# SIR PADAMPAT SINGHANIA UNIVERSITY

## Udaipur

## SCHOOL OF ENGINEERING

## Course Curriculum of 4-Year B. Tech. Degree Programme in Computer Science & Engineering (Batch- 2018-22)

## Credit Structure

| B. Tech. Core | | B. Tech. Elective | |
|---|---|---|---|
| **Category** | **Credits** | **Category** | **Credits** |
| Departmental Core Subjects | 98 | Departmental Electives | 29 |
| Humanities & Basic Sciences Subjects | 40 | Open Electives | 13 |
| Management Subjects | 2 | | |
| Total | 140 | Total | 42 |
| | | Grand Total | 182 |

## Distribution of Total Credits & Contact Hours in all Semesters

| S. No. | Semester Number | Credits/Semester | Contact hours/week |
|---|---|---|---|
| 1 | I | 21 | 25 |
| 2 | II | 22 | 27 |
| 3 | III | 25 | 30 |
| 4 | IV | 24 | 32 |
| 5 | V | 24 | 31 |
| 6 | VI | 25 | 31 |
| 7 | VII | 28 | 34 |
| 8 | VIII | 13 | 17 |
| | **Total** | 182 | -- |

## Course Structure: B. Tech. 2018-2022

## Semester - I

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CE-151 | Engineering Mechanics | 3 | 1 | 0 | 4 |
| 2 | ME-151 | Engineering Drawing & Computer Aided Drafting | 0 | 1 | 1 | 2 |
| 3 | ME-152 | Manufacturing Practices | 0 | 0 | 1 | 1 |
| 4 | HU-153 | Professional Communication - I | 2 | 0 | 0 | 2 |
| 5 | CH-154 | Chemistry – I | 3 | 0 | 1 | 4 |
| 6 | MA-151 | Mathematics - I | 3 | 1 | 0 | 4 |
| 7 | PH-151 | Physics - I | 3 | 0 | 1 | 4 |
| | | | | | Total Credits | 21 |
| 8 | EP-199 | Endeavour Project(Beyond the Syllabus) | | | | |
| | | | | | Total Contact hours/week | 25 |

## Semester - II

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-152 | Introduction to Computers & Programming | 2 | 0 | 2 | 4 |
| 2 | EC-152 | Basics of Electrical & Electronics Engineering | 3 | 0 | 1 | 4 |
| 3 | HU-154 | Professional Communication - II | 1 | 1 | 0 | 2 |
| 4 | CH-155 | Chemistry - II | 3 | 0 | 1 | 4 |
| 5 | MA-152 | Mathematics - II | 3 | 1 | 0 | 4 |
| 6 | PH-152 | Physics - II | 3 | 0 | 1 | 4 |
| | | | | | Total Credits | 22 |
| 7 | EP-199 | Endeavour Project(Beyond the Syllabus) | | | | 3 |
| | | | | | Total Contact hours/week | 27 |

## Semester - III

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-250 | Data Structures | 3 | 0 | 2 | 5 |
| 2 | CS-251 | Introduction to Database Systems | 3 | 0 | 2 | 5 |
| 3 | CS-252 | Discrete Mathematical Structures | 3 | 1 | 0 | 4 |
| 4 | EC-252 | Digital Electronics Circuits | 3 | 1 | 1 | 5 |
| 5 | HU-251 | Business & Technical Communication | 1 | 1 | 0 | 2 |
| 6 | MA-252 | Introduction to Algebra & Matrix Analysis | 3 | 1 | 0 | 4 |
| | | | | | Total Credits | 25 |
| 7 | EP-299 | Endeavour Project(Beyond the Syllabus) | | | | |
| | | | | | Total Contact hours/week | 30 |

## Semester - IV

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-253 | Computer Architecture | 3 | 0 | 2 | 5 |
| 2 | CS-254 | Design Practices in Computer Science | 0 | 1 | 2 | 3 |
| 3 | CS-255 | Programming Languages | 3 | 0 | 2 | 5 |
| 4 | CS-2XX | Departmental Elective - I | 3 | 0 | 2 | 5 |
| 5 | MA-254 | Introduction to Probability Theory & Stochastic Processes | 4 | 0 | 0 | 4 |
| 6 | XX-XXX | Open Elective - I | X | X | 0 | 2 |
| | | | | | Total Credits | 24 |
| 7 | EP-299 | Endeavour Project(Beyond the Syllabus) | | | | 3 |
| | | | | | Total Contact hours/week | 32 |

## Semester - V

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-350 | Operating Systems | 3 | 0 | 2 | 5 |
| 2 | EC-360 | Introduction to Signals & Systems | 3 | 0 | 1 | 4 |
| 3 | CS-3XX | Departmental Elective - II | 3 | 0 | 2 | 5 |
| 4 | CS-3XX | Departmental Elective - III | 3 | 0 | 1 | 4 |
| 5 | CS-3XX | Departmental Elective - IV | 3 | 0 | 1 | 4 |
| 6 | XX-XXX | Open Elective - II | X | X | 0 | 2 |
| | | | | | Total Credits | 24 |
| 7 | EP-399 | Endeavour Project(Beyond the Syllabus) | | | | |
| | | | | | Total Contact hours/week | 31 |

## Semester - VI

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-357 | Computer Networks - I | 3 | 0 | 2 | 5 |
| 2 | CS-358 | Theory of Computation | 3 | 1 | 0 | 4 |
| 3 | CS-359 | Analysis & Design of Algorithms | 3 | 0 | 1 | 4 |
| 4 | EC-357 | Embedded Systems | 3 | 0 | 1 | 4 |
| 5 | CS-3XX | Departmental Elective - V | 3 | 0 | 1 | 4 |
| 6 | CS-3XX | Departmental Elective - VI | 3 | 0 | 1 | 4 |
| | | | | | Total Credits | 25 |
| 7 | EP-399 | Endeavour Project(Beyond the Syllabus) | | | | 3 |
| | | | | | Total Contact hours/week | 31 |

## Semester - VII

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-451 | Compiler Design | 3 | 0 | 1 | 4 |
| 2 | CS-452 | Computer Networks - II | 3 | 0 | 2 | 5 |
| 3 | CS-463 | Programming Concepts | 0 | 0 | 1 | 1 |
| 4 | CS-450 | Summer Internship | - | - | - | 3 |
| 5 | CS-455 | Comprehensive Viva Voce | - | - | - | 2 |
| 6 | CS-460 | Minor Project | 0 | 0 | 3 | 3 |
| 7 | IN-454 | Internet of Things | 0 | 0 | 3 | 3 |
| 8 | HU-451 | Interview Skills | 0 | 0 | 1 | 1 |
| 9 | MA-454 | Quantitative Aptitude | 0 | 1 | 0 | 1 |
| 10 | BM-451 | Ethics & IPR | 2 | 0 | 0 | 2 |
| 11 | XX-XXX | Open Elective - III | 3 | 0 | 0 | 3 |
| | | | | | Total Credits | 28 |
| 12 | EP-499 | Endeavour Project(Beyond the Syllabus) | | | | |
| | | | | | Total Contact hours/week | 34 |

## Semester - VIII

| S. No. | Course Code | Course Title | L | T | P | Credit(s) |
|---|---|---|---|---|---|---|
| 1 | CS-4XX | Departmental Elective - VII | 3 | 0 | 0 | 3 |
| 2 | CS-470 | Major Project | 0 | 0 | 4 | 4 |
| 3 | XX-XXX | Open Elective - IV | 3 | 0 | 0 | 3 |
| 4 | XX-XXX | Open Elective - V | 3 | 0 | 0 | 3 |
| | | | | | Total Credits | 13 |
| 5 | EP-499 | Endeavour Project(Beyond the Syllabus) | | | | 3 |
| | | | | | Total Contact hours/week | 17 |

## List of Departmental Elective(s) - I

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-256 | JAVA Programming | 3 | 0 | 2 | 5 |
| 2 | CS-263 | Linux & Shell Programming | 3 | 0 | 2 | 5 |

## List of Departmental Elective(s) - II

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-351 | Computer Graphics | 3 | 0 | 2 | 5 |
| 2 | CS-352 | Game Design | 3 | 0 | 2 | 5 |
| 3 | CS-370 | System Administration with Linux | 3 | 0 | 2 | 5 |

## List of Departmental Elective(s) - III

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-353 | Artificial Intelligence | 3 | 0 | 1 | 4 |
| 2 | CS-354 | Cryptography | 3 | 0 | 1 | 4 |

## List of Departmental Elective(s) - IV

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-355 | Simulation & Modelling | 3 | 0 | 1 | 4 |
| 2 | CS-356 | Digital Hardware Design | 3 | 0 | 1 | 4 |

## List of Departmental Elective(s) - V

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-361 | File Structure & Information System Design | 3 | 0 | 1 | 4 |
| 2 | CS-369 | Android Based Web Applications | 3 | 0 | 1 | 4 |

## List of Departmental Elective(s) - VI

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-362 | Advanced Java | 3 | 0 | 1 | 4 |
| 2 | CS-367 | Advanced Database Management Systems | 3 | 0 | 1 | 4 |

## List of Departmental Elective(s) - VII

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | CS-453 | Data Mining & Knowledge Discovery | 3 | 0 | 0 | 3 |
| 2 | CS-454 | Pattern Recognition | 3 | 0 | 0 | 3 |

## List of Open Elective(s) - I

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | HU-252 | Language through Literature & Films | 0 | 2 | 0 | 2 |
| 2 | BM-270 | Foundations of Economic Science | 2 | 0 | 0 | 2 |

## List of Open Elective(s) - II

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | HU-351 | Fun with Drama | 0 | 2 | 0 | 2 |
| 2 | BM-370 | Marketing Management | 2 | 0 | 0 | 2 |

## List of Open Elective(s) - III

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | BT-471 | Bioprocess Technology | 3 | 0 | 0 | 3 |
| 2 | CE-462 | Air Pollution & Industrial Waste Management | 3 | 0 | 0 | 3 |
| 3 | CS-458 | Information Retrieval | 3 | 0 | 0 | 3 |
| 4 | CS-462 | Management Information Systems & E-Commerce | 3 | 0 | 0 | 3 |
| 5 | EE-465 | Energy Conversion Process | 3 | 0 | 0 | 3 |
| 6 | ME-465 | Solar Energy & Applications | 3 | 0 | 0 | 3 |
| 7 | PH-451 | Nanotechnology | 3 | 0 | 0 | 3 |
| 8 | PH-453 | Chaos in Engineering Systems | 3 | 0 | 0 | 3 |

## List of Open Elective(s) - IV

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | BT-475 | Bioremediation Technology | 3 | 0 | 0 | 3 |
| 2 | CE-464 | Environmental Management | 3 | 0 | 0 | 3 |
| 3 | CS-459 | Statistical Simulation & Data Analysis | 3 | 0 | 0 | 3 |
| 4 | EC-473 | Robotics & Automation | 3 | 0 | 0 | 3 |

## List of Open Elective(s) - V

| S. No. | Course Code | Course Title | L | T | P | Credit |
|---|---|---|---|---|---|---|
| 1 | BT-472 | Bioelectronics & Biosensors | 3 | 0 | 0 | 3 |
| 2 | CS-461 | Soft Computing | 3 | 0 | 0 | 3 |
| 3 | EE-466 | Hydro Power Generation | 3 | 0 | 0 | 3 |
| 4 | MA-453 | Mathematical Statistics | 3 | 0 | 0 | 3 |
| 5 | ME-467 | Total Quality Management | 3 | 0 | 0 | 3 |

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - I

## (Departmental Core Subject)

CE-151 L-T-P-C
Engineering Mechanics 3-1-0-4

**Objective:** *The subject deals with the concepts of static & dynamic systems involving kinematic & dynamic analysis.*

**Course Content**

Basic principles: Equivalent force system; Equations of equilibrium; Free body diagram; Reaction; Static indeterminacy. Structures: Difference between trusses, frames & beams, Assumptions followed in the analysis of structures; 2D truss; Method of joints; Method of section; Frame; Simple beam; types of loading & supports; Shear Force & bending Moment diagram in beams; Relation among load, shear force & bending moment. Friction: Dry friction; Description & applications of friction in wedges, thrust bearing (disk friction), belt, screw, journal bearing (Axle friction); Rolling resistance. Virtual work & Energy method: Virtual Displacement; Principle of virtual work; Applications of virtual work principle to machines; Mechanical efficiency; Work of a force/couple (springs etc.); Potential energy & equilibrium; stability. Center of Gravity & Moment of Inertia: First & second moment of area; Radius of gyration; Parallel axis theorem; Product of inertia, Rotation of axes & principal moment of inertia; Moment of inertia of simple & composite bodies. Mass moment of inertia. Kinematics of Particles: Rectilinear motion; Curvilinear motion; Use of Cartesian, polar & spherical coordinate system; Relative & constrained motion; Space curvilinear motion. Kinetics of Particles: Force, mass & acceleration; Work & energy; Impulse & momentum; Impact problems; System of particles. Kinematics & Kinetics of Rigid Bodies: Translation; Fixed axis rotational; General plane motion; Coriolis acceleration; Work-energy; Power; Potential

energy; Impulse-momentum & associated conservation principles; Euler equations of motion & its application.

**Text/Reference Books**


1. Engineering Mechanics: Statics and Dynamics. Shames I. H. 4th Ed. PHI. 2002.
2. Engineering Mechanics. Vol I - Statics, Vol II - Dynamics. Meriam J. L. &Kraige L. G. 5th Ed. John Wiley. 2002.
3. Engineering Mechanics. Vol. I and II. Hibbler R. C. Pearson Press. 2002.

# Detailed Syllabus for B. Tech. Degree Programme
# in
# Computer Science & Engineering

## Semester- I

## (Departmental Core Subject)

ME-151 L-T-P-C
Engineering Drawing & Computer Aided Drafting 0-1-1-2

**Objective:** *Engineering drawing is a visual language of an engineer. It permits students to convert an object into its visual representation.*

**Course Content**

Importance of engineering drawing; Conventions & standards: ISO; Scales; Curves; Orthographic projections : points, lines, planes & solids; Sections of solids; Isometric projections; Development of surfaces; Intersection of solids.

