SINGHANIA UNIVERSITY

CURRICULUM AND SYLLABUS

B.Tech In Information And Technology
### Semester 1

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Type</th>
<th>Subject Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIT101</td>
<td>Theory</td>
<td>Engineering Mathematics-I</td>
<td>6</td>
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<tr>
<td>BIT102</td>
<td>Theory</td>
<td>Applied Science – I</td>
<td>6</td>
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<tr>
<td>BIT103</td>
<td>Theory</td>
<td>Fundamentals of Programming languages</td>
<td>6</td>
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<tr>
<td>BIT104</td>
<td>Theory</td>
<td>Basic Electrical Engineering</td>
<td>6</td>
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<tr>
<td>BIT105</td>
<td>Theory</td>
<td>Basic Civil and Environmental Engineering</td>
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<tr>
<td>BIT106</td>
<td>Theory</td>
<td>Engineering Graphics – I</td>
<td>6</td>
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<tr>
<td>BIT107</td>
<td>Theory</td>
<td>Manufacturing Practices</td>
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### Semester 2

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<tr>
<th>Subject Code</th>
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<tbody>
<tr>
<td>BIT201</td>
<td>Theory</td>
<td>Engineering Mathematics-II</td>
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<tr>
<td>BIT202</td>
<td>Theory</td>
<td>Applied Science – II</td>
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<tr>
<td>BIT203</td>
<td>Theory</td>
<td>Engineering Mechanics</td>
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<tr>
<td>BIT204</td>
<td>Theory</td>
<td>Basic Electronics Engineering</td>
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<tr>
<td>BIT205</td>
<td>Theory</td>
<td>Engineering Graphics – II</td>
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<tr>
<td>BIT206</td>
<td>Theory</td>
<td>Basic Mechanical Engineering</td>
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<td>BIT301</td>
<td>Theory</td>
<td>Discrete Structures</td>
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<tr>
<td>BIT302</td>
<td>Theory</td>
<td>Computer Organization</td>
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<tr>
<td>BIT303</td>
<td>Theory</td>
<td>Digital Electronics and Logic Design</td>
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</tr>
<tr>
<td>BIT304</td>
<td>Theory</td>
<td>Fundamental of Data structures</td>
<td>6</td>
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<tr>
<td>BIT305</td>
<td>Theory</td>
<td>Humanities and Social Sciences</td>
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<tr>
<td>BIT306</td>
<td>Theory</td>
<td>Digital Laboratory</td>
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<tr>
<td>BIT307</td>
<td>Theory</td>
<td>Programming Laboratory</td>
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<tr>
<td>BIT308</td>
<td>Theory</td>
<td>Communication and Language Lab</td>
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### Semester 4

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<tbody>
<tr>
<td>BIT401</td>
<td>Theory</td>
<td>Engineering Mathematics – III</td>
<td>6</td>
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<tr>
<td>BIT402</td>
<td>Theory</td>
<td>Computer Graphics</td>
<td>6</td>
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<tr>
<td>BIT403</td>
<td>Theory</td>
<td>Processor Architecture &amp; Interfacing</td>
<td>6</td>
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<tr>
<td>BIT404</td>
<td>Theory</td>
<td>Data Structures and Files</td>
<td>6</td>
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<tr>
<td>BIT405</td>
<td>Theory</td>
<td>Data Communication</td>
<td>6</td>
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<tr>
<td>BIT406</td>
<td>Theory</td>
<td>Processor Interfacing Laboratory</td>
<td>6</td>
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<tr>
<td>BIT407</td>
<td>Theory</td>
<td>Data Structures and Files Laboratory</td>
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<tr>
<td>BIT408</td>
<td>Theory</td>
<td>Objected Oriented Programming and Computer Graphics Laboratory</td>
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### Semester 5

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<tr>
<td>BIT501</td>
<td>Theory</td>
<td>Operating System</td>
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<tr>
<td>BIT502</td>
<td>Theory</td>
<td>Theory of Computation</td>
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<tr>
<td>BIT503</td>
<td>Theory</td>
<td>Computer Network Technology</td>
<td>6</td>
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<tr>
<td>BIT504</td>
<td>Theory</td>
<td>Database Management Systems</td>
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<tr>
<td>BIT505</td>
<td>Theory</td>
<td>Software Engineering</td>
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<tr>
<td>BIT506</td>
<td>Theory</td>
<td>Operating System Design Laboratory</td>
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<tr>
<td>BIT507</td>
<td>Theory</td>
<td>Information Systems Design Laboratory</td>
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<tr>
<td>BIT508</td>
<td>Theory</td>
<td>Network Laboratory</td>
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<tr>
<td>BIT509</td>
<td>Theory</td>
<td>Soft Skills Laboratory</td>
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### Semester 6

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<tbody>
<tr>
<td>BIT601</td>
<td>Theory</td>
<td>System Software Programming</td>
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<tr>
<td>BIT602</td>
<td>Theory</td>
<td>Management Information Systems</td>
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<tr>
<td>BIT603</td>
<td>Theory</td>
<td>Programming Paradigms</td>
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<tr>
<td>BIT604</td>
<td>Theory</td>
<td>Design and Analysis of Algorithms</td>
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<tr>
<td>BIT605</td>
<td>Theory</td>
<td>Human Computer Interaction &amp; Usability</td>
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<tr>
<td>BIT606</td>
<td>Theory</td>
<td>Software Design Laboratory</td>
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<td>BIT607</td>
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<td>Software Devel. Tools Laboratory</td>
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<tr>
<td>BIT608</td>
<td>Theory</td>
<td>Seminar &amp; Technical communication</td>
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### Semester 7

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<tbody>
<tr>
<td>BIT701</td>
<td>Theory</td>
<td>Information Assurance and Security</td>
<td>6</td>
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<tr>
<td>BIT702</td>
<td>Theory</td>
<td>Object Oriented Modeling and Design</td>
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<tr>
<td>BIT703</td>
<td>Theory</td>
<td>Software Testing and Quality Assurance</td>
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<tr>
<td>BIT704</td>
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<td>Elective – I</td>
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<tr>
<td>BIT705</td>
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<td>Elective – II</td>
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<tr>
<td>BIT706</td>
<td>Theory</td>
<td>Computer Lab Practices I</td>
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<tr>
<td>BIT708</td>
<td>Theory</td>
<td>Project Work</td>
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### Semester 8

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<tr>
<td>BIT801</td>
<td>Theory</td>
<td>Distributed System</td>
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<tr>
<td>BIT802</td>
<td>Theory</td>
<td>Information Retrieval</td>
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<tr>
<td>BIT803</td>
<td>Theory</td>
<td>Elective – III</td>
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<tr>
<td>BIT804</td>
<td>Theory</td>
<td>Elective – IV</td>
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<tr>
<td>BIT805</td>
<td>Practical</td>
<td>Computer Lab Practices II</td>
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<tr>
<td>BIT806</td>
<td>Theory</td>
<td>Project Work</td>
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Semester I (Engineering Mathematics–I)

Unit 1

Unit 2
Complex Numbers & Applications: Argand’s Diagram, De'Moivre's theorem and its application to find roots of algebraic equations. Hyperbolic Functions, Inverse Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

Unit 3
Differential Calculus: Successive Differentiation, Leibnitz Theorem.

Unit 4
Expansion of Functions: Taylor's Series and Maclaurin's Series.
Differential Calculus: Indeterminate Forms, L’ Hospital's Rule, Evaluation of Limits.

Unit 5

Unit 6
Jacobian: Jacobians and their applications. Errors and Approximations.
Maxima and Minima: Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:
Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:
Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).
Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
Semester I (Applied Science – I)

Both schemes are exactly half for Chemistry and Physics each

Chemistry

Unit 1: Solid state and materials chemistry
Crystallography: Unit cell, Bravais lattices, Cubic crystals - CN, APF, radius ratio. Three laws of crystallography, Weiss indices and Miller indices with numericals, X-ray diffraction – Bragg’s Law and numericals. Crystal defects (point and line defects) and their effects on properties of crystals.
Zinc sulphide – structure and applications as luminescent.
Molecular electronics: Basic concepts. Study of following molecules for their structures and properties on the basis of orbitals, chemical bonding, band theory, electrical conductivity, applications in electronics such as in diodes, transistors, ICs, photovoltaic devices, sensors etc.
1. Conductive polymers-polypyrrole, polythiophene
2. Pure carbon compounds- graphite, single wall and chiral carbon nano-tubes, fullerenes
3. Liquid crystals
4. Charge transfer compounds-tetrathiofulvalene.

Unit 2: Volumetric analysis
Standard solutions and their preparations, various ways of expressing concentrations of solutions, equivalent weights in different types of reactions. Volumetric analysis – acid-base, complexometric, oxidation-reduction, precipitation – with specific examples, theories of indicators used in above titrations, titration curve (acid-base only) numericals on all above.

Unit 3: Polymers
Definition and important terms: Monomer, Polymer, Polymerization, Degree of polymerization (Dp), Glass transition temperature (Tg), Molecular weight, Polymer dissolution.
Classification on the basis of - a) Polymerization mechanism – (step and chain polymers, brief mechanism should be explained), b) Polymerization reactions – (addition and condensation), c) Thermal behaviour – (thermoplastics and thermosetting), d) Types of monomers – (homopolymer and copolymer).
Commercial Polymers–Synthesis, properties and applications- Polyethylene (PE), Polypropylene (PP), Polyvinyl chloride (PVC), Polystyrene (PS), Phenol formaldehyde (PF), Acrylonitrile butadiene styrene (ABS), Epoxy resin.
Compounding of Plastics.
Rubbers–Synthesis, structure, properties and applications of a) Natural rubber–isolation, Polyisoprene. b) Vulcanized rubber–Valcanisation of rubber by sulfur. c) Synthetic rubber-Styrene – Butadiene rubber, Silicon rubber and Neoprene rubber.
Speciality polymers – Basic concepts and applications of conductive, liquid crystalline, thermally stable and biodegradable polymers. Polymer composites, Recycling of polymers.

Term work: Any four experiments
1. To standardize KMnO₄ solution by preparing standard oxalic acid and to estimate ferrous ions.
2. To standardize Na₂S₂O₃ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
3. To determine phenol by iodometric method.
4. To determine molecular weight of a polymer using Ostwald viscometer.
5. Preparation of (any one ) polystyrene, urea formaldehyde, phenol formaldehyde and its characterization.
6. To determine chloride ions from solution by Volhard method.
7. To determine calcium from the given sample of cement by volumetric method.

Term work is based on performance and regular checking of the experiments.

Reference Books:
2. Principles of the solid state, H.V. Keer (New age international publishers).
3. Polymer Science, V.R. Gowarikar (Wiley Eastern Ltd.).

Laboratory Manual:
Physics

Unit 4: Interference and electron Optics

Interference:- Interference of waves, Interference due to thin films of uniform (with derivation) and non-uniform thickness (without derivation), Fringe width, Newton’s Rings, Applications of Newton’s Rings for determination of (i) wavelength of incident light / radius of curvature of Plano convex lens (ii) refractive index of a given liquid; Michelson’s interferometer, applications for determination of (i) wavelength of a monochromatic source (ii) refractive index /thickness of a transparent material; Engineering applications of interference (i) Testing of optical flatness of surfaces (ii) Nonreflecting / Antireflection coatings.

Electron Optics :- Motion of an electron in electric (parallel, perpendicular) and magnetic (extensive, limited) fields, crossed fields. Electrostatic and magneto static focusing, Scanning electron microscope (SEM), Bainbridge mass spectograph.

Unit 5: Diffraction and ultrasonic

Diffraction :- Diffraction of waves, classes of diffraction, Fraunhofer diffraction at a single slit (geometrical method), conditions for maxima and minima, Intensity pattern due to a single slit, Plane diffraction grating, conditions for principal maxima and minima, intensity pattern; Resolving power, Resolving power of a grating.

Ultrasonics :- Ultrasonic waves, Piezo-electric effect, Production of ultrasonic waves by Piezoelectric oscillator, Magnetostriuctive effect, Production of ultrasonic waves by magnetostriective oscillator, properties of ultrasonic waves, Applications of ultrasonic waves (i) Scientific- Echo sounding, Sound signaling, depth sounding, SONAR, cleaning of dirt etc (ii) Engineering –thickness measurement, cavitation, Ultrasonic cleaning, Nondestructive testing, Flaw detection, Soldering, Drilling and welding (iii) Medical- for diagnostics and treatment

Note: Discuss any one application for 4 marks

Unit 6: Polarisation and nuclear physics

Polarisation :- Introduction, production of plane polarised light by refraction (pile of plates), Law of Malus, Double refraction, Huygen’s theory of double refraction, Cases of double refraction of crystal cut with the optic axis lying in the plane of incidence and (i) parallel to the surface (ii) perpendicular to the surface (iii) inclined to the surface, Retardation plates-quarter wave plate (QWP), Half wave plate (HWP); Analytical treatment of light for the production of circularly and elliptically polarised light, Detection of various types of light (PPL, CPL, EPL, Upl, Par PL), Optical activity, Specific rotation, Polaroids

Nuclear Physics :- Nuclear fission in natural Uranium-Chain reaction, Critical size. Nuclear fuels, Nuclear fusion, and thermonuclear reactions-P-P and CN cycles, Particle accelerators-cyclotron, betatron.

Reference Books:
1.Optics, Jenkins and White (Tata Mcgraw Hill)
2.Text Book of Optics, Brijlal and Subramanyam (S. Chand and Company)
3.University Physics, Young and Freedman (Pearson Education).
4.Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons).
5. Concepts of Modern Physics-Beiser (Tata Mcgraw Hill)

Term Work: Any Four experiments
1.Determination of wavelength by using diffraction grating.
3.Experiment on ultrasonic waves.
5.Determination of specific rotation by Laurent’s half shade polarimeter.
6.Demonstration of Lissajous figures (principles of interference and polarisation) using a CRO, phase measurement.
7.Michelson’s interferometer
8. Determination of e/m by Thomson’s method.
(Determination of polarising angle for glass and to determine refractive index of glass using Brewster’s law
Or Experimental verification of law of Malus).
10.Determination of wavelength of the given source by Fraunhoffer diffraction at a single slit.

Term work is based on performance and regular checking of the experiments.
Semester I (Fundamentals of Programming Languages)

Objectives

- To learn and acquire art of computer programming
- To know about some popular programming languages and how to choose a programming language for solving a problem using a computer
- To learn to program in C

1. Program Planning Concepts
   Algorithm; Advantages of Generalized Algorithms; How to Make Algorithms Generalized; Avoiding Infinite Loops in Algorithms – By Counting, By using a Sentinel Value; Different ways of Representing an Algorithm – As a Program, As a Flowchart, As a Pseudo code; Need for Planning a Program before Coding; Program Planning Tools – Flowcharts, Structure charts, Pseudo codes; Importance of use of Indentation in Programming; Structured Programming Concepts – Need for Careful Use of “Go to” statements, How all programs can be written using Sequence Logic, Selection Logic and Iteration (or looping) Logic, functions.

2. Programming Languages
   What is a Programming Language; Types of Programming Languages – Machine-level, Assembly-level and High-level Languages, Scripting Languages, Natural Languages; Their relative Advantages and Limitations; High-level Programming Language Tools – Compiler, Linker, Interpreter, Intermediate Language Compiler and Interpreter, Editor, Matlab, GUI; Overview of some popular High-level Languages – FORTRAN, COBOL, BASIC, Pascal, C, C++, JAVA, LISP; Characteristics of a Good Programming Language; Selecting a Language out of many Available Languages for Coding an Application; Subprograms.

3. Program Testing and Debugging
   Definition of Testing & Debugging; Difference between Testing and Debugging; Types of Program Errors; Testing a Program; Debugging a Program for Syntax Errors; Debugging a Program for Logic Errors, Concept of APIs/Libraries.

4. Program Documentation
   What is Documentation; Need for Documenting Programs and Software; Forms of Documentation – Comments, System Manual, User Manual; Documentation Standards and Notations.

5. Programming in C Language
   Character set, Constants, Variables, Keywords and Comments; Operators and Operator Precedence; Statements; I/O Operations; Preprocessor Directives; Pointers, Arrays and Strings; User Defined Data Types – Structure and Union; Control Structures – Conditional and Unconditional Branching Using “if”, “switch”, “break”, “continue”, “go to” and “return” Statements; Loop Structures – Creating Pretest Loops using “for” and “while” Statements; Creating Posttest Loops using “do...while” statement; Functions – Creating Subprograms using Functions; Parameter Passing by Value; Parameter Passing by Reference; Main Function.
Semester I (BASIC ELECTRICAL ENGINEERING)

SECTION – 1

Unit 1. General:

Concepts of emf., p.d. and current, resistance, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. S.I. units of work, power and energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems. batteries and cells, their types, primary cells and secondary cells, Lead Acid, Ni-Cd and Ni-MH batteries, current capacity and cell ratings. charging, importance of initial charging and discharging of batteries. series and parallel battery connections, maintenance procedure.

Unit 2. D.C. Circuits:

Classification of electrical networks, Ohm's law, Kirchhoff's law and their applications for network solutions. Simplifications of networks using series and parallel combinations and star-delta conversions, Superposition theorem, Thevenin’s theorem and maximum power transfer theorem.

Unit 3. Electromagnetism:

Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, solenoid and toroid. concept of m.m.f., flux, flux density, reluctance, permeability and field strength, their units and relationships. simple series and parallel magnetic circuits, comparison of electrical and magnetic circuit, force on current carrying conductors placed in magnetic field, Fleming’s left hand rule.

Faradays laws of electromagnetic induction, statically and dynamically induced e.m.f., self and mutual inductance, coefficient of couplings. energy stored in magnetic field.
SECTION – II

Unit 4. Electrostatics and AC fundamentals:

A) Electrostatics field, electric flux density, electric field strength, absolute permittivity, relative permittivity, capacitance and capacitor, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and time constant.

B) Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of instantaneous, peak(maximum), average and r.m.s. values, frequency , cycle, period, peak factor and form factor, phase difference ,lagging, leading and in phase quantities and phasor representation. rectangular and polar representation of phasors.

Unit 5. Single phase A.C. Circuits:

Study of A.C. circuits consisting of pure resistance, pure inductance, pure capacitance and corresponding voltage-current phasor diagrams and waveforms. Development of concept of reactance, study of series R-L, R-C, R-L-C circuit and resonance, study of parallel R-L, R-C and R-L-C circuit, concept of impedance, admittance, conductance and susceptance in case of above combinations and relevant voltage-current phasor diagrams, concept of active, reactive and apparent power and power factor.

Unit 6. Polyphase A.C. Circuits and Single phase Transformers:

A) Polyphase A.C. Circuits: Concept of three-phase supply and phase sequence. voltages, currents and power relations in three phase balanced star-connected loads and delta-connected loads along with phasor diagrams.

B) Single phase transformers: Construction, principle of working, e.m.f. equation, voltage and current ratios. losses, definition of regulation and efficiency, determination of these by direct loading method. descriptive treatment of autotransformers and dimmerstats.

Term work:
The term work shall consist of record of minimum eight exercises and experiments, out of which Group A is compulsory and any five experiments from Group B should be conducted.

Group A
1. Wiring Exercises:
   a) Study of various wiring components (wires, switches, fuse, sockets, plugs, lamp holders, lamps etc. their uses and ratings).
   b) Control of two lamps from two switches (looping system).
   c) Staircase wiring.
   d) Use of Megger for insulation test and continuity test of wiring installations and machines.
2. a) Study of fluorescent tube circuit.
   b) Study of compact fluorescent lamp(CFL).
   c) Study of HID lamps such as mercury vapour lamp /sodium vapour lamp.
3. a) Study of safety precautions while working on electric installations and necessity of earthing.
   b) Introduction to energy conservation and simple techniques to achieve it.
Group B

4. Determination of temperature rise of medium resistance such as shunt field winding.
5. Verification of Kirchhoff’s laws and Superposition theorem.
6. Verification of Thevenin’s theorem.
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Single phase transformer
   a) Voltage and current ratios.
   b) Efficiency and regulations by direct loading.

Note: College should provide printed text and figures for Group A experiments and only printed text for Group B experiments.

