, Functions: Pass"-by-value, Pass-by reference and Value Receiving, Functions: Command Line Parameter and Library functions, Arrays: initialization, Access, Passing and Receiving, Arrays: 2D handling, Arrays: Sorting and Searching, String Handling, Structure: Initialization, Access, Passing and Receiving, Structure.

Structure: Embedded Structure, Union and Bit-fields, File: Types of File, Text File Handling, File: Binary File Handling.

File: Data File Management Program, Pointer: Concept, Passing and Receiving, Memory Allocation and Release, Pointer: List or Tree Management by Self-Referential Structure, Pointer: Pointer and Multi Dimensional Arrays, Enumeration, Macros, Processor and Compiler, Directives, Library, Compiler and Linker, Segment and Memory Model, Video Adapter, Modes and Graphics Initialization, Graphics Functions.

(Pre-requisite CSE 111)

Text Book:

1. Gottfried: Programming with C.

Reference Books:

1. B. Kernighan & D. Ritchie: The C programming language.
2. H.Schildt: Teach yourself C.
3. Deitel&Deitel: C how to Program.
4. L. Balagurushami: Programming in ANSI C.

CSE 122 Structured Programming Language Sessional

Laboratory work based on CSE 121

CSE 211 Object Oriented Programming

Introduction to Java: History of Java**,** Java Class Libraries**,** Introduction to Java Programming**,** A Simple Program**.**

Developing Java Application: Introduction, Algorithms, Pseudo code, Control Structure, The If /Else Selection Structure, The While Repetition Structure, Assignment Operators, Increment and Decrement Operators, Primitive Data Types, Common Escape Sequence, Logical Operator

Control Structure: Introduction, The For Structure, The Switch Structure, The Do/While Structure, The Break and Continue Structure**.**

Methods: Introduction, Program Module in Java, Math Class Methods, Method Definitions, Java API Packages, Automatic Variables, Recursion, Method Overloading, Method of the Applet Class**.**

Arrays: Introduction, Arrays, Declaring and Allocating Arrays, Passing Arrays to Methods, Sorting Arrays, Searching Arrays, Multiple-Subscripted Arrays

Object-Based Programming: Introduction, implementing a Time Abstract Datatype with a Class, Class Scope, Controlling Access to Members, Utility Methods, Constructors, Using Overload Constructor, Using Set and Get Method, Software Reusability, Friendly Members, Finalizers, Static Class Members, Data Abstraction and Information Hiding

Object-Oriented Programming: Introduction, Superclasses and Subclasses, Protected Members, Using Constructor and Finalizers in Subclasses, Composition vs. Inheritance, Introduction to polymorphism, Dynamic method building, Final Methods and Classes, Abstract Superclasses and Concrete Classes**.** String and Characters, Graphics, Exception Handling, Files and Stream, Java API, Utility Classes, 2D Graphics, GUI, Swing, Events.

Text Book:

1. Patrick Naughton & H. Schildt: Java
2. 2: The complete reference.
3. Herbert Schildt : "Teach yourself C++"
4. 4.E Balagurusamy : "Object-Oriented Programming with C++"

Reference Books:

1. Deitel&Deitel: Java How to program. 2. Sun Java Tutorial.

CSE 212 Object Oriented Programming Sessional

Laboratory work based on CSE 211

CSE 217 Data Structure

Basic: Basic Data Structures and Representation of Data. Data Structures Operations.

Linear Data Structures: Arrays, Records, Pointer, Linked Lists, Linked Lists with Sentinels, Stack, Queue, Dequeue and Priority Queue, Recursion, Data Structures' Operations on Them.

Non Linear Data StructuresTrees: Binary Tree, Traversing Binary Trees, Insertion Deletion and Searching, Binary Search Trees, B+ Trees, Indexing, Red-Black Trees, Operations on Red-Black Trees, Heap, Heapsort, Heap Property, Heapify, Building and Maintaining a Heap, Huffman's Algorithm, Binomial Heaps.

Graphs: Introduction to Graph, Sequential and Linked Representation of a Graph on Memory, Operations on Graph, Traversing a Graph,

Hashing Techniques: Characteristics of Hash Functions, Collision Resolution, Probing Chaining, Perfect Hashing.

Data Structures for Disjoint Sets: Disjoint Set Operations, Linked List Representation of Disjoint set, Disjoint Set Forests.

Augmenting Data Structures: Dynamic order Statistics, How to Augment a Data Structure, Interval Trees. Searching and Sorting Techniques in Different Structures.

(Pre-requisite CSE 121)

Text Book:

1. Seymour Lipschetz : Data Structure

Reference Books:

1. T. Cormen et. al.: Introduction to Algorithms.
2. Ellis Horowitz & Sartaj Sahni Mehta: Fundamentals of data structures in C++.
3. Tanenbaum: Data structures in C.
4. Ellis Horowitz & Sartaj Sahni: Fundamentals of Computer Algorithms.
5. Aho, Hopcroft, Ullman: Data Structures and Algorithms.
6. Robert Sedgwick: Algorithms.