**List of Experiments**

1. Introduction to Engineering Graphics, Sheet Layout, instruments, BIS standards, Lines, Lettering & Dimensioning
2. Scales -Types of Scales-Plain Scale, Diagonal scale, vernier scale
3. Curves- conic sections, ellipse, parabola, hyperbola, cycloid, epicycloid, hypocycloid
4. Orthographic Projections-Introduction, multi-view projection system, orthographic views, Methods of multi-view projections, projecting side views, Sectional Views
5. Projection of Points -Introduction, position of points in I, II, III & IV quadrant
6. Projection of Lines & Auxiliary projections-, Line inclined to one plane & parallel to the other-Line inclined to both the planes. Projection on auxiliary planes
7. Projection of Planes- Introduction, Perpendicular & parallel to the reference planes Projections of planes inclined to one reference plane & perpendicular to the other, plane inclined to both ref. planes

8. Projection of solids with axes inclined to one of the reference plane & parallel to the other
9. Fundamentals of 2-D, Drawing & Edit commands. Draw 2D& 3D object drawing
10. Section of Solids- Sections of prisms, pyramids, cone cylinder
11. Development of Surfaces- Methods of development-Cube, prisms, pyramids, cone cylinder
12. Intersection of Surfaces- Line method-cutting plane method, Intersection of two prisms- Intersection of cylinder & cylinder
13. Isometric Projection- Isometric axes lines & planes, Isometric Scale, Isometric views of standard shapes, solids

**Text/Reference Books**


1. Engineering Drawing. Dhananjay A.J. Tata McGraw-Hill. 2008
2. Engineering Drawing. Bhatt N. D. &Panchal V.M. 43th Ed. Charator Publishing House. 2001.
3. Engineering Drawing. Shah M. B. &Rana B. C. 2nd Ed. Pearson Education. 2009.
4. Graphic Science and Design. French T. E., Vierck C. J. & Foster R. J. 4th Ed. McGraw-Hill. 1984.
5. Fundamentals of Engineering Drawing. Luzadder W. J. & Duff J. M. 11th Ed. PHI. 1995.
6. Engineering Drawing and Graphics. Venugopal K. 3rd Ed. New Age International. 1998.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - I

## (Departmental Core Subject)

ME-152 L-T-P-C
Manufacturing Practices 0-0-1-1

**Objective:** *This course is intended to impart basic knowledge of various hand tools & their usage in different sections of manufacturing; including Carpentry, Fitting, House wiring, Black smithy, Tin smithy.*

**List of Experiments**

1. Demonstration of the manufacturing practices, workshop safety, trades, tools, experiments
2. Measurement of the dimensions of a given job using precision instruments
3. Fabrication of a fitting job with drilling & tapping of a hole
4. Preparation of a funnel with spout as per drawing from 30 SWG. G.I sheet. Joints to be soldered with the soldering iron
5. Fabrication of a T-half lap joint & T-bridle joint
6. Preparation of a wooden patterns as per given drawings
7. Preparation of a mould for a given wooden pattern
8. Preparation of an aluminum casting with the help of a given wooden pattern

**Text/Reference Books**


1. Elements of Workshop Technology-Vol. I. Choudhury H. Asia Publishing House. 1986.
2. All About Machine Tools. Gerling H. New Age International. 1995.
3. Workshop Technology. Chapman W. A. J. Oxford IBH. 1975.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - I

## (Humanities & Basic Sciences Subject)

| | |
|---|---|
| HU-153 | L-T-P-C |
| Professional Communication - I | 2-0-0-2 |

**Objective:** *To develop communicative competence.*

**Course Content**

Communication: Importance of effective communication skills, Objectives & Process of communication; Types of communication: Verbal & non-verbal; Channels of communication, Media of communication; Barriers to communication: Physical, Psychological, Mechanical, Linguistic & Cultural; Types of listening, Principles of effective listening.

Word Power: Words often misspelt, One word substitute, Use of idiomatic expressions & phrases.

Time & Stress Management: Planning, Scheduling & Prioritizing, Multitasking, Delegating; Saying no assertively; Stress & its causes, Barriers to stress management & Handling stress.

**Text/Reference Books**


1. Technical Communication. Raman M. & Sharma S. Oxford University Press. 2004.
2. Essentials of Business Communication. Pal R. & Korlahalli J. Sultan Chand & Sons. 2011.
3. Word Power Made Easy. Lewis N. 2nd Ed. Goyal Publisher. 2011.

# Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - I

## (Humanities & Basic Sciences Subject)

| | |
|---|---|
| CH-154 | L-T-P-C |
| Chemistry - I | 3-0-1-4 |

**Objective:** *The subject deal with the concepts related to Physical chemistry & develops a scientific attitude by means of distinguishing, analyzing & solving various engineering problems. It also provides in-depth knowledge of thermodynamics, quantum chemistry, chemical kinetic, corrosion & colloids.*

**Course Content**

Concept of Thermodynamic system: Definition with example of di thermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property. Introduction to first law of thermodynamics: different statements, mathematical form. Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas. Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. Heat Capacity**:** Definition, Classification of Heat Capacity (Cp&Cv): Definition & General expression of Cp - Cv. Expression of Cp - Cv for ideal gas. Reversible & Irreversible processes: Definition, Work done in Isothermal Reversible & Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V & T), slope of P-V curve in adiabatic & isothermal process. Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier & Laplace, Hess's law of constant heat summation, Kirchhoff's law.2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle).Joule Thomson &

throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. Evaluation of entropy: characteristics & expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. Work function & free energy: Definition, characteristics, physical significance, mathematical expression of ΔA & ΔG for ideal gas, Maxwell's Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Condition of spontaneity & equilibrium reaction. Chemical potential, Real gas, Real Solution, Cell EMF & its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half-cell, quinhydrone half-cell & calomel half-cell (construction, representation, cell reaction, expression of potential, Discussion, Application)Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application).Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) b)ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion. Corrosion - basics & impacts, Reaction laws: rate & order; molecularity; zero, first & second order kinetics. Pseudo unimolecular reaction, Arrhenius equation. Mechanism & theories of reaction rates (Transition state theory, Collison theory: Steady state approximation, Rate determining state approximations, Bohr's theory & its limitations, de-Broglie relation, Heisenberg Uncertainty principle, Schrodinger equation, Schrodinger equation for hydrogen atom in Cartesian coordinate & polar coordinates, Significance of four quantum numbers, shape of s, p & d atomic orbitals, discovery of spin, spin quantum number & magnetic quantum number. Rules for filling electrons in orbitals, stability of half & completely filled orbitals, relative energies of atomic orbitals, anomalous electronic configurations, The properties of liquid surface, surfactants, colloidal systems, solid surfaces, physio sorption, & chemisorption.

**List of Experiments**

1. Determination of water hardness by complexometric titration.
2. Determination of total alkalinity of water sample.
3. Determination of chloride ion in water sample by Argentometric method.

4. Determination of total dissolved oxygen content in water sample by Wrinkler's method.
5. Copper sulfate estimation by iodometric titration.
6. Potassium dichromate estimation by iodometric titration.
7. Redox titration: Estimation of FAS by internal & external indicators.
8. Gravimetric analysis: Estimation of Ba as $BaSO_4$
9. Gravimetric analysis: Estimation of Ag as AgCl
10. pH metric measurements: Determination of strength of unknown HCl solution by pH metric titration.

**Text/Reference Books**


1. Physical Chemistry. Atkins P. W. 5th Ed. ELBS. 1994.
2. Physical Chemistry. Levine I. A. 4th Ed. McGraw-Hill.1995.
3. Quantum Chemistry. Levine I. A. 2nd Ed. Prentice Hall. 1995.
4. Introductory Quantum Chemistry. Chandra A. K. 4th Ed. Tata McGraw-Hill. 1994

# Detailed Syllabus for B. Tech. Degree Programme
# in
# Computer Science & Engineering

## Semester - I

## (Humanities & Basic Sciences Subject)

MA-151 L-T-P-C
Mathematics - I 3-1-0-4

**Objective:** *To develop an understanding of the fundamental concepts of the calculus, differential equations & linear algebra to connect them with real world problems from other disciplines along with the development of mathematical reasoning & problem solving abilities.*

**Course Content**

Differential Calculus (Functions of one variable): Taylor's &Maclaurin's theorems with remainders, concavity & convexity of a curve, points of inflexion, asymptotes & curvature.

Differential Calculus (Functions of several variables): Partial derivatives & their geometrical interpretation, derivatives of composite & implicit functions, Euler's theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of several variables, maxima &minima - Lagrange's method of multipliers.

Integral Calculus**:** application to length, area, volume & surface area of revolution. Multiple integrals with applications to: volume, surface area & moments of inertia.

Ordinary Differential Equations**:** Solution of dy/dx = f(x, y); linear differential operator L, higher order ordinary differential equations with constant coefficients.

Matrix Algebra**:** Rank & inverse of a matrix, consistency of linear system of equations; Eigen values, Eigen vectors & their applications to system of ordinary differential equations; Cayley-Hamilton theorem; Diagonalization of matrices.

**Text/Reference Books**


1. Higher Engineering Mathematics. Ramana B.V. 1st Ed. Tata McGraw-Hill Education. 2006.
2. Calculus and Analytic Geometry. Thomas G. B. & Finney R. L. 9th Ed. Addison-Wesley. 1998.
3. Advanced Engineering Mathematics. Kreyszig E. 10th Ed. Wiley Eastern. 2012.
4. Advanced Engineering Mathematics. Jain R. K. & Iyengar S. R. K. 3rd Ed. Narosa Publishing House. 2010.
5. Calculus - Vol.2. Apostol T. M. 2nd Ed. Wiley .2003.
6. Higher Engineering Mathematics. Grewal B.S. 42nd Ed. Khanna Publishers. 2012.

# Detailed Syllabus for B. Tech. Degree Programme
# in
# Computer Science & Engineering

## Semester - I

## (Humanities & Basic Sciences Subject)

PH-151 L-T-P-C
Physics - I 3-0-1-4

**Objective:** *Objective of this course is to introduce concepts of electrostatics & magnetostatics leading to the Maxwell's electromagnetic waves & understanding the wave nature of light using various optical phenomena like interference, diffraction & polarization. The particle nature of electromagnetic wave will also be introduced*.

**Course Content**

Gauss law & its applications in electrostatics in vector form, electric polarization, permittivity, energy density in an electric field, Ampere's law, charged particle motion in E & B fields, magnetization, Faraday's law of electromagnetic induction; Equation of continuity, generalized Ampere's law, Maxwell's equations, wave equation, plane wave solutions, electromagnetic wave propagation in dielectrics & conductors, reflection/refraction, polarization, interference, diffraction of EM waves Origin of quantum hypothesis, de Broglie's hypothesis of matter waves, Uncertainty principle, Wave function & wave mechanics, Schrodinger equation, QM operators, Expectation value, one-dimensional solutions: zero potential, step potential, potential barrier & potential well.

**List of Experiments**

1. Determination of wavelength of sodium light source using Newton's Ring Method
2. Determination of wavelength of monochromatic light source using Fresnel's Biprism

3. Determination of the wavelength of monochromatic light using Michelson Interferometer
4. Determination of wavelength of laser using single slit diffraction
5. Determination of the wavelength of prominent lines of mercury using plane transmission grating
6. Determination of specific rotation of sugar solution using Polarimeter
7. Determination of Refractive index & dispersive power of prism material using spectrometer
8. Verification of the BiotSavart's law
9. Variation of magnetic field along the axis of a circular coil & determination of the radius of the coil
10. Determination of frequency of AC mains using Sonometer
11. Determination of the characteristic constant or ballistic constant of a ballistic galvanometer

**Text/Reference Books**


1. Elements of Electromagnetics. Sadiku M. N. O. 6th Ed. Oxford. 2014.
2. Optics. Ghatak A. Tata McGraw-Hill Publishing Company Ltd. 2005.
3. Electromagnetics. Laud B.B. 2nd Ed. New Age International (P) Ltd. 1987.
4. Classical Electrodynamics. Jackson J.D.3rd Ed. Wiley. 1998.
5. Foundations of Electromagnetic Theory. Reitz J.R., Milford F.J. & Christy R. W. 4th Ed. Narosa Pub. House. 2008.
6. Fundamentals of Optics. Jenkins F. A. & White H. E. 4th Ed. McGraw-Hill International Editions. 2001.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - II

## (Departmental Core Subject)

CS-152 L-T-P-C
Introduction to Computers & Programming 2-0-2-4

**Objective:** *This course is an introductory course of computer science. It provides basic insight into the building blocks of a modern day computer & the newest peripherals attached with it. In addition to this, the learner is delved into the basic programming concepts of a high level language.*

**Course Content**

Introduction to computer architecture; memory, ALU, CPU, I/O devices. Introduction to system software; operating systems, compilers & multi-user environments. Concept of an algorithm. Introduction to the design & implementation of correct, efficient & maintainable programs. Use of high level programming language for the systematic development of programs.

**List of Experiments**

1. Basic & calculation based programs
2. Conversion based programs
3. Decision making statement & operator based programs
4. Loop based programs
5. Multi way decision making statement based programs
6. Array based programs
7. Strings based programs
8. Function based programs
9. Structure based programs

10. Pointers based programs
11. File handling based programs

**Text/Reference Books**


1. A Book on C. Kelly A. & Pohl I. 4th Ed. Pearson Education. 1999.
2. The C Programming Language. Kernighan B. & Ritchie D. 2nd Ed. Prentice Hall of India. 1988.
3. C: The Complete Reference. Schildt H. 4th Ed. Tata McGraw-Hill. 2000.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - II

## (Departmental Core Subject)

EC-152 L-T-P-C
Basics of Electrical & Electronics Engineering 3-0-1-4

**Objective:** *The aim of this course is to develop an understanding of the basics of electrical & electronics components, circuits & systems, operation of transformers & other electrical machines.*

**Course Content**

Circuit Analysis Techniques: Circuit elements, Simple RL & RC Circuits, Ohm's law, Kirchoff's laws, Nodal Analysis, Mesh Analysis, Linearity & Superposition, Source Transformations, Thevnin's & Norton's Theorems, Phasor Relationship for R, L & C, Impedance & Admittance, Phasor Diagrams, Response as a function of ω.

Diodes & Transistors: Semiconductor Diode, Zener Diodes, Rectifier Circuits, Wave Shaping Circuits, Bipolar Junction Transistors, Field-Effect Transistors.

Operational Amplifiers: Op-amp Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing, Voltage Buffer.

Logic Gates: Number Systems & Codes, Logic Gates, Boolean Theorems, De Morgan's Theorems, Sum-of Product Form, Algebraic Simplification, Karnaugh Map Method.

Introduction to Transformers & AC Machines: Ideal Transformer, Circuit Model of Transformer, Efficiency, Three Phase Induction Motor.

Introduction to Fractional-kW Motors & DC Machines: Single Phase Induction Motors, DC Generator & DC Motor.

**List of Experiments**

1. Study & Verification of Kirchoff's Current Law

2. Study & Verification of Kirchoff's Voltage Law
3. Study & Verification of Thevenin's Theorem for dc network
4. Study & Verification of Norton's Theorem for dc network
5. Study & Verification of R-C series circuit & determination of phase angle
6. Study of the volt-ampere (V-I) characteristics for Silicon P-N Junction diode
7. Study of the volt-ampere (V-I) characteristics for a Zener diode
8. Study of the input & output characteristics for a transistor in common base configuration
9. Verification of Truth Table for basic & universal logic gates
10. Determination of copper loss & core loss for a single phase transformer through O/C-S/C Test

**Text/Reference Books**


1. Engineering Circuit Analysis. Hayt W. H. & Kemmerly J. E. McGraw-Hill. 1993.
2. Circuits, Devices and Systems. Smith R. J. & Dorf R. C., John Wiley & Sons.1992.
3. Electronic Devices and Circuit Theory. Boylestad R. L. & Nashelsky L. 6th Ed. Prentice Hall India. 2001.
4. Digital Systems. Tocci R. J. 6th Ed. Prentice Hall India. 2001.
5. Electrical Engineering Fundamentals. Del T. V. Prentice Hall India. 1994.
6. Circuit Theory (Analysis and Synthesis). Chakrabarti A. Dhanpat Rai & Co. 2001.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - II

## (Humanities & Basic Sciences Subject)

HU-154 L-T-P-C
Professional Communication - II 1-1-0-2

**Objective**: *To build interpersonal skills & communicate effectively.*

**Course Content**

Business Meetings: Notice, Agenda, Minutes of Meeting.