Text Books:

3. Electrical Engineering- G.K. Mittal

Reference Books:

4. Principles of Electrical Engineering by Del. Toro, PH
Semester I (Basic Civil and Environmental Engineering)

Section I

Unit 1: Introduction to Civil Engineering
a) Role of Civil Engineer in the construction of buildings, dams, expressways and infrastructure projects for 21st century. Importance of an interdisciplinary approach in engineering.

Unit 2: Materials and Construction
a) Use of basic materials cement, bricks, stone, natural and artificial sand, Reinforcing Steel-Mild, Tor and High Tensile Steel. Concrete types - PCC, RCC Prestressed and Precast. Introduction to smart materials. Recycling of materials.
b) Substructure - Function of Foundations, (Only concepts of settlement and Bearing capacity of soils.) Types of shallow foundations, (only concept of friction and end bearing pile).
d) Introduction to automation in construction:- Concept, need, examples related to different civil engineering projects.

Unit 3: Uses of maps and field surveys
b) Conducting simple and differential levelling for setting out various benchmarks, determining the elevations of different points and preparation of contour maps. Introduction to GIS Software and other surveying softwares with respect to their capabilities and application areas.
Section II

Unit 4: Ecology and Eco System

b) Introduction to solid waste management, Disposal of electronic wastes.

Unit 5: Planning for the Built Environment


Unit 6: Energy and Environmental Pollution
a) Types of energy:- conventional and non-conventional. Need for harnessing alternative energies to meet the increased demand. Methods of harnessing energies.

b) Sources, causes, effects and remedial measures associated with
   1. Air Pollution
   3. Noise Pollution
   4. Land Pollution

Term Work:
Any 8 Practical Exercises from those given below should be carried out, record to be submitted in the field book and file which will form a part of termwork.

1. Study of any 4 types of maps and writing their uses.
2. Exercise on use of dumpy level and laser level.
5. Determination of coordinates of a traverse using Global Positioning system (GPS)
6. Measurement of distance by EDM and comparing it with the distance measured using tape.
7. Visit to a construction site for studying the various construction materials used, type of structure, type of foundation and components of superstructure – submission of visit report.
8. Demonstration of use of any 4 Civil Engineering softwares.
9. Making a poster (Full imperial sheet size) in a group of 4 students, related to Energy/Environment.
10. Presentation in a group of 4 students, any case study related to Energy/Environment.

TEXT BOOKS:
1. Surveying and Levelling --- Kanetkar and Kulkarni, PVG Prakashana
2. Environmental Studies D.L.Manjunath – Pearson Education.
Semester I (Engineering Graphics – I)

SECTION – I

UNIT – I Drafting Technology and Introduction to Any Drafting Software/Package

Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Tolerances – methods of representing tolerances, unilateral and bilateral tolerances, tolerance on linear and angular dimensions, geometrical tolerances. Symbols used on drawing, surface finish symbols, welding symbols.

Advantages of using Computer Aided Drafting (CAD) packages, applications of CAD, basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

UNIT – II Curves used in Engineering Practice

Ellipse, Parabola, Hyperbola, normal and tangents to these curves, Involute, Cycloid, Epi-cycloid, Hypo-cycloid, Archimedean Spiral, Helix on cone and cylinder.

UNIT – III Orthographic Projections

Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.

UNIT – IV Auxiliary Projections

Auxiliary planes – Auxiliary Vertical Plane (AVP), Auxiliary Inclined Plane (AIP), symmetrical auxiliary view, unilateral auxiliary view, bilateral auxiliary view.

SECTION – II

UNIT – V Isometric Projections

Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

UNIT – VI Interpretation of Given Views/Missing Views

Identification of lines/edges and surfaces, visualization of given orthographic views, adding a missing/third view, adding a sectional view, to convert a given view in to a sectional view.

UNIT – VII Freehand Sketching

Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.
Semester II (Engineering Mathematics – II)

Unit 1  
**Differential Equations (DE):** Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types

Unit 2  
**Application of DE:** Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff’s Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical problems

Unit 3  
**Fourier Series:** Definition, Dirichlet's conditions, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis and Applications to Problems in Engineering.  
**Integral Calculus:** Reduction formulae, Beta and Gamma functions.

Unit 4  
**Integral Calculus:** Differentiation Under the Integral Sign, Error functions.  
**Curve Tracing:** Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves

Unit 5  
**Solid Geometry:** Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder

Unit 6  
**Multiple Integrals and their Applications:** Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, Mass, Center of Gravity and Moment of Inertia.

Text Books:  
Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning).  
Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

Reference Books:  
Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).  
Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
Both schemes are exactly half for Chemistry and Physics each

**Chemistry**

**Unit 1 : Fuels and combustion**

**Fuels** : Definition, classification of fuels, calorific value and its units. Determination of calorific value – Bomb calorimeter, Boy’s colorimeter – numericals. Solid fuels : Coal, classification of coal, proximate and ultimate analysis of coal, numericals based on analysis of coal - Dulong and Goutel formula. Types of carbonisation of coal-low temperature and high temperature carbonization. Liquid fuels : Origin of petroleum, composition of petroleum, refining of petroleum, octane number of petrol, cetane number of diesel, power alcohol, biodiesel. Gaseous fuels : Composition, properties and applications of natural gas, treatment products such as CNG, LPG, LNG. Hydrogen gas as a fuel, production, properties, storage and transportation. Rocket propellants-characteristics, classification. **Combustion** : Chemical reactions, calculation on air requirement for combustion – numericals

**Unit 2 : Corrosion and its prevention**


**Unit 3 : Water and phase rule**


**Phase rule** :- Gibb’s Phase rule and the terms involved in it with examples. One component system – Water and Sulphur. Reduced phase rule. Applications and limitations of phase rule.

**Term Work:** Any four experiments
1. To determine total alkalinity of water sample.
2. To determine chloride content of water sample by Mohr’s method.
3. To determine temporary and permanent hardness of water sample by EDTA method.
4. Spectrophotometric / colorimetric estimation of Fe^{2+} from the given solution.
5. To construct a phase diagram for a binary system, naphthalene and benzoic acid and find eutectic point.
6. Study of corrosion of metals in medium of different pH.
7. Analysis of mixture of phosphoric acid and hydrochloric acid using indicators and pH meter separately.
8. To determine moisture, volatile matter and ash content of a given sample of coal.

**Term work is based on performance and regular checking of the experiments.**

**Reference books :**
1. Materials science and engineering an introduction, William D. Callister, (Jr.,Wiley. publisher)
2. Principles of the solid state, H.V. Keer, (New age international publishers).
4. Textbook of Physical chemistry, Samuel Glasstone (Mcmiilon and Co. Ltd.)

**Laboratory manual**
1. Laboratory manual on Engineering Chemistry, Sudharani (Dhanpat Rai publishing company)
Physics

Unit 4: Wave particle duality and wave equations

Wave Particle Duality: Wave particle duality of radiation and matter, concept of group velocity and phase velocity; Uncertainty principle, Illustration of electron diffraction at a single slit.

Wave Equations: Concept of wave function and probability interpretation, Physical significance of the wave function, Schrodinger’s time independent and time dependent wave equations, Applications of Schrodinger’s time independent wave equations to problems of (i) Particle in a rigid box (infinite potential well), Comparison of predictions of classical mechanics with quantum mechanics (ii) Particle in a non-rigid box (finite Potential Well)- Qualitative (results only);

Unit 5: Lasers and superconductivity


Superconductivity: Introduction to superconductivity, Properties of superconductors (zero resistance, Meissner effect, critical fields, persistent currents), isotope effect, BCS theory. Type I and type II Superconductors, Applications (super conducting magnets, transmission lines etc), DC and AC Josephson effect

Unit 6: Semiconductor physics and physics of nanoparticles

Semiconductor physics: Band theory of solids, Classification of solids on the basis of band theory, Types of semiconductors, Introduction to the concept of electrical conductivity, conductivity of conductors and semiconductors. Hall effect and Hall coefficient, Fermi-Dirac probability distribution function, Position of Fermi level in intrinsic semiconductors (with derivation) and in extrinsic semiconductors (variation of Fermi level with temperature (without derivation)), Band structure of PN junction diode under zero bias, forward bias and reverse bias; Transistor working, PNP and NPN on the basis of band diagrams, Photovoltaic effect, working of a solar cell on the basis of band diagrams and Applications.

Physics of Nanoparticles: Introduction, Nanoparticles, Properties of nanoparticles (optical, electrical, magnetic, structural, mechanical), Brief description of different methods of synthesis of nanoparticles such as physical, chemical, biological, and mechanical. Synthesis of colloids. Growth of nanoparticles, Synthesis of metal nanoparticles by colloidal route, Applications of nanotechnology-electronics, energy, automobiles, space and defence, medical, environmental, textile, cosmetics.

Reference Books:
1. Principles of Physics, Serway and Jewett (Saunders college publishing)
2. Introduction to Solid State Physics, Kittel C (Wiley and Sons)
3. Laser and Non-Linear Optics, B.B.Laud (Oscar publication)
4. Physics of the Atom, Wehr and Richards (Addison, Wesley)

Term Work: Any four experiments
1. Determination of band gap of a semiconductor.
2. Characteristics of a solar cell, calculation of fill factor, To plot power vs. resistance graph and hence to calculate value of R for maximum value of workable power.
3. Hall effect and determination of Hall coefficient.
5. Diode characteristics (Ge/Si, LED, Zener)
6. Synthesis of metal nanoparticles (gold/silver) by the chemical route.
8. To find refractive index of glass using a laser (using Snell’s law). (may show demonstrations of polarisation and diffraction).
9. An experiment based on laser (e.g.; To find number of lines/cm of a given grating using a laser source/ to find beam divergence/true beam width )

Term work is based on performance and regular checking of the experiments.
Semester II (Engineering Mechanics)

Section-I (Statics)
Unit 1. Resultant of coplanar force system.
A. Principle of statics, Force systems, Resolution and composition of forces, Resultant of concurrent forces.
B. Moment of a force, Couple, Varignon’s theorem, Equivalent force couple system, Resultant of parallel and general force system. Distributed forces, Centroid of plane lamina and wire bends.

Unit 2. Equilibrium of Force system.
A. Free body diagram, Equilibrium of concurrent, parallel and general forces in a plane, Equilibrium of three forces in a plane, Types of beams, simple and compound beams, type of supports and reaction.
B. Resultant and Equilibrium of concurrent and parallel forces in a Space.

Unit 3. Analysis of structure and friction.
A. Two force member, Analysis of plane trusses by method of joint and method of section, cables subjected to point loads.
B. Friction - Application of friction on inclined plane, wedges, ladders and flat belt.

Section-II (Dynamics)
Unit 4. Rectilinear motion of particles.
A. Kinematics- Basic concepts, Equations of motion for constant acceleration and motion under gravity, Variable acceleration, Motion curves, Relative motion and dependant motion.
B. Kinetics- Newton’s second law of motion and its applications.

Unit 5. Curvilinear motion of particles.
A. Kinematics- Basic concepts, Equation of motion in cartesian, path and polar coordinate, Motion of projectile.
B. Kinetics-Newton’s second law of motion. Motion in cartesian and path coordinate of a particle.

Unit 6. Work energy and impulse momentum principle for particle.
B. Linear Impulse & Momentum, Conservation of momentum, Direct central impact and coefficient of restitution, Impulse momentum principle.

Term Work

Term work consists of the following.
a) Statics-(Any three experiments from the list below)
   1. Verification of law of parallelogram of forces/ polygon of forces.
   2. Support reaction of simple / compound beams.
   3. Determination of coefficient friction of belt/inclined plane.
   4. To determine forces in Space Force System.
b) Dynamics-
   1. Curvilinear motion.
2. Determination of coefficient of restitution.

c) **Exercise**- At least two examples on each part of the units should be solved during practical hours under the guidance of the concerned teacher.

d) **Assignment**- Minimum five numerical examples from each unit given by concerned teacher.

**Note:** Examples in Exercise and Assignment should be unsolved problems from text and reference books prescribed in the syllabus.

**Text book (latest editions)**


**Reference books**


3. Engineering Mechanics statics and dynamics by J. L. Meriam and Craige, John Willey and Son’s publication.


1. Diodes & Circuits
   PN junction diode, V-I characteristics, Diode as rectifier, Specifications of rectifier diodes, HW, FW, Bridge rectifiers, Equations for $I_{DC}$, $V_{DC}$, $V_{rms}$, $I_{rms}$, Efficiency & ripple factor for each configuration. Capacitor filter, ripple factor. Zener diode-characteristics, Specifications, Zener voltage regulator. LED-characteristics, Configurations-Discrete, seven segment, bar graph, matrix. Concept of multiplexed display.

2. Semiconductor devices & applications

3. OP AMPS and applications

4. Digital Electronics
   CMOS NOT, NAND, NOR, AND, OR, EXOR gates, De Morgan’s theorem. Technologies-SSI, MSI, LSI, VLSI. Half adder, full adder, mux, demux, D flip flop, shift registers, counters. Block diagram of Microprocessor & Microcontroller. Advantages of using them.

5. Industrial applications
   Transducers for-Temperature, level, displacement, pressure. Range, specifications, Limitations & applications. Block diagrams of-Digital thermometer, weighing machine. Introduction & block diagram of-Two wire transmitter, PID controller, data logger, alarm annunciator, CNC machine, PLC.

6. Communication systems
List of Practical:

2. Study of semiconductor devices I- Study of data sheet specifications of- Diodes, BJT, FET, OPAMP. Build and test positive/negative regulator with bridge rectifier and filter.
4. Build and test BCD counter with 7 segment LED display.
5. Study of controls of CRO. Measurement of- frequency, Phase, AC and DC voltages.
7. Build and test half and full adder circuit.
8. Soldering practice and Study of soldering techniques.

Books

1. Art of Electronics- Paul Horowitz, Cambridge LPE
2. Electronics Devices and Circuits An Introduction – Allen Mottershed, PHI
NOTE – ONLY FIRST ANGLE METHOD OF PROJECTIONS IS TO BE USED IN ALL THE UNITS.

UNIT – I Projections of Point and Line
Projections of points, projections of lines, lines inclined to one reference plane, lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Distance between skew lines.

UNIT – II Projections of Planes
Projection of planes, angle between two planes, distance of a point from a given plane, inclination of the plane with HP and VP, True shape of a plane surface.

UNIT – III Projections of Solids
Projections of solids inclined to one reference plane, inclined to both the reference planes, projections of cube, right regular prisms, right regular pyramids, right circular cylinder, right circular cone, tetrahedron, frustum of solids.

UNIT – IV Sections of Solids
Types of section planes, projections of above solids cut by different section planes, True shape of cut surfaces.

UNIT – V Development of Lateral Surfaces (DLS) of Solids.
Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.

Term Work: Term Work should be prepared on Five A2 (594X420mm) (Half imperial) size drawing screen using any drafting software/package as detailed below.

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Description</th>
<th>Minimum Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet No. – 1</td>
<td>Projection of Line</td>
<td>2 Problems</td>
</tr>
<tr>
<td>Sheet No. – 2</td>
<td>Projections of Planes</td>
<td>2 Problems</td>
</tr>
<tr>
<td>Sheet No. – 3</td>
<td>Projections of Solids</td>
<td>2 Problems</td>
</tr>
<tr>
<td>Sheet No. – 4</td>
<td>Sections of Solids</td>
<td>2 Problems</td>
</tr>
<tr>
<td>Sheet No. – 5</td>
<td>DLS of Solids</td>
<td>2 Problems</td>
</tr>
</tbody>
</table>

Important Note: The problems for Term Work should be different for each student. The Term Work of a batch should be preserved in a form of CD/DVD and the same should be produced before a TW Verification Committee appointed by the University.

Text Books:
2. D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd..

Reference Books:
Semester II (Basic Mechanical Engineering)

Unit 1
Thermodynamics
Thermodynamic work, p-dV work in various processes, p-V representation of various thermodynamic processes and cycles
Ideal gas equations, Properties of pure substance, Statements of I and II laws of thermodynamics and their applications in Mechanical Engineering.
Carnot cycle for Heat engine, Refrigerator and Heat pump.

Unit 2
Energy conversion devices (Theoretical study using schematic diagrams only)

Unit 3
Heat Transfer
Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties. Selection of heat sink and heat source.
Power Plants (Description with Block Diagrams)
Thermal, Hydroelectric, Nuclear and Solar-Wind Hybrid Power Plants.

Unit 4
Machine elements:
Power transmission shafts, axles, keys, bush and ball bearings, Flywheel and Governors.
Power Transmission Devices
Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and single plate), brakes (types and applications only)
Applications of these devices.
Mechanisms: (Descriptive treatment only)
Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism
Unit 5  
**Materials Used in Engineering and their Applications**
Metals – Ferrous and Non-Ferrous, Nonmetallic materials, Material selection criteria  
**Design considerations**
**Steps in Design**
**Introduction to manufacturing processes and Their Applications:**
Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.

Unit 6  
**Machine Tools** (Basic elements, Working principle and types of operations)  
Lathe Machine – Centre Lathe  
Drilling Machine – Study of Pillar drilling machine  
Introduction to NC and CNC machines  
Grinding machine, Power saw, Milling Machine.

**Term work:** Term work shall consist of record of any eight experiments out of the following:

1. Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms  
2. Finding relation between input angle and output angle for various link lengths  
3. Demonstration of operations of centre lathe (turning, step turning, facing, boring, taper turning, knurling, grooving, threading)  
4. Demonstration of operations on drilling machines (drilling, reaming, spot facing, counterboring)  
5. Demonstration of Two stroke and four stroke engine  
6. Study of Package type boilers  
7. Study of domestic refrigerator & window air-conditioner  
8. Study of power transmitting elements: Coupling, Gears and bearings.  
9. Joule’s porous plug experiment  
10. Joule’s paddle wheel experiment.  
11. Experimental verification of effect of insulating material on heat transfer

**References:**
**Text Book:**
Hajra-Chaudhari “Workshop Technology”
**Reference Books:**
**Communication Skill**

**Teaching Scheme:**
**Practical: 02 Hrs.**

The teacher shall explain in detail, the gist and techniques involved in the following work units to the students. The students should complete practical work based on the following topics. The teacher shall subsequently formulate the exercises to adjudge the skill sets acquired by the students. These exercises will be undertaken by the groups of the students of suitable strength.

**Work Unit 1- Fundamentals of Communication:**
Elements of communication, types of Communication- diagonal, downward, upward, horizontal communication. Importance of effective communication, manners and etiquettes in communication, stages of communication, ideation, encoding, transmission, decoding, response, general communication, technical communication. Barriers to effective communication, Listening skill, speaking skill, Reading skill, writing skill.

**Work Unit 2- Organization and Listening Comprehension in Communication:**
Spatial organization, chronological organization, order of increasing and decreasing importance, styles of communication, accuracy, brevity, clarity, objectivity, impersonal language, professional speaking ability, listening process, hearing and listening, types of listening- superficial, appreciative, focused, evaluative, attentive, empathetic. Barriers to listening- physical, psychological, linguistic, cultural. Speech decoding, oral discourse analysis, effective listening strategies, listening in conversational interaction, listening to structured talks, pre-listening analysis, predicting, links between different parts of the speech, team listening, listening and notes taking.

**Work Unit 3- Speaking Skills:**
The speech process, message, audience, speech style, feedback, conversation and oral skills, fluency and self expression, body language, phonetics and spoken english, speaking techniques, word stress, correct stress patterns, voice quality, correct tone, types of tones, Job interview, interview process, characteristics, of the job interview, pre-interview preparation techniques, interview questions and answers, positive image projection techniques. Group discussion- characteristics, subject knowledge, oral and leadership skills, team management, strategies, individual contribution. Presentation skills-planning, preparation, organization, delivery.

**Work Unit 4- Reading and language skills:**
The reading process, purpose, different kinds of texts, reference material, scientific and technical texts, active and passive reading, strategies-vocabulary skills, eye reading and visual perception., prediction techniques, scanning skills, distinguishing facts and opinions, drawing inferences and conclusions, comprehension of technical material- scientific and technical texts, instructions and technical manuals, graphic information. Note making- tool for study skills, topicalising, organization and sequencing. Summarizing and paraphrasing.