CSE 218 Data Structure Sessional

Laboratory work based on CSE 217

CSE 221 Database Management System

Introduction: Purpose of Database Systems, Data Abstraction, Data Models, Instances and Schemes, Data Independence, Data Definition Language, Data Manipulation Language, Database Manager, Database administrator, Database Users, Overall System Structure, Advantages and Disadvantage of a Database Systems. Data Mining and analysis, Database Architecture, History of Database Systems.

Relationship Entity-Model: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Composite and Multivalued Attributes, Mapping Constraints, Keys,

Entity-Relationship Diagram, Reducing of E-R Diagram to Tables, Generalization, Attribute Inheritance, Aggregation, Alternative E-R Notatios, Design of an E-R Database Scheme.

Relational Model: Structure of Relational Database, Fundamental Relational Algebra Operations, The Tuple Relational Calculus, The Domain Relational Calculus, Modifying the Database.

Relational Commercial Language: SQL, Basic structure of SQL Queries, Query-byExample, Query., Nested Sub queries, Complex queries, Integrity Constraints, Authorization, Dynamic SQL, Recursive Queries, Overview of PL/SQL.

Relational Database Design: Pitfalls in Relational Database Design, Functional Dependency Theory, Normalization using Functional Dependencies, Normalization using Multivalued Dependencies, Normalization using join Dependencies, Database Design Process.

File and System Structure: Overall System Structure, Physical Storage Media, File Organization, RAID, Organization of Records into Blocks, Sequential Files, Mapping Relational Data to Files, Data Dictionary Storage, Buffer Management.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+ -Tree Index Files, B-Tree Index Files, Static and Dynamic Hash Function, Comparison of Indexing and Hashing, Index Definition in SQL, Multiple Key Access.

Query Processing and Optimization: Query Interpretation, Equivalence of Expressions, Estimation of Query-Processing Cost, Estimation of Costs of Access Using Indices, Join Strategies, Join Strategies for parallel Processing, Structure of the query Optimizer, Transformation of Relational Expression.

Concurrency Control: Schedules, Testing for Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Validation Techniques, Multiple Granularity, Multiversion Schemes, Insert and Delete Operations, Deadlock Handling.

Distributed Database: Structure of Distributed Databases, Trade-off in Distributing the Database, Design of Distributed Database, Transparency and Autonomy, Distributed Query Processing, Recovery in Distributed Systems, Commit Protocols, Concurrency Control, Shared Server Configuration.

Data Mining: Data analysis and OLAP, Data Warehouse, Data Mining, Overview of Data Mining Techniques Information Retrieval and Structured Data. Basic of Ontology.

Administrative Functionalities: Architecture of a Database, Concept of Physical and Logical Databases Tablespaces, Database Creation, Maintaining Data Dictionary, Database Backup/Recovery, Database maintaining and Performance Tuning, Data GuardPhysical, logical and Standby Database.

Text Book:

1. Database System Concepts: Abraham Silberschratz, Henry K. Korth, S. Sudarshan, 5th edition

Reference Books:

1. Chip Dawes, Bob Bryla: OCA Oracle 10g Administration 1, BPB Publications.
2. Fundamentals of Database Systems: Benjamin/Cummings, 1994.
3. Database Principles, Programming, Performance: Morgan Kaufmann 1994. 4. A First Course in Database Systems: Prentice Hall, 1997.
4. Database Management Systems, McGraw Hill, 1996.
5. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques

CSE 222 Database Management System Sessional

Laboratory work based on CSE 221

CSE 227 Algorithm

Efficient algorithm designing techniques: Divide-and-Conquer paradigm, Greedy method, Dynamic programming, Backtracking, Branch and bound; Flow algorithms; Approximation Algorithms; Introduction to parallel and randomized algorithms;
Analysis of algorithms: Complexity Analysis, Master Method, Correctness and loop invariants, Algebraic simplification and transformations, Lower bound theory, NP completeness, NP-hard and NP-complete problems;
Search and traversal: Basic search and traversal technique, Shortest path problems, Topological sorting, Connected components, Spanning trees; Graph algorithms.

Text Book:

1. Introduction to Algorithms:Thomas H. Cormen. Charles E. Leiserson. Ronald L. Rivest. Clifford Stein.

CSE 228 Algorithm Sessional

Laboratory work based on CSE 227

CSE 231 Operating System Concepts

Introduction: Operating Systems Concept, Computer System Structures, Operating System Structures, Operating System Operations, Protection and Security, Special Purpose Systems.

Fundamentals of OS: OSServices andComponents, Multitasking,Multiprogramming, Time Sharing, Buffering, Spooling.