Group Discussions: Classification of GD topics; GD as a part of the selection process; GD phases; Non-verbal communication in GD, Do's & don'ts of GD.

Professional Mannnerisms & Grooming: Kinesics, Office etiquette; Telephone skills, Netiquette.

SWOT, Résumé, Cover letter writing, Job Acceptance Letter.

Goal setting: Significance, Progressive steps to achieve goals; Anticipating career challenges & utilizing opportunities.

**Text/Reference Books**


1. Foundations of Business Communication: An Integrative Approach. Young, D. McGraw Hill Education. 2005.
2. How to Succeed in Group Discussions and Personal Interviews. Mandal S. Jaico Publishers. 2004.
3. Business Communication: Connecting in a Digital World (SIE). Lesikar R. & Pande N. McGraw Hill Education. 2015.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - II

## (Humanities & Basic Sciences Subject)

CH-155 L-T-P-C
Chemistry - II 3-0-1-4

**Objective:** *This course aims at understanding various concepts of inorganic & organic chemistry, broad spectrum knowledge of chemical bonding, organic reaction mechanism, stereochemistry, spectroscopy, polymer science, green chemistry & environmental pollution studies.*

**Course Content**

Bonding Models in Inorganic Chemistry- Introduction, Ionic bonding: Introduction to stoichiometric defects (Schottky & Frenkel) & non – stoichiometric defects (Metal excess & metal deficiency).Role of silicon & germanium in the field of semiconductor. Valence shell Electron Repulsion Theory (VSEPR). Discussion of structures of $IF_3$, $SnCl_2$, $CO_3^{2-}$ & Valence bond theory, Molecular orbital theory Linear combination of atomic orbitals (LCAO) method. Structures of simple hetero nuclear diatomic molecules such as CO, NO, HF, Coordination numbers, Crystal field theory, Metal ions in Biological systems, Air Pollution Types of pollutants, source effects, sink & control of primary pollutants – CO, NOx, HC, SOx& particulates, effects of pollutants on man & environment – photochemical smog & acid rain. Greenhouse effect, ozone layer depletion, Water Pollution: Classification of pollutants, their sources, effects of water pollutions on human & plant life, waste water treatment – domestic & industrial. Pollution due to Oil & grease in water. Thermal pollution: Sources, effects of thermal pollution on plant & animal life, control techniques, radioactive pollution: sources, effects, treatment& disposal,Solid Waste Management, Weapons of mass destruction, biological weapons, chemical weapons, disarmament & peaceful uses of chemistry in

day to day life. Green Chemistry, 12 principles of green chemistry, application of green chemistry in industrial processes, Renewable & Non-renewable energy resources & Primary & Secondary energy resources, Polymers, Organic Reaction Mechanism, Stereochemistry of Carbon Compounds, Basic concepts of spectroscopy, UV-VIS spectroscopy, applications, Fundamentals of Microwave & IR spectroscopy & its applications, determination of molecular structure.

**List of Experiments**

1. Inorganic qualitative analysis: Detection of acid radicals.
2. Inorganic qualitative analysis: Detection of basic radicals.
3. Estimation of available chlorine in bleaching powder sample.
4. Thin layer chromatography: Separation of given amino acids by TLC method.
5. Determination of rate constant of a first order reaction by titrimetric method.
6. Spectrophotometry: Verification of Beer's law.
7. Conductometric measurements: Determination of strength of unknown HCl solution by conductometric titration.
8. Qualitative analysis of single solid organic compounds: Detection of characteristic elements (N, Cl, Br & I) by chemical tests.
9. Qualitative analysis of single solid organic compounds: Detection of functional groups by systematic chemical tests.
10. Flame photometry: Determination of Na & K in water sample.

**Text/Reference Books**


1. Environmental Sciences towards sustainable future. Wright R. Prentice Hall of India. 2007.
2. Essentials of Ecology & Environmental sciences. Rana S. V. S. 3rd Ed. Prentice Hall of India. 2007.
3. Ecology. Subrahmanyam S. & Sambamurty S. S. 2nd Ed. Narosa Publishing House. 2007.
4. Concepts of Ecology. Kormondy E. J. 4th Ed. Prentice Hall of India Pvt. Ltd. 2007.
5. Textbook of Environmental Studies for Undergraduate Courses. Bharucha E. 2nd Ed. University Grants Commission. New Delhi. 2004.
6. Advanced Inorganic Chemistry. Cotton F. A. & Wilkinson G. 3rd Ed. Wiley Eastern Ltd.1972.
7. Inorganic Chemistry. Shriver D. J. Atkins P. W. & Langford C. H. 2nd Ed. ELBS.

1994.
8. Organic Chemistry. Pine S. H. 5th Ed. McGraw-Hill. 1987.
9. Fundamentals of Molecular Spectroscopy. Banwell C. N. & McCash E. M.4th Ed. McGraw-Hill. 1962.
10. Introduction to Molecular Spectroscopy. Barrow G. M. 5th Ed. McGraw-Hill 1962.
11. Green Chemistry Engineering. Doble M. & Kruthiventi A. K. Academic press.2007.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - II

## (Humanities & Basic Sciences Subject)

MA-152 L-T-P-C
Mathematics - II 3-1-0-4

**Objective:** *The objective of the course is to make the students familiar with certain important mathematical techniques involving complex analysis & transforms which have applications in various disciplines of Engineering & Technology.*

**Course Content**

Complex Analysis**:** Complex Variables: Limit, continuity, differentiability & analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral, Cauchy's integral formula, derivatives of analytic functions, Taylor's series, Laurent's series, Zeros & singularities, Residue theorem, evaluation of real integrals.

Transform Calculus: Definition of Laplace Transform, linearity property, conditions for existence of Laplace Transform. First & second shifting properties, Laplace Transform of derivatives & integrals, unit step functions, Dirac delta-function, error function. Differentiation & integration of transforms, convolution theorem, inversion, periodic functions. Evaluation of integrals by Laplace Transform. Solution of initial & boundary value problems. Fourier Transform, Fourier sine & cosine transforms. Linearity, scaling, frequency shifting & time shifting properties. Self reciprocity of Fourier Transform, convolution theorem. Applications to boundary value problems. Brief Introduction of Z-Transform, Mellin transform & Wavelet Transform.

Fourier Series :Periodic functions, Fourier series representation of a function, half range series, sine & cosine series, Fourier integral formula, Parseval's identity.

**Text/Reference Books**


1. Higher Engineering Mathematics. Ramana B. V. 1st Ed. Tata McGraw-Hill Education. 2006.
2. Complex Analysis for Mathematics and Engineering .Mathews J. H. & Howell R. W. 3rd Ed. Narosa. 1998.
3. Advanced Engineering Mathematics .Kreyszig E. 10th Ed. Wiley Eastern. 2012.
4. Advanced Engineering Mathematics. Jain R. K. & Iyengar S. R. K. 3rd Ed. Narosa Publishing House.2009.
5. Complex Variables- Introduction and Applications. Ablowitz M. J. & Fokas, A. S. Cambridge University Press. 1998.
6. Complex Variables and Applications .Brown J. W. & Churchill R. V. 7th Ed. Mc-Graw Hill. 2004.

# Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - II

## (Humanities & Basic Sciences Subject)

PH-152 L-T-P-C
Physics - II 3-0-1-4

**Objective:** *The objective of this course to introduce the notion of quantum physics & its applications in understanding the electrical, thermal & magnetic properties of various materials, band theory of solids, nanostructures, lasers, superconductivity & its applications.*

**Course Content**

Nature of waves & particles, Wave-packets & uncertainty, Wave particle duality, Wave mechanics & its mathematical tools, Classical & quantum statistics, Statistics of discrete energy levels, Black body spectral density, Bose condensation; Free electrons, density of states, Kronig-Penny model, Effective mass, Band structure, Electrons in various types of solids, Particle in quantum well, Harmonic oscillator & Hydrogen atom problems, Application to semiconductor doping, Nonperiodic materials; Tunneling of particles & examples, Tunneling through multiple barriers & semiconductor junctions; Interaction among quantum wells: materials under electric & magnetic fields, magnetic resonance effects; Nanostructures – Concepts of electrons in low dimensional confinement, Quantum wells & Super-lattices leading to new device concepts; Lasers – Einstein coefficients, Population inversion, Light amplification, Optical resonators, Characteristics of lasers; Superconductors –Vortex, Flux quantization, SQUID, Levitation & its applications.

**List of Experiments**

1. Determination of Planck's constant using Light Emitting Diode

2. Determination of temperature coefficient, reverse saturation current & energy band gap of a P-N junction
3. Determination of the energy band gap of semiconductor using four-probe method
4. Determination of the charge carrier concentration & Hall coefficient of a given semiconductor using Hall experiment setup
5. Determination of the ratio of e/m for the electron using the helical method
6. Determination of electronic charge by Millikan's oil drop method
7. Determination of velocity of ultrasonic waves using quartz crystal
8. Determination of wavelength of He-Ne laser using millimeter scale as a grating
9. Determination of wavelength of Diode laser using single slit / double slit & obtain diffraction patterns of different apertures
10. Determination of numerical aperture of an optical fibre cable
11. Determination of capacitance of a parallel plate capacitor with & without dielectric material
12. Determination of the height of a distant object/building with the help of sextant

**Text/Reference Books**


1. Concepts of Modern Physics. Beiser A. 5th Ed. McGraw-Hill.1995.
2. Modern Physics. Krane K. S. 2nd Ed., John-Wiley. 1995.
3. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles. Eisberg R. & Resnick R. 2nd Ed. John-Wiley. 1985.
4. Introduction to Solid State Physics. Kittel C. 7th Ed. John-Wiley India Pvt. Ltd. 1995.
5. Solid State Physics. Pillai S. O. 6th Ed. New Age International Publishers Ltd. 2009.
6. Semiconductor physics and devices. Neamen D. 4th Ed. McGraw-Hill. 2011.

EP-199/EP-299/EP-399/EP-499 L-T-P-C
Endeavour Project (Beyond the Syllabus) 0-0-0-3

Our University is continuously looking at innovative ways to deliver knowledge to our students, making learning & delivery mechanism innovative, interesting & easy with truly 'out of the box' teaching-learning process. This beyond the syllabus initiative uses all working second Saturdays as class days.

Endeavour is a compulsory interdisciplinary project for all students of the University. Respective Heads of the Department shall select students & form groups. Each project shall be supervised by a faculty member.

The faculty of SPSU will select a contemporary topic, which is preferably industry relevant & associate a company or professional who can provide application-oriented perspective. The topic chosen may be from wide range of subjects. For example: - Biodiversity, Social subjects, Media & advertisement, Environment, Scientific, Technical, Management, Architecture, Tourism or any other subject or their combination.

The project is evaluated in two phases: Internal Evaluation & External Evaluation. This ensures descriptive assessment of the projects performance & challenges faced during the implementation of the project. The project will be spread over two semesters beginning from the odd semester (July to November) & ending in the even semester (December to May) every year. The grade obtained in this course may be used to improve the student's semester grade point average.

The final report should include the reasons for the choice of the title, the concept, the structure, the results with working models/drawings etc. & its practicality. The role & responsibility of every individual of the group should be indicated clearly. The report should be written in the prescribed format/guidelines, certified by the faculty member & presented as a seminar.

The project is evaluated as per the approved procedure & marks obtained are computed in the even semester.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - III

## (Departmental Core Subject)

CS-250 L-T-P-C
Data Structures 3-0-2-5

**Objective:** *The subject deals with the concepts behind data structures, various searching & sorting operations, heap, hashing & graph problems.*

**Course Content**

Introduction to object-oriented programming through stacks queues & linked lists. Dictionaries; skip-lists, hashing, analysis of collision resolution techniques. Trees, traversals, binary search trees. Balanced BST, Trees, Priority queues & binary heaps. Object oriented implementation & building libraries. Applications to discrete event Simulation. Sorting: merge, quick, radix, selection & heap sort, Graphs: Breadth first search & connected components. Depth first search in directed & undirected graphs. Union-find data structure & applications. Directed acyclic graphs; topological sort.

**List of Experiments**

1. Programs related to 1-dimensional & 2-dimensional arrays
2. Program related to recursion
3. Program related to various types of searching algorithms
4. Program related to various types of sorting algorithms
5. Programs related to various types of link list creation
6. Programs related to link list inserting elements, deleting elements & counting nodes
7. Programs related to stack
8. Program related to infix, prefix & postfix

9. Program related to queues & various operations
10. Program related to circular queue & various operations
11. Program related to tree creating & various operations performed on tree
12. Programs related to graphs
13. Programs related to heap creation of min-heap or max-heap, searching etc.

**Text/Reference Books**


1. Data Structures, Algorithms and Software Principles in C. Standish T. Addison-Wesley Publishing Co.1994.
2. Data Structures and Program Design in C. Kruse R. L. 2nd Ed. PHI. 1996.
3. Data Structures and Algorithm Analysis. Weiss M. A. 2nd Ed. Addison-Wesley Publishing Co. 1998.
4. Fundamental of Data Structures in C. Horowitz E., Sahni S. & Anderson S. 2nd Ed. Universities Press. 2008.
5. Data Structures using C & C++. Tenenbaum A. M. PHI. 2008.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - III

## (Departmental Core Subject)

CS-251 L-T-P-C
Introduction to Database Systems 3-0-2-5

**Objective:** *This course will enable students learn database concepts, data organization, data models, various approaches to database design, strengths of relational model, normalization etc. At the end of the course the student will be able to understand database design & normalization techniques, use of Structured Query Language & the importance of backup & recovery techniques.*

**Course Content**

Evolution & architecture of DB systems, DB models. The relational DB model, Operations on the relational model. The database language SQL, constraints & triggers in SQL, system aspects of SQL. Object oriented query languages. XML databases.

**List of Experiments**

1. DDL, DML & TCL SQL statements
2. Implementation of different constraints
3. Implementation of select clause with where, order by, between, like, not like, group by & having
4. Implementation of various SQL wildcard Characters
5. Implementation of referential integrity constraints
6. Implementation of various numeric & character functions
7. Implementation of Date data type & different date functions
8. Implementation of stored procedures
9. Implementation of user defined functions

10. Implementation of Triggers

**Text/Reference Books**


1. Database System Concepts. Silberschatz A., Korth H. F. & Sudarshan S. 5th Ed. McGraw-Hill. 2006.
2. Database Management Systems. Ramakrishnan R. & Gehrke J. 3rd Ed. McGraw-Hill. 2003.
3. Database Modeling & Design, Elmasri R., Navathe S. B. & Theorey T. J. 2nd Ed. Morgan Kaufmann Publishers. 1994.
4. Database Systems: The Complete Book. GarciaMolina H., Ullman J.D. & Widom J. 1st Ed. Pearson Education. 2007.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - III

## (Departmental Core Subject)

CS-252 L-T-P-C
Discrete Mathematical Structures 3-1-0-4

**Objective:** *The aim of this course is to enable students to develop logical & mathematical reasoning abilities & apply them in practice. This course covers elementary discrete mathematics for computer science & engineering. It emphasizes mathematical definition & proofs as well as applicable methods.*

**Course Content**

Propositional Logic: Language of Propositional logic, truth table, natural deduction.