**Work Unit 5 - Referencing and Writing skills:**
Methods of referencing, book references, user guides, references for reports, journal references, magazines and newspapers, unpublished sources, internet references, explaining and elucidating.
Writing skills - Sentence structure, sentence coherence, emphasis. Paragraph writing, letter writing skills - form and structure, style and tone. Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales letters.
Work Unit 6 – Reports, Resumes and Job Applications:
Types of reports, information and analytical reports, oral and written reports, formal and non formal reports, printed forms, letter and memo format, manuscript format, proposals, technical articles, journal articles and conference papers, review and research articles.
E-mails, Business Memos, Employment Communication- resume design, resume style,

Reference Book:

3. ‘Developing Communication Skills’ Krishna Mohan, Meera Banerji, McMillan India Ltd.
4. ‘Principles and Practice of management’ Dr. P. C. Shejwalkar, Dr. Ghanekar and Dr. Bhivapathaki, Everest publishing House
Semester - III
Information Technology
Discrete mathematics- the mathematics of integers and of collections of object – underlies the operation of digital computer, and is used widely in all fields of computer science for reasoning about data structures algorithms and complexity. The primary objective of subject is to prepare students mathematically for the study of computer engineering. Topics covered in the course include proof techniques, logic and sets, functions, relations, counting techniques, probability and recurrences. By the end of the course, students should be able to formulate problems precisely, solve the problems, apply formal proof techniques, and explain their reasoning clearly.

**Prerequisite:** Basic Mathematics

**Learning objectives:** … the student will be able to

- Use appropriate set, function, or relation models to analyze practical examples, interpret the associated operations and terminology in context.
- Determine number of logical possibilities and probability of events.
- Learn logic and proof techniques to expand mathematical maturity.
- Formulate problems precisely, solve the problems, apply formal proof techniques, and explain their reasoning clearly.

**Unit I:**
**Sets and Propositions**
Sets, Combination of sets, Finite and Infinite sets, Un-countably infinite sets, Principle of inclusion and exclusion, multisets.
Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs, Mathematical Induction.

**Unit II:**
**Groups and Rings**
Algebraic Systems, Groups, Semi Groups, Monoid, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Ring, Integral Domain, Field, Ring Homomorphism, Polynomial Rings and Cyclic Codes.

**Unit III:**
**Relations and Functions**
Properties of Binary Relations, Closure of relations, Warshall’s algorithm, Equivalence Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains.
Functions, Composition of functions, Invertible functions, Pigeonhole Principle, Discrete Numeric functions and Generating functions, Job scheduling Problem.

**Recurrence Relations**
Recurrence Relation, Linear Recurrence Relations With constant Coefficients, Homogeneous Solutions, Total solutions, solutions by the method of generating functions.
Unit IV:
Graphs
Basic terminology, multi graphs and weighted graphs, paths and circuits, shortest path in weighted graph, Hamiltonian and Euler paths and circuits, factors of a graph, planer graph and Travelling salesman problem.

Unit V:
Trees
Trees, rooted trees, path length in rooted trees, prefix codes, binary search trees, spanning trees and cut set, minimal spanning trees, Kruskal’s and Prim’s algorithms for minimal spanning tree, The Max Flow –Min cut theorem (transport network).

Unit VI:
Permutations, Combinations and Discrete Probability

Text Books:

Reference Books:
6. N. Deo, “Graph Theory with application to Engineering and Computer Science”, Prentice Hall of India, 1990, 0 – 87692 – 145 – 4
Learning Objectives

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units of digital computers.
3. To learn basics of Parallel Computer Architecture.

Unit I:
Computer Evolution & Arithmetic
A Brief History of computers, Designing for Performance, Von Neumann Architecture, Hardware architecture, Computer Components, Interconnection Structures, Bus Interconnection, Scalar Data Types, Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2’s Complement method for multiplication, Booths Algorithm, Hardware Implementation, Division, Restoring and Non Restoring algorithms, Floating point representations, IEEE standards, Floating point arithmetic.

Unit II:
The Central Processing Unit
Machine Instruction characteristics, types of operands, types of operations, Addressing modes, Instruction formats, Instruction types, Processor organization, Intel 8086 as example, Programmers model of 8086, max/min mode, Register Organization, Instruction cycles, Read Write cycles, 8086 assembly instruction examples to explain addressing modes.

Unit III:
The Control Unit
Single Bus Organization, Control Unit Operations: Instruction sequencing, Micro operations and Register Transfer, Hardwired Control: Design methods – State table and classical method, Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts, Microinstructions and micro- program sequencing.

Unit IV:
Memory Organization

Unit V:
I/O Organization
Unit VI: Parallel Organization

Instruction level pipelining and Superscalar Processors, Multiple Processor Organizations, Closely and Loosely coupled multiprocessors systems, Symmetric Multiprocessors, Clusters, UMA NUMA, Vector Computations,
RISC: Instruction execution characteristics,, RISC architecture and pipelining. RISC Vs CISC.

Text Books


Reference Books

DIGITAL ELECTRONICS AND LOGIC DESIGN

**Prerequisites**: Basic Electronics Engineering.

**Learning Objectives**

1. To learn and understand basic digital design techniques.
2. To learn and understand design and construction of combinational and sequential circuits.
3. To introduce basic components of microprocessors.

**Unit I**: Number System & Logic Design Minimization Techniques

- Introduction. Binary, Hexadecimal numbers, Octal numbers and number conversion.
- Signed Binary number representation. Signed Magnitude, 1’s complement and 2’s complement representation. Binary, Hexadecimal Arithmetic, 2’s complement arithmetic.
- Algebra for logic circuits: Logic variables;
- Logic function: NOT, AND, NOR, XOR, OR, XNOR, NAND.
- Boolean algebra. Truth tables and Boolean algebra. Idealized logic gates and symbols. DeMorgan’s rules Axismatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra.

**Unit II**: Logic Families

- TTL: Standard TTL characteristics- Speed, power dissipation, fan-in, fan-out, current and voltage parameters, noise margin, operating temperature etc. Operation of TTL NAND gate. TTL Configurations- Active pull-up, Wired AND, totem pole, open collector.
- CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations- Wired Logic, Open drain outputs.
- Interfacing: TTL to CMOS and CMOS to TTL.

**Unit III**: Combinational Logic

- Logic minimization Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP and POS forms, Don’t care conditions.
- Reduction techniques: K-Maps (only up to 4 variables) & Quine – McClusky technique
- Arithmetic Operations: - Binary Addition, Subtraction, BCD Addition
- Circuits: - Half- Adder, Full Adder, Half Subtract or, Full Sub tractor, BCD adder using and subtractor using IC 7483, look ahead carry, parity generator and checker using IC 74180, magnitude comparator using IC 7485.
- Multiplexers (MUX): Working of MUX, Implementation of expression using MUX (IC 74153, Demultiplexers IC 74151).
- Demultiplexers (DEMUX):- Implementation of expression using DEMUX, Decoder (IC 74138).
Unit IV:
Sequential Logic
  Introduction: Sequential Circuits. Difference between combinational circuits and sequential circuits
  Flip-flop: SR, JK, D, T; Preset & Clear, Master and Slave. Flip Flops their truth tables and excitation tables, Conversion from one type to another type of Flip Flop. Study of 7473, 7474, 7476
  Application of Flip-flops. Bounce Elimination Switch, registers, counters.
  Registers: Buffer register; shift register; 7495
  Counters: Asynchronous counter, Synchronous counter, Ring counters, BCD Counter, Johnson Counter,
  Modulus n counter (IC 7490, IC 74191), Pseudo Random Binary Sequence Generator, Sequence generator and detector.

Unit V:
ASM & Programmable Logic Devices
  Algorithmic State Machines, ASM charts, notations, design of simple controller, multiplexer controller method.
  Examples. Sequence Generator, Types of Counter.
  Programmable Logic Devices:
  PLD: PLA- Input, Output Buffers, AND, OR, Invert/ Non-Invert Matrix.
  Design Example- Any 4 Variables SOP function using PLDs.
  Study of basic architecture of FPGA CPLD.

Unit VI:
VHDL and Introduction to Microprocessors
  Introduction to HDL, VHDL- Library, Entity, Architecture, Modeling Styles, Concurrent and Sequential Statements, Data Objects & Data Types, Attributes.
  Design Examples. VHDL for Combinational Circuits-Adder, MUX.
  VHDL for Sequential Circuits-Synchronous and Asynchronous Counter, Shift Register.
  Introduction to Microprocessor. Introduction of Ideal Microprocessor, Data Bus, Address Bus, Control Bus, 8085 Programmers model as an example.

Text Books

Reference Books
  1. John Yarbrorough, “Digital Logic applications and Design” Thomson
  2. Flyod “Digital Principles”, Pearson Education
FUNDAMENTAL OF DATA STRUCTURE

**Prerequisite**: Fundamental knowledge of ‘C’ from ‘Fundamentals of Programming Language’.

**Learning Objectives**

The students shall learn the C language and pointers in depth. They will be able to use pointers for data manipulation. They will learn linear data structures.

**Unit I**

**Introduction to C**

- Constants, variables and keywords in C, operators and control structure in C (decision, loop and case), functions, macros, arrays and string manipulation, structure, union, enumeration, bitwise operations.

**Unit II**

**Arrays & Pointers in C**

- Functions: Parameter passing call by value and call by reference, scope rules, functions and pointers, function returning pointer and pointer to function, String manipulations using arrays, pointer to pointer.
- Structure and Union: Passing and returning structure as parameter for function, structure and pointer.
- Recursion: Definition, writing recursive functions & how recursion works. File handling using C.

**Unit III**

**Introduction to Data structures & Analysis of Algorithms**

- Introduction to Data Structures: Concept of data, Data object, Data structure, Abstract Data Types (ADT), realization of ADT in ‘C’.
- Concept of Primitive and non-primitive, linear and Non-linear, static and dynamic, persistent and ephemeral data structures.

**Unit IV**

**Searching and sorting techniques**

- Need of searching and sorting, why various methods of searching and sorting, Sorting methods: Linear and binary search.
- Sorting methods: Bubble, insertion, selection, merge, quick, bucket. Time complexity of each searching and sorting algorithm.
Unit IV:
Linear data structures using sequential organization
Concept of sequential organization, Concept of Linear data structures, Concept of ordered list, Storage representations of ordered list such as row major, column major and their address calculation.
Representation of sparse matrix using arrays, application of array in polynomial representation and algorithm for sparse matrix addition, multiplication, simple and fast transpose.

Unit VI:
Linear data structures using linked organization
Concept of linked organization, singly linked list, doubly linked list, circular linked list. Linked list as ADT. Representation and manipulations of polynomials using linked lists, comparison of sequential linked organization with linked organization, concept Generalized Linked List.

Text Books

References Books
HUMANITIES AND SOCIAL SCIENCES

Learning Objectives

This course will lead to the learning of
1. Human and social development.
2. Contemporary national and international affairs.
3. Emergence of Indian society and Economics.
4. Sectoral development and Economic development and related issues (such as international economics, WTO, RBI, etc).

Unit II:
Indian Society
Structure of Indian Society, Indian Social Demography– Social and Cultural,
Differentiations: caste, class, gender and tribe; Institutions of marriage, family and kinship-
Secularization –Social Movements and Regionalism- Panchayatraj Institutions; Affirmative Action
Programme of the Government-various reservations and commissions.

Unit II:
Social Development
Scientific approach to the study of human beings. Evolution of human kind, social change
and evolution. Industrial revolution. National policy on education, health and health care and
human development.

Unit III:
Sectoral Development
Agriculture : Technology changes, Green revolutions, Employment Rural and Urban,
Government Schemes.
Industrial Development : Strategies, Public and Private Sectors, Categories, infrastructure,
transport and communication, Consumer Awareness.

Unit IV:
Environment and Ecology
Ecosystems : Structure, Working, components.
Pollution : Water and Air Pollution, Global Warming, Control Strategies, International Treaties.
Energy Sources : Renewable and Non Renewable, Hydro power, Biomass, Ocean, Geothermal and
Tidal .

Unit V:
Economic Development
Need for planned economic development – Law of demand and supply. Planning objective,
five years plan, priorities and problems. Population and development.
Indian Economics – basic features, natural recourses population size and composition, national
income concepts, micro economics of India, inflation.
Unit VI:
Banking and Trades

Indian Banking, Role of Reserve bank of India.

Outcome

Making engineering and technology students aware of the various issues concerning man and society. These issues will help to sensitize students to be broader towards the social, cultural, economic and human issues, involved in social changes.

Methodologies

1. Suitable case studies should be discussed.
2. Student group discussion activity.

Reference Books

A. Combinational logic design
1. TTL Characteristics (study and write-up only).
2. Design (truth table, K map) and implement 4 bit Code converter.
   i. Binary to gray and vice versa.
   ii. BCD to Excess-3 and vice versa.
3. Design (truth table, K map) and implement 4 bit BCD Adder/Subtractor using IC 7483.
4. Realization of Boolean expression using multiplexer IC 74151/74153.
5. Design (truth table, K map) and implement Parity generator/detector using EX-OR gates and IC 74180.

B. Sequential circuit design
2. Design (State diagram) and implement 4 bit Up, Down, Controlled Up/Down Ripple counter using master slave JK flip-flop IC 7476.
3. Design (State diagram, state table, K map) and implement 4 bit Up, Down, Controlled Up/Down Synchronous counter using master slave JK flip-flop IC 7476.
4. Design and implement Modulo ‘n’ counter with IC 7490 and IC 74191.
5. Design (State diagram, state table, K map, Bush table & Bush diagram) and implement Sequence Generator (with & without bushing) using master slave JK flip-flop IC 7476.
6. Design (State diagram, State table, K map) and implement Sequence Detector using master slave JK flip-flop IC 7476.

C. VHDL Programming
Simulation of
1. 4:1 multiplexer using data flow modeling.
2. Full adder with Half adder using structural modeling.
4. 3 bit bidirectional shift register.

D. ASM, PALs and FPGA
1. Simple ASM using multiplexer controller method.
2. Implementation of combinational logic using PLAs
3. Study of FPGA devices (Study and Write up only).

- Instructor will frame assignments based on the suggested assignments as given above. Students will submit the term work in the form of journal consisting of minimum of 16 assignments of which assignment of Group C and 2 assignments from Group D are compulsory.

- Practical examination will be based on the term work and questions will be asked to judge the understanding of assignments performed at the time of examination.
PROGRAMMING LABORATORY

This laboratory includes the assignments based on Fundamentals of Data Structures using features of C Language.

List of experiments:

1. Implement set operations using arrays and perform union, intersection, difference, symmetric difference.
2. Implement following Matrix operations:
   a. addition with pointers to arrays,
   b. multiplication without pointers to arrays,
   c. transpose with pointers to arrays,
   d. saddle point without pointers to arrays.
3. Perform following String operations with and without pointers to arrays (without using the library functions) : a. substring, b. palindrome, c. compare, d. copy, e. reverse.
4. Structure manipulation (for any database like Employee or Bank database) with and without pointers to structures.
5. Accept student information (e.g. RollNo, Name, Percentage etc.).
   a. Display the data in descending order of Percentage (Bubble Sort).
   b. Display data for Roll No specified by user (Linear Search).
   c. Display the number of passes and comparisons for different test cases (Worst, Average, Best case).
6. Accept Mobile user information (e.g. MobileNo, Name, BillAmount etc.).
   a. Display the data in descending order of MobileNo. (insertion Sort)
   b. Display the data in ascending order of Name (Selection Sort)
   c. Display details for Mobileno specified by user (Binary Search)
   d. Display the number of passes and comparisons for different test cases (Worst, Average, Best case).
7. Implement Quick Sort recursively of the following set of numbers such as 56, - 90, 80, 78, 234, 654, 432, 12, 0, -11.
8. Implement Sparse matrix and perform following operations on it: Addition, Simple Transpose and Fast Transpose.
9. Create a singly linked list with options:
   a. insert (at front, at end, in the middle),
   b. delete (at front, at end, in the middle),
   c. Display,
   d. Display Reverse,
   e. Revert the SLL.
10. Accept input as a string and construct a Doubly Linked List for the input string with each node contains, as a data one character from the string and perform:
    a) Insert b) delete, c) Display forward, d) Display backward.
Reference:

STEVE McCONNEL, “Code complete”

Note: While performing the assignments following care should be taken

1. Proper indenting, coding styles, commenting, naming conventions should be followed.
2. Avoid using global variables as far as possible
3. Use of functions is necessary
4. All Assignments to be implemented using C and Time and Space Complexity is to be verified with theoretical findings.
5. Faculty should prepare a lab manual including standard test cases & should be available for reference to students.

Student should submit term work in the form of a journal based on the above assignments. Practical examination will be based on the term work. Questions will be asked during the examination to judge the understanding of the practical performed at the time of examination. Candidate is expected to know the theory involved in the experiment.
Learning Objectives

- Provide a sound grammatical and functional framework and systematic practice of key language.
- Present language in relevant and realistic situations.
- Develop an essential Business English vocabulary.
- Integrate pronunciation practice with the main language points.
- Build confidence by developing tactics to help learners control conversations and avoid communication breakdowns.
- Motivate learners with activities to check their progress.
- Encourage learners to talk about their own jobs and experiences.
- Raise awareness of the cultural aspects of business communication.

Overview

This course is designed for students with a limited knowledge of English who now want to communicate simply and confidently in a range of job-related situations. It maximizes study time by focusing on essential language and skills and developing effective learning strategies. Students learn listening, speaking, reading and writing skills with exposure to Business English. It will allow systematic coverage of Grammar & Vocabulary through natural recycling of language. The course will enable students to speak and write simple English in a range of everyday situations as well as communicate effectively in business environment. It will also focus on remedial teaching. The course aims at enabling students to revise, consolidate and extend their command of English grammar and vocabulary.

Teaching methodology in a Language Lab

- Teaching with one to one and one to many control with the teacher. This facility may be utilised for teaching topics like Grammar, Writing Skills, Vocabulary, Phonetics etc.
- Broadcasting facility could be utilised for conducting both reading and listening comprehension.
- One to one as well as one to many conversation facility in the software may be utilised for making corrections, remedial teaching and discussions with students.
- Conference grouping could be used for conducting GDs.
- Word chatting.
- Pairing discussion may be used for conducting various activities to improve communication skills.
- Students demonstration.
- Class tests.
- Student monitoring by teacher.
- Audio recording.
- Audio on demand (by students).
- Video on demand (by students).
- Material upload (by teacher for upgradation of teaching material).
1: **Vocabulary building**
expressions used in day to day situations, word & phrases useful in a professional context, business expressions, abbreviations, telephone language, business idioms, polite requests, register, British and American English

2 : **Phonetics**
Consonants, vowels, word stress, elementary intonation, Pronunciation practice, General phonetics exercises in language laboratory.

3 : **Grammar**
Functional Grammar, the tense: structure and use, formation of correct sentences in various situations, common mistakes and how to avoid them, auxiliary verbs and various ways in which each can be used, Reported speech and its use in spoken communication.

4 : **Reading & Listening Skills**
Reading Comprehension, Listening Comprehension and Discussions based on Listening sessions in groups of 10. Comprehension with various purposes such as finding precise information, interpretation of the information, understanding the gist.

5: **Writing Skills**
Business Correspondence: Business Letters, Covering Letters, Minutes of meeting, E-mail Etiquettes, Resume. Technical Writing: Introduction to Technical Writing (Manuals, brochures etc.) Technical Reports.

6 : **Communication Skills**
Formality and politeness, Body Language, Communication barriers, Planning, preparation, delivery and assessment of activities like: Public Speaking, Presentation Skills, Group Discussion, Interview Skills, Extempore, Expressing agreement or disagreement politely, Telephone etiquettes, Practice in language laboratory, PPT.

7. **Meeting**
Purpose, Procedure, Chairmanship, participation, minutes of meeting, Physical arrangements.

8. **Group Discussion**
Group Dynamics, Purpose, Organization, Group discussion for any 4 technical/non technical topics.

9. **Audio Visual aids**
Basic Principles and guidelines, types of aids and use, Development of Power Point presentation on any technical or non technical topic with animation, Sound, video etc.