Process Management: Process Concept, Process Scheduling, Process State, Process Management, interprocess Communication, interactionbetween Processes and OS, Communication inClient-Server Systems, Threading, Multithreading,Process Synchronization.

Concurrency Control: Concurrency and RaceConditions,MutualExclusion Requirements, Semaphores, Monitors, Classical IPC Problem and Solutions, DeadLocks-

Characterization,Detection, Recovery, Avoidance and Prevention.

Memory Management: Memory Partitioning,Swapping,Paging, Segmentation, Virtual Memory - Concepts,Overlays, Demand Paging, Performance of DemandPaging,Page Replacement Algorithm, Allocation Algorithms.

Storage Management: Principles of I/O Hardware, Principles of I/O Software, Secondary Storage Structure, Disk Structure,Disk Scheduling,Disk Management,Swap-Space Management, Disk Reliability, Stable Storage Implementation.

File Concept: File Support, Access Methods, Allocation Methods, Directory Systems, File Protection, Free space Management.

Protection & Security: Goalsof Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, The Security Problem, Authentication, One-Time Passwords,ProgramThreats, System Threats, Threat Monitoring, Encryption, Computer-Security Classification.

Distributed Systems: Types ofDistributed Operating System, Communication Protocols, Distributed FileSystems, Naming and Transparency, Remote File Access, Stateful Versus Stateless Service, File Replication.

Text Book:

    1. Silberschatz& Galvin Wiley: Operating System Concepts (7th Edition), 2000.

Reference Books:

1. William Stallings: Operating System Internals.
2. Andrew Tanenbam, Albert S. Woodhull Pearson: Operating Systems Design & Implementation.
3. Andrew S. Tanenbaum: Modern Operating System.

CSE 232 Operating System Concepts Sessional

Laboratory work based on CSE 231

CSE 317 Theory of Computing

Finite Automata: Deterministic finite automata, Non-deterministic finite automata, equivalence and Conversion of deterministic and non-deterministic finite automata, pushdown automata

Context free languages: Context free grammars, ambiguity, Chomsky normal form, pumping lemma; Turning machines: basic machines, configuration, computing with turning machine, combining turning machines, Church-Turing thesis, Hilbert's problems;

Decidability: Decidable Languages, Undecidability, halting problem

Complexity: class P, class NP, NP completeness.

Text Book:
    1. Michael Sipser: Introduction to the theory of computation.

Reference Books:

    1. Hopcroft, Motwani& Ullman: Introduction to Automata Theory, Languages and Computation.

    2. Lewis & Papadimitriou: Elements of the theory of computation.

    3. Peter Linz: An introduction to formal languages and automata.

    4. ZviKohavi: Switching and Finite Automata Theory.

CSE 321 Software Engineering

Concepts of software engineering: requirements definition, modularity, structured design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools, Software project organization, quality assurance, management and communication skills. Product Metrics, Process and Project Metrics, Estimation for software concepts. Risk management.

Analysis Concepts and Principles: Requirement Analysis, Analysis Modeling, Data Modeling.

Agile development: Agility, Agility principles, Extreme programming.

Testing Conventional Applications: White-box testing, Basis path testing, Control structure testing, Black-box testing.

(Pre-requisite CSE 315)

Text Book:

    1.**Software Engineering**, 7th Edition, *byROGER S. PRESSMAN*

Reference Books:

    1. M. Shooman: Software Engineering.
    2. Dewild: Computer Systems and Software Engineering.
    3. A.V. Mayrhauser: Software Engineering.
    4. Sommerville:Software Engineering.

CSE 322 Software Engineering Sessional

Laboratory work based on CSE 321

CSE 331 Pattern Recognition

Introduction: Introductory Concepts: Pattern Recognition System, The Design Cycle, Learning and Adaptation: Supervised Learning, Unsupervised Learning, Reinforcement Learning.

Bayesian Decision Theory: Bayesian Decision Theory-Continuous Features, Minimum-Error-Rate Classification, Classifier, Discriminant Functions and Decision Surfaces, Bayes Decision Theory-Discrete Features.

Maximum Likelihood and Bayesian Parameter Estimation: Maximum Likelihood Estimation, Bayesian Estimation, Hidden Markov Model.

Nonparametric Techniques: K-nearest neighbor estimation.

Linear Discriminant Functions: Linear Discriminant Functions and Decision Surfaces, Minimum Square Error Procedures.

Multilayer Neural Networks: Overview on Multi-layer Neural Networks.

Stochastic Methods: Stochastic Search: Simulated Annealing, Evolutionary Methods: Genetic Algorithms.

Nonmetric Methods: Decision Tress, Recognition with Strings.

Unsupervised Learning and Clustering: Application to Normal Mixtures: K-means clustering, Unsupervised Bayesian Learning: The Bayes classifier, Data Description and Clustering: Similarity Measures, Criterion Function for clustering, Hierarchical Clustering.