Predicate logic: language of predicate logic, Logical inference with Quantifiers. Proof Techniques.

Combinatorics: Counting techniques: recurrence relation & its application to analysis of algorithm; Basic Discrete Probability, probabilistic counting.

Graph theory: Graph as a discrete structure, modeling applications using Graphs, Hamiltonian graphs, planar graphs, Graph coloring, Network flows, matching.

Algebra: Groups & Examples, Cosets & Normal subgroups, Lagrange theorem, cyclic groups, permutation groups, Finite Abelan groups, homomorphism, Matrix groups. Rings, Ideals, Firleds, Finite fields, Polynomial rings, Unique Factorization. Introduction to lattices & Boolean algebra.

**Text/Reference Books**


1. Concrete Mathematics. Graham R. L., Knuth D. E. & Patashnik O. 2nd Ed. Addison-Wesley. 1994.
2. Discrete Mathematics with Applications to Computer Science. Tremblay J.P. & Manohar R. P. Tata McGraw-Hill. 1997.
3. Elements of Discrete Mathematics. Liu C.L. 2nd Ed. Tata McGraw-Hill. 2000.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - III

## (Departmental Core Subject)

EC-252 L-T-P-C
Digital Electronics Circuits 3-1-1-5

**Objective:** *This course is develops the skill & knowledge required for designing digital circuits that are used in low cost, high speed, innovative & programmable devices for real time embedded applications*

**Course Content**

Switching algebra. Minimizing functions using maps, Minimization using QM method, Different logic families: TTL, ECL, I2L. NMOS, CMOS. Pass transistor logic. Combinational logic circuits: adders/subtractors, fast adder, magnitude comparator, multiplexer demultiplexers, encoders, decoders, ROMs, PLAs etc. Sequential logic circuits: flip flops & latches, shifters, counters. Finite state machine: state transition diagrams & state transition tables. HDL implementation. Asynchronous sequential Logic. Memory elements: ROM, PROM, RAM-SRAM, DRAM. Case studies: a simple computer, RTL a micro-instruction, instruction decoders timing & controller circuits, data path unit.

**List of Experiments**

1. Verification of basic & universal logic gates
2. Designing of half adder, full adder & verification of the truth tables using logic gates
3. Designing of half subtractor, full subtractor & verification of the truth tables using logic gates
4. Designing & implementation of code converter - I

5. Designing & implementation of code converter - II
6. Designing of 4-bit adder & subtractor & verification of the truth tables
7. Designing & implementation of magnitude comparator & verification of the truth tables
8. Designing & implementation of multiplexer & verification of the truth tables
9. Designing & implementation of demultiplexer & verification of the truth tables
10. Designing & implementation of encoder & verification of the truth tables

**Text/Reference Books**


1. Art of Electronics. Horowitz P. & Hill W. 2nd Ed. Cambridge University Press. 1989.
2. Digital Design. Mano M. M. Pearson Education. 2002.
3. The ARRL Handbook for Radio Communications- American Radio Relay League. 2008.
4. Electronic Instruments Handbook. Coombs C.F. McGraw-Hill. 2000.
5. The Circuit Designer's Companion. Williams T. Newnes. 2005.
6. Troubleshootting Analog Circuits. Pease R. Newnes. 1991.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - III

## (Humanities & Basic Sciences Subject)

HU-251 L-T-P-C
Business & Technical Communication 1-1-0-2

**Objective:** *To develop persuasive & professional communicative competence.*

**Course Content**

Presentation Skills: Types of presentation; Effective strategies for oral presentations - audience analysis; organizing contents & use of media; Awareness of body language, time & space; Tone, variety of pitch, rate, volume & Articulation.

Letter Writing: Essentials of an effective business letter, Types of business letters: Sales Letter, Complaint Letter, Claim & Adjustment Letters.

Technical Report Writing: Characteristics & structure of a formal report; Classification & types of reports; Organization, Analysis & Interpretation of data; Revising & Editing especially in areas like abstracting/ summarizing as well as citations, references & bibliographies, check list for reports.

**Text/Reference Books**


1. How to Prepare, Stage and Deliver Winning Presentations. Leech T. 2nd Ed. Prentice Hall. 2004.
2. Business Communication Today. Boove C & Thill J. 11th Ed. Prentice Hall. 2011.
3. Effective Technical Communication. Rizvi A. 11th Ed. Tata McGraw-Hill Publishing Company Ltd. 2005.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - III

## (Humanities & Basic Sciences Subject)

MA-252 L-T-P-C
Introduction to Algebra & Matrix Analysis 3-1-0-4

**Objective:** *This course will help the students to build a strong foundation in mathematics & develop abstract thinking skills.*

**Course Content**

Group theory: Product of sets; mappings & their compositions; Groups, subgroups, Normal subgroups, Factor subgroups ,Lagrange's theorem, Homomorphism & Isomorphism theorems, Permutation groups, Matrix groups, Abelian groups. Rings & Fields, Ideals, Homomorphism, Euclidean domains, Finite & Infinite fields, Polynomial rings Matrix rings.

Linear Algebra & Matrix Theory: Vector spaces, subspaces, direct sums, bases & dimension, Linear transformation, Matrix of the linear transformation, Change of basis, rank-nullity theorem. Eigen values & Eigen vectors, The Characteristic & Minimal polynomials, Diagonalization. Finite dimensional inner product spaces, Graham Schmidt orthogonolization process, Linear functional, Adjoints of linear operators. Self-adjoint & normal linear operators. Normal linear spaces, Examples of Banach & Hilbert spaces.

**Text/Reference Books**


1. Elementary linear algebra with applications. Anton H. 8th Ed. John Wiley. 1995.
2. Matrix and Linear Algebra. Dutta K. B. 7th Ed. PHI. 2006.
3. A first course in abstract algebra. Farleigh J. B. 7th Ed. Pearson Education. 2002.
4. Linear Algebra. Hoffmann K. & Kunze R. PHI. 1971.
5. Applied Linear Algebra. Olver P. J. & Shakivban C. 1st Ed. PHI. 2005
6. Linear algebra - A Geometric approach. Kumaresan S. 1st Ed. PHI. 2000.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - IV

## (Departmental Core Subject)

CS-253 L-T-P-C
Computer Architecture 3-0-2-5

**Objective:** *This course introduces the concepts of architectural design & coherent the functions of digital components used in the making of a computer system. Aim of this subject is to understand the concept of processing of computer & design of a computer machine.*

**Course Content**

Subsystems of a computer; Instructions & their formats; Assembly programming; Performance metrics; Performance comparison; Information representation; Integer & floating point arithmetic; Processor data path design; Control unit design; Microprogramming; Performance improvement with pipelining; Memory organization – cache & virtual memory; Input/output organization; Interrupts & DMA.

**List of Experiments**

1. Programs related to logic gates
2. Programs related to combinatorial circuit
3. Programs related to tri state buffer
4. Programs related to multiplexer
5. Programs related to Half Adder / Full Adder
6. Programs related to Half Subtractor / Full Subtractor
7. Programs related to code conversion like binary to gray codes etc.
8. Programs related to comparator
9. Programs related to multiplier

10. Programs related to encoders/decoders
11. Programs related to registers & counters
12. Programs related to Flip Flop

**Text/Reference Books**


1. Computer Organization and Architecture: Designing for Performance. Stallings W. 8th Ed. Pearson Education India. 2010.
2. Computer Organization and Design. Patterson D. A. & Hennessy J. L. 4th Ed. Morgan Kaufmann. 2008.
3. Structured Computer Organization. Tanenbaum A. S. 5th Ed. Prentice Hall of India. 2009.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - IV

## (Departmental Core Subject)

CS-254 L-T-P-C
Design Practices in Computer Science 0-1-2-3

**Objective:** *The course deals with the basics of UML & the SRS preparation and will enable the students to test applications & create Use case models & DFD etc.*

**Course Content**

Basic design methodology – introduction to the steps involved, Familiarization with software practices, tools & techniques, Software project involving conceptualization, design, analysis, implementation & testing using the tools & techniques learnt.

**List of Experiments**

1. Designing & development of SRS
2. Designing & development of Use case modeling
3. Designing & development of UML diagram
4. Designing & development of software testing using rational rose
5. Designing & development of class & object diagram
6. Designing & development of sequence diagram
7. Designing & development of collaboration diagram
8. Designing & development of Use case writing
9. Designing & development of DFD etc
10. Validation & verification testing
11. Black box & white box testing

**Text/Reference Books**


1. Software Testing Techniques. Beizer B. 2nd Ed. Dreamtech. 2003.
2. Fundamentals of Software Engineering. Rajib M. 4th Ed. PHI Publication. 2009.
3. Software Engineering: A Practitioners Approach. Pressman R. S. 7th Ed. McGraw-Hill. 2009.
4. Software Engineering. Sommerville I. 9th Ed. Addison Wesley. 2010.

**Detailed Syllabus for B. Tech. Degree Programme**
**in**
**Computer Science & Engineering**

## Semester - IV

## (Departmental Core Subject)

CS-255 L-T-P-C
Programming Languages 3-0-2-5

**Objective:** *The basic thrust of this course will be on learning the distinctive techniques in the different paradigms & what semantic & compiling issues come up in the various languages considered. The course introduces imperative languages, functional programming, declarative programming & semantics of object-oriented programming.*

**Course Content**

Imperative Languages: block structure, scope rules, parameter passing, constructs like co-routines, tasks etc.

Functional programming: functions, recursion, macros, user-defined control constructs, higher order constructs, types, data abstraction, polymorphism, semantics, implementation issues.

Declarative programming: declarative programming, Horn clauses, procedural interpretation of Horn clauses, SLD-resolution including unification, the logical variable, implementation issues: abstract machines & compiling to abstract machines.

Object-oriented programming: objects & programming with objects, classes & instances, hierarchies & inheritance, encapsulation, semantics of OO languages & implementation issues.

**List of Experiments**

1. Case study of procedural Programming languages
2. Case study of functional Programming languages
3. Case study of declarative Programming languages

4. Programs related to classes & objects
5. Programs related to constructors & destructors
6. Programs related to operator overloading & type conversion
7. Programs related to Inheritance
8. Programs related tovirtual functions & polymorphism
9. Programs related to managing data files
10. Programs related to exception handling

**Text/Reference Books**


1. Programming Languages Concept and Paradigms. Watt D. A. Prentice-Hall. 1990.
2. Programming Language Design Concepts. Watt D. A. Wiley. 2004.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - IV

## (Humanities & Basic Sciences subject)

MA-254 L-T-P-C
Introduction to Probability Theory & Stochastic Processes 4-0-0-4

**Objective:** *The main objective of this course is to make the students familiar with probability theory, statistics & random processes which have applications in Computer Science & Engineering, Electronics & Communication Engineering.*

**Course Content**

Axioms of probability, Probability space, conditional probability, independence, Baye's rule, Repeated trials, Bernoulli trials, Random variables: discrete r.v., probability mass functions, c.d.f., common distributions, continuous r.v., probability density & distributions of r.v., joint distributions, order statistics, expectation; moments, transforms, conditional expectations, stochastic processes, Markov chains & Markov processes (birth, death, etc.), Queuing models.

**Text/Reference Books**


1. Stochastic Processes. Medhi J. 3rd Ed. New Age International. 2009.
2. A First Course in Probability. Ross S. 6th Ed. Pearson Education India. 2002.
3. An Introduction to Probability Theory and its Applications. Feller W. 3rd Ed. Wiley. 1968.
4. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Trivedi K. S. 2nd Ed. Wiley India. 2008.
5. Stochastic Processes. Ross S. M. 2nd Ed. Wiley. 1996.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - V

## (Departmental Core Subject)

CS-350 L-T-P-C
Operating Systems 3-0-2-5

**Objective:** *The objective of this course is to cover the underlying concepts of operating system & practical implementation of various algorithms of operating system using programming language. This syllabus provides a comprehensive introduction of operating system, process management, memory management, file management, I/O management, protection & security issues & case study of various operating systems.*

**Course Content**

Overview: functions of Operating Systems, layered architecture basic concepts; interrupt architecture, system calls & notion of process & threads; synchronization & protection issues; scheduling; memory management including virtual memory & paging techniques; input-output architecture & device management; file systems; distributed file systems. Case studies of Unix, Windows NT, Design & implementation of small operating systems.

**List of Experiments**

1. Hardware & Software requirement of different operating system
2. Programs related to command line argument to make OS commands
3. Various DOS commands & practicing commands on command window
4. Various UNIX commands & practicing commands on terminals
5. Shell scripts & writing shell programs
6. Programs related to CPU scheduling
7. Programs related to deadlock in operating system

8. Programs related to memory allocation algorithms
9. Programs related to virtual memory (Page Replacement Algorithm)
10. Programs related to disk management

**Text/Reference Books**


1. Operating System Concepts. Silberschatz A. & Galvin P. B. 8th Ed. Wiley. 2008.
2. Operating Systems: Internals and Design Principles. Stalling W. 6th Ed. Pearson. 2008.
3. Modern Operating System. Tanenbaum A. S. 3rd Ed. Pearson. 2007.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - V

## (Departmental Core Subject)

EC-360 L-T-P-C
Introduction to Signals & Systems 3-0-1-4

**Objective:** *The subject deals with the concepts of signals & systems involving system representation techniques along with state-space representations. It is also showing various mathematical representation, like Fourier, Laplace & z-transform & their interpretations for various types of signals & systems.*

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**Course Content**

Classification of signals & systems, various system representation techniques, Differential, Difference & state-space representations.

Fourier transforms & series, application to analysis of systems, Laplace transform, its properties, & its application to system analysis, Z-transforms, its properties & applications, Random variables & random process, characterization of random variables & random process, linear systems & random signals.

**List of Experiments**

1. Program to generate the basic signals & observe these waveforms.
2. Program to find the convolution of two given functions.
3. Program to find the autocorrelation & cross correlation for any given signals.
4. Program to find the sampling of various continuous time signals.
5. Program to generate an LTI system function for the given poles & zeros & find its impulse response & step response.
6. Program to generate an LTI system function for the given coefficients of numerator & denominator & plot its response for the given input signal.

7. Program to find the Fourier transform of a square wave.
8. Program to find the Fourier series of a sine wave.
9. Program to find the Laplace transform of a triangular wave.
10. Program to study the z-transform & inverse z-transform.

**Text/Reference Books**


1. Signals Systems, Transforms. Charles L. P. & Eve A. 5th Ed. Pearson Education. 2013.
2. Signals and systems. Oppenheim, Willsky & Nawab. 2nd Ed. Prentice – Hall India. 2010.
3. Signals and Systems. Haykin S. & Van V. 2nd Ed. Wiley India. 2007.
4. Digital Signal Processing. Salivahanan S., Vallavaraj A. & Gnanapriya C. 1st Ed. Tata McGraw Hill. 2000.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VI

## (Departmental Core Subject)

CS-357 L-T-P-C
Computer Networks - I 3-0-2-5

**Objective:** *Upon completing the course, the student will be familiar with the basics of data communication & various types of computer networks, understand the challenges of network communication & the operation of the protocols that are used inside the internet. The students will also learn design of communication protocols, the OSI model & TCP/IP protocol suite model, different types of network topologies.*

**Course Content**

Fundamentals of Digital Communications, including channel capacity, error rates, multiplexing, framing & synchronization. Broadcast network & multi-access protocols, including CSMA/CD. Data link protocols, network protocols including routing & congestion control, IP protocol. Transport protocol including TCP. Network application services & protocols including email, www, DNS. Network security & management.