10 **Effective Stress Management**
Sources of stress, Recognizing stress, Managing emotional and physical stress.
Term work

Term work shall consist of Journal/Reports/Presentations assigned by teacher and home assignments. A minimum of 10 assignments must be completed covering all topics. On topics 1 to 4 must be in a language lab. Group discussions oral presentation must be in batches. It is in the best interest of Institute that students develop the skills and senior Faculty Guest faculty be involved.

Reference Books

1. Krishna Mohan and Banerji Meera: Developing Communication Skills Macmillan India
Semester - IV
Information Technology
ENGINEERING MATHEMATICS - III

SECTION I

Unit I: Linear Differential Equations (LDE)
Solution of n'th order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy’s & Legendre’s DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit II: Complex Variables
Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy’s Theorem, Cauchy’s Integral Formula, Laurent’s Series, Residue Theorem.

Unit III: Transforms

SECTION II

Unit IV: Statistics and Probability

Unit V: Vector Differential Calculus

Unit VI: Vector Integral Calculus
Line, Surface and Volume integrals, Work-done, Green’s Lemma, Gauss’s Divergence Theorem, Stoke’s Theorem, Applications to Problems in Electro-Magnetic Fields.

Text Books:

Reference Books:
COMPUTER GRAPHICS

Pre-requisites

1. Computer Programming and basic data structures.
2. Mathematics topics such as analytical geometry, trigonometry, linear algebra and matrices.
3. Knowledge of vector space, Matrices, Dot products and distances.

Learning Objectives

1. Understand the foundations of computer graphics: hardware systems, math basis, light and color.
2. Come to appreciate the complexities of modeling realistic objects through modeling complex scenes using a high-level scene description language.
3. Become acquainted with some advanced topics in computer graphics.
4. The student should gain an expanded vocabulary for discussing issues relevant to computer graphics (including both the underlying mathematics and the actual programming).
5. The student should gain an appreciation and understanding of the hardware and software utilized in constructing computer graphics applications.
6. The student should gain a comprehension of windows, clipping and view-ports in relation to images displayed on screen.
7. The student should gain an understanding of geometric, mathematical and algorithmic concepts necessary for programming computer graphics.

Teaching aid
Faculties should use LCD to demonstrate the concept of Graphics.

Introduction
Unit I:
Basic Concepts
Graphics Primitives: Introduction to computer graphics, Basics of Graphics systems, Raster scan & random scan displays, display processor, display file structure, algorithms and display file interpreter.
Display devices, Interactive devices: Tablets, touch panels, mouse, joysticks, track balls, light pen etc., Data generating devices: Scanners and digitizers, primitive operations, display file structure, algorithms and display file interpreter, Text and line styles.
Scan conversions, lines, line segments, vectors, pixels and frame buffers, vector generation, DDA and Bresenham’s line and circle drawing algorithms*, initialising, thick lines, character generation: Stroke Principle, Starburst Principle, Bit map method, display of frame buffer.
(* Scan conversion algorithms should be given mathematical treatment).
Unit II:
2D & 3D Transformations
2D Geometric Transformations, Basic transformations- translation, scaling, rotation, other transformations such as reflection, shearing, matrix representation and homogeneous coordinate system, Composite transformation, 3D transformation Polygon filling methods.

Unit III:
3D Viewing & 3D object representation
Projections, Specifying an arbitrary 3D View, Examples of 3D viewing ,Polygon surfaces, polygon tables, plane equation, polygon meshes, curved lines & surfaces, quadric surfaces, Spline representation.

Unit IV:
Color models & animation
Colors spaces : RGB, HSV, CMY(K), YIQ, Color Mixing. Computer Animation : Animation sequences ,functions & Languages, Key-frame systems, Motion Specifications.

Unit V:
Ray Tracing
Ray tracing methods, algorithms, ray surface intersection calculations. Transformation, Hierarchy, Local Illumination and shading.

Unit VI:
Advanced Topics
Rendering equation and Monte Carlo methods, anti-aliasing, texture mapping, shadows, GPU, Bezier curves, Fractals, fractal lines and surfaces(With complete mathematical treatment of this unit)
Interactive Graphics & usage of at least two tools of computer graphics (3D studio, Maya, Similar tools) ( Usage of tools in Lab ).

Text Books

Reference Books
2. Foley and Van Dam,"Computer Graphics:Principles and Practice”, Pearson Education
PROCESSOR ARCHITECTURE AND INTERFACING

Prerequisites: Computer Organization

Learning Objectives

1. To learn the architecture and assembly language programming of 80386 Microprocessor.
2. To provide insight to DOS and BIOS and their functions.
3. To study architecture and programming 8051 micro-controllers.

Unit I:
Introduction to 80X86 Processors
16/32bit processor 80x86, 80386 Features and Architecture, Pin Description, Functional Description, Register Set, 80386 Real mode, Segmentation
Bus Cycles Initialization and configuration, Bus operations, Address pipelined, Memory organization and I/O organization, 16/32 bit transfer.

Unit II:
Assembly Language Programming
Introduction to assembly language programming, Instruction set, Assembler, linker, loader, concepts, Assembler directives, file I/O processing, Far and near procedures, macros, Timing and delay loops, DOS internal, DOS calls, .EXE, .COM files, Interfacing with 8086: Programmable parallel ports, 8255 A PPI, interfacing, keyboard & display, parallel printer interface, interfacing RAM.

Unit III:
Protected Mode
Segmentation- support registers, related instructions descriptors, memory management through segmentation, logical to linear/physical address translation, protection in segmentation, Privilege instructions.
Paging - support registers, descriptors, linear to physical address translation, TLB, page level protection, virtual memory, .entering into PM mode and returning back to RM mode.

Unit IV:
Multitasking, Interrupts, Exceptions and I/O
Inter-privilege level transfer using Call gates and confirming code segment.
Multitasking - Support registers, related descriptors, Task switching, I/O permission bit map.
Virtual Mode - features, address generation, privilege level, instructions and registers available, entering and leaving V86 mode.
Interrupt structure - Real, Protected and Virtual 8086 modes, Comparison of all three modes.
Unit V:
**Microcontroller**

Microcontroller 8051 Architecture, On-Chip data memory and program memory organization - Register set, Register bank, SFRs, External data memory and program memory, Interrupts structure and Response.

Unit VI:
**Microcontroller**

Timers and their programming, Serial port and programming, Other features, Design of minimum system using 8051 micro-controller for various applications. Features of PIC 16C, PIC 16F8XX ,Texas MSP 430.

**Text Books**

1. Turley, “Advanced Programming of 80386 ”
2. Douglas V Hall,” Microprocessors and Interfacing”

**Reference Books**

1. Tribel Singh,”8088 /8086 Processor”, PHI
**DATA STRUCTURES AND FILES**

*Learning objectives*

The students should be capable of applying appropriate data structures for any given application.

**Unit I : File organization**

C Files and command line argument, Primitive operations and implementation in C, Concept of sequential, simple Index file and direct access file, Hashing, Hashing function and it’s characteristics, Concept of collision resolution, linear probing, chaining with & without replacement, rehashing, Processing of sequential, Index-sequential and direct files. Sequential file organisation, direct file organisation, index sequential file organisation and their implementation.

**Unit II : Stack**

Concept of stack as ADT, Implementation of stacks using linked and sequential organization. Concept of multistacks, Importance of stack in recursion, Importance of implicit and explicit stack Application of stacks.

**Unit III : Queues**

Concept of queues as ADT, Implementation of linear and circular queue using linked and sequential organization. Concept of multiquues, dequeue and priority queue. Application of queues.

**Unit IV : Tree**

Difference in linear and non-linear data structure, Trees and binary trees-concept and terminology, binary tree as an ADT. Algorithm for tree traversals (recursive and non recursive). Conversion of general tree to binary tree. Binary search trees, Concept of threaded binary tree. Threaded binary tree as an ADT. Preorder, Inorder traversals of inorder threaded binary search tree.

**Unit V : Graphs**

Graph as an ADT, Representation of graphs using adjacency matrix, adjacency list, Depth First Search and Breadth First Search. Algorithms for minimal spanning tree (Prim’s and Kruskal’s) and shortest path- Dijkstra’s algorithm Application of these algorithms.

**Unit VI : Symbol Tables and Dynamic Trees**

Notion of Symbol Table, AVL Trees, OBST, Heap data structure its application in heap sort, Huffman's algorithm,
Hash Tables: Basic concepts, hash function, hashing methods, collision resolution, bucket hashing.

Text Books

Reference Books
DATA COMMUNICATION

Learning Objectives

1. Fundamentals of data communications.
2. Basic Network configurations.
3. Understanding the differences between data communications and telecommunications.
4. Practical examples of networks such as
   • Fundamentals of communications media.
   • Hardware configurations within networks.
   • Data transmissions.

Unit I:
Layer Models and Signals
Layered Tasks: Sender, Receiver, And Carrier, Hierarchy.
The OSI Model: Layered Architecture, peer-to-peer Processes, Encapsulation Layers In The OSI Model.
TCP/IP Protocol Suite.
Addressing: Physical &logical Addresses, Port Addresses, Specific Addresses.
Analog And Digital: Analog And Digital Data, Analog And Digital Signals, Periodic And Non-periodic Signal.
Digital Signals: Bit Rate, bit Length, Digital Signal as a Composite Analog Signal, Transmission Of Digital Signals.
Data Rate Limits: Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity, Using Both Limits.
Performance: Bandwidth, Throughput, Latency (delay), Bandwidth-delay Product, Jitter.
Digital-to-digital Conversion: Line Coding, Line Coding Schemes, Block Coding, Scrambling.
Analog to digital Conversion: Pulse Code Modulation (PCM), Delta Modulation (dm).
transmission modes: parallel transmission, serial transmission

Unit II:
Modulation And Multiplexing
Digital-to-analog Conversion: Aspects Of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Amplitude Modulation
Analog-to-analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation
Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing Synchronous Time-Division Multiplexing, Statistical Time-Division Multiplexing
Spread Spectrum: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum
Unit III:
Transmission Media And Switching
Guided Media: Twisted-Pair, Coaxial and Fiber-Optic Cable
Unguided Media: Wireless, Radio Waves, Microwaves, Infrared
Circuit-switched Networks: Three Phases, Efficiency, Delay, Circuit-Switched Technology in Telephone Networks
Datagram networks: Routing Table, Efficiency, Delay, Datagram Networks in the Internet
Virtual-circuit networks: Addressing, Three Phases, Efficiency, Delay in Virtual-Circuit Networks, Circuit-Switched Technology in WANs
Structure of a switch: Structure of Circuit Switches, Structure of Packet Switches
Digital Subscriber Line: ADSL, ADSL Lite, HDSL, SDSL, VDSL.

Unit IV:
Error Control And Data Link Control
Types of errors: Redundancy, detection versus correction, forward error correction versus retransmission, coding, modular arithmetic
Block coding: error detection, error correction, hamming distance, minimum hamming distance
Linear block codes: minimum distance for linear block codes, some linear block codes
Cyclic codes: cyclic redundancy check, hardware implementation, polynomials, cyclic code analysis, advantages of cyclic codes
Checksum: idea, one's complement, internet checksum
Framing: fixed-size framing, variable-size framing
flow and error control: flow control, error control protocols
Noiseless channels: simplest protocol, stop-and-wait protocol
Noisy channels: stop-and-wait automatic repeat request, go-back-n automatic repeat request, selective repeat automatic repeat request, piggybacking
HDLC: configurations and transfer modes, frames, control field
Point-to-point Protocol: Framing, Transition Phases, Multiplexing, Multilink PPP.

Unit V:
Multiple Access and Ethernet
Random access: ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access With Collision Detection (CSMALCD), Carrier Sense Multiple Access With Collision Avoidance (CSMALCA)
Controlled access: reservation, polling, token passing
Channelization: Frequency Division Multiple Access (FDMA), Time-Division Multiple Access (TDMA), Code Division Multiple Access (CDMA)
ETHERNET: IEEE standards, data link layer, physical layer
Standard Ethernet: MAC Sub-layer, Physical Layer
bridged Ethernet, switched Ethernet, full-duplex Ethernet
Fast Ethernet: MAC Sub-layer, Physical Layer
Gigabit Ethernet: MAC sub-layer, Physical Layer, Ten-gigabit Ethernet
Unit VI:
Devices, Backbone networks and SONET

Connecting devices: passive hubs, repeaters, active hubs, bridges, two-layer switches routers, three-layer switches, gateway
Backbone networks: bus backbone, star backbone.
Virtual LANs: membership, configuration, communication between switches, IEEE standard, advantages
SONET Architecture: signals, Sonet devices, connections.
Sonet layers: path layer, line layer, section layer, photonic layer, device-layer relationships, Sonet frames: frame, byte, and bit transmission, STS-L frame format, overheads, encapsulation

Text Books

2. P. C. Gupta,”Data Communications”, PHI

Reference Books

2. Leon - Garcia, Indra Widijaja,”Communication Networks Fundamental Concepts and Key Architectures”
3. Achyut Godbole,”Data Communication Networks”,TMGH
Instructions :- The term work of students should be assessed depending on 11 assignment listed as follows.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>NO. OF ASSIGNMENT</th>
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<tbody>
<tr>
<td>A</td>
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Group A: ALP based 8086 Microprocessor

1. Write Assembly language program (ALP) to add array of N numbers stored in the memory.

   OR

1. Write ALP to perform non-overlapped and overlapped block transfer.

2. Write ALP to convert 4-digit Hex number into its equivalent BCD number and 5-digit BCD number into its equivalent HEX number. Make your program user friendly to accept the choice from user for
   
   i. HEX to BCD  
   ii. BCD to HEX  
   iii. EXIT.

Display proper strings to prompt the user while accepting the input and displaying the result.

3. Write ALP to perform string manipulation to calculate string length and reverse a string. The strings to be accepted from the user is to be stored in code segment Module_1 and write FAR PROCEDURES in code segment Module_2 for following operations on the string:

   Concatenation of two strings

   Compare two strings

   OR

   Number of occurrences of a sub-string in the given string

Find number of words, characters, number of lines and number of capital letters from the given text in the data segment

Note: Use PUBLIC and EXTERN directive. Create .OBJ files of both the modules and link them to create an EXE file.
Group B: Interfacing with 8086/8051

4. (a) Write 8086 ALP to convert an analog signal in the range of 0V to 5V to its corresponding digital signal using either successive approximation ADC or dual slope ADC.

4. (b) Write 8086 ALP to interface DAC and generate following waveforms on oscilloscope,
   (i) Square wave - Variable Duty Cycle and frequency,
   (ii) Ramp wave - Variable direction,
   (iii) Trapezoidal wave,
   (iv) Stair case wave.

4.(c) Write 8086 ALP to rotate a stepper motor for given number of steps at a given angle and in the given direction of rotation based on the user choice.

Any two assignments based on 8086 interfacing (4a-4c)

OR

4.Write ALP to interface 8051 with :

   (a) Interfacing DAC and writing programs to generate triangular, trapezoidal and sine waveforms.
   (b) Interfacing 8/12 bit ADC to 8051 or equivalent and to write a program to find out the average value for 10 readings.
   (c) Interface stepper motor to 8051 and write a program to rotate motor with different step angles and with different speeds.

Any two assignments based on 8051 interfacing (4a-4c)

Group C: File Processing / Dos Commands

5. Write following programs in C using int86, int86x, intdos, intdosx functions
   To delete a file
   To create a directory
   Read and display disk information such as Drive, tracks, sectors etc

OR

5. Write ALP to read Boot Sector and Display contents of Boot Sector(use Inline C Code).

6. Write 8086 ALP to perform Encryption and Decryption of a text message.

Program should open, say, FILE1, read the content of FILE1 and encrypt it using suitable encryption key. Store encrypted text along with encryption key in, say, FILE2. Read and display the contents of encrypted file i.e. FILE2. Decrypt the data and store the decrypted data in, say, FILE3. Compare the
contents of FILE1 and FILE3 after decryption. Make your program user friendly with proper screen
echoes.

OR

6. Write 8086 ALP to read command line arguments using PSP(Program Segment Prefix) and
implement “DOS COPY Command “. Use File Handle function for handling the files. Handle all the
errors and display appropriate message if user does not enter proper command line argument.

**GroupD: Assignments based on programming 8051 microcontroller.**

7. Write a program to add n, 8 bits numbers found in internal RAM location 40H onwards and store
results in R6 and R7.

8. Write a program to multiply 16 bit number by 8 bit number and store the result and internal
memory location.

9. Write a program for block transfer for internal / external memory.

10. Timer programming :ISR based

    Write ALP to generate square wave using Timer interrupt on any port pin.

    OR

10. Serial port programming : ISR based

    Connect two 8051 Ics using serial ports Send FFH and 00H alternatively to receiver .Output received
byte to port1 ,see port1 pin waveform on CRO.

    Write ALP to establish communication between two 8051 in asynchronous or synchronous mode.

11. Write ALP to switch from real mode to protected mode and back to real mode. Display an
appropriate message in each mode.
DATA STRUCTURES AND FILES LIBORATORY

1. Implement all primitive operations on Sequential file in C

2. Implementation of Hash table using array and handle collisions using Linear probing with replacement and Chaining without replacement

3. Represent single variable polynomial as a circular linked list. Accept the terms in the polynomial in any order, i.e. not necessarily in the decreasing order of exponent. Sort while creating polynomial in the decreasing order of exponent and write a menu driven program to perform display, addition, multiplication and evaluation.

4. Implement stack as an abstract data type (ADT) using linked list. Use this ADT for a) infix to prefix conversion, b) infix to postfix conversion, c) evaluation of postfix expression.

5. Consider a scenario for Hospital to cater services to different kinds of patients as
   a) Serious (top priority), b) non-serious (medium priority), c) General Checkup (Least priority). Implement the priority queue to cater services to the patients.

6. Accept a postfix expression and construct an expression tree and perform recursive and non recursive traversals.

7. Create a binary search tree of mnemonics from assembly language(e.g. add, mult, div, sub etc.) and perform following operations:
   a) Insert, b) delete, c) depth of the tree, d) search a node, e) Find its mirror image f) Print original g) mirror image level wise.

8. Represent a given graph using adjacency list and perform DFS and BFS Use the map of the area around the college as the graph. Identify the prominent land marks as nodes and perform DFS and BFS on that

9. Represent a given graph using adjacency matrix and find the shortest path using Dijkstra’s algorithm. Use the map of the area around the college as the graph. Identify the prominent land marks as nodes and find minimum distance to various land marks from the college as the source.

10. Implement Huffman’s algorithm.
References:

Code complete: STEVE McCONNEL
Note: While performing the assignments following care should be taken

1. Proper indenting, coding styles, commenting, naming conventions should be followed.
2. Avoid using global variables as far as possible
3. Use of functions is necessary
4. Faculty should prepare a lab manual including standard test cases & should be available for reference to students.

Student should submit term work in the form of a journal based on the above assignments. Practical examination will be based on the term work. Questions will be asked during the examination to judge the understanding of the practical performed at the time of examination. Candidate is expected to know the theory involved in the experiment.
OBJECT ORIENTED PROGRAMMING AND COMPUTER GRAPHICS LABORATORY

Unit I:
Introduction to Object Oriented Programming
Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism.