SVM: Support Vector Machine.

Text Book:

    1. Pattern Recognition by Richard O. Duda, Peter E. Hart and David G. Stork.

Reference Book:

    1. Pattern Recognition and Image Analysis by Earl Gose, Richard Johnsonbaugh, Steve Jost.

CSE 332 Pattern Recognition Sessional

Laboratory work based! on CSE 331

CSE 341 Artificial Intelligence

What Is Artificial Intelligence: The AI Problems, The Underlying Assumption, What Is An AI Technique?

Problems, Problem Spaces and Search: Defining the Problem as a State Space Search, Production System, and Problem Characteristics.

Heuristics Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation Issues: Representation and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Facts in Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching.

Game Playing: Overview, the Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

Planning: Overview, an Example Domain: The Blocks World, Components of a Planning System, Goal Stack Planning.

Understanding: What Is Understanding, What Makes Understanding Hard, And Understanding As Constraint Satisfaction.

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.

Expert Systems: Representing and Using Domain Knowledge, Expert System Shells Explanation, Knowledge Acquisition.

(Pre-requisite CSE 227, MATH 135)

Text Book:
     1. Russell and Norvig: Artificial Intelligence: A modern approach.

Reference Books:
     1. Nils J. Nilsson: Artificial Intelligence.
     2. Elaine Ritch & Kevin Knight: Artificial Intelligence.
     3. Herbert Schildt: Advanced Turbo Prolog.
     4. Townsend: Introduction to Turbo Prolog.
     5. Guy L. & Steele Jr.: Common LISP Language.
     6. DeiterNesendane: Expert System.
     7. Patrick Henry, Winston Berthold, Klaus Paul Horn: LISP.

CSE 342 Artificial Intelligence Sessional

Laboratory work based on CSE 341

CSE 434 Web Technology Sessional

Understanding Web Apis: REST, XML, JSON, RSS Parsing.
Server-Side Technology: Web Application Frameworks (Example: Silverlight, Adobe Flex), Web 2.0 and Web Apis.
Front-End Technology: HTML,XHTML, XML. CSS Styling, Layout, Selector, Document Object Model and Javascript.

Client-Programming: WebApisWith JavaScript (Example: Google Ajax API). **MVC:** Understanding Model, View and Controller Model.

Javascript Exercise: The Goal of This Assignment Is to Allow You to Explore and Use As Many of Javascript's Objects, Methods, and Properties As Possible in A Small Assignment.
PHP Exercise: BuildaSet ofPHPScriptsThat PerformSomeDynamic ServerSide Functionality.
Understanding Plug-ins: Develop A Firefox Extension

Text Books:

1. Internet & World Wide Web How To Program: Deitel&Deitel.

Optional II:

CSE 411 Compiler

Introduction to Compilers: Introductory Concepts,Types of Compilers, Applications, Phases of A Compiler.

Lexical Analysis: Role of The Lexical Analyzer, Input Buffering, token Specification, Recognition of tokens, Symbol Tables.

Parsing: Parser and Its Role, Context Free Grammars, top-Down Parsing.
Syntax-Directed Translation: Syntax-Directed Definitions, Construction of Syntax Trees, top-Down Translation.

Type Checking: Type Systems, Type Expressions, Static and Dynamic Checking of Types, Error Recovery.

Run-Time Organization: Run-Time Storage Organization, Storage Strategies.
Intermediate Code Generation: Intermediate Languages, Declarations, Assignment Statements. **Code Optimization:** Basic Concepts of Code Optimization, Principal Sources of Optimization.

Code Generation. Features of Some Common Compilers: Characteristic Features of C, Pascal and Fortran Compilers.

(Pre-requisite CSE 317)

Text Book:

1. Aho, Ulman &Ravishethi: Principle of Compiler Design.

Reference Books:

1. Philip: Compiler Design Theory.
2. Willam A. Barrette: Compiler Construction, Theory and Design.

CSE 412 Compiler Sessional

Laboratory work based on CSE 411

CSE 421 Computer Graphics

Introduction to Graphical data processing, fundamentals of interactive graphics programming, Architecture of display devices and connectivity to a computer;

Image Representation: Color Models, Display monitor.

Scan conversion: Scan Converting a point, DDA algorithm, Bresenham's algorithm, Midpoint ellipse algorithm, Region Filling algorithm, Anti-Aliasing.

Implementation of graphics concepts of two-dimensional and three-dimensional viewing, clipping and transformations, projection. Hidden line algorithms.

Visible surface detection and hidden surface removal methods: back-face detection, depth buffer method, depth-sorting method, BSP trees method.

Raster graphics concepts: Architecture, algorithms and other image synthesis methods, Design of interactive graphic conversations.