**List of Experiments**

1. Basic configuration of various network connecting devices
2. Basics of routing & switching
3. Configuration of VLAN,VTP & STP
4. IPv4 & IPv6 addressing concepts & implementation using network topologies
5. Configuration & verification of static & dynamic routing (RIP, EIGRP, OSPF)
6. Configuration & verification of inter VLAN routing (router on a stick)
7. Configuration & verification of DHCP, ACL & NAT

**Text/Reference Books**


1. Computer Networks: A Systems Approach. Peterson L. L. & Davie B. S. 4th Ed. Elsevier India. 2007.
2. Computer Networks. Tanenbaum A. S. 4th Ed. Pearson India. 2003.
3. Computer Networking: A Top Down Approach. Kurose J. F. & Ross K. W. 3rd Ed. Pearson India. 2005.
4. Internetworking with TCP/IP Vol. 1. Comer D. E. 5th Ed. Prentice Hall of India. 2006.
5. An Engineering Approach to Computer Networking. Keshav S. 1st Ed. Pearson India.1999.
6. Data Communications and Networking. Frouzen B. 4th Ed. Tata McGraw-Hill. 2006.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VI

## (Departmental Core Subject)

CS-358 L-T-P-C
Theory of Computation 3-1-0-4

**Objective:** *The objective of this course is to enable the students to understand the theoretical computer science covering the aspects of automata theory, grammars, complete problems ad NP-Completeness.*

**Course Content**

Regular Languages, Finite Automata, equivalence, minimization, Myhill-Nerode Theorem, introduction to non-determinism, Context free grammars, Pushdown automata, equivalence & applications. Turing machines, Recursive & Recursively enumerable sets, non-determinism, RAMs & equivalence, Universal Turing Machines, undecidability, Rice's theorems for RE sets, Post machines, Basics of Recursive function theory. Equivalence, Church's thesis, computational complexity, space & time complexity of Turing Machines, Relationships, Savage's theorem, Complexity classes, Complete problems, NP-completeness, Cook-Levin theorem.

**Text/Reference Books**


1. Introduction to the theory of Computation. Siper M. & Thomson. 3rd Ed. Cengage learning. 2013.
2. Introduction to Automata Theory, language and computation. Hopcraft J. E. & Ullman J. D. Special Indian student edition. Narosa Publishing House. 1979.
3. Theory of Computer science (Automata, Language and Computation). Mishra K. L. P. & Chandrasekaran N. 3rd Ed. PHI. 2014.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VI

## (Departmental Core Subject)

CS-359 L-T-P-C
Analysis & Design of Algorithms 3-0-1-4

**Objective:** *The course entails techniques to solve computational problems by efficient means of algorithm. The aim is to maintain optimum time complexity too. Fundamental design methodologies & their implementation, search techniques, dynamic programming, randomized techniques, algorithms for set manipulations, graph algorithms with implementation issues, NP-Completeness & reductions, approximation algorithms play a pivotal role in this course.*

**Course Content**

RAM model & complexity; O (log n) bit model, integer sorting & string sorting. Review of fundamental data structures; Red-black trees, merge able heaps, interval trees. Fundamental design methodologies & their implementations; Search Techniques, Dynamic Programming, Greedy algorithms, Divide-and-Conquer, Randomized techniques. Algorithms for set manipulations, their implementations & applications; Union-Find Randomized data structures; Skip lists, Universal Hash functions, Graph Algorithms with implementation issues; Depth-First Search & its applications, minimum Spanning Trees & Shortest Paths. Convex hulls, sorting, Selection Matrix multiplication, pattern matching, integer & polynomial arithmetic, FFT, introduction to the theory of lower bounds, NP-Completeness & Reductions. Approximation algorithms.

**List of Experiments**

1. Time complexity, Big O notations, worst, best, average case
2. Time complexity of sorting algorithms (Insertion, quick, merge sort)

3. Concepts of dynamic programming
4. Programs related to travelling salesperson problem using dynamic programming
5. Programs related to divide & conquer technique
6. Programs related to sorting algorithms using divide & conquer technique
7. Programs related to greedy algorithms
8. Programs related to knapsack problem using greedy method
9. Programs related to 8 queen's problem using the backtracking
10. Program related to Floyd's algorithm
11. Programs related to BFS, DFS, Dijkastra, Bellman Ford algorithms
12. Programs related to graph colouring problem
13. Programs related to string matching algorithms
14. Programs related to spanning tree algorithms (Prim's &Kruskal's)

**Text/Reference Books**


1. The Design and Analysis of Computer Algorithms. Aho A., Hopcroft J. & Ullman J. Pearson. 2002.
2. Algorithm Design. Kleinberg J. & Tardos E. Addison-Wesley Publishing Co. 2005.
3. Data Structures and Algorithm Analysis. Weiss M.A. 2nd Ed. Addison-Wesley Publishing Co. 1998.
4. Computer Algorithms: Introduction to Design and Analysis. Basse S. & Gelder A. V. 3rd Ed. Pearson.1999.

**Detailed Syllabus for B. Tech. Degree Programme**
**in**
**Computer Science & Engineering**

**Semester - VI**

**(Departmental Core Subject)**

EC-357 L-T-P-C
Embedded Systems 3-0-1-4

**Objective:** *Embedded system provides cost effective solution for industrial, consumer & space applications. The objective of teaching this course to the student is to train them to learn all aspects of hardware & software development to design embedded system for various applications*

**Course Content**

Introduction to embedded systems with examples, embedded system design & modeling with unified markup language (UML).ARM processor fundamentals: Introduction to microprocessors & microcontrollers, 8-bit & 16- bit, von Neumann & Harvard architectures, CISC & RISC architectures, open source core (LEOX), ARM versions, ARM instruction set: programming model, assembly language, Thumb instruction set, memory organization, data operations & flow control. CPUs: Input/output mechanisms, isolated & memory mapped IO; interrupts & real time operations, ARM interrupts vectors, priorities & latency; supervisor modes, exceptions, traps, co-processors; cache memory & memory management. Embedded Platforms: CPUs: bus protocols, system bus configuration, USB & SPI buses, DMA, ARM bus; memory devices: memory device configuration, ROM, RAM, DRAM; I/O devices: timers, counters, ADC & DAC, keyboards, displays & touch screens. Processes & Operating Systems: multiple tasks & multiple processes; process abstraction; context switching: cooperative multitasking, preemptive multitasking, process & object-oriented design; operating systems & RTOS; scheduling polices; inter-process communication. Networks: distributed embedded architectures: networks abstractions, hardware

&software architectures; networks for embedded systems: I2C bus, CAN bus; examples. Case studies: Inkjet printer, telephone exchange, etc.

**List of Experiments**

1. Assembly language program related to assembler directives & factorial calculations
2. Assembly language program related to swapping of register contents, compare & loop , shifting of data
3. Assembly language program related to addition of two 32-bit numbers use of subroutine
4. Assembly language program related to copy block
5. Assembly language program related to hex to ASCII conversion
6. Assembly language program related to larger of two numbers
7. Assembly language program related to GPIO programming
8. Assembly language program related to copy word & stack operation

**Text/Reference Books**


1. Computers as components: Principles of embedded computing system design. Wolf W. 2nd Ed. Elsevier. 2008.
2. Product data sheet LPC 2141/42/44/46/48. NXP Semiconductors.
3. ARM7TDMI Technical Reference Manual. ARM Limited.
4. The art of designing embedded systems. Jack G. 2nd Ed. Elsevier. 2008.
5. Programming Embedded Systems in C and C++. Michael B. O'Really. 1999.
6. C Programming for Embedded Systems. Kirk Z. CMP Books. 2000.

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**Computer Science & Engineering**

## Semester - VII

## (Departmental Core Subject)

CS-451 L-T-P-C
Compiler Design 3-0-1-4

**Objective:** *This course discusses principles & techniques involved in the designing of analysis & synthesis phases of compilation .It also entails design & implementation of a lexical analyzer, syntax analyzer, semantic analyzer, code generation schemes ,type checking & for the optimization of codes & run-time environment.*

**Course Content**

Compilers & translators; lexical & syntactic analysis, top-down & bottom up parsing techniques; internal form of source programs; semantic analysis, symbol tables, error detection & recovery, code generation & optimization. Type checking & static analysis. Algorithms & implementation techniques for type-checking code generation & optimization. Students will design & implement translators, static analysis, type checking & optimization.

**List of Experiments**

1. Implementation of various types of regular expressions
2. Implementation of pattern matching operation, string operation for various expressions
3. Implementation of parenthesis from a file
4. Implementation & identification of various types of tokens from a file
5. Implementation & redefining the macro yymore() as a function
6. Implementation of lexical analyzer
7. Simulation of a calculator

8. Conversion of an infix expression to prefix expression, evaluation of prefix & postfix expressions
9. Implementation of parser for the grammar in arithmetic expression
10. Implementation of predictive parsing
11. Implementation of LR-parsing
12. Implementation of intermediate code generation

**Text/Reference Books**


1. Compilers Principles, Techniques and Tools. Aho A. V., Lam M. S., Sethi R. & Ullman J. D. 2nd Ed. Pearson. 2009.
2. Principles of Compiler Design. Aho A. V. & Ullman J. D. Narosa Publishing House. 1999.
3. Compiler Design in C. Holub A. I. 2nd Ed. Prentice-Hall of India. 2008.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - VII

## (Departmental Core Subject)

CS-452 L-T-P-C
Computer Networks - II 3-0-2-5

**Objective:** *This course is intended to provide students with a clear understanding of the state of the art in computer network systems & protocols in some depth, including both abstract & concrete aspects of high speed networks & wireless standards.*

**Course Content**

Review of the internet architecture, layering; wired & wireless MAC; intra & inter-domain internet routing, BGP, MPLS, MANETs; error control & reliable delivery, ARQ, FEC, TCP, congestion & flow control; QoS, scheduling; mobility, mobile IP, TCP & MAC interactions, session persistence; multicast; Internet topology, economic models of ISPs/ CDNs/content providers; future directions.

**List of Experiments**

1. Advanced configuration of various network connecting devices
2. Study of enhanced features of Routing & Switching
3. Configuration of RSTP, PVST
4. Recognition of high availability (FHRP) such as VRRP, HSRP, GLBP
5. Configuration of advanced routing using IPv4 & IPv6 (RIPng, EIGRP, Single & Multi-area OSPF)
6. Configuration & verification of Ether channel, SNMP, NTP, PPP
7. Configuration & verification frame relay & MPLS

**Text/Reference Books**


1. Computer Networks: A Systems Approach. Peterson L. L. & Davie B. S. 4th Ed. Elsevier India. 2007.
2. Computer Networks. Tanenbaum A. S. 4th Ed. Pearson India. 2003.
3. Computer Networking: A Top Down Approach. Kurose J. F. & Ross K. W. 3rd Ed. Pearson India. 2005.
4. Internetworking with TCP/IP Vol. 1. Comer D. E. 5th Ed. Prentice Hall of India. 2006.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - VII

## (Departmental Core Subject)

CS-463 L-T-P-C
Programming Concepts 0-0-1-1

**Objective:** *This course is designed to provide knowledge of the essential features of C, C++, Java & Excel.*

**Course Content**

Decision making statement & operator based programs, Loop based programs, Multi way decision making statement based programs, Array, String, Function, Structures, Pointers, Files, Imperative Languages, Functional programming, data abstraction, polymorphism, semantics, implementation issues, Declarative programming, Object-oriented programming with objects, classes & instances, Programming concepts in JAVA , advanced applications in Excel

**List of Experiments**

1. Decision making statement & operator based programs
2. Loop based programs
3. Multi way decision making statement based programs
4. Array & string based programs
5. Function based programs
6. Structure based programs
7. Pointers based programs
8. File handling based programs
9. Programs related to classes & objects
10. Programs related to constructors & destructors

11. Programs related to operator overloading & type conversion
12. Programs related to Inheritance
13. Programs related tovirtual functions & polymorphism
14. Programs related to managing data files
15. Programs related to exception handling
16. Programs related to class, objects, command line argument, polymorphism, inheritance & function overriding
17. Programs related to following access controls w.r.t. to class: private, no modifier, protected, public
18. Programs related to various I/O classes, interfaces & functions
19. Programs related to synchronization
20. Hands on practical's in Excel

**Text/Reference Books**


1. A Book on C. Kelly A. & Pohl I. 4th Ed. Pearson Education. 1999.
2. The C Programming Language. Kernighan B. & Ritchie D. 2nd Ed. Prentice Hall of India. 1988.
3. C: The Complete Reference. Schildt H. 4th Ed. Tata McGraw-Hill. 2000.
4. Programming Languages Concept and Paradigms. Watt D. A. Prentice-Hall. 1990.
5. Programming Language Design Concepts. Watt D. A. Wiley. 2004.
6. Core Java(TM), Volume I and II (Sun Core Series). Horstmann C. S. & Cornell G. 9th Ed. 2012.
7. Java How to Program. Deitel H. M & Deitel P. J. 7th Ed. Prentice Hall. 2007.
8. The Complete Reference: Java. Schieldt H. 9th Ed. Tata McGraw-Hill. 2014.

## Detailed Syllabus for B. Tech. Degree Programme
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## Computer Science & Engineering

## Semester - VII

## (Departmental Core Subject)

CS-450 L-T-P-C
Summer Internship 0-0-0-3

Summer Internships offer students personal & real world spirits & exposes to an actual working life, an experiential foundation to their career choices & the chance to build valuable business networks. Under this programme each student undergoes training in an Industry for a minimum period of six weeks during the summer vacation after VI Semester. Through the internship students are exposed with the various processes involved at any typical industrial unit such as, operating procedure, construction processes, management procedures etc. & have the opportunity to relate with the knowledge they acquired in the classroom. Students execute a small project based on any of the above mentioned aspects under the supervision of competent personnel in the industry & a faculty member of the university.

After completion of the Internship, students are required to prepare a report, based on the activities performed during the internship, as per the prescribed format/ guidelines. The report should be certified by the Supervisors, & presented in the form of a seminar in the VII Semester.

Evaluation of the Summer Internship will be done as per the approved procedure.

## Detailed Syllabus for B. Tech. Degree Programme
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## Computer Science & Engineering

## Semester - VII

## (Departmental Core Subject)

CS-455 L-T-P-C
Comprehensive Viva Voce 0-0-0-2

The knowledge gained by the students during their B.Tech. programme will be evaluated through a Comprehensive Viva Voce Test in the VII Semester. The test will cover the entire syllabi of the B.Tech. degree programme. Preparation for the Comprehensive Viva Voce Test will also help the students in their placement activities. The evaluation will be done as per the approved procedure.