Unit II:
Programming with C++
++: Extensions to C: Variable declarations, global scope, ‘const’, reference variables, comments, default parameters, function prototypes, function overloading, inline functions, default and constant arguments, ‘cin’, ‘cout’, formatting and I/O manipulators, new and delete operators

Unit III:
Classes and Objects:
Defining a class, data members and methods, public, private and protected members, inline member functions, static data members, static member functions, ‘this’ pointer, constructors, destructors, friend function, dynamic memory allocation, array of objects, pointers and classes, class as ADT's and code reuse

Unit IV:
Operator Overloading:
Introduction, Need of operator overloading, overloading the assignment, binary and unary operators, overloading using friends, rules for operator overloading, type conversions

Unit V:
Inheritance and Polymorphism
Concept and need, single inheritance, base and derived classes, friend classes, types of inheritance, hybrid inheritance, member access control, static class, multiple inheritance, ambiguity, virtual base class, polymorphism, virtual functions, pure virtual functions, abstract base class, virtual destructors, early and late binding, container classes

Unit VI:
Templates:
Introduction, Templates: Function template and class template, function overloading vs. function templates, member function templates and template arguments, Introduction to Generic Programming: Introduction to Standard Template Library (STL), containers, iterators and algorithms, study of container template classes for vectors and stacks and related algorithms
NameSpaces: Introduction, Rules of namespaces
Unit VII  :
Exception Handling:
   Introduction, syntax for exception handling code: try-catch-throw, Multiple Exceptions, Exceptions with arguments, Introduction to RTTI
Managing Console I/O Operations: Introduction, C++ streams, stream classes, unformatted I/O, formatted I/O and I/O manipulators

Unit VIII :
Files and Streams
Concept of a file, file operations, streams, opening and closing a file, detecting end-of-file, file modes, file pointer, structures and files, classes and files, sequential file processing, Error handling

Text Books:

Reference Books:

Suggested list of Assignments
GROUP A:

- Constructor, Destructor:
  1. Create a class named weather report that holds a daily weather report with data members day_of_month,hightemp,lowtemp,amount_rain and amount_snow. The constructor initializes the fields with default values: 99 for day_of_month, 999 for hightemp,-999 for low emp and 0 for amount_rain and amount_snow. Include a function that prompts the user and sets values for each field so that you can override the default values. Write a program that creates a monthly report.

- Static member functions,friend class,this pointer,inline code and dynamic memory allocation :
  2. Develop an object oriented program in C++ to create a database of the personnel information system containing the following information: Name, Date of Birth, Blood group, Height, Weight, Insurance Policy number, Contact address, telephone number, driving licence no. etc Construct the database with suitable member functions for initializing and destroying the data viz constructor, default constructor, copy constructor, destructor, static member functions, friend class, this pointer, inline code and dynamic memory allocation operators-new and delete.

- Operator overloading :
  3. Design a Class ‘Complex ‘ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).
4. Write a C++ program to perform String operations
   i.  = Equality
   ii. == String Copy
   iii. + Concatenation
   iv.  << To display a string
   v.  >> To reverse a string
   vi. Function to determine whether a string is a palindrome
   To find occurrence of a sub-string. Use Operator Overloading.

• Inheritance:
  5. Design a base class with name, date of birth, blood group and another base class consisting of the data members such as height and weight. Design one more base class consisting of the insurance policy number and contact address. The derived class contains the data members telephone numbers and driving license number.
  Write a menu driven program to carry out the following things:
  i) Build a master table ii) Display iii) Insert a new entry
  iv) Delete entry v) Edit vi) Search for a record

• Templates:
  6. Write a program in C++ using function template to read two matrices of different data types such as integers and floating point values and perform simple arithmetic operations on these matrices separately and display it.

• Virtual functions & files:
  7. Design a base class consisting of the data members such as name of the student, roll number and subject. The derived class consists of the data members subject code, internal assessment and university examination marks. Construct a virtual base class for the item name of the student and roll number. The program should have the facilities.
  i) Build a master table ii) List a table iii) Insert a new entry
  iv) Delete old entry v) Edit an entry vi) Search for a record

• Exception Handling:
  8. Create a class named Television that has data members to hold the model number and the screen size in inches, and the price. Member functions include overloaded insertion and extraction operators. If more than four digits are entered for the model, if the screen size is smaller than 12 or greater than 70 inches, or if the price is negative or over $5000 then throw an integer. Write a main() function that instantiates a television object, allows user to enter data and displays the data members. If an exception is caught, replace all the data member values with zero values.

GROUP B:

1. Assignments to understand functions available in graphics library such as,
   (a) Text and Graphics mode, initialization of graphics mode, graphics drivers, switching between text and graphics mode, error handling.
   (b) Color, Color Palette, Aspect ratio, Text: fonts, alignment, size, orientation and justification.
   (c) Graphics Primitives: Pixel, Line, Circle, Ellipse, Polygons, Line styles, Bar graphs, Pie Charts, Histograms, filling a polygon, windowing.
   (d) Writing a Graphics Editor
2. Write a program to implement algorithm for line and circle drawing.
3. Write a program to implement algorithm for filling a polygon using scan-fill method.
4. Write a program to implement 2-D transformations.
5. Case study of any graphics tool.
• Instructor will frame assignments based on the suggested assignments as given above. Instructors are expected to incorporate variations in above list.
• Students will submit Term Work in the form of a journal that will include at least 13 assignments. Each programming assignment will consist of pseudo-algorithm, program listing with proper documentation and printout of the output.
Practical Examination will be based on the term work and questions will be asked to judge understanding of the assignments at the time of the examination.
Semester - V
Information Technology
OPERATING SYSTEM

Unit I Introduction
Examples of O. S.: Linux , MS-Windows, Handheld OS .

Unit II Process Management
Process , Process description, Process states, Process control, Threads, Processes and Threads, Uniprocessor Scheduling: Types of scheduling, Scheduling algorithms: FCFS, SJF, Priority, Round Robin, UNIX Multi-level feedback queue scheduling, Thread Scheduling, Multiprocessor Scheduling concept, Real Time Scheduling concept..

Unit III Process Communication and Synchronization
Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies

Unit IV Memory Management
Memory Management requirements, Memory partitioning: Fixed ,dynamic partitioning, Buddy System Memory allocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit), Fragmentation, Swapping, Segmentation, Paging, Virtual Memory, Demand paging, Page Replacement Policies (FIFO, LRU, Optimal, clock),Thrashing, Working Set Model.
Note: Every aspect of O.S. should be taught in comparison w.r.t. WINDOWS OS & UNIX OS

Unit V I/O and File Management
I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches.

Unit VI Protection and Security

Text Books:

Reference Books:
THEORY OF COMPUTATION

Unit I  Basic Concept:
Symbol/alphabets, string/word, language, formal language, natural and formal language
Basic Machine, Finite State machine: state tables, transition graph, acceptance and rejection

Unit II Finite automata(FA):
Definition of FA, representation (tabular form of state transition function and machine transition function, transition graphs, and adjacency matrix), finite control of FA over string, language acceptance by FA., deterministic finite automaton(DFA) and non-deterministic finite automaton(NFA), concept of moves, NFA with e moves, NFA without e moves, removal of e moves, conversion of NFA without e moves to DFA, conversion of NFA with e moves to DFA, FA with output: Moore and mealey machines-definition, models, inter conversion

Unit III  Contexts Free Grammars and languages:
Phrase structure grammar, context free grammar, context free languages(CFL), Production rules, formalization, derivation and derivation trees, ambiguous grammar, removal of ambiguity and inherent ambiguity, simplification of grammar-removal of unit production, useless production, useless symbol, and production; normal forms(chomsky normal form and greibach normal form), Chomsky hierarchy.

Unit IV  Regular Grammar and CFL
Regular Grammar: Definition, left linear and right linear regular grammar, regular grammer and finite automata, FA to RG and RG to FA, inter conversion between left linear and right linear regular grammar.
CFL:
Properties, normal forms, etc. Pumping lemma of CFL, definition of/for CFL and application automata theory
Unit V  **Push down automata**(PDA)

Definition, deterministic, pushes down automata(DPDA), non-deterministic push down automata(NPDA), the language of PDA. Equivalence of PDA’s and CFG’s, closure properties of CFL’s. Concept of post machines.

**Unit VI Turning Machine:**

Definition and example of TM, recursive sets, partial recursive function, recursively enumerable sets, computing a partial function with TM, combining TM’s variations of TM: Multi-tape TM’s, universal TM, model of computation and church’s turing hypothesis, unsolvable problem, TM’s halting problem

**Text Books:**


**Reference Books:**

Unit I  Network Layer and Routing:
Network layer – I :
Design issues, packet switching, connectionless and connection oriented services, virtual circuit and datagram subnet, routing algorithms like adaptive and non-adaptive (2 each), congestion control algorithms and prevention policies, Load shading, jitter control, quality of service, internetworking.

Unit II Network layer – II (Protocols) :
ARP, RARP, ICMP, IPv4, IPv6, Addressing schemes, Subnetting, Supernetting, CIDR, Unicast/multicast protocols, MPLS, VLAN, DHCP, Bootstrap, BOOTP

Unit III  Transport Layer:

Unit IV Application Layer :
Session layer services and protocols, Presentation layer services, WWW & HTTP, Persistent / non-persistent pipeline, FTP, TFTP, SMTP, POP3, IMPA, MIME, Domain name system (DNS) and DNS servers, Resource records, P2P, SNMP, Network management framework and it’s infrastructure, MIB, SMI.

Unit V  Multimedia Networking:
Multimedia networking applications, streaming stored audio and video, making the best of the best-effort services, protocol for real time interactive application RTP, RTCP, RTSP, SIP, H.323/H.324, Content Distribution Networks, scheduling and policing mechanism, integrated services, RSVP
Unit VI  Wireless and Broadband Network:

Text Books:

Reference Books:
Aim:
The course is designed for understanding database design and use of database management system in implementing database applications.

Objectives:
? To implement an entity relationship diagrams (ERD) to express requirements and demonstrates skills to model data requirements and create data models in to normalized designs
? To develop understanding of database systems theory in order to apply that knowledge to any particular database implementation using SQL
? To learn and understand various Database Architectures and Applications

Prerequisites:
• Discrete Structures
• Data Structures

Unit I
Introduction to DBMS: Basic concepts, Advantages of a DBMS over file-processing Systems, Data abstraction, Database Languages, Data Models: Introduction to Hierarchical, Network, ER, and Object Relational Model, Data Independence, Components of a DBMS and overall structure of a DBMS, Multi-User DBMS Architecture, System Catalogs
Data Modeling: Basic Concepts, entity, attributes, relationships, constraints, keys, E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables.
Relational Model: Basic concepts, Attributes and Domains, Codd's Rules, Relational Integrity: Domain, Entity, Referential Intelligences, Enterprise Constraints, Views, Schema diagram

Unit II
Relational Query Languages: Relational Algebra
Introduction to SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updation using Views, Indexes, Nulls
SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries, concept of Stored Procedures, Cursors, Triggers, assertions, roles and privileges
Programmatic SQL: Embedded SQL, Dynamic SQL.
Unit III  **Relational Database Design:**
Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependencies: Basic concepts, closure of set of functional dependencies, closure of attribute set, canonical cover, Decomposition: lossless join decomposition and dependency preservation, The Process of Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Unit IV  **File Systems:** File Organization, Organization of records in files, Indices, Static and Dynamic Hashing, B-trees and B+ Trees
Introduction to Query Processing: Overview, Measures of query cost, Selection and join operations, Evaluation of Expressions, Introduction to Query Optimization, Estimation, Transformation of Relational Expressions

Unit V  **Transaction Management:** Basic concept of a Transaction, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Timestamping Methods, Optimistic Techniques, Multi-Version Concurrency Control, Different Crash Recovery methods such as Shadow-Paging and Log-Based Recovery: Deferred and Immediate, Checkpoints

Unit VI  **Object-Oriented Databases:** Need of OODBMS, Storing Objects in Relational Database, Introduction to OO Data Models, Persistent Programming Languages, Pointer Swizzling Techniques
Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Distributed Database systems
Introduction to data mining using association rules, introduction to data warehousing and its components.

Text Books:

Reference Books:
SOFTWARE ENGINEERING

Unit I  Introduction To Software Engineering

Unit II  Requirements Engineering
Requirements Engineering, Initiating the process, Eliciting Requirements, Building The Requirements Model, Negotiating, Validating requirements, Requirements Analysis, Scenario-Based Analysis, Requirements Modeling strategies, Flow-Oriented Modeling, Class based modeling, SRS.

Unit III  Design Engineering

Unit IV  Testing Strategies

Unit V  Project management Concepts
Management Spectrum, people, product, process, project, critical practices, Process and project Metrics: Metrics in process and project domains, software measurement metrics for software quality, Estimation for software project: project planning process, software scope and feasibility, resources, Decomposition Techniques, Empirical Estimation Models, Estimation Empirical, Estimation for Object Oriented project , Specialized Estimation techniques, Make by decision.
Unit VI  Project Planning

Text Books:

Reference Books:
List of assignments

1. Shell programming
   A. Write a program to handle student data base with options given below,
      a) Create data base. b) View Data Base. c) Insert a record.
      d) Delete a record. e) Modify a record. f) Result of a particular
      student. g) Exit.
   B. Menu driven program for
      a) Find factorial of a no. b) Find greatest of three numbers c) Find a prime no
      d) Find whether a number is palindrome e) Find whether a string is palindrome
   C. Write shell program using command-line argument for
      a. Finding biggest of three numbers
      b. Reversing a number
      c. Accept a number N and a word and print the word N times, one word per
         line
      d. Sum of individual digits of a 4-digit number
         (1234 -> 1+2+3+4=10)

2. AWK programming (Assignment A and B from shell programming)

3. Implement following programs to exhibit UNIX Process Control
   A. Program where parent process sorts array elements in descending order
      and child process sorts array elements in ascending order.
   B. Program where parent process Counts number of vowels in the given
      sentence
      And child process will count number of words in the same sentence.
   The above programs should use UNIX calls like fork, exec and wait. And also show
   the orphan and zombie states

4. Simulation of following CPU scheduling algorithms:
   a. FCFS
   b. SJF (preemptive and non-preemptive)
   c. Priority Scheduling (preemptive and non-preemptive)
   d. Round Robin Scheduling
   Any three in journal

5. Deadlock avoidance using Banker's Algorithm.

6. Simulation of Memory allocation algorithms (First Fit, Best Fit, Next Fit)
7 Simulation of Page replacement algorithms (FIFO, LRU, Optimal)

8 Mutual Exclusion and Synchronization of threads using POSIX Semaphores and/or Mutex (Reader-Writer problem or Dinning philosopher problem)

9 Inter-process Communication for Producer-Consumer problem in UNIX (Pipes or Shared Memory)

10 Linux Kernel Compilation (Not in Practical Exam). Download a raw Linux Kernel, compile it and boot the machine through newly compiled kernel.

Students must submit the term-work in the form of journal. Each assignment has to be well documented with problem definition, theory and code documentation. Staff in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Note:
1. The practical examination will be based on the above mentioned assignments. Questions will be asked during the practical examination to judge the understanding of the students. It is expected that the student know the theoretical aspect of the problem.
2. Assignments to be implemented using UNIX (Linux as a variant) Operating System.

Reference Books:

INFORMATION SYSTEMS DESIGN LABORATORY

Objectives:

- To understand basics of GUI programming
- To understand and learn Visual programming paradigms and database programming.
- To understand and learn RDBMS concepts, database design principles
- To understand and learn SQL DDL, DML
- To get exposure to development experience of small systems through developing a mini project.

Part I and Part II assignments are to be performed individually by the students. Where as Part III mini project is to be performed in the group of 3 as team work

Part I: Assignments on GUI Design using any front end (VB6, VB.NET, Java, Delphi or equivalent tool.)

1. Build a VB or VC application like basic calculator, editor, games etc. with the GUI design and VB or VC programming.

2. Build suitable GUI by using forms and placing controls on it for any application. (Ex. Students registration for FE admission, railway reservation, online ticket booking, new email user creation etc.). Proper data entry validations are expected.

3. Usage of MDI form for creating a menu and connecting other form.

Above exercises have been specified to give idea/prerequisite learning for the concepts required in defining the problem statement for a front end to a DBMS based system. Front end tools support development of following concepts

- Controls (Text Boxes, Labels, Option & Command buttons, Check Boxes, List boxes & Combo boxes, shapes, Panels, Frames, Rich Text boxes, Scroll bars, Grid control, control arrays, Image & Picture boxes, Message boxes, Progress bar, Tab controls).
- Properties (Use of important properties (Behavior, Layout, Design etc) for every controls on the form.
- Events (Click, double click, change, Form Load, Got Focus, Lost Focus, Key pressed).
- Programming Components (Data types, variable declarations, control structures).
- Overall program development life cycle (Form design, Control & events, packaging and deployment).
Part II: Study of SQL using RDBMS (Oracle/MySql/DB2/Sql Server)

(Instructor will define problem definition for each batch of reasonable complexity such that it facilitates the use of all ER/EER features such as all types of relationships including aggregation, generalization, all types of attributes, strong and weak entities. Mapping of ER diagram to schema design should be implemented at least up to 3NF)

1 ER/EER Assignment
Design and draw an ER/EER diagram using standard notations for service industry (like Hospital, Airline, hotel, insurance, health case etc) and map this diagram into Database Tables.

2 DDL/DML Assignment
a) Create Database Tables in RDBMS generated in problem 1. (Instructor should see that student’s uses row level and table level integrity constraints, while creating tables)

b) Use DML statements such as INSERT, UPDATE, DELETE to insert the data into tables and to update/delete the data inserted into/from tables if required.

c) Write and execute SQL queries to extract information from the tables. (Instructor should frame problem definition such that it will involve use of text manipulation functions, aggregate functions, group value functions, Date functions, conversion and transformation functions, simple queries and nested queries, renaming of attributes, removal of duplications, creating views etc.)

3 PL/SQL assignments
a. Simple PL/SQL programs using the tables created.
b. Write and execute Triggers. (Instructor will frame appropriate problem definition, so that students study different data types & variables, program control statements)

Part 3: Miniproject on RDBMS and Front End development

A groups of minimum 2 and maximum 3 students should be formed. This mini project is to done as a team activity.

The mini project will go through following phases:

i) Design the Database (use ER/EER diagrams and Normalization up to 3 NF if required)

ii) Create at least 5-6 tables using all types of possible constraints, and relationship (foreign key) between them.

iii) Populate the database using SQL insert/creating forms.

iv) Implement suitable functionality related to the project which involves proper data processing.
v) Create triggers and active elements to maintain the integrity of the database and perform appropriate action on database updates.

vi) Develop suitable User Interface using appropriate tools & languages.

vii) Generate at least 3-4 suitable data report related to the functionality of the system with proper heading sub headings and footers.

viii) Group of students should submit the Project Report which will be consist of Title of the Project, Abstract, Introduction, scope, Requirements, Entity Relationship Diagram with EER features, Data Dictionary, Relational Database Design, Database Normalization, Graphical User Interface, Source Code, VB Forms and Data Reports, Testing document, Conclusion.

ix) Students should take software engineering concepts in to consideration for above points. They must maintain a log book of the activities related to the projects.

Staff in charge will frame the mini project specification to be performed. There will be a variation between each group. Not more than two batches will have the same application or mini project.

Students will have a CD of the mini projects, containing exported table, programs, various diagrams drawn and other related material. Few sample system are given below.

- Performance appraisal system
- Employee Information System
- Human Resource monitoring system
- Administrations and Management of Policies for insurance agent.
- Hotel Occupancy monitoring
- Hospital staff database
- Payroll system in the college
- Passengers Database for airline industry
- Aviation Industry Information System
- Customers Feedback monitoring.
- Patients History database
- Sales Force Automation
- Marketing Info Systems
- Inventory Control Systems
- Online investment Management
- Cash Management System
- Attendance monitoring system
- Result analysis Information system

**Examination**

In oral examination the candidate will have to demonstrate the mini projects and answer questions on design and documentation of the mini projects, technology used in above lab as well as on the DBMS and front end concepts used in the laboratory.
The examiner will view the CD of the project group and assertion that more than two batches should not have same application. The candidates will be judged on the mini project as well as the oral exam, individually. Project group can create presentation while demonstrating their mini project and show their individual contribution to the development of the project.

Reference Books:

2. SQL and PL/SQL for Oracle 10g Black Book, Dr. P.S.Deshpande DreamTech Press
1. Basic TCP/IP utilities and commands. (e.g.: ping, ifconfig, tracert, arp, tcpdump, whois, host, netsat, nslookup, ftp, telnet etc…)

2. Configure a router (Ethernet & Serial Interface) using router commands including access lists on any network simulator (e.g. packet Tracer).

3. Network design and implementation for small network using actual physical components with IP address scheme.

4. Network design & implementation for medium, large network using any network simulator with IP address scheme (CIDR). E.g VLAN Implementation.