Ray Casting Method: Illumination Models, Surface Rendering Methods, Polygon Rendering, Ray TracingterrainVisualisation with Height Mapping, Modeling Surface Details with Texture Mapping; Color and Shading Models;

Text Book:

  1. James Foley et al: Computer Graphics: Principles and practices in C.

Reference Books:

  1. Roy Plastock, Zhigang Xiang: Computer Graphics.(2nd edition)
  2. A. Plastock& G. Kalley: Theory and Problems of Computer Graphics.
  3. Steven Harrington: Computer Graphics A Programming Approach\

CSE 422 Computer Graphics Sessional

Laboratory work based on CSE 421

CSE 423 Simulation & Modeling

Simulation Modeling Basics: Systems, Models and Simulation; Classification of Simulation Models; Steps in a Simulation Study; Concepts in Discrete-Event Simulation: Event-Scheduling Vs. Process-Interaction Approaches, Time-Advance Mechanism, Organization of a Discrete-Event Simulation Model; Continuous Simulation Models; Combined Discreet-Continuous Models; Monte Carlo Simulation; Simulation of Queuing Systems.

Building Valid and Credible Simulation Models: Validation Principles and Techniques, Statistical Procedures for Comparing Real-World Observations and Simulation Outputs, Input Modeling; Generating Random Numbers and Random Variates; Output Analysis.

Simulation Languages: Analysis and Modeling of Some Practical Systems.

Text Book:

      1. Discrete-event System Simulation by Banks J. & Carson JS.

Reference Books:

      1. System Simulation by Geoffrey Gordon.
      2. Simulation Modeling with Pascal

CSE 424 Simulation & Modeling Sessional

Laboratory work based on CSE 423

CSE 447 Multimedia Systems Design

Media and Data Streams: Medium, Main properties of a Multimedia System, Traditional Data Stream Characteristics.

Sound/audio: Basic sound concepts, MIDI basic concepts, MIDI devices and messages, Speech generation & analysis.

Image and Graphics: Digital image representation, image format, graphics format, image synthesis, image analysis, image transmission.

Video and animation: Computer video format, Conventional television systems, Enhanced definition systems, High Television definition systems, computer based animation.

Data Compression: Coding requirements, Source, Entropy and hybrid coding, Lossless and lossycompression, JPEG, H.261, MPEG, MP3 and etc.

Computer Technology Issues: Communication architecture, Multimedia workstations, cache systems, Storage systems and optical storage.

Multimedia OS: Real-time operation, Resource management, Process management, file systems and multimedia networking.

Multimedia Database: Data organization, indexing andretrieval.

Web TechnologiesIssues: Elements of webstyling, Usability,Accessibilityandinformationarchitectureand Content Management Systems (CMS).
MultimediaApplications: Digitallibraries,Systemsoftware,Toolkits,Conferencing paradigms,Structuredinteractionsupportandexamples fromvideo/audio/graphics conferencing.

Reference Books:

1. Ralf Steinmetz & Klara Nahrstedt: Multimedia computing, communications and applications.
2. Simon J.Gibbs&DionysiosC.Tsichritzis: Multimedia Programming Objects, Environ-ments and Framework.

CSE 448 Multimedia Systems Design Sessional

Laboratory work based on CSE 447

CSE 453 Digital Image Processing

Introduction: Digitization of images and Its properties, data structures for image analysis, image Processing;

Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation, Use of Motion in Segmentation;

Image Transforms: Z-Transform, 2D Fourier Transform, Discrete Cosine Transform, Hadamard Transform, Walsh Transform, Slant Transform;

Image Compression: Run-Length Coding, Transform Coding Standards.

Text Book:

1. Rafael C. Gonzalez&Richard E. Woods
2. Digital Image Processing: Pearson Education Asia.

Reference Book:

1. Pitas &A. N.Venetsanopoulos: Non-Linear Digital Filter: Principles and Applications, Kluwer Academic Publications.

CSE 454 Digital Image Processing(Sessional)

Laboratory work based on CSE 453.

Computer Engineering Courses

CSE 113 Electrical Engineering

Fundamental electrical concepts and measuring units: D.C. voltages, current, resistance and power, laws of electrical circuits and methods of network analysis, principles of D.C measuring apparatus, laws of magnetic fields and methods of solving simple magnetic circuits. Alternating current, Instantaneous' and RMS current, voltage and power, average power combinations of R, L & C circuits, Phasor, representation of sinusoidal quantities. Diode logic gates, transistor switches, transistor transistor gates, MOS gates.

Logic families: TTL, ECL, IIL and CMOS logic with operation details, Propagation delay, product and noise immunity, Open collector and High impedance gates, Electronic circuits for flip-flops, counters and register, memory systems, PLA's. AID, D/A converters with applications, SIH circuits, LED, LCD find optically coupled oscillators, Non-linear applications of OP AMPs, Analogue switches.