## Detailed Syllabus for B. Tech. Degree Programme
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## Computer Science & Engineering

## Semester - VII

## (Departmental Core Subject)

CS-460 L-T-P-C
Minor Project 0-0-3-3

Students undertake project work to develop the skill & aptitude of problem-solving. The project work is divided into two parts: Minor & Major. The Minor project is to be undertaken in the VII Semester.

Students will choose an area of their interest in consultation with a faculty member of the department, who will act as the Supervisor. The area of interest could be confined to his/her discipline or may be interdisciplinary.

The project work will involve all or some of the following processes: identification of problem, study of related literature, data collection & analysis, theoretical formulation, fabrication, experimentation & result analysis.

The preliminary work such as problem identification through literature survey, field survey etc. & preparation of plan of execution should be complied in the form of a report, in the prescribed format/ guidelines. The report, duly certified by the Supervisor, should be submitted to the Head of the Department.

Progress made by students will be continuously monitored & evaluated as per the approved procedure.

## Detailed Syllabus for B. Tech. Degree Programme
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## Computer Science & Engineering

## Semester - VII

## (Departmental Core Subject)

IN-454 L-T-P-C
Internet of Things 0-0-3-3

**Objective:** *The explosive growth of the "Internet of Things (IoT)" is changing our world & the rapid drop in price for typical IoT components is allowing people to innovate new designs & products at home & office environment. This course provides an overview of key concepts & challenges related to digital transformation. The course examines the evolution of the Internet & how the interconnection of people, processes, data & things is transforming every industry. In this course, the importance of IoT in society, the current components of typical IoT devices & trends for the future, IoT design considerations, constraints & interfacing between the physical world &IoT devices will be covered. The course all covers how to make design trade-offs between hardware & software, key components of networking to ensure that students understand how to connect their device to the Internet. This course help students to understand the concepts of Internet of Things so that they can be able to build IoT applications.*

**Course Content**

Introduction – Concepts & Technologies behind Internet of Things (IOT): Welcome to IoT, Elements of IoT, Introduction to the IoT Systems, Introduction to configuring things, Network of physical objects embedded with sensing, Programming in IoT, Prototyping, systems & interconnection, Prototyping ideas for IoT& study with case studies, Embedded Systems, Computer Networks, M2M (Machine to Machine Communication, Internet of Everything (IOE), Concepts & Definitions: Identification, localization, wireless protocols, data storage &security; Collecting, communicating, coordinating, & leveraging the data from connected devices; Understand how to develop & implement IOT

technologies, solutions, & applications. Machine Learning, Distributed Computing, Artificial Intelligence, Transitioning to the IoT, IoT connections, Implementing an IoT solution, security in IoT, Modeling an IoT solution, M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, M2M to IoT – A Market Perspective – Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain & global information monopolies, A use case example, Differing Characteristics.

IOT Reference Architecture: Internet of Things computing & communication capabilities, State of the art Architecture, Reference Model & architecture, IoT reference Model, IoT Reference Architecture, Design & develop IOT devices, IOT Network Architecture, IOT Device Architecture, IOT Application Architecture, Client Server vs Publish Subscribe Architecture, Internet of Things (IoT) & Web of Things (WoT), Internet & Web Layering, Business Aspects of the Internet of Things, Functional View, Information View, Deployment & Operational View, Other Relevant architectural views, M2M to IoT – An Architectural Overview – Building an architecture, Main design principles & needed capabilities, An IoT architecture outline, standards considerations, M2M &IoT Technology Fundamentals - Devices & gateways, Local & wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M &IoT Analytics, Knowledge Management

IOT Device Design: Embedded systems design constraints, Energy, Sensors: Classification & selection criteria based on nature, frequency & amplitude of signal. Embedded Development Boards: Arduino, Raspberry Pi, Intel Galileo, ESP8266, BeagleBone black, NodeMCU, mBed, UDOO Neo. Interfacing peripherals & Programming GPIOs: Input/output peripherals, Sensor modules, Design Considerations: Cost, Performance & Power Consumption tradeoffs, Real-World Design Constraints, Technical Design constraints, Data representation & visualization, Interaction & remote control.

IOT Communication Protocols: Protocols for IOT devices, WiFi, Bluetooth, ZigBee& 2G/3G/4G cellular, Wired Communication Protocols: UART, USART, I2C, SPI, Industrial Automation, Service-oriented architecture-based device integration, Wireless Communication Protocols: Bluetooth, Zigbee, 6lowPAN, WiFi, Networking Protocols:

OSI Reference Model, TCP/IP, Ethernet. Application Protocols: HTTP, Web sockets, MQTT, CoAP.

Cloud Computing: Cloud computing for IoT, Computing & storage capabilities, Concept & Architecture of Cloud, Role of Cloud Computing in IOT, Tools, API & Platform for integration of IOT devices with Cloud, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.

Optimizing power consumption of IOT Devices: Power consumption of IoT, hardware components, application & communication protocols, configuring extended battery life, Performance & power consumption, Selections of MCUs & communication interfaces, Power management plan of the IOT device addressing complexities at various level, Application's complexities, Computing system's complexities – Microprocessor architecture, Communication system's complexities.

IOT Analytics: IoT real-time data analytics, IOT data streams & databases, Tracking & managing of IoT assets, Representational State Transfer (REST) & Activity Streams, Making Things Smart: Getting Things onto the Internet, Business Cases & Concepts, Business Issues & Models, Persuasive Technologies & Behavioral Change, Big Data & Semantic Technologies. Data Analytics, Data Visualization & tools in IOT, Predictive modeling & analysis, Machine learning & Virtual Reality Systems (VRS), Commercial Building Automation- Introduction, Case study: phase one-commercial building automation today, Case study: phase two-commercial building automation in the future.

**List of Experiments**

1. Introduction to IoT devices
2. Characteristics of IoT devices
3. Physical design of IoT devices
4. Logical design of IoT
5. Functional blocks of IoT devices
6. Communication models & APIs
7. Bay Area Rapid Transit (BART) API using Python, JavaScript & jQuery
8. Introduction to Software define Network (SDN)
9. Network & Communication aspects of IoT

10. Wireless medium access issues of IoT
11. MAC protocol survey & Survey routing protocols
12. Sensor deployment & Node discovery of IoT
13. Data aggregation & dissemination of IoT
14. Design challenges in IoT
15. Development challenges in IoT
16. Security challenges in IoT
17. Domain specific applications of IoT
18. Home automation using IoT
19. Industry applications using IoT
20. Surveillance applications using IoT
21. Introduction to different IoT tools
22. Developing applications through IoT tools
23. Developing sensor based application through embedded system platform
24. Implementing IoT concepts with python
25. Analyze IoT Process using controlled system
26. Open & closed loop control system
27. Process diagram of IoT using sensors, actuators & Microcontrollers
28. Power plant Earthquake Emergency Shutdown System - Case study on IoT
29. Record sunrise & sunset using IFTTT - case study on IoT application development
30. Representational State Transfer (REST) & Activity Streams
31. Project work on IoT

**Text/Reference Books**


1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence. Holler J., Tsiatsis V., Mulligan C., Avesand S., Karnouskos S. & Boyle D. 1st Ed. Academic Press. 2014.
2. Internet of Things (A Hands-on-Approach). Madisetti V. & Bahga A. 1st Ed. VPT 2014.
3. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything. daCosta F. 1st Ed. Apress Publications. 2013.
4. Fundamentals of Wireless Sensor Networks: Theory and Practice. Dargie W. & Poellabauer C.

## Detailed Syllabus for B.Tech Degree Programme
## in
## Computer Science & Engineering

## Semester - VII

## (Humanities & Basic Sciences Subject)

| | |
|---|---|
| HU-451 | L-T-P-C |
| Interview Skills | 0-0-1-1 |

**Objective:** *To understand the intricacies of interview & develop skills to perform satisfactorily.*

**Course Content**

SWOT Analysis.

Significance of Etiquette, Grooming, Kinesics, Paralanguage & Proxemics in interviews.

Résumé, Cover letter, Thank you Letter, Job Acceptance Letter.

Interview types, Open-ended, Behavioural & Hypothetical questions, FAQs.

Group Discussion & Interview sessions.

**Text/Reference Books**


1. How to Succeed in Group Discussions and Personal Interviews. Mandal S. Jaico Publishers. 2004.
2. Cover Letters. Fein R. Jaico Publishers. 2005.
3. The Definitive Book of Body Language. Barbara P. Manjul Publishing House Pvt. Ltd. 2013.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VII

## (Humanities & Basic Sciences Subject)

MA-454 L-T-P-C
Quantitative Aptitude 0-1-0-1

***Objective:*** *To introduce certain topics from quantitative aptitude with emphasis on analytical ability & computational skills needed in competitive examinations. This module would also train the students to solve quantitative aptitude problems during the placement drives.*

**Course Content**

Problems on Alligation or mixture. Problems on Ages. Problems on Clock. Problems on Calendar. Problems on Speed, Time & distance. Problems on Time & Work. Problems on Heights & distances. Problems on Trains. Problems on Boats & Streams. Problems on Pipes & Cisterns.

**Text/Reference Books**


1. Quantitative Aptitude. Aggarwal R. S. S. Chand. 2012.
2. Quantitative Aptitude. Trishna Knowledge Systems. Pearson. 2014.

## Detailed Syllabus for B. Tech. Degree Programme
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## Computer Science & Engineering

## Semester - VII

## (Management Subject)

BM-451 L-T-P-C
Ethics & IPR 2-0-0-2

**Objective:** *The aim of this course is to sensitize students towards professional ethics, values & associated aspects. It initially addresses concerns relating to product & service quality & then moves on to ethical aspects of organizational functioning. The course throws light on ethical issues & crimes that are likely to remain at the core of corporate concerns & discusses intellectual property related issues that are the need of modern industrial & business enterprises.*

**Course Content**

Role of Corporations: Some big changes in the world in last 60 years (WW II, GATT, WTO) & impact on business, Need for strategic planning & process management, Business strategies & challenges in leading global organizations.

Quality Management: Quality as a strategic imperative, Evolution of quality management, Distinction between quality control, quality assurance & quality management, International standards (ISO family of standards) & International models for quality management, quality in services, enhanced focus on accreditation, the accreditation process, standards for key services (food processing: HACCP & education: NAAC).

Ethics & Human Values: Ethics & morals values, Ethical theories, Common features of unethical companies & leaders, Professional ethics, Professional Codes of Ethics, Benefits & limitations of code of ethics, Corporate social responsibility & its business implications.

Intellectual Property Issues: Protecting the intangible, Evolution of knowledge as property, What are Intellectual property rights, Classification of intellectual property, Role of WTO & WIPO, The patenting process, Patent infringement, Copyrights, Requirements for registration of a copyright, Copyright infringement. Fair use of copyrighted material, Trade secrets, Reverse engineering, Protecting software.

Environmental & Health Concerns: Introduction, Manufacturing in the 21st century, Resource conservation, the social costs of environmental destruction (land, water & air pollution), ISO 14000 standards & approaches to environmentally friendly technology, carbon trading, international treaties & their limitations.

**Text/Reference Books**


1. Managing intellectual Capital: Organizational, Strategic and Policy Dimensions. Teece D. J. Oxford University Press. 2000.
2. Profiting from Intellectual Capital: Extracting Value from Innovation. Sullivan P.H. John Wiley. 1998.
3. Intellectual property law in India. Narang P.S. Georgia Law Agency. 2001.
4. ISO 9000 Quality systems Handbook. Hoyle D. 6th Ed. A Butterworth-Heinemann Title. 2009.
5. Implementing ISO 9000: 2015. Purushothama B. Edited. WPI Publishing. 2014.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - VIII

## (Departmental Core Subject)

CS-470 L-T-P-C
Major Project 0-0-4-4

After completion of the Minor Project, students shall undertake the Major Project in the VIII Semester. The idea conceived in the Minor Project shall be executed in this semester under the supervision of the faculty member. Students shall complete the practical aspect of the project. Thereafter they will prepare a report, as per the prescribed format/ guidelines, incorporating the results, their analysis and interpretation. The report, duly certified by the Supervisor, should be submitted to the Head of the Department.

Progress made by the student will be continuously monitored and evaluated as per the approved procedure.

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## Semester - IV

## (Departmental Elective - I)

CS-256 L-T-P-C
JAVA Programming 3-0-2-5

**Objective:** *This course is designed to provide knowledge of the essential features of Java. This course also provides the skills required to use Java libraries in order to develop efficient applications.*

**Course Content**

Overview of Java: Fundamentals of Java technology, analyzing & executing a simple Java technology application, Define modeling concepts: abstraction, encapsulation & packages, code reusability, define class, member, attribute, method, constructor & package, Scope & life time of a variable, invoking a method on a particular object, API online documentation Identifiers, Keywords, Types & Flow Control, Arrays: comments, valid & invalid identifiers, keywords, eight primitive types, literals, primitive variable & reference variable, variable declaration, Object creation, initialization, reference variables, instance & local variables, initialization of an instance variables, operators, legal & illegal assignments of primitive types, boolean expressions & their requirements in control constructs, assignment compatibility & required casts in fundamental types, use if, switch, for, while & do constructions & the labeled forms of break & continue as flow control structures in a program. Declare & create arrays of primitive, class, or array types, array initialization, multidimensional array, copying one array to another.

Classes & inheritance: Class fundamentals, declaring objects, assigning object reference variables, constructor & method overloading, static variables, methods & initializers, final classes, final methods & final variables, enumerated types, abstract classes & methods, the this keyword, garbage collection, using objects as parameters,

argument passing, returning objects, recursion, Inheritance basics, using super, creating a multilevel hierarchy, method overriding, dynamic method dispatch, using abstract, using final with inheritance, the object class.

Packages, Interfaces, Exceptions & Assertions: Packages, access protection, importing packages, interfaces, define exceptions, use of try, catch & finally statements, exception categories, common exceptions, defining own exceptions, assertions, appropriate & inappropriate uses of assertions, enable assertions at runtime

Multithreading: Define a thread, creating separate threads, controlling the code & data that are used by that thread, thread execution, difficulties when multiple threads share data, inter thread communication, synchronization.