5. Network analysis as well as packet header study with the help of any protocol analyzer/packet sniffer.


7. Socket Programming in C Language on Linux.
   a) TCP Client, TCP Server
   b) UDP Client, UDP Server

8. Configuration of any three of the following for each student:
   a) Remote Login Service – TELNET/SSH
   b) Configuration of FTP server and accessing it via FTP Client.
   c) Installation and configuration of APACHE WEB SERVER / IIS / PWS along with HTTP server.
   d) Installation and configuration of DHCP Server in Wireless Environment using an Access Point.
   e) Installation and configuration of DNS Server.
   f) Installation and configuration of Mail Server.

9. Case Study of existing College network with IP Address Scheme.

**Infrastructure Requirements:**
College should procure few equipment for effective understanding of the concepts. It is expected that lab has networking components like router, switches, hubs etc.

**Term Work:**
Staff in-charge will suitably frame the above assignments and flexibility may be incorporated. Students will submit term work in the form of journal. Each assignment has to be well
documented with problem definition, code documented with comments. Staff in charge will assess the assignments continuously and grade or mark each assignment on completion date.

**Examination:**
Oral examination will be based on the term work submitted by the candidate and the associated theory of the assignment performed in the lab.
Learning Objectives

? To help students develop their soft skills and equip them with the requisite skills to make their communication effective.
? To develop other skills this will make the transition from college to workplace, smoother and help them to excel in their jobs.
? To enhance students performance at placement interviews, group discussion and other recruitment process.
? Understand and participate in Group Discussions and related activities.
? Understand the basics of how to make an effective presentation.
? Learn the development of self-confidence.

Unit I  Soft skills Basics:
What are soft skills?, global competition, hard skills (technical skills) versus soft skills, emotional intelligence, interpersonal skills, cross-cultural communication, motivation, leadership skills, decision making, negotiation skills, business etiquette, problem solving skills, conflict management, crisis management, social understanding, behaviors traits, teamwork.
Human values: Morals, values, ethics, integrity, work ethics, virtues, respect for others, caring, sharing, honesty, courage, cooperation, commitment, empathy, self confidence, challenges in work place, spirituality.

Unit II  Presentation Skills:

Unit III  Group Discussion:
Group Discussion Basics, Nature of G.D, G.D and debate, importance of G.D, strategy of G.D, techniques for individual contribution, group interaction strategy. Points for GD Topics.

Unit IV  Interview Preparation:
Interview process, characteristic of job interview, pre-interview preparation techniques, Preparing for the Interviews, frequently asked interview questions. Attending the Interview, Interview Process, Employers Expectations, General Etiquette, Dressing Sense, Postures & Gestures.
Unit V  **Seminar and Project report writing:**
Need of standard format for seminar and report. Process of selection of seminar topic, Writing abstract, approval, seminar report writing, printing and delivery of seminar.

Unit VI  **Other Skills**
Managing time, Meditation, Stress and stress management, Improving Personal Memory, Study skills that include Rapid reading, Notes taking, Complex problem solving, creativity, Model business letters and Effective Email communication

List of possible Assignments:
Faculty should frame at least 6 assignments based on the all units.

1  **Resume / Letter writing /Essay**
Write a personal essay and or resume or SOP (statement of purpose) which may include:
- Who am I (family background, past achievements, past activities of significance.)
- Strength and weakness (and how to tackle them)
- Personal Short-term Goals, long term goals and action plan to achieve them
- Self assessment on soft-skills

2  **Presentation Skills:**
Presenting a review to a group (Each student should be given 10 minutes to present his review)
- Book review (Any favorite book, which they read and summarize in 10-15 minutes about that book)
- Film review (Any favorite film, which they liked most and summarize in 10-15 minutes about that film)
- Biographical Sketch (sketch of a persons life)
- Any topic such as an inspirational story/personal values/beliefs/current topic

3  **Group Discussion**
- Group discussions could be done for groups of 5-8 students at a time for half so total need for two group discussions for each student of the batch will be required.
- Every student shall be given 15 minutes of presentation time & 45 minutes of discussion on his/ her GD topic.
4 Interview Skills

- Students participate in Mock Interviews conducted by faculty from same/other department.

5 Oral presentation

- Elocution, declamation, debate or extempore delivery within a group of 12-15 students.
- More stress should be given on proper body language, voice modulation etc.

6 Abstract/Synopsis writing

- Students should submit abstract/synopsis of the any seminar/project studied, along with the proper references.

7 Activity Logs

- Find out how you really spend your time in a day.
- Activity logs help you to analyze how you actually spend your time. Check for amount of time that you waste.
- Learning from your log: Once you have logged your time for a few days, analyze your daily activity log.

Term Work:

Term work shall consist of a journal consisting of regular assignments and presentations completed in the practical class and at home, the total number of assignments should not be less than SIX, generally covering the topics mentioned above. As far as possible, submission should be word processed on a computer using a standard package by the student himself.

For the purpose of assignments, extensive use of research papers published in technical journals and articles published in magazines and newspapers may be made so that there is no repetition by the individuals.

Oral presentations exercises and group discussions should be conducted batch wise so that there is a closer interaction. Students should be sent to industrial visits for exposure to corporate environment.

Reference Books:

4. M Ashraf Rizvi, Effective technical communication, Mc-Graw Hill
5. TIME, How to Do Well in GDs and Interviews, 1/e, Pearson Education, ISBN - 9788131725542
8. Dr. R. L. Bhatia, “Managing time for competitive edge”
Semester – VI

Information Technology
Introduction to system software, need, Components: Assembler, Macro processor, Compiler, Interpreter, Loader, Linker.

Assembler:
- Elements of assembly language processing
- A simple assembly scheme
- Pass structure of Two Pass assembler

Design of II Pass assembler:
- Processing of Imperative, Declarative and Assembler directives to be considered
- Pass I along with data structures, Flowchart
- Intermediate Code, Variants
- Pass II flow chart/algorithm
- Various data structures that can be used and their comparison
- Concept Of Single Pass assembler: Backpatching,
  Comparison of single & II pass Assembler.

Unit II Macros
- Macro definition and Call
- Macro Expansion
- Design of Macro Processor: Definition and expansion processing algorithms along with Data structures
- Nested Macro calls: Call within a call and definition within a definition – Flow chart along with one example to be discussed.
- C Preprocessor

Unit III Compiler I:
- Phases of compiler
  - Block Diagram
  - Discussion of simple assignment statement and the output generated by all phases by compiler
- Lexical Analysis:
  - Finite Automata, Regular Expression, RE to DFA
Implementation of lexical Analyzer
Syntax Analysis
  Context Free Grammars
  Derivation of Parse Tress
  Parsers
  Top Down Parsers: Recursive Descent Parser, Predictive Parser
  Bottom Up Parsing: Shift Reduce Parser, SLR parser

Unit IV Compiler II:
  Intermediate code formats
    Postfix notation, Parse and syntax tress, Three address code, quadruples and triples
    Quadruple generation for 1D and 2D arrays
  Code optimization:
    Machine Independent: Common Subexpression elimination, removing of loop invariants, Reduction in strengths.
    Machine dependent Issues: Assignment and use of registers, Rearrangement of Quadruples for code optimization.
  Issues of Code generation

Unit V Loaders and Linkers:
  Loader Schemes
    Compile and Go Loader Scheme
    General Loader Scheme
    Absolute Loaders
    Subroutine Linkages
    Relocating Loaders
    Direct Linking Loaders
  Design of Absolute Loader
  Design of Direct Linking Loader
    Specification of Problem
    Specification of Data Structures
    Format of Data Bases
    Algorithm/Flowchart
  Dynamic linking
    Other Loading Schemes: Binders, Linking Loaders, Overlays,
  Dynamic
    Binders.

Unit VI System Software Development Tools:
  Software tools for program development
  Editors
  Debug monitors
  Programming Environment
  User Interfaces
  Lex and Yacc
Text Books:

Reference Books:
MANAGEMENT INFORMATION SYSTEMS

Basics of management and their functions.
Database management systems and its implementation.

Objectives:
To learn and understand fundamentals of Information Systems.
To learn and understand methodology and applications of MIS in manufacturing and service industry with the help of case studies.
To learn how Information System supports in problem solving and managerial decision making.
To learn current trends in electronic business.

Unit I  Introduction to Information System
Foundations of Information Systems: Need and objective of Information systems. Components and resources of information systems, Types of information systems: Operations support systems and Management support systems.
Management Information Systems: Definition, role and impact of MIS, Functions of the managers: planning, organizing, staffing, coordinating and directing, MIS as a support to the management
Management of Business: Concept of Corporate Planning, Essentaility of strategic planning, development of business strategies, types of strategies, MIS for Business Planning

Unit II  Decision Support Systems
Data Warehouse in decision making, Data Mining for Decision support, Artificial Intelligent Systems, Knowledge Based Expert systems, GIS for decision making process.

Unit III  E-commerce
Customer Relationship Management (CRM): Introduction, What is CRM? Three phases of CRM, Benefits, challenges and trends in CRM, E-ERM
Supply Chain Management: Role of SCM, Benefit, Challenges and
Trends in SCM

Unit IV  Applications of MIS

Applications in Manufacturing Sector: HR Management, Marketing Management, Finance Management, Materials Management and Marketing Management,

Applications in service: Banking, Insurance, Airline, Hotel, Hospital, Education


Unit V  Enterprise Management Systems


BPO Services: Business Process Outsourcing, Voice BPO, Inbound Call Center Services, Outbound Call Center Services, non-voice BPO, Scope of BPO, challenges in BPO management

ITES: Objectives of ITES, ITES Services and applications like Medical Transcription, Document Processing

Unit VI  Security and Ethical Challenges

Security and Ethical Challenges: Introduction, Ethical responsibility of Business Professionals, Cyber Crime, Hacking, Cyber Theft, Software Piracy, Patents, copy writes, Privacy issues, Health issues, cyber laws and Information Technology Act

Disaster management, System controls and audits, Contingency management and their solutions.

Global Management of Information Technology: Cultural, political and Geo-economic challenges, Platforms and Data access issues

Text Books:

Reference Books:
PROGRAMMING PARADIGMS

Unit I  Introduction:
Role of programming languages, Need to study programming languages, Characteristics of Programming Languages, Programming language paradigms: Imperative, Object Oriented, Functional, Logic, Event Driven and Concurrent Programming, Language design issues, Language translation issues, Data Types: properties of Types and objects, Elementary data types, structured data types, Type conversion, Binding and binding times.

Unit II  Procedures:
Sequence Control: Implicit and explicit sequence control, sequencing with arithmetic expressions, sequencing with Nonarithmetic expressions, sequence control between statements.
Subprogram control: subprogram sequence control, attributes of data control, shared data in subprograms, different parameter passing methods, lifetime of variables, Storage management, Exceptions and exception handling. Desirable and undesirable characteristics of procedural programming. Case study of Pascal.

Unit III  Object Oriented Programming:
General characteristics for object based programming, Design Principles for object oriented programming, Implementing object oriented programming, desirable characteristics of object oriented programming.
Object Oriented Programming in Java:
Abstraction, Inheritance, Polymorphism, I/O, access specification, interfaces, packages, exception handling, multithreading, event handling.
AWT: working with windows, Graphics, Text, using AWT controls, layout manager and menus. Comparative study of C++ and JAVA.
Unit IV  **Declarative Programming Paradigm:**  
Logic programming language model, logical statements, Resolution, Unification, Search structures, Applications of Logic programming. Case study of Prolog.
Applicative programming Paradigm:
Lambda calculus: Ambiguity, free and bound identifiers, reductions, typed lambda calculus, principles of functional programming. Case study of LISP

Unit V  **Parallel Programming Paradigm :**  
Classification of computer architectures, principles of parallel programming, precedence graph, data parallelism, control parallelism, message passing, shared address space, synchronization mechanisms, mapping, granularity, compilers, operating systems.

Unit VI  **Additional Programming Paradigms:**  
Data flow programming design principles, Database programming design principles, Network programming design principles, Socket programming in JAVA, Internet programming design principles, windows programming.

**Text Books:**

**Reference Books:**
DESIGN AND ANALYSIS OF ALGORITHMS

Unit I Introduction

Unit II Divide and Conquer and The Greedy Method
Characteristic; Analysis Methodology:- Merge sort – Quick Sort – Binary search – Large integer Multiplication and Strassen’s Matrix multiplication- closest pair and convex Hull problems
The Greedy Method : General characteristics of greedy algorithms, Prim’s and kruskal’s Algorithms, Dijkstra’s Algorithm, Huffman Trees.

Unit III Dynamic Programming
General strategy, Principle of optimality, Warshall’s and Floyd’s Algorithm – Optimal Binary Search Trees – knapsack Problem

Unit IV Backtracking
General method—Recursive backtracking algorithm, iterative backtracking method. 8-queens problem, sum of subsets and Graph coloring, Hamiltonian cycle and Knapsack Problem.

Unit V Branch-Bound
The method, Least Cost Search, FIFO branch and bound, LC branch and bound. 0/1 Kanpsack problem –LC branch and bound and FIFO branch and bound solution. Traveling sales person problem.
Unit VI  **NP-Hard and NP-Complete Problems**  
Basic concepts, Non deterministic Algorithms, The classes of NP hard and NP complete, Cooks Theorem.  
**NP-Complete problems**- Satisfiability problem, vertex cover problem.  

**Text Books:**

**Reference Books:**
HUMAN COMPUTER INTERACTION AND USABILITY

Aim:
This course is intended to expose the students to the concepts and practices of the human-computer interaction a multidisciplinary research field. The exposure has different purposes:

1. provide a broad understanding of the importance of human factors in developing an interactive system
2. introduce some of the popular methods used in designing for usability
3. illustrate practical applications of HCI designs.

Objective:
By the end of this course, a student will recognize the importance of human psychology in interface design process. Following are the some Objectives

1. To expose students to the central concepts of human-computer interaction.
2. To identify the main modes of human computer interaction.
3. To understand the role of ICT society.
4. To introduce students to techniques of user interface design, interaction paradigms, and current trends in HCI research and development.
5. To learn (and to apply) useful criteria for guiding the design and evaluation of user interfaces.
6. To identify key open problems in HCI and to discuss potential solutions.

Unit I  HCl introduction and basic concepts
Human input-output channels, human memory,
Thinking - reasoning and problem solving
Good and poor design, What is interaction design, goals of interaction design
Models of interaction, ergonomics

Unit II  Interaction Design Basics
Interaction styles, elements of the WIMP Interface
Paradigms for interaction,
The process of interaction design - Basic activities of interaction design, characteristics of interaction design process, practical issues lifecycle models for interaction design, life cycle models in HCI

Unit III  Design Process and Standards
HCI in the software process –Usability engineering life cycle, iterative design and prototyping, design rationale
Design Rules - Principles to support usability, standards, guidelines, golden rules and heuristics, HCI patterns, Multi-modal Interaction
Design for Diversity
Unit IV

**UI evaluation** - What, why and when to evaluate, HutcheWorld case study
Evaluation framework – evaluation paradigms and techniques, DECIDE evaluation framework
**Web** – Usability standards and guidelines

Unit V

**Models and Theories**
Cognitive models – hierarchical models, linguistic models,
Task analysis – Task decomposition, knowledge-based analysis, uses of task analysis
Dialogue notations and design – What is dialog, dialog design notations, diagrammatic notations
Modeling rich interactions – status event analysis, rich contexts

Unit VI

**Groupware**
Groupware – groupware systems, computer mediated communication, frameworks for groupware, implementing synchronous groupware
Ubiquitous Computing – applications, virtual and augmented reality, information and data visualization

**Text Books:**

**Reference Books:**
SOFTWARE DESIGN LABORATORY

Part A: System Software

1. Implementation of TWO Pass assembler with hypothetical Instruction set. Instruction set should include all types of assembly language statements such as Imperative, Declarative and Assembler Directive. While designing stress should be given on
   a) How efficiently Mnemonic opcode table could be implemented so as to enable faster retrieval on op-code.
   b) Implementation of symbol table for faster retrieval.
      (Concepts in DSF should be applied while design)

2. Implementation of Macro Processor. Following cases to be considered
   a) Macro without any parameters
   b) Macro with Positional Parameters
   c) Macro with Key word parameters
   d) Macro with positional and keyword parameters.
      (Conditional expansion, nested macro implementation not expected)

3. Regular Expression to DFA (To be taken from compiler point of view) The implementation to be done as per the algorithm covered in the book “Compiler – Design and Principles” By Aho – Ullman Sethi.

4. Lexical Analyzer for subset of C.

5. Recursive Descent parser for assignment statement.

6. Implementation of Calculator using LEX and YACC.

7. Screen Editor with following Features
   i. Open an existing file
   ii. Create and Save the current file.
   iii. All cursor movements up, down, left, right arrow keys
   iv. Delete and backspace keys.

8. Implementation of DLL.

Part B: DAA

Any two problems such as 8 queen, tower of Hanoi, Knapsack etc using different algorithmic strategy.

Staff In-charge should frame assignments based on the above topics. It is expected that this variation between assignments to individual students. Students must submit the term-work in the form of a journal at each assignment has to be well documented with problem definition, code documented title comments. The assignments will be documented, using software-engineering principles. Staff in charge will assess the assignments continuously and grade or mark each
assignment on completion date declared for each assignment.

**Note:** The practical examination will be based on the assignments performed by the candidates as part of the term-work. Questions will be asked during the practical examination to judge the understanding of the students. It is expected that the candidate knows the theoretical aspect of the problem.
Unit I  **Object oriented Programming using core java**
Develop mini-project in Core Java using any IDE. Following points should be covered
1. Object oriented programming Principle.
2. Effective Use of IDE and customization to improve productivity and accuracy.
3. add Set/ Get Methods,
4. Overriding methods from base class
5. Add equals() and Hashcode() methods.
6. Add constructors
7. Customization, commenting javadoc etc.

Unit II  **Client Side Technologies**
Develop User interface using HTML and client side scripting JavaScript and simple Applets. Focus on changing the behavior of the pages and Form Validations through Client side scripting. For this, reuse the mini project developed in core java in Unit I

Unit III  **Server side Programming**
Develop a Server side mini-project using Servlets, JSP pages and the Java Beans. Preferably this mini-project should reuse the part of the mini project developed for Unit-I and Unit-II. Focus in this mini-project should be to understand
1. How to use an IDE environment for web application development
2. How to use tomcat through an IDE for running web applications.
3. HTTPRequest, HTTPResponse, Session etc.
4. Data persistence through JDBC
Text Books:
1. Jeff Friessen, "Beginning java 6 platform from Novice to Professional", Apress/Springer, 9788181288769

Reference Books:
Each student will select a topic in the area of Computer Engineering and Technology preferably keeping track with recent technological trends and development. The topic must be selected in consultation with the institute guide.

Each student will make a seminar presentation in the term making use of audio/visual aids for a duration of 20-25 minutes and submit the seminar report in the form of bound journal (two copies) duly signed by the guide and Head of department. Attendance at seminars for all students is compulsory.

A panel of staff members from the institute will assess the seminar internally during the presentation.

**Format of the Seminar Report**

- Title Page with Title of the topic, Name of the candidate with Exam Seat Number, Roll Number, Name of the Guide, Name of the Department, Institution and Year
- Seminar Approval Sheet
- Abstract
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Introduction with section describing organization of the report
- Literature Survey
- Details of Analytical and/or experimental work, if any
- Discussions and Conclusions
- Acknowledgement
- References
Semester – VII

Information Technology
Unit I
Security Fundamentals

Unit II
Cryptography

Unit III
Key Management

Unit IV
Network Security

Unit V
Security Management and Applications

Unit VI
Cyber Crimes & Laws

Text Books :

Reference Books :
Object Oriented Modeling and Design

Unit I  Introduction to OMG Standards: MDA, MOF, XMI, CORBA, UML 2.0. UML History, UML 2.0 New Features. Introduction to UML, UML Meta Model Conceptual Model of UML, Extensibility mechanisms like stereotypes, tagged values, constraints and profiles. OCL. Overview of all diagrams in UML 2.0.