Text Book:

1. Robert L. Boylestad: Introductory Circuit Analysis.

Reference Books:
1. B.L. Theraja: Electrical Technology.
2. M.E. Van Valkenburg: Network Analysis, 3rd edition.
3. Boylestad&Nashelsky: Electronic Devices and Circuit Theory, 4th Edition, PHI.
4. R.P. Word: An Introduction to Electrical Engineering.
5. Hayt&Kemmerly: Engineering Circuit Analysis.
6. Korchner&Corcorn: Altering Current Circuits.

CSE 114 Electrical Engineering Sessional

Laboratory work based on CSE 113

CSE 123 Electronics

Semiconductors: Semiconductors, junction diode characteristics.

Bipolar transistors: Bipolar transistors characteristics, small signal low frequency h-parameter model, hybrid-pi model, amplifiers voltage and current amplifiers,oscillators, differentials amplifiers, operational amplifiers, linear application of OPAMPs gain input and output impedance.

Linear wave shaping: diode wave shaping techniques, clopping and clamping circuits, comparator druids, switching circuits, pulse transformers, pulse transmission, pulse generation, monostable, bistable and astablemultivibrators, Schmitt trigger, blocking oscillators and time-base circuit, Timing circuits, Simple voltage sweeps, linear current sweeps.

Text Books:
1. Robert Boylestad& Louis Nashelsky: Electronic devices & circuit theory.

Reference Books:
1. Abraham Bell: Electronic Devices and Circuits.
2. Taub & Schilling: Digital Electronics.
3. Floyd: Digital Fundamentals.
4. Millman& Taub: Pulse, Digital and Switching Waveform.
5. Millman&Halkias: Integrated Electronics.
6. Albert Paul Malvino: Electronic principle.
7. R.P. Jain: Digital Electronics.

CSE 124 Electronics Sessional

Laboratory work based on CSE 123

CSE 213 Digital Logic Design

Number System: Review of Number system, Binary, Octal, Hexadecimal, BCD, and ASCII.

Basic Logic Circuits: Boolean algebra, De Morgan's Theorem, logic gates and their truth tables, Canonical forms, Combinational Logic Circuits, Mapping Technique - Karnaugh Map, Minimization techniques.

Combinational Circuits: Half and Full Adders, Subtractor, Combinational Circuit design, Encoders, Decoders; Comparator; Parity generator, ALU, Multiplexer, De-multiplexers, PLA

Sequential Circuits: Flip-flops, race around problems, Counters: asynchronous counters, synchronous counters and their applications, Synchronous and asynchronous logic design: State diagram, Mealy and Moore machines, State minimizations and assignments, pulse mode logic, Fundamental mode design; PLA design;

Memory Circuit & System: Introduction to memories, ROM, Static and Dynamic RAM, Flash memories, Charge coupled device and magnetic bubble memories.

Text Books:
>   1. Digital logic and computer design *by Morris Mano*

Reference Books:
>   1. Digital Systems Principles and Applications *by Ronald J. Tocci*
>   2. Digital Fundamentals *by Floyd & Jain*

CSE 214 Digital Logic Design Sessional

Laboratory work based on CSE 213

CSE 233 Computer Organization and Architecture

Basic Structure of Computer: Computer Organization: Fundamentals of computer design, Performance and cost, Instruction set design and examples, Measurements.

Basic processor implementation techniques: Hardwircd and micro-programmed control; Caches and multiprocessor caches, Design I/O systems, I/O performances, Information representation and transfer, instruction and data access methods,

The control unit: hardwired and micro programmed, memory organization, 1/0 systems, channels, DMA and interrupt, Van Neumann SISD organization,RISC and CISC machines.

Pipelining: Pipelined machines, interleaved memory system, caches, Hardware and architectural issues of parallel machines, Array processors, associative processors, multiprocessors, systolic processors, data flow computer and interconnection networks, High level language concept of computer architecture.

Text Book:

1. V.C.Hamacher,Z.G. Vranesic& S.G. Zaky: Computer Organization.

Reference Books:

1. Hennesy& Patterson: Computer organization – the hardware/software interface.
2. Hennesy& Patterson: Computer architecture – A quantitative approach.
3. J.P. Hayes: Computer Architecture and Organization.
4. A.S. Tanenbaum: Structured Computer Organization.
5. M.M. Mano: Computer System Architecture.
6. Whang: Computer Architecture.

CSE 234 Computer Organization and Architecture Sessional

Laboratory work based on CSE 233

CSE 323 Compute Networks

Introduction: Uses of computer networks; Network Hardware; Network Software; Reference Models, Transmission & switching; Network protocols; Fiber optic network, Satellite networks, Packet radio networks.

The Physical Layer: the theoretical basis for data communication, Guided transmission media, wireless transmission, communication satellites etc.