Console I/O & File I/O: Fundamentals of I/O: command-line arguments & system properties, Properties class, construct node & processing streams, serialize & deserialize objects, steams for reading & writing. Read & writing data from the console, describe files & file I/O

Collections & Generics Framework: Describe the general purpose implementations of the core interfaces in the Collections framework, map interface, the legacy collection classes, Comparable & Comparator interfaces, generic collections, type parameters in generic classes, Refactor existing non-generic code

GUIs Using the Swing API & Events: JFC Swing technology, define swing, swing packages, containers, components & layout managers, top-level, general-purpose & special purpose properties of container, swing single-threaded model, building a GUI using Swing components. Define events & event handling, Java SE event model, GUI behavior, event listeners, concurrency in Swing-based GUIs, SwingWorker class

Networking: Code to set up the network connection, TCP/IP, use of ServerSocket & Socket classes to implement TCP/IP clients & servers

**List of Experiments**

1. Programs related to class, objects, command line argument, polymorphism, inheritance & function overriding
2. Programs related to super keyword
3. Programs related to constructors, this keyword, abstract class & final keyword

4. Programs related to packages, sub packages & interface
5. Programs related to following access controls w.r.t. to class: private, no modifier, protected, public
6. Programs related to following exception handlers: try-catch, try-finally, try-catch-finally, throws & throw
7. Programs related to different String & StringBuffer/StringBuilder methods
8. Programs related to various I/O classes, interfaces & functions
9. Programs related to serializable & transient
10. Programs related to different methods of URL & InetAddress class
11. Programs related to TCP & UDP
12. Programs related to various AWT & Swing components
13. Programs related to multithreading using Thread class & Runnable interface
14. Programs related to synchronization

**Text/Reference Books**


1. Core Java(TM), Volume I and II (Sun Core Series). Horstmann C. S. & Cornell G. 9th Ed. 2012.
2. Java How to Program. Deitel H. M & Deitel P. J. 7th Ed. Prentice Hall. 2007.
3. The Complete Reference: Java. Schieldt H. 9th Ed. Tata McGraw-Hill. 2014.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - IV

## (Departmental Elective - I)

CS-263 L-T-P-C
Linux and Shell Programming 3-0-2-5

**Objective:** *This course aims at developing an understanding of the Linux operating system and its tools, utilities necessary for working with Linux environment. The course covers basic Linux commands, shell programming and some important utilities related with file handling and text processing.*

**Course Content**

Introduction to linux operating system, Simple commands like ls, cp, mv, grep, head, tail, sort, uniq, diff, echo, date, which, whereis, whatis, who, finger etc. Directory commands, access permissions, changing access permissions for files and directories, hard & symbolic links. Environment and path setting. vi editor, advance editing techniques and vim(improved vi). Programming utilities, Compiling & linking C, C++ programs, make utility, debugging C programs using gdb, system calls. Introduction to X-window system xinitrc file. Shell Programming, types of shell, command line, standard input and standard output, redirection, pipes, filters, special characters for searching files and pathnames. shell script-writing and executing, parameters & variables. Control structures, the Here document, functions,.Awk utility and regular expressions. Advance Linux: Process concept, zombie process. orphan process, signals, inter process communication, Pipes and FIFO, Sockets and client/server programs, X-window system.

**List of Experiments**

1. Introduction to simple Linux Commands

2. Simple C/C++ programs using Vi editor
3. Simple Shell Scripts
4. Advance Shell Scripts
5. Programs with Pipes and FIFO for IPC
6. Programs with Exec and Fork functions for process creation
7. Simple AWK Scripts with regular expressions
8. Simple X windows GUI programs
9. Simple Socket programs with small clients and servers

**Text/Reference Books**


1. Unix and Shell Programming. Das S. 4th Ed. Tata McGraw-Hill Publishing Company Ltd. 2008.
2. Beginning Linux Programming. Mathew N. & Stones R. 4th Ed. Wiley.2007.
3. Linux Command Line and Shell Scripting . Blum R. & Bresnahan C. 3rd Ed. Wiley. 2015.

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## Semester - V

## (Departmental Elective - II)

CS-351 L-T-P-C
Computer Graphics 3-0-2-5

**Objective:** *This course is designed to discuss the principles & methods of computer graphics & its applications in solving problems requiring visualization of complex objects using two dimensional & three dimensional representation methods, rendering & coloring them.*

**Course Content**

Graphics pipeline; Graphics hardware: Display devices, Input devices; Raster Graphics: line & circle drawing algorithms; Windowing & 2D/3D clipping: Cohen & Sutherland line clipping, Cyrus Beck clipping method; 2D & 3D Geometrical Transformations: scaling, translation, rotation, reflection; Viewing Transformations: parallel & perspective projection; Curves & Surfaces: cubic splines, Bezier curves, B-splines, Parametric surfaces, Surface of revolution, Sweep surfaces, Fractal curves & surfaces; Hidden line/surface removal methods; illuminations model; shading: Gouraud, Phong; Introduction to Ray-tracing; Animation; Programming practices with standard graphics libraries like open-GL.

**List of Experiments**

1. Drawing a line using Digital Differential Analyzer Algorithm (DDA), Bresenham's line drawing algorithm, generalized Bresenham's algorithm
2. Bresenham's circle & generalized ellipse algorithms
3. Generation of code for basic household objects like table, chair & sofa using built-in primitives

4. Generation of code for fish, kite, hut, car/jeep & clown
5. Performing 2D transformations like translation, rotation, scaling, shear & reflection & generate a suitable code for the same
6. Generation of code for point clipping algorithm, Cohen-Sutherland line clipping algorithm & Liang-Barsky line clipping algorithm
7. Performing 3D transformations like translation, rotation, scaling, shear & reflection & generate a suitable code for the same
8. Generation of code for the concept of Bezier & Spline curves
9. Generation of code for the concept of ray casting
10. Generation of code for shadow algorithm
11. Creation of suitable animation or a scene or a game to demonstrate the learned skills

**Text/Reference Books**


1. Computer Graphics with OpenGL. Hearn D. & Baker M. P. 3rd Ed. Pearson. 2009.
2. Interactive Computer Graphics: A Top-Down Approach using OpenGL. Angel E. 5th Ed. Pearson. 2009.
3. Computer Graphics: Principles and Practice in C. J. D. Foley J. D., Dam A. V., Feiner S. K. & Hughes J. F. 2nd Ed. Addison-Wesley. 1995.

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## Semester - V

## (Departmental Elective - II)

CS-352 L-T-P-C
Game Design 3-0-2-5

**Objective:** *The purpose of this course is to make the students understand the concept behind the game design, strategy planning & its marketing.*

**Course Content**

Introduction to Games Programming: role of game programming in the game industry, history of computer games, definition of a game, features & requirements of a game, good game vs. bad game.

Fundamental of Games Programming: Review of data structures & algorithms, various methods of information control in games, data control in games, user-interfaces, keyboard input in games.

Tile-based & Board Games Programming: Tile-based map, board games.

Strategy in Games & Games Theory: Basic strategies & principles, fundamental of games theory, games with sequential moves, games with simultaneous moves, mixed strategies, probability & expected utility, collective-action games, competitive games, uncertainty & information, strategy-based Game Programming, search algorithms, path-finding algorithms, shortest-path algorithms, A* algorithm, application of AI in computer games.

Issues in Game Programming: Code optimization, speed in games, data storage consideration, level design, playability, choice of game implementation.

Marketing The Game: Game Packaging, manuals, advertising the Game, media hype, identifying your Market, Game support for players, issues within Game marketing, a study of errors & ingenuity in Game marketing, merchandising.

**List of Experiments**

1. Understanding programming language and transferring the code to NetBeans & to Java, learning about variables, input output, procedures, methods, class & objects, graphics conditionals & arrays
2. Generation of code to understand control environment
3. Generation of code to setup a game in the wonderland Mad Tea Party scene
4. Generation of code to add animation to a game in the wonderland Mad Tea Party scene
5. Generation of code to makan alien walk with proper knee & hip motion
6. Understanding the concept of user input by adjusting time on a clock by user input
7. Understanding the procedure & procedure parameters by creating a stomp method for Troll class, wag method for Dalmatian class & code for hokey pokey dance
8. Understanding the concept of functions by generating code for movement for walrus & UFO
9. Generation of codes to understand the object oriented concepts
10. Generation of codes to understand the concept of loop control structure & arrays

**Text/Reference Books**


1. Game Programming Gems. DeLoura M. Edited. Charles River Media. 2000.
2. Strategies and Games : Theory and Practice. Dutta P. K. MIT Press. 1999.
3. 3D Game Programming. La-Mothe A. Waite Group Press. 1996

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## Semester - V

## (Departmental Elective - II)

CS-370 L-T-P-C
System Administration with Linux 3-0-2-5

**Objective:** *Linux system administration helps students to learn how to manage servers efficiently since Linux server provides stable solution for next-generation datacenters. With the flexibility to deploy on physical hardware, as a virtual host, as a virtual guest or in the cloud, system administrators need to have a strong functional knowledge of Linux server in any current IT work environment. The course explores the security & network access controls in Linux, organizing network system & Mail Services, Securing Data & Account Management.*

**Course Content**

Fundamentals of Linux: Development of Linux, Linux Distributions. Structure of Linux Operating System, Logging In & General Orientation, The X Window System, KDE, GNOME. Navigating the File Systems, Managing Files, File Permission & Access, Shell Basics, Shell Advanced Features, File Name Generation. Common Unix commands

Administration of Linux: Installing Linux, Configuring Disk Devices, Creating & Managing File Systems, File System Backup, Kickstart Installation, Linux Boot Loaders, Linux Kernel Management, Managing User Accounts, Understanding File Listing, Ownership & Permission, Managing Software using RPM, Connecting to Network, Linux Network Services, Setting up a Printer

Input & Output Redirection: Input Redirection, Output Redirection, Error Redirection, Filter, Pipes. Networking in Linux: Network Connectivity, IP address, Accessing Remote system, Transferring files, & Internet configuration. Process Control: Identifying

Process, Managing Process, Background Processing, Putting jobs in Background. Offline File Storage: Storing files to Media Booting process & User

Linux Basic networking & naming service: Introduction to Networking, Networking, Internet Network Services, Dynamic DNS, Electronic Messaging, Apache , NIS & Network File Sharing: NIS, Network File Sharing, SAMBA. Security: Defining System Security Policies, System Authentication Services & Security, Securing Services, Securing Data & Communication

The Unix File System: Inodes - Structure of a regular file – Directories - Conversion of a path name to an inode - Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open – Read - Write - Lseek – Close - File creation - Creation of special files - Changing directory & root - changing owner & mode – stat & fstat - pipes - Dup - Mounting & Un mounting file systems - Link & Un link.

**List of Experiments**

1. Installation of Linux Server
2. Configuration for Linux Server.
3. Configuration of Local Storage for Linux Server.
4. Configuration of File & Share Access for Linux Server.
5. Configuration of Print & Document Services for Linux Server.
6. Configuration of Linux server for Remote Management.
7. Creating Virtual Machine in Linux Server.
8. Configuration and Setting Virtual Machine.

**Text/Reference Books**

1. Red hat Linux Administration. Turner M. & Shah S. McGraw-Hill. 2010.
2. Redhat Fedora linux for Dummies. Barkakati N. Wiley Publishing Inc. 2011.

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## Semester - V

## (Departmental Elective - III)

CS-353 L-T-P-C
Artificial Intelligence 3-0-1-4

**Objective:** *This course is designed to discuss the principles & methods of artificial intelligence & its applications in finding solution to the logical problems. This course also covers introduction to intelligent systems including Fuzzy logic based & artificial intelligent systems.*

**Course Content**

Problem solving, search techniques, control strategies, game playing (minimax), reasoning, knowledge representation through predicate logic, rule-based systems, semantic nets, frames, conceptual dependency formalism. Planning. Handling uncertainty: Bayesian Networks, Dempster-Shafer theory, certainty factors. Fuzzy logic, learning through Neural nets- Back propagation, radial basis functions, Neural computational models: Hopfield Nets, Boltzman machines. PROLOG programming.

**List of Experiments**

1. Understanding the basic concepts of inference engine with its representation of objects & relationship; variables, facts, conjunction, rules; unification & arithmetic
2. Programs related to data structures (structures & trees, lists, recursive search, mapping comparison, accumulators)
3. Programs related to the concepts of backtracking & cut
4. Programs related to the basic input-output(reading & writing terms, characters, files)

5. Programs to understand built in predicates in inference engine
6. Programs related to the concept of sorted dictionary
7. Programs related to some problems like tower of Hanoi, travelling sales man problem, monkey & banana problem & 8-puzzle problem
8. Case Study on expert system
9. Programs related to Fuzzy logic
10. Programs to represent membership functions through graphs
11. Case study of implementation of Fuzzy logic showing fuzzification & defuzzification of the dataset
12. Program for simple implementation of back propagation algorithm

**Text/Reference Books**


1. Artificial Intelligence. Rich E., Knight K. & Nair S. B. 3rd Ed. Tata McGraw-Hill India.
2. Computational Intelligence: a logical approach. Poole D., Mackworth A. & Goebel R. Oxford University Press. 2004.
3. Artificial Intelligence: Structures and Strategies for complex problem solving. Luger G. 4th Ed. Pearson Education 2002.
4. Artificial Intelligence: A new Synthesis. Nilsson J. Elsevier Publishers. 1998.

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## Semester - V

## (Departmental Elective - III)

CS-354 L-T-P-C
Cryptography 3-0-1-4

**Objective:** *Upon the completion of the course, the students should have a fundamental understanding of the objectives of cryptography & network security, the cryptographic techniques that provide information & network security. The course also includes techniques to evaluate the security of communication systems, overview of networks & protocols based on a multitude of security metrics.*

**Course Content**

To update knowledge in modern cryptosystems their analysis & applications to other fields. Course contents Applying the corresponding algorithms/ programmes. Classical cryptosystems, Preview from number theory, Congruence & residue class rings, DES-security & generalizations, Prime number generation. Public Key Cryptosystems of RSA, Rabin, etc. their security & cryptanalysis. Primality, factorization & quadratic sieve, efficiency of other factoring algorithms. Finite fields: Construction & examples. Diffie-Hellman key exchange. Discrete logarithm problem in general & on finite fields. Cryptosystems based on discrete algorithm problem such as Massey-Omura cryptosystems. Algorithms for finding discrete logarithms, their analysis. Polynomials on finite fields & their factorization/irreducibility & their application to coding theory. Elliptic curves, Public key cryptosystems particularly on Elliptic curves. Problems of key exchange, discrete logarithms & the elliptic curve logarithm problem. Implementation of elliptic curve cryptosystems. Counting of points on Elliptic Curves over Galois Fields of order 2m.Other systems such as Hyper Elliptic Curve & cryptosystems based on them.

Combinatorial group theory: investigation of groups on computers, finitely presented groups, coset enumeration. Fundamental problems of combinatorial group theory. Coset enumeration, Nielsen & Tietze transformations. Braid Group cryptography. Cryptographic hash functions. Authentication, Digital Signatures, Identification, certification infrastructure & other applied aspects.

**List of Experiments**

1. Implementation of GCD (repeated subtraction, Euclidean algorithm)
2. Programs related to extended Euclidean algorithm
3. Programs related to generation of prime numbers
4. Programs related to modular arithmetic functions (addition, subtraction, multiplication)
5. Programs related to multiplicative inverses, modular addition, multiplication & division
6. Design of modular arithmetic functions for matrices
7. Programs related to mono alphabetic, poly alphabetic & transposition ciphers
8. Programs related to Euler's Phi (totient) function
9. Programs related to factorization methods (Trial division, Fermat, Pollard p-1, Pollard rho)
10. Programs related to Chinese remainder theorem
11. Programs related to public-key ciphers & key exchange protocols

**Text/Reference Books**


1. Cryptography and Network Security. Forouzan B. A. 2nd Ed. Tata McGraw-Hill. 2010.
2. Cryptography and Network Security. Stalling W. 4th Ed. Pearson. 2006.
3. Cryptography and Network Security. Kahate A. 3rd Ed. Tata McGraw-Hill. 2003.