Unit III  CRC method, Class diagrams, Classes and Relationships, Advanced Classes, Advanced relationships generalization, association with its adornments, dependencies, realization. Interfaces and ports. Packages & diagrams. Instances, Active Objects & object diagram, Composite structure diagrams including composite structures, collaborations

Unit IV  Interaction diagrams. Interaction Overview diagrams including interactions, signals, exceptions, regions, partitions, Sequence diagrams, Communication diagrams.


Note: All diagrams are to be assumed for UML 2.0 for each diagram the need, purpose, Concepts, Notation, Forward Engineering, and Reverse Engineering for class diagram must be considered.

Text Books :

2. Dan PHone, Neil Pitman, "UML 2.0 in a Nutshell (In a Nutshell (O'Reilly)
3. Tom Pender, Eugene McSheffrey, Lou Varvels, Wiley "UML 2 Bible"

Reference Books :

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado "UML 2 Toolkit"
Unit I  
Testing Principles  
Need of testing, Basic concepts – errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing, functional testing, performance testing, recovery testing, white box testing, black box testing, verification and validation

Unit II  
Test Management  
Testing Life Cycle – Roles and activities,  
Test Planning – forming a test team, develop test plan review  
Test Cases design strategies  
black box approach: random testing, equivalence class partitioning and boundary value analysis.  
white box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.  
Test execution: build test data, life cycle of defect, defect tracking, defect detection stages, defect detection stages, defect types, defect severity, defect analysis and prevention.

Unit III  
Software Metrics  
Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure – GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point, Metrics for software maintenance, In-process quality metrics.

Unit IV  
Quality Assurance  
Quality concepts – quality, quality control, quality assurance, cost of quality  
Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa’s Seven Basic Tools

Unit V  
Quality Standards  
Basic concept of – ISO 9000 & 9001, CMM, six sigma.

Unit VI  
Development of CMM  
CMM – Following KPAs: requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), defect prevention (DP), process change management

Text Books:  

References Books:  
3. Pankay Jalote “CMM Practice” Pearson Education.
management, data warehousing and data mining

Unit I
Overview
Programmatic SQL – Embedded SQL, Dynamic SQL, and ODBC Standard.

Unit II
Transaction processing and concurrency control

Unit III
Object-based databases and xml
Object-based databases – Complex data types, structured types and inheritance in SQL, table inheritance, array and multiset types in SQL, object-identity and reference types in SQL, implementing O-R features, Persistent programming languages, OO vs OR. XML – Structure of XML, Document Schema, Querying and Transformation, API in XML, XML applications.

Unit IV
Data warehousing
Introduction to Data Warehousing – Concepts, Benefits and Problems, DW Architecture – Operational Data, load manager, meta data, DW Data flows – inflow, upflow, meta flow, DW tools and technologies – Extraction, cleansing and transformation tools, DW DBMS, admin and management tools, data marts – reasons and issues, Data Warehousing using Oracle.
Data Warehousing Design – Designing, Dimensionality modeling, Design methodology, DW design using Oracle.

Unit V
Olap and data mining
On-line Analytical Processing – OLAP BenchMarks, applications, benefits, tools, categories, extensions to SQL, Data mining – introduction, techniques, predictive modeling, tools. Data mining algorithms – Apriori, Decision tree, k-means, Bayesian classifier.

Unit VI
Database security

Text Books:

Reference Books:
Elective I – Artificial Intelligence

**Prerequisites:** Discrete mathematics, basic probability theory and statistics
Knowledge of any programming language and data structures

**Objectives**
- Introduction to the basic principles and applications of Artificial Intelligence.
- Understanding of the basic areas of artificial intelligence such as problem solving, knowledge representation, reasoning, planning, perception, vision and learning
- Students will also be able to design and implement key components of intelligent agents and expert systems of moderate complexity in C++/Java and/or Lisp or Prolog and evaluate their performance.

**Unit I**
Introduction to AI and intelligent agents
- What is Artificial Intelligence? The Turing Test, AI Problem, AI Techniques, Foundation of Artificial Intelligence
- Intelligent Agents – Agents and environments, Good behavior, nature of environments, structure of agents, problem solving agents
- Application of AI and Swarm intelligent systems

**Unit II**
Heuristics search and game playing
- Defining the problem as a state space search, production system, problem characteristics
- Heuristic search techniques- Generate and test, Hill Climbing, Best-First Search, Constraint satisfaction problems (CSP)
- Application of search in Game playing – Minimax search procedure, Adding alpha-beta cutoffs, additional refinement, State of Art Game programs.

**Unit III**
Knowledge representation & NLP
- Representation and mapping, Approach & Issues in knowledge representation, Prepositional logic
- First order logic – representation revisited, syntax and semantics for first order logic, using first order logic, Knowledge engineering in first order logic, inference in First order logic, unification and lifting
- Weak-slot and filler structure, Strong slot and filler structures. Reasoning Under Uncertainty – Nonmonotonic reasoning, logic for Nonmonotonic reasoning
- Natural Language Processing- Introduction, Steps in the process, Spell checking

**Unit IV**
Planning and perception
- Planning – Block world problem, components of a planning systems, Goal stack planning, Non-linear planning, Hierarchical planning, least commitment strategy
- Perception – Image formation, Image processing operations, Extracting 3D information, Object Recognition, Using vision for manipulation and navigation

**Unit V**
Learning and expert system
- What is learning?, Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction leaning, Explanation based learning, Formal learning theory. Connectionist models- learning in Neural network
- Architecture of expert system, expert system shell, explanation, knowledge Acquisition, Two case studies of an expert system.

**Unit VI**
AI Programming and Advanced AI
- AI Programming: Converting English to Prolog facts and Rules, Prolog Terminology, Arithmetic operation, Matching, Backtracking, Cuts, Recursion, Lists. Prolog in Artificial Intelligence
- Advanced AI: Genetic Algorithms, Parallel & Distributed AI
**Text Books:**


**Reference Books:**

Elective I – Compiler Design

**Prerequisite:** System Software Programming

**Objectives:**
- To introduce principles behind the design of common programming language features
- To understand the details of all phases of compilers
- To apply the phases of compiler on object oriented programming languages.

**Unit I**
- High Level languages; Programming Paradigms; Compilers and their structure, Types of the compilers
- Syntax and Notations; Regular Expressions and Lexical Syntax; Context Free Grammars; Lexical Analysis

**Unit II**
- Parsing – Top Down Parsing; Recursive Descent Parsing; Bottom up Parsing, LR parsing & LALR parsing; Ambiguity

**Unit III**
- Abstract Syntax Trees; Semantic Actions, Control Flow; Loops and Loop Invariants, Types; Type Checking

**Unit IV**
- Procedures/Functions; Calls; Parameter Passing; Scope and Scope Rules, Runtime Memory Models; Activations Records (Frames); Activation Stacks (Call Stacks)

**Unit V**
- Intermediate Representation; Basic Blocks and Conditional Branches; Instruction Selection; Liveness Analysis; Register Allocation

**Unit VI**
- Program Structuring; Data Abstraction & Information Hiding; Modules & Objects and Object Orientation; Class-based and Object-based Languages, Inheritance; Derived Classes; Notion of Self, Implementation of Object Oriented Languages

**Text Books :**


**Reference Books :**

4. O’Reilly, LEX and YACC,
Elective I – Advanced Operating Systems

Prerequisite: Basics of Operating systems

Objectives: To understand and explore advanced OS concepts
To study OS Design and internals

Unit I
Introduction
Operating System Architecture, multitasking, multiuser, multiprocessing, multi-threading OS, Operating System Services for process management, process scheduling concepts, system calls for process management, process communication and synchronization concepts, memory and I/O management overview, UNIX commands for system administration.

Unit II
Multitasking OS: Design and implementation
Kernel of multitasking OS: services, process state transitions, functional specification, implementation considerations, system list, ready list and its manipulation, IPC and synchronization, process management, interrupt management

Unit III
Multiprocessor systems
Introduction, parallel hardware and interconnections, types of multiprocessor OS, Sharing OS, mutiprocessor OS design considerations, threads, thread scheduling, kernel mode processes, multiprocessor synchronization, implementation of mutual exclusion.

Unit IV
Memory management overview, Pages, Zones, kmalloc, vmalloc, slab layer, slab layer allocator, deallocator, statically allocating on the stack, High memory mapping. Non contiguous memory management

Unit V
I/O systems
I/O device types, I/O structure, Driver interfaces, disk device driver access strategies, unification of files and I/O devices, generalized disk device drivers, disk caching, I/O scheduler.

Unit VI
File system
File system organization, operations, implementation, file descriptors, file blocks allocation, mapping of file blocks, System Calls for the file system: open, read, write, lseek, Close, mounting and un-mounting file systems, link, unlink, file system abstractions, VFS, file system maintenance, file security

Text Books:
2. Charles Crowly,”Operating systems a design oriented approach”, TMGH
4. Daniel Bovet: “Understanding the Linux kernel”, 3rd edition, O'Reilly

Reference Books:
Elective II – Embedded System

Prerequisite: Digital circuits and Logic Design, Knowledge of microcontrollers, microprocessors

Objectives: Understand the basics of embedded systems and its applications

Unit I Introduction to Embedded System
Definition of Embedded System & its classification, characteristics of embedded systems, design parameters/Metrics of embedded systems. Components of embedded systems with review of Microprocessor & Microcontrollers, introduction to embedded processor, Digital signal processor, Application specific system processor, Multiprocessor systems using General Purpose Processor

Unit II System Processor
Standard Single purpose processors: Peripherals, Introduction, Timers, Counters and watchdog Timers, UART, Pulse Width Modulators, Clocking unit, Real Time Clock Reset Circuitry. Processor and memory organization, processor and memory selection, Memory Types, Memory map and addresses.

Unit III I/O Interfacing
I/O devices: ADC/DAC, Optical Devices such as LED/LCD Display devices, Keyboard controller, Timer & counting devices, serial communication using I2C, SPI,CAN, RS232, & USB. Device drivers & interrupt service Mechanism: ISR concepts and ISR handling mechanisms

Unit IV Programming Concepts, Embedded System Programming C & C++

Unit V Real Time Operating Systems
Real Time & embedded system OS: off the shelf operating Systems, Embedded OS, Real Time OS, hand held OS. RTOS Task and task scheduling, Interrupt Latency & Response time, Strategy for synchronization between the processes, ISR, OS functions & tasks for resource management, Semaphores, message Queue, mailbox, pipes, signals, event registers, memory management, priority Inversion problems and solutions.

Unit VI Overview & Applications of Embedded System
Case Study of coding for Vending machine system using MUCOSRTOS, Case study coding for send application layer byte streams on A TCP/IP Network Using RTOS Vx works, Case study of an Embedded System for an adapting Cruise control System in a car, Case Study in embedded system for Smart Card, Case Study of Digital camera.

Text Books :

5. David Simon,”An Embedded Software Primer ”
Reference Books:

Elective II – Mobile Computing

**Prerequisite:** Computer Networks

**Objective:** Understanding the fundamentals involved in technologies of Mobile computing

**Unit I**
Introduction
Introduction – PCS Architecture, Cellular Telephony, Cordless Telephony and Low-Tier PCS, Generations of Wireless Systems, Basic Cellular System, Concept of Frequency reuse channels, Cells Splitting

Mobility Management – Handoff, Roaming Management, Roaming Management under SS7

Handoff Management – Handoff Detection, Strategies for Handoff Detection, Channel Assignment, Link Transfer Types, Hard Handoff, Soft Handoff

**Unit II**
GSM

GSM System Overview - GSM Architecture, Location Tracking and Call Setup, Security, Data Services, Unstructured Supplementary Service Data,

GSM Network Signaling – GSM MAP Service Framework, MAP Protocol Machine, MAP Dialogue, Examples of MAP Service Primitives

GSM Mobility Management – GSM Location Update, Mobility Databases, Failure Restoration, VLR Identification Algorithm, VLR Overflow Control

**Unit III**
GSM Services

GSM Short Message Service – SMS Architecture, SMS Protocol Hierarchy, Mobile-Originated Messaging, Mobile – Terminated Messaging, DTE-DCE Interface

International Roaming for GSM – International GSM Call Setup, Reducing the International Call Delivery Cost

GSM Operations, Administration, and Maintenance – Call Recording Functions, Performance Measurement and Management, Subscriber and Service Data Management Mobile Number Portability – Fixed Network Number Portability, Number Portability for Mobile Networks, Mobile Number Portability Mechanisms, Implementation Costs for Mobile Number

Portability Mobile Prepaid Phone Services – Wireless IN approach, Service node approach, Hot billing approach, Comparison of prepaid solutions

**Unit IV**
Mobile Data Networks

General Packet Radio Service (GPRS) – GPRS Functional Groups, GPRS Architecture GPRS Network Nodes, GPRS Interfaces, GPRS Procedures, GPRS Billing, Evolving from GSM to GPRS

Wireless Application Protocol (WAP) – WAP Model, WAP Gateway, WAP Protocols WAP UAPProf and Caching, Wireless Bearers for WAP, WAP Developer Toolkits, Mobile Station Application Execution Environment


**Unit V**
Mobile Network Layer

Mobile IP: Goals, assumptions and requirements, entities and terminologies, IP packet delivery, agent discovery, registration, tunneling and encapsulation, optimization, reverse tunneling, IPv6, DHCP, MANET : routing, destination sequence distance vector, dynamic source routing, alternative metrics, protocol overview

**Unit VI**
Emerging Mobile Technologies

Bluetooth, Wireless Broadband (WiMAX), RFiD, Java Card., WLL, W-LAN, UMTS, Spread Spectrum Technologies
Text Books :

2. Jochen Schiller, “Mobile Communications”, Pearson Education

Reference Books :

**Elective II – Multimedia Systems**

**Prerequisites:**
- Digital Electronics
- Data Structures and Files

**Objectives:**
- To learn the storage and processing of various Multimedia components.
- To learn the advance graphics.

**Unit I**
Introduction:
What is multimedia, Goals and objectives, characteristics of multimedia presentation, multimedia applications, Multimedia building blocks, multimedia and internet, Multimedia architecture, Windows multimedia support, hardware support, distributed multimedia applications, streaming technologies, multimedia database systems, Multimedia authoring tools, overview of multimedia software tools, multimedia Document Architecture, (MHEG, SGML, ODA, OMF etc.)

Text: Types of text, Text compression: Huffman coding, LZ & LZW, text file formats: TXT, DOC; RTF, PDF, PS.

**Unit II**
Digital Image Processing
Basic Image fundamentals, Image data types, image File formats - (BMP, TIFF, JPEG, PCX etc), Image acquisition, storage processing, Communication, and display, Image enhancement: Enhancement by point processing, Spatial filtering.


**Unit III**
Audio and audio compression
Nature of sound waves, characteristics of sound waves, psycho-acoustic, and elements of audio systems: Microphone, amplifiers, speakers, synthesizer, MIDI, digital audio, CD formats. Audio file formats: WAV, AIFF, VOC, AVI, MPEG Audio File formats, RMF, WMA

audio compression techniques such as DM, ADPCM and MPEG

**Unit IV**
Video

**Unit V**
Virtual Reality and Multimedia
Concept, Forms of VR, VR applications, VR devices: Hand Gloves, Head mounted tracking system, VR chair, CCD, VCR, 3D Sound system, Head mounted display. Virtual Objects
Basics of VRML.

**Unit VI**
Animation
Uses of animation, types of animation, principles of animation, Techniques of animation: Onion Skinning, Motion Cycling, masking, Flip Book animation, Rotoscoping & blue-screening, color cycling, morphing, animation on the web, 3D animation, Creating animation using Flash, 3D-Max
Text Books :


Reference Books :

5. Mark Nelson, "Data Compression Book ", BPB.
7. Robert Reinhardt, Snow Dowd, “Flash 8 Bible”
9. Sanford Kennedy, “3ds max Animation and Visual Effects Techniques”
Information Assurance and Security Laboratory

Section A  Programming
1. Writing program in C++ or Java to implement RSA algorithm for key generation and cipher verification
2. Write a Client – Server program in C++ or Java for authentication verification.
3. Develop and program in C++ or Java based on number theory such as Chinese remainder or Extended Euclidian algorithm. (Or any other to illustrate number theory for security)

Section B  Cryptography Library (API)
1. Writing program in C++, C# or Java to implement RSA algorithm using Libraries (API)
2. Writing program in C++, C# or Java to implement SHA-1 algorithm using Libraries (API)
3. Writing program in C++, C# or Java to implement AES algorithm using Libraries (API)

Section C  Security Tools
1. Configure and demonstrate use of IDS tool such as snort.
2. Configure and demonstrate use of Traffic monitoring tool such as Wireshark with security perspective.
3. Configure and demonstrate use of vulnerability assessment tool such as Nessus
4. Implement web security with Open SSL tool kit

Students should submit the term work in the form of a journal. Each assignment has to be well documented with problem definition, theory and code documentation. Staff in charge will assess the assignments continuously and grade or mark each assignment on completion date, declared for each assignment.

Note: Oral examination will be based on the term work submitted by the student and the associated theory of the subject.
Part A  Object Oriented Modeling & Design
Select a hypothetical system of sufficient complexity/ Select a Real Time system of sufficient complexity and implement assignment 1 to 9 using any UML 2.0 Tool.

1. Prepare a SRS plan & Draw use case diagram.
2. Design class diagram & composite structure diagram.
3. Apply advanced notations to same class diagram & do forward engineering.
4. Study reverse engineering using C++ code/java code for class diagram.
5. Draw package diagram.
6. Design sequence & communication diagrams {vice versa}.
7. Design interaction overview diagrams

Every Project group should implement assignment 1 to 9 for their project definition using any UML 2.0 Tool.

Part B  Software Testing and Quality Assurance

1. Manual Testing
   a) Write black box test cases for an application using Test Director tool.
   b) Perform white box testing – Cyclomatic complexity, data flow testing, control flow testing
2. Automated Testing
   Perform Black Box testing using automated testing tool on an application.
   Testing Points to be covered – data driven wizard, parameterization, exception handing
3. Defect Tracking :
   a. Log the test results in Test Director
   b. Prepare a Defect Tracking Report / Bug Report using MS-Excel or Defect Tracking Tool like BugZilla
4. a. Calculate Software Metrics for an application using FP analysis method.
   b. Prepare any two of the Ishikawa’s Seven tools listed below for an application
      1. The cause-and-effect or Ishikawa diagram
      2. The check sheet
      3. The control chart
      4. The histogram
      5. The Pareto chart
      6. The scatter diagram
      7. Stratification

Note: All 04 assignments are compulsory.
Recommended Tools

a) Quick Test Professional – preferred
b) Win Runner
c) Load Runner
d) Silk Test
e) Rational Robo

Suggested Applications (not mandatory) – front end (VB) – back end (Oracle / MS Access)

a) Calculator – Integer operations, add, sub, div
b) Login Form and successful & failed login pages.
c) Inventory management – atleast 2 forms
d) Library management - atleast 2 forms
e) Training & Placement Cell system
f) Online reservation system

Reference Books :

a) Software Testing Techniques : Boris Beizer : dreamTech
b) Software Testing Tools : Dr. KVKK Prasad : dreamTech
Project Work

The Student will undertake one project over the academic year, which will involve the analysis, design of a system or sub system in the area of Information Technology and Computer Science and Engineering.

The project will be undertaken preferably by a group of at least 4 students who will jointly work and implement the project. The group will select a project with approval of the guide (Staff-member assigned).

The aim of project is to allow the students to study the feasibility of the project, planning project, studying existing systems, tools available to implement the project and state of art software testing procedures and technology with use of case tools.

Every group must submit the preliminary project report of the project in \textit{LATEX} by the end of first month from the commencement of the first term. It should have the following details in it.

1. Introduction
2. Aims and objectives
3. Literature survey
4. Problem statement
5. Project Requirements
6. Proposed architecture/ high level design of the project
7. Project plan

A panel of examiner will evaluate the viability of project and allot the term work marks.

The group will submit at the end of semester II.

a) The Workable project.
b) Project report (in \textit{LATEX}) in the form of bound journal complete in all respect – 1 copy for the Institute and 1 copy of each student in the group for certification.

The term work will be accessed by the examiners in consultation with the guide. Oral examination will be based on the project work completed by the candidates. Preliminary report work completed by candidates. Preliminary report must also be presented during the oral examination.