The Data link layer: Data link layer design issues, Error detection and correction, Elementary data link protocols. The medium access control sub layer: the channel allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband Wireless, Bluetooth etc**.**

The Network layer: Network layer design issues, Routing Algorithms, Congestion Control Algorithms, Quality of service, Internetworking

The Transport layer: The transport service, Elements of transport protocols, A simple transport protocols, UDP, TCP, performance issues.

The Application layer: The Domain Name System, Electronic Mail, World Wide Web, Multimedia etc.

Network Security: Cryptography, Symmetric-key Algorithm, Digital signature, Communication Security, Web security etc.

(Pre-requisite CSE 435)

Text Book:

1. Andrew S. Tanenbaum, Computer Networks

Reference Books:

1. William A Shay, Understanding communication and networks

2. Leon-Garcia and I. Widjaja,   Communication Networks

3. Bertsekas and Gallagar, Data Networks

4. Douglas Comer & D. L. Stevens ,Internetworking with TCP/IP
5. Richard Stevens, TCP/IP Utilities - Vol. I, The protocols
6. SidnieFeit, TCP/IP, Architecture, Protocols and implementation
7. Behrouz A. Fourouzan,Data Communications and Networking

CSE 324 Compute Networks Sessional

Laboratory work based on CSE 323

CSE 333 Computer Peripherals and Interfacing

Basic I/O Interface: Literature components and their characteristics**,** Interface Components and Their Characteristics, Microprocessor I/O. Microprocessor Bus Signals, Peripheral Devices, I/O devices, Interrupt and Interrupt Responses, Hardware Interrupt Applications, 8254 Software Programmable Timer/Counter, 8259 Priority Interrupt Controller,Software Interrupt Applications, Direct Memory Access (DMA).

Digital Interfacing: Programming Parallel Ports and I/O Handshaking, 8255A PPI device,Interfacing to a Micro-Computer Lathe, Interfacing Microprocessor to Keyboards, Interfacing to Alphanumeric Displays, SCSI, Serial Interface Principles, Asynchronous and SynchronousTransmission, RS232 and EIA-562 Standards, USB, PCIE.
Analog Interfacing and Control: Op-Amp Characteristics and Circuits, Sensors and Transducers. D/A and A/D Converters – Types Operations.

Microcomputer System Peripherals: Microcomputer Displays, Computer Vision, Disk Data Storage Systems, Disk Controllers and Interfaces, Printer Mechanism and Interfacing.

Text Books:
1. Microprocessors and Interfacing: Hardware and Software, *by Dauglas V. Hall.*
2. The Intel Microprocessors, *by Barry B. Brey.*

Reference Books:
1. Computer Peripherals, *by Barry M. Cook.*

CSE 334 Computer Peripherals and Interfacing Sessional

Laboratory work based on CSE 333

CSE 413 Microprocessor and Assembly Programming

Introduction to Microprocessor: Introduction to different types of microprocessors, generation of microprocessor, characteristics of 8-bit, 16-bit, 32-bit microprocessors.

Architecture of Microprocessor: Microprocessor architecture, instruction set interfacing, I/O operation, interrupt structure, advanced microprocessor concept, microprocessor based system design.

Addressing Modes: Data addressing modes, program memory addressing modes, stack memory addressing modes.

Hardware Specifications: 8086 PIN-OUTS and PIN functions, clock generator, bus buffering and latching, bus timing.

Assembly Language

Data Movement Instructions: Machine and Assembly instruction types and their formats, instruction execution, Machine language programming, instruction sets and their implementations.

Arithmetic and logic instructions: Different types of arithmetic and logical instruction in assembly language.

Program Control Instructions: The assembly process, Addressing methods, Subroutines, macros and files.

(Pre-requisite CSE 213)

Reference book-

1. The Intel Microprocessor by Barry B. Brey.
2. Assembly Language Programming and Organization of the IBM PC by Ytha Yu and Charles Marut.

CSE 414 Microprocessor and Assembly Programming Sessional

Laboratory work based on CSE 413

Option III:

CSE 315 System Analysis and Design

System analysis fundamentals: Systems, roles, and development methodologies.

Understanding and modeling organizational system: Project management.

Information requirements analysis: Interactive methods;

Information gathering: Unobtrusive methods, agile modeling and prototyping;

The analysis process: Using data flow diagrams, analyzing systems using data dictionaries, process specifications and structured decisions; object oriented systems analysis and design using UML.

The essentials of design: Designing effective output, designingeffective input, designing databases; human-computer interaction;

Qualityassurance and implementation: Designing accurate data entry procedures;

Text Book:

1. System Analysis and Design: Alan Dennis.

CSE 427 VLSI Design

Design and analysis techniques for VLSI circuits, Design of reliable VLSI circuits, noise considerations, design and operation of large fan out and fan in circuits, clocking methodologies, techniques for data path and data control design, Simulation techniques, Parallel processing, special purpose architectures in VLSI, VLSI layouts partitioning and placement routing and wiring in VLSI, Reliability aspects of VLSI design.