The project report contains the details.

1. Problem definition and requirement specification acceptance test procedure (ATP).
2. System definition - requirement Analysis.
3. System design.
5. Test result and procedure – test report as per ATP.
6. Platform choice use.
7. Conclusions.
8. Appendix tools used, References.

Documentation will use UML approach with presentation, Category, Use Case, Class Diagrams etc.
Semester – VIII

Information Technology
Prerequisite: Operating System and Computer Networks

Objective: Understand the fundamentals of distributed environment in complex application

Unit I  Introduction
System Models: Architectural models, fundamental models and Failure Model.

Unit II  Inter-process Communication and Coordination
Message Passing Communication: Communication Primitives, Message Synchronization and Buffering, Pipe, Pipe and Socket APIs, Group Communication, Multicasting
Remote Procedural Call: Basic Operation, Implementation and Call Semantics, Failure Handling, LRPC
Object Oriented Distributed Computing Technologies – Basics, design issues of various technologies like RMI and CORBA with semantics and executions.

Unit III  Synchronization and Election
Clock Synchronization: Logical and Physical Clocks, Algorithms and Uses
Mutual Exclusion: Centralize, Distributed and Token Ring Algorithms, Comparison
Logical Clocks: Lamport’s Logical Clock, Vector Clocks
Global State: Needs, Properties and Various Global States
Election Algorithm: Bully and Ring Algorithm

Unit IV  Distributed File Systems
Introduction, Characteristics, File Service Architecture
Sun Network and CODA File System: Overview of NFS, Communication, Processes, Naming, Synchronization, Consistency and Replication, Fault Tolerance and Security
Naming Services: Case Study of Global Name Service and X.500 Directory Service

Unit V  Distributed Shared Memory
Replication: Introduction, Reasons for Replication, Object Replication and Scaling Technique
Distributed Shared Memory: Design and Implementation Issue;
Data Centric Consistency Models - Strict, Sequential, Casual, PRAM, Weak, Release, Entry
Client-Centric Consistency Models: Eventual, Monotonic Reads, Monotonic Writes, Read Your Writes, Writes Follow Reads

Unit VI  Fault Tolerant and Recovery
Fault Tolerance: Concepts, Failure Models, Failure Masking by Redundancy
Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems
Text Books:

2. Andrew S. Tanenbaum & Maarten van Steen”, Distributed Systems – Principles and Paradigms”, Publisher: PHI.

Reference Books:

Information Retrieval

Objective: To deal with IR representation, storage, organization & access to information items


Unit II  File Structures, Inverted file, Suffix trees & suffix arrays, Signature files, Ring Structure, IR Models, Basic concepts, Boolean Model, Vector Model, and Fuzzy Set Model. Search Strategies, Boolean search, serial search, and cluster-based retrieval, Matching Function

Unit III  Performance Evaluation- Precision and recall, alternative measures reference collection (TREC Collection), Libraries & Bibliographical system- Online IR system, OPACs, Digital libraries - Architecture issues, document models, representation & access, Prototypes, projects & interfaces, standards

Unit IV  Taxonomy and Ontology: Creating domain specific ontology, Ontology life cycle  Distributed and Parallel IR: Relationships between documents, Identify appropriate networked collections, Multiple distributed collections simultaneously, Parallel IR - MIMD Architectures, Distributed IR – Collection Partitioning, Source Selection, Query Processing

Unit V  Multimedia IR models & languages- data modeling, Techniques to represent audio and visual document, query languages Indexing & searching- generic multimedia indexing approach, Query databases of multimedia documents, Display the results of multimedia searches, one dimensional time series, two dimensional color images, automatic feature extraction.

Unit VI  Searching the Web, Challenges, Characterizing the Web, Search Engines, Browsing, Mata searchers, Web crawlers, robot exclusion, Web data mining, Metacrawler, Collaborative filtering, Web agents (web shopping, bargain finder,..), Economic, ethical, legal and political issues..

Text Books:
2. C.J. Rijsbergen, "Information Retrieval", (www.dcs.gla.ac.uk)
3. I. Witten, A. Moffat, and T. Bell, “Managing Gigabytes”

Reference Books:
2. V. S. Subrahmanian, Satish K. Tripathi “Multimedia information System”, Kulwer Academic Publisher
Objective: To get an overview of design and evaluation issues of RTS, Real Time Communication and operating systems.

Unit I Introduction to Real Time Systems

Unit II Task Assignment and scheduling
Types of tasks, Timings, precedence, resource constraints, classification of scheduling algorithms, priority driven approach for periodic and aperiodic task, Non preemptive method(EDD), preemptive methods(EDF and LST), Rate monotonic, deadline monotonic, EDF and its variants for periodic tasks, Resource and resource access scheduling protocols: blocking and priority inversion, priority inheritance and priority ceiling protocols.

Unit III Programming languages, tools and databases

Unit IV Real Time Communication
Hierarchical Round Robin Deadline, based. Fault tolerant Routing, medium access control protocols of broadcast networks, Internet and resources reservation protocols.

Unit V Real Time Kernel and Operating Systems
Time services, features of RTOS, Program and processes Threads, sharing resources,
Resources management: memory management and process management, foreground/background systems, operating system architecture, Real time POSIX standards, capabilities of RTOS.

Unit VI Fault Tolerance and Reliability, UML For Real Time Systems
Fault types, detection, error containment, Redundancy- Hardware, Software, Time, Information redundancy, Data diversity. Reversal checks, Malicious or Byzantine failures, Integrated failure handling, Reliability models: Hardware and software error models, Modeling for time, resource, schedulability, performance, RT UML profile

Text Books :
1. C.M. Krishna, ”Real Time systems”, Tata Mc Graw Hills publications
3. Douglass,”Real Time UML”, Pearson Education
4. Peckol,”Embedded System”, WILEY publications

Reference Books :
Elective III – Software Architecture

Objectives:

- Introduction to the software architecture as a discipline.
- Introduction to current architecture approach.
- Introduction to software architecture strategies.

Unit I
- Architecture: Business cycle, What is software architecture, why software architecture is important, documenting software architectures.

Unit II
- Understanding quality attributes, architecture and quality attributes, achieving quality attributes.

Unit III

Unit IV
- Types of architectures styles and their comparison. Introduction to Three tier architecture [Presentation, business and persistence layers]. Concept of loose coupling, Addressing Quality attributes through multi tier architecture. Introduction to XML, Advantages of coupling through xml, structure of XML.

Unit V
- Introduction to Web servers and Application servers, Introduction to Java EE, Introduction to concept of Messaging, Introduction to Enterprise Java Beans, concept of Entity beans, Session bean, message beans, use of EJBs in three tier architecture. Introduction to Web services.

Unit VI
- Components, Interfaces, IUNKNOWN, DLL servers, Introduction to .NET architecture, .NET assemblies, .NET remoting, .NET web services.

Text Books:


Reference Books:

1. Dale Rogerson, “Inside Com (Microsoft Programming series)” (paperback)
2. James L. Weaver, Kevin Mukhar, James p. Crume (Publisher) Beginning J2EE 1.4 from Novice to Professional (Apress Beginner series) (paperback)
3. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,”Design Patterns : Elements of reusable Object oriented Software” (Addision-wesley professional computing series) (Hardcover)
Elective III – Advanced Graphics

Prerequisite: Computer Graphics

Objectives:
- Provide solid grounding in three dimensional modeling mechanisms.
- Introduce students to techniques in virtual reality, solid modeling and animation

Unit I  Brief Review of 3D modeling and 3D object Representation
3D display methods, Polygon surfaces, polygon meshes, Curved lines and surfaces, Quadratic surfaces, Spline representation and specification B-Spline curves and surfaces.

Unit II  Animation
Introduction, Devices for producing animation, Conventional and Computer assisted animation, Animation languages, Basic rules of animation, Methods of controlling animation, frame-by-frame animation techniques, real-time animation techniques

Unit III  Solid Modeling
Representing solids, Primitive instancing, sweep representations, Boundary representations, spatial-partitioning representations, constructive solid geometry, user interfaces for solid modeling, comparison of representations.

Unit IV  Illumination models, color models and applications
Basic illumination models, Polygon rendering methods, Basic ray tracing methods and algorithms, color models: RGB, CMY, HSV, HLS, YIQ, conversion between color models, color selection and application.

Unit V  Rendering
Introduction, Basics of illumination and shading models, Transparency, Shadows and textures, Ray tracing from the light source, cone, beam and pencil tracing.

Unit VI  Virtual Reality
Basics, Devices for virtual reality, Virtual reality languages, Applications

Text Books:

References Books:
Elective III – Advance Computer Networks

Prerequisite: Computer Network
Objective: To introduce students to a set of advanced topics in networking and lead them to the understanding of the networking research

Unit I Introduction
Requirements, Network architecture, Networking principles, Network services and Layered architecture, Network services and Layered architecture, Future networks (Internet, ATM, Cable TV, Wireless – Bluetooth, Wi-Fi, WiMax, Cell phone)

Unit II Advanced Technologies
Virtual circuits, Fixed size packets, Small size packets, Integrated service, History, Challenges, ATM Network protocols, IP over ATM, Wireless networks: Wireless communication basics, architecture, mobility management, wireless network protocols. Ad-hoc networks Basic concepts, routing; Bluetooth (802.15.1), Wi-Fi (802.11), WiMAX (802.16), Optical Network: links, WDM system, Optical LANs, Optical paths and networks.

Unit III Performance of Networks
Control of networks: objectives and methods of control, Circuit switched networks, Datagram and ATM networks. Mathematical background for control of networks like Circuit switched networks, Datagram and ATM networks

Unit IV Advanced Routing - I
Routing architecture, Routing between peers (BGP), IP switching and Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols, Traffic Engineering (TE) and TE with MPLS, NAT and Virtual Private Networks (L2, L3, and Hybrid), CIDR –Introduction, CIDR addressing, CIDR address blocks and Bit masks

Unit V Advanced Routing - II

Unit VI Ad Hoc Networking

Text Books:
Reference Books:

2. A. S. Tanenbaum, “Computer Networks”, Publisher: Pearson Education;
5. W. R. Stevens ,”TCP/IP Illustrated, Volume 1,2,3”, Publisher: Pearson Education
Elective IV – Bio Informatics

Unit I
Introduction
Introduction, Historical overview, Bioinformatics Applications, Bioinformatics Major databases, Molecular biology

Unit II
Data Visualization & Statistics
Sequence Visualization, Structure visualization, statistical concepts, micro arrays, imperfects data, quantitative randomness, data analysis, tool selective, statistics of alignment, clustering and classification.

Unit III
Data mining and pattern matching
Methods & Technology overview, infrastructure, pattern recognition & discovery, machine learning, text mining & tools, dot matrix analysis, substitution matrices, dynamic programming, word methods, multiple sequence alignment, tools for pattern matching.

Unit IV
Modeling, Simulation & Collaboration

Unit V
Bioinformatics tools
Introduction, working with FASTS, working with BLAST, FASTA & BLAST algorithms & comparison

Unit VI
Further Scope
Introduction to environmental biotechnology, introduction to generic engineering.

Text Books :

Reference Books :
4. David W. Mount,”Bioinformatics: Sequence and Genome Analysis”.
5. Stuart M. Brown,”Essentials of Medical Genomics”.
6. Jean-Michel Claverie & Cedric Notredame ,’Bioinformatics for Dummies”.
7. Ian Korf, Mark Yandell, and Joseph Bedell,” Blast ”
Elective IV – Neural Network and Expert System

Unit I  Introduction to Artificial Neural Networks
Biological Neural Networks, Pattern analysis tasks: Classification and Clustering, Computational models of neurons, Basic structures and properties of Artificial Neural Networks, Structures of Neural Networks Learning principles

Unit II  Feedforward Neural Networks
Perceptron, its learning law , Pattern classification using perceptron, Single layer and Multi-layer feed forward Neural Networks (MLFFNNs), Pattern classification and regression using MLFFNNs, ADALINE : The Adaptive Linear Element, its Structure and Learning laws, Error back propagation learning, Fast learning methods: Conjugate gradient method, Auto associative Neural Networks, Bayesian Neural Networks

Unit III  Radial Basis Function Networks and Pattern Analysis
Regularization theory, RBF networks for function approximation , RBF networks for pattern classification

Unit IV  Self organizing maps and feedback networks
Pattern clustering, Topological mapping, Kohonen’s self, organizing map
Feedback Neural Networks : Pattern storage and retrieval ,Hopfield model, Boltzmann machine, Recurrent Neural Networks

Unit V  Expert Systems Architectures:
Introduction, Rule Based System Architecture, Non-Production System Architecture, Dealing with uncertainty, Knowledge Acquisition and Validation

Unit VI  Shells and Case Studies

Text Books :
1. B.Yegnanarayana, “Artificial Neural Networks”, Prentice Hall of India
2. Satish Kumar, “Neural Networks – A Classroom Approach”, Tata McGraw;Hill

Reference Books :
Elective IV – Geo Informatics Systems

Unit I 
Digital Image Processing Fundamentals
Basic character of digital images, preprocessing, registration, enhancement, spatial filtering, transformations, classification,
Visual Image Interpretation: Types of pictorial data products, image interpretation strategy, image interpretation process, basic elements of image interpretation.

Unit II
Foundations of Remote Sensing
Basic Principles of remote sensing, Electromagnetic remote sensing process,
Microwave Remote Sensing:
The radar Principle, factors affecting microwave measurements, radar wavebands, SLAR Systems, SAR, Interpreting SAR images, geometrical
Remote Sensing platform and Sensors: Satellite system parameters, sensor parameters, imaging sensor systems, Earth recourses satellite series.

Unit III
GIS Fundamentals
GIS: Definition, evolution, components, approaches, Geospatial data, GIS operations.
GIS architecture, models of GIS, framework for GIS, GIS categories, level / scales of measurement.
Map projections, Map as a model, classification of maps, map scale, cartographic symbolization, types of map, spatial referencing system, map projections, grid systems, computer in map production, digital database in a GIS, linkage of GIS to remote sensing

Unit IV
Spatial Data Management
Existing GIS data, Metadata, conversion of existing data, creating new data, geometric transformations, Describing data quality and errors, Sources of errors in GIS, Finding and modeling errors in GIS, Managing GIS error, types of errors- RMS error, location error, topological error, spatial data accuracy. Attribute data in GIS, Spatial data processing.

Unit V
Data Modeling and Analysis
Data Exploration, types of data queries, Vector data analysis- buffering, overlay, distance measurement, pattern analysis, Raster Data analysis-different types of operations, comparison of vector and raster based data analysis.
Basic elements of GIS modeling- Binary models, Index models, Process models

Unit VI
Applications and development
Urban and Municipal Applications- introduction and methodology.
GIS implementation and Project Management – Software Engg. as applied to GIS, GIS project planning, System Analysis and user requirements studies, geospatial database design methodology, GIS application software design methodology, system implementation and maintenance, Geospatial Information Domain, issues and trends in GIS development.
Text Books:


Reference Books:

Elective IV – Open Elective

In this subject, a student can opt for a subject from other branch of engineering. An institution may design the syllabus of a subject in consultation with a software company. This syllabus will be approved by the University authorities and the students can opt for the subject as an open elective.
Assignment No 1

a) Design and develop the code for controlling traffic lights at an intersection. Consider an intersection with two, two-way streets. A traffic light will normally be green for G seconds, yellow for Y seconds and red for R seconds. During the night for a certain period of time, the intersection will automatically suspend normal service and its lights will flash yellow.
   1. Develop an object oriented design.
   2. Using programming language.
   3. Make suitable assumptions and state them clearly.

b) Performance analysis and Run time estimation of the Traffic light System
   1. Define accomplishment levels for the system and calculate its performability.
   2. Analyze the source code to estimate the execution time of different modules.
   3. Make suitable assumptions and state them clearly.

Assignment No 2

Frame a problem statement to implement RMA scheduling for periodic tasks (Minimum 03 tasks) for a uniprocessor with certain time period and deadline and check the following parameters:

a) Compute total CPU Utilization.

b) Necessary and Sufficient condition for optimum scheduling.

c) Time Demand Analysis (Draw the graph between Time demand function and Time)

d) Implement above system and find out total work load carried out.

Assignment No 3

Implement the two contention based protocols — ‘Virtual Time CSMA (VTCSMA – L) and ‘Window Protocol’. Compare their performances in terms of the number of packets that meet their deadlines.

- In both cases, keep the Number of nodes and the sequence of packets (along with their deadlines) same so that their performances can be compared.
- Run VTCSMA for 3 different values of the virtual clock rate as 2,4 and 8 time units
- Protocol for 3 different values of the initial window size (i.e. 10,20,40)
- Make suitable assumptions if required and state them clearly.

The coding can be done in any language of your choice.

Assignment No 4

Write a report on ‘Hard Real-Time Databases’. Describe how you would construct a hard real-time database, where missing of even a single deadline is unacceptable. Mention the features you would provide and explain how you would implement them.

Assignment No 5

Install Real Time Linux as RTOS on Linux using real time patches for RTLinux – 2.4 (Open Source).

Assignment No 6

Design object oriented diagrams using UML 2.x for problem statement 1 in the list for all possible cases.
Guidelines for framing the assignments:

The faculty in charge will frame minimum 6 to maximum 8 assignments such that the students get hands on the concepts they study in each unit of electives.
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The faculty in charge will frame minimum 6 to maximum 8 assignments such that the students get hands on the concepts they study in each unit of electives.
Elective III – Software Architecture Lab

Part A: Design Patterns

1. Implement iterator design pattern in language of your choice and submit it along with a write-up with its specification.
2. Implement observer design pattern in language of your choice and submit it along with a write-up with its specification.
3. Implement strategy design pattern in language of your choice and submit it along with a write-up with its specification.

Part B: Architectural

1. Study a case study of any website or any other large system and its architecture for fault Tolerance, scalability, performance, transaction management and other quality attributes.
2. Study and submit a report for any of the MVC based Frameworks.

Part C: Web development, Middleware and Web services

1. Prepare a representative paper design of a hypothetical system using components, interfaces and its deployment issue with UML 2.0.
2. Explore and Implement JAVA based XML processing.
3. Implement a sample EJB based application or develop a small web application using java technology or dot net technology.
Computer Lab Practices II

Part A  Distributed Systems
1. Implement a program in Linux using C/C++ to implement Client-Server architecture using Socket programming. (In the assignment when user stores a file on a server, the server splits the file and stores the file on two or more servers. Whenever the user retrieves the file, the server retrieves the file again from different serves forwards all the fragments to the user and display it as a single file.)
2. Write a program to implement bulletin-board using concept of broadcast and remove the message when read by the entire users.
3. Write a program to implement Simple Remote Calculator Service using RMI which can be used from a client Program.

Case Study on Cloud Computing

• Definition, What’s new, Benefits, Drawbacks, All the services - (DAAS, AAAS, Process as a Service, Platform as a Service, Info as a Service, Integration as a Service, Security as a Service, Storage as a Service, Governance/Management as a Service, TAAS, Infrastructure as a Service.)

Part B  Information Retrieval
1. Develop a text processing system which provides the summary of the text by giving weightage to the words appearing in the text. (Use - Luhn's concept of automatic text analysis & Working concept of conflation algorithm.)
2. Implementation of Single-pass Algorithm for Clustering. (consider 4 to 5 files)
3. Implementation of Inverted Index.
Content Management System-Definition, Format, Structure, Functionalities and Various tools
The Student will undertake one project over the academic year, which will involve the analysis, design of a system or sub-system in the area of Information Technology and Computer Science and Engineering.

The group will submit at the end of semester II.
   a) The Workable project.
   b) Project report (in \texttt{LATEX}) in the form of bound journal complete in all respect – 1 copy for the Institute and 1 copy of each student in the group for certification.

The term work will be accessed by the examiners in consultation with the guide. Oral examination will be based on the project work completed by the candidates. Preliminary report work completed by candidates. Preliminary report must also be presented during the oral examination.

The project report contains the details.

1. Problem definition
2. Requirement specification
3. System design details (UML diagrams)
5. Test result and procedure – test report as per ATP.
6. Platform choice use.
7. Conclusions.
8. Appendix tools used, References.