(Pre-requisite CSE 123, CSE 213)

CSE 435 Data Communication

Information Theory: Basic concept of information; Entropy; Information rate; Channel capacity.
Data Encoding & Multiplexing: Sampling principal; Nyquist sampling rate; PAM, PWM, PPM, PCM, DPCM; Delta modulation; A-law & μ -law compandings; ASK, FSK, PSK & QPSK systems; NRZ, Bipolar AMI, Manchester, B8ZS, HDB3 coding; FDM; TDM.
Data Link Control: Flow control; Error detection; Error control; HDLC; Other data link control protocols.
Circuit Switching & Packet Switching: Switching network; Circuit switching network; Circuit switching concepts; Routing in CS; Control signaling; Packet switching principles; Routing in PS; X.25.
ATM and Frame Relay: Protocol architecture; ATM logical connection; ATM cells; Transmission of ATM cells; ATM service categories; ATM adaptation Layer; Frame Relay.
ISDN: Overview; ISDN channels; ISDN protocols; Broadband ISD

Text Book:
1. William Stallings,Data and Computer Communications
Reference Books:
1. Behrouz Forouzan, Data Communication and Networking
2. Simon Haykin John, Communication Systems
3. J Dunlop & D G Smith, Telecommunication Engg.

CSE 441 Optical Fiber Communication

Nature of Light: Properties of light, Refractive index, Snell's Law, Critical angle, Total internal reflection, Numerical aperture.

Optical Fiber Basics: Optical fiber Construction, Optical fibers based on modes or mode types, Optical fibers based on refractive index profile, Characteristics and structure of each type.

Optical Sources: LED, Laser Diodes, Light Source Linearity Modal Partition and Reflection Noise.

Power Launching and Coupling: Source to Fiber Power Launching, Launching Scheme, Fiber to Fiber Joints, Splicing Fiber Connectors.

Photo Detectors: Basic Principle, Photo Detectors Noise, Response Time, Avalanche Multiplication Noise.

Optical Receiver Operation: Receiver Configuration, Digital Receiver Performance Preamplifiers

Signal Degradation in Optical Fibers: Attenuation, Losses, Dispersion, Polarization, Nonlinear effects,Solution of dispersion (Solitons).

Digital Transmission System: Point to Point Link, Line Coding, Eye Pattern, System Performance.

Modulation and Multiplexing ofOptical fiber: modulation formats (Return-to-Zero (RZ), Non-Return-to-zero (NRZ))**,** Multiplexingtechniques **(**WDM, TDM,FDM, Subcarrier multiplexing, CDM, Hybrid multiplexing).

Advanced Systems and Techniques: Optical Amplifiers, Fiber Bragg Grating, Local Area Networks.

(Pre-requisite CSE 323)

Text Book:

1. John M. Senior: Optical Fiber Communications, Principle and Practice.

Reference Book:

1. Frederick C. Allard: Fiber Optics.

CSE 443 Mobile and Telecommunications

Introduction: Concept, evaluation and fundamentals of cellular telephony, mobile standards, mobile system architecture, design, performance and operation. Voice digitization and modulation techniques.

Cellular System Design: Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking&GoS, Capacity and coverage improvement.

Statistical Multipath Channel: Time varying Channel impulse response, Narrow band fading model, Wideband fading models, Discrete time model. Space-time channel model.

Spread Spectrum: SS principle, DSSS system model, spreading codes, system model, spreading codes, synchronization, RSKE receiver, FHSS, Spreading code for Multi-user DSSS, DL & UL channel, Multi-user detection, MC-CDMA, Multiuse FHSS.

Multi carrier modulation: Data transmission using multi carrier, MCM with overlapping sub channel, Sub carrier fading mitigation, Cyclic Prefix, OFDM, Matrix reorientation of OFDM, MIMO-OFDM, MC-CDMA.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Cross Bar Switching, Cross Bar Switch Configurations, Cross Point Technology, and Cross Bar Exchange Organization.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching.
(Pre-requisite CSE 435)

Text Book:
   1. Viswanath, Telecommunication switching system and networks

Reference Books:
   1. Frenzel, Communication Electronics
   2. Roddy and Coler, Electronics Communication
   3. S. Haykin, John Wiley, Communication system
   4. J. Bellamy Digital Telephony

CSE 449 Fault Tolerance Systems

Introduction to Fault Tolerant Systems and Architectures, 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 selfchecking circuits, Burst error correction and Triple modular redundancy, Maintenance processor.

CSE 400 Project & Thesis

All candidates are required to undertake supervised study and research culminating in a Thesis /Project in their field of specialization.