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## Semester - V

## (Departmental Elective - IV)

CS-355 L-T-P-C
Simulation & Modelling 3-0-1-4

**Objective:** *The aim is to study the simulation strategies & the mathematical models on system concepts. Modification in deterministic, probabilistic, continuous, discrete, static physical, dynamic physical, static mathematical & dynamic mathematical models of simulation is a great research challenge in this context. The course also introduces probability distributions, use & generation of random variables & concept of PERT for project scheduling.*

**Course Content**

Fundamentals of modelling; Classification of simulation models; the simulation process: System investigation; model formulation, validation & translation; Time flow mechanisms; Design of computer simulation experiments; Simulation of complex discrete-event systems with applications in industrial & service organizations. Tactical planning & management aspects; Random variable generation & analysis.

**List of Experiments**

1. Introduction to Scilab working environment & simple programs
2. Implementation of simple plotting functions
3. Simulation of Exponential growth model
4. Simulation of Exponential decay model
5. Simulation of modified Exponential growth model
6. Simulation of logistic curve model
7. Simulation of Cobb-Douglas model

8. Simulation of Cobweb model
9. Simulation of distributed lag model
10. Simulation of Monte Carlo method
11. Simulation of static mathematic model
12. Simulation of dynamic mathematic model

**Text/Reference Books**


1. System Simulation. Gordon G. PHI Learning. 2005.
2. System Simulation with Digital Computer. Deo N. PHI Learning. 2006.

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## Semester - V

## (Departmental Elective - IV)

CS-356 L-T-P-C
Digital Hardware Design 3-0-1-4

**Objective:** *The objective of the course is to give clear understanding of combinational circuit design, tree network, sequential circuit design & implementation, asynchronous & pulse mode circuit design, micro-programmed control design & an Introduction to hardware-software code design.*

**Course Content**

Combinational circuit design using MSI/LSI & programmable logic modules; Iterative & tree networks; Sequential circuit design & implementation; Algorithmic state machine design; Asynchronous & pulse mode circuit design; Hardware description language & synthesis; Micro programmed control design; Testing of digital systems; Introduction to hardware-software code design.

**List of Experiments**

1. Basic programming constructs available in hardware description language like Verilog for instantiation of multiple gates, multiple clocks, time control, using #, @ assignment with time control & blocking procedural assignment
2. Generation of code for structural Verilog , modules & ports
3. Generation of code for four state division machine
4. Generation of code for transferring block devices
5. Generation of code for understanding behavioral Mealy machine, mixed Mealy machine
6. Generation of code for understanding Mealy division machine

7. Generation of code for understanding & transferring Mealy ASM into behavioral Verilog
8. Generation of code for understanding conditional command signals into Verilog

**Text/Reference Books**


1. Dedicated Digital Processors: Methods in Hardware/Software Co-Design. Lindenberg F. M. Wiley. 2003.
2. Digital Hardware Design. Peatman J. B. 1st Ed. Tata McGraw-Hill. 1980
3. Digital Hardware Design Catt I., Walton D. & Davidson M. 1st Ed. Macmillan Press Ltd. 1979.

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## Semester - VI

## (Departmental Elective - V)

CS-361 L-T-P-C
File Structure & Information System Design 3-0-1-4

**Objective:** *The course entails detailed information related to file structure & information system design. The students should have a clear understanding about various storage media, external sorting concept, file organizations, creation & updation of files, dynamic hashing techniques & concurrent operations on the structures.*

**Course Content**

Secondary storage media, blocking, buffering, External sorting techniques, Concept of a file, primary key & secondary key, sequential, Indexed & relative file organizations. Updation of indexed sequential & random access files, Creation & Updation of relative files, dynamic hashing techniques, list structure, multi ring & inverted files, grid files, etc. Introduction to concurrent operations on the structures.

**List of Experiments**

1. Programs to demonstrate different types of keys in file handling in data storage
2. Programs related to index sequential files
3. Programs related to random access files
4. Programs related to relative files
5. Programs related to dynamic hashing techniques
6. Programs related to list structure
7. Programs related to multi-ring files
8. Programs related to inverted files
9. Programs related to grid files

10. Programs related to single level multi-level concurrent operations

**Text/Reference Books**


1. Design of Library Automation Systems: File Structures, Data Structures and Tools. Cooper M. D. 1st Ed. Wiley. 1996.
2. File Structures. Folk M. J. & Zoellick B. 2nd Ed. Addison-Wesley Publishing Co.1991.
3. Practical File System Design. Giampaolo D. Morgan Kaufmann Publishers. 1999.

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## Semester - VI

## (Departmental Elective - V)

CS-369 L-T-P-C
Android Based Web Applications 3-0-1-4

**Objective:** *The course aims at developing an in-depth understanding of the tools & technologies necessary for Web based Android application development. The course covers client side scripting like HTML, JavaScript, CSS, server side scripting like PHP together with simple Android system programming.*

**Course Content**

Introduction to Android: History of Android, Introduction to Android Platform, Introduction to Android Operating Systems, Android Development Tools, Android Architecture, Android Stack, Android Versions & Installing Android SDK & updating SDK components, Eclipse, IDEs & ADT plug-in, working with Emulator.

Android Development Tools: Installing & using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating an Android project, run on emulator, Deploy it on USB-connected Android device.

HTML & CSS: Basics, document tags, text, hyperlinks, lists, color, images, tables, frames, forms, introduction of CSS, using styles, defining styles, properties & values in styles. Introduction to HTML5.

JavaScript & DHTML: Basics of JS, variables, strings, functions, statements, operators, arrays, data & objects, regular expressions, exception handling, cookies, events. Introduction to AJAX, JSON & jQuery.

PHP, MySQL, Perl & CGI: Basics of PHP & MySQL. developing CGI applications, creating HTML pages dynamically

Android User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes, User Interface Design, Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu & Dialog. SQLite database & connecting with the database.

**List of Experiments**

1. Designing of HTML webpage with different fonts, tags & colors
2. Designing of HTML webpage with different frames & hyperlink
3. Designing a webpage using HTML5 & CSS
4. Programs related to JavaScript
5. Implementation of JavaScript programs for text validation
6. Implementation of JavaScript programs for event handling
7. Implementation of PHP programs
8. Programs related to PHP & MYSQL integration
9. Implementation of simple Android program, creating APK Testing on AVD & real device
10. Implementation of Android program with UI component

**Text/Reference Books**


1. Web Enabled Commercial Application Development Using HTML, DHTML, Javascript, Perl, Cgi. Bayross I. 4th Ed. BPB Publications. 2010.
2. Learning PHP & MySQL: Step-by-Step Guide to Creating Database-Driven Web Sites. Davis M. & Phillips J. 2nd Ed. O'Reilly Media. 2007.
3. Professional Android Application Development. Meier R. 4th Ed. Wiley. 2012.

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## Semester - VI

## (Departmental Elective - VI)

| | |
|---|---|
| CS-362 | L-T-P-C |
| Advanced Java | 3-0-1-4 |
| Pre-requisite | CS-256 |

**Objective:** *This course is designed to familiarize students with concept of Java to database connectivity, Bean, RMI, MVC & EJB such that a student can write applications with advanced Java libraries.*

**Course Content**

JDBC & Java Beans: JDBC versus ODBC, different types of drivers, two tier versus three tier model, creating JDBC program. Java Beans – properties of java beans, study existing java beans, creating own java beans.

Distributed computing: Overview of current technologies (J2EE, RMI, CORBA, DCOM), RMI & ORBs, patterns for distributed components, defining interfaces to active objects, remote RMI interfaces, RMI, clients, server & registry. Creating simple RMI application.

Servlets: Advantages of Servlets over CGI, Servlet API, life cycle of servlet. Creating simple Servlet, installing & configuring Apache Tomcat 4 as a standalone servlet, processing the request: form data, generating the response, handling cookies, session tracking.

JSP: Introduction to JSP, JSP processing, JSP Application Design, JSP scripting elements: expression, scriptlets & declarations, JSP directives, Implicit JSP objects, Error Handling, JDBC using JSP, using of java beans in JSP.

Fundamentals of EJB: Introduction to J2EE architecture, EJB: introduction, understanding stateful & stateless session beans life cycle, writing stateless session bean, introduction to entity beans, writing first entity bean.

**List of Experiments**

1. Implementation of JDBC
2. Implementation of graphical & non graphical java beans
3. Implementation of RMI application that interacts with database
4. Implementation of servlet that interacts with database
5. Implementation of various servlet initialization parameters (ServletContext & ServletConfig Parameter)
6. Implementation of filters & multiple filters
7. Implementation of session tracking using cookies, hidden forms & URL re writing
8. Implementation of JSP scriplets, JSP expression & JSP declarations
9. Implementation of following JSP implicit objects: request, response, config, application , session, pageContext, page (only define), exception
10. Implementation of exception handling in JSP
11. Implementation of JSP page & JSP include directives
12. Implementation of following JSP action tags: jsp:forward, jsp:include, jsp:useBean, jsp:setProperty, jsp:getProperty
13. Implementation of MVC architecture (use JSP, Servlet & Java class having business logic) & interaction with the database
14. Implementation of stateless, state full & singleton EJB

**Text/Reference Books**


1. Java How to Program. Deitel P. & Deitel H. 9th Ed. Pearson. 2011.
2. J2EE: The Complete Reference. Keogh J. Tata Mc-Graw Hill. 2002.
3. Java Server Pages. Bergsten H. 2nd Ed. O'Reilly Media. 2002.
4. Head first servlet and JSP. Basham B., Sierra K. & Bates B. 2nd Ed. O'Reilly Media. 2008.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - VI

## (Departmental Elective - VI)

| | |
|---|---|
| CS-367 | L-T-P-C |
| Advanced Database Management System | 3-0-1-4 |
| Pre-requisite | CS-251 |

**Objective:** *The course entails database design, normalization concepts, relational algebra and calculus, advanced query management and query processing with optimization, transaction & concurrency control.*

**Course Content**

Database Design: Functional Dependencies – Non-loss Decomposition – Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-valued Dependencies & Fourth Normal Form – Join Dependencies & Fifth Normal Form

Database Language SQL and System Aspects of SQL, Constraints and triggers, Disk Storage, Disk and Memory Organization for Relational Operators, Representing Data Elements, Index Structures, Query Execution, Query Compilation, Query Optimization, Coping with System Failures, Concurrency Control, Transaction Management, Representation of Data. Relational Model: The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus - Fundamental operations – Additional Operations- SQL fundamentals. Data Constraints, Column level & table Level Constraints, working with Tables. Manipulation Data in SQL. Introduction to Distributed Databases & Client/Server Databases

Transactions: Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit - Save Points – SQL Facilities for recovery –Concurrency – Need for Concurrency – Locking Protocols – Two

Phase Locking – Intent Locking – Deadlock- Serializability – Recovery Isolation Levels – SQL Facilities for Concurrency.

**List of Experiments**

1. Create User & grant & revoke the privileges & use of commit save point roleback command
2. Create the following: Synonym sequences & Index, Create alter & update views
3. Create PL/SQL program using cursors, control structure, exception handling
4. Create following: Simple Triggers, Package using procedures & functions.
5. Create the table for: OMPANY database, STUDENT database & Insert five records for each attribute.
6. Illustrate the use of SELECT statement
7. Conditional retrieval - WHERE clause
8. Query sorted - ORDER BY clause
9. Perform following: UNION, INTERSECTION & MINUS operations on tables & UPDATE, ALTER, DELETE, DROP operations on tables
10. Query multiple tables using JOIN operation.
11. Grouping the result of query - GROUP BY clause & HAVING clause
12. Query multiple tables using NATURAL & OUTER JOIN operation.

**Text/Reference Books**


1. Database System Concepts. Silberschatz A. Korth H. F. & Sudharshan S. 5th Ed. Tata McGraw Hill. 2006.
2. Fundamentals of Database Systems. RamezElmasri & Navathe S. B. 4th Ed. Pearson/Addision Wesley. 2007.
3. Database Management Systems. Ramakrishnan R. 3rd Ed. McGraw Hill. 2003.

## Detailed Syllabus for B. Tech. Degree Programme
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## Semester - VIII

## (Departmental Elective - VII)

CS-453 L-T-P-C
Data Mining & Knowledge Discovery 3-0-0-3

**Objective:** *This course deals with the fundamentals of data mining aspects & techniques like classification, clustering, association, knowledge extraction, data warehouse & their architectures as well as implementation using variety of data mining tools.*

**Course Content**

Introduction to Data Mining, Data Cleaning & transformation, Data Warehousing architecture, Front end data warehousing operations, data cubes & other visualizations, data synchronization with operational databases, Classificatory knowledge Extraction & prediction, Decision Trees, Association Rule Mining, Error analysis, LIFT charts & ROC curves, Bagging & Boosting, Clustering, Sequence analysis, Design of parallel & distributed data mining systems, mining complex data. Laboratory assignments: Implementation of the above concepts.

**Text/Reference Books**


1. Data Mining: Concepts and Techniques. Han J. & Kamber M. Moergan.
2. Data Mining: Introductory and advanced topics. Dunham M. H. Pearson Edu.
3. Building the Data warehouse. Inmon W. H. Willey.
4. Data Warehousing, Data Mining and OLAP. Bzon A. & Smith S. J. McGraw-Hill.

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## Computer Science & Engineering

## Semester - VIII

## (Departmental Elective - VII)

CS-454 L-T-P-C
Pattern Recognition 3-0-0-3

**Objective:** *The purpose of this course is to make the students aware of the latest state of the art algorithms available in data mining & information retrieval & also apprise them of intelligent systems based on Fuzzy logic & Artificial Neural networks.*

**Course Content**

Introduction: Introduction to Pattern Recognition, applications & relation with other fields like Data Mining, Information Retrieval, etc.; Linear Discriminant Functions & its Applications; Bayesian Decision Theory; Maximum-Likelihood & Bayesian Parameter Estimation; Component Analysis, Expectation Maximization, Hidden Markov Model; Nonparametric Techniques; Nearest Neighbor, K-NN; Non-metric Methods; Decision Trees, ID3, Grammar based Methods; Neural Network Based Approaches; Introduction to Fuzzy Logic Based Techniques; Support Vector Machine; Applications.

**Text/Reference Books**


1. Pattern Recognition. Theodoidis S. & Koutroumbas K. 4th Ed. Elsevier Inc. 2009.
2. Principles of Soft Computing. Sivanadam S. N. & Deepa S. N. 2nd Ed. Willey India. 2008.
3. Principles of data mining. Bramer M. 1st Ed.(Indian Reprint). Springer International edu. 2009.

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## Semester - IV

## (Open Elective - I)

HU-252 L-T-P-C
Language through Literature & Films 0-2-0-2

**Objective:** *To introduce the nuances of English Literature & develop reflective, creative & literary abilities.*

**Course Content**

Ruskin Bond -The Eyes Have It.

Sudha Murthy - Appro JRD.

Bacon - Of Studies; Of Youth and Age.

Douglas Malloch - Be the best of whatever you are.

Rabindranath Tagore - Where the mind is without fear.

Enhancement of emotional, creative & social quotient through viewing & discussions on selected films.

**Text/Reference Book**

1. Literature and Language Teaching: A Guide for Teachers and Trainers. Lazar G. Cambridge University Press. 2008.

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## Computer Science & Engineering

## Semester - IV

## (Open Elective - I)

BM-270 L-T-P-C
Foundations of Economic Science 2-0-0-2

**Objective:** *The objective of this course is to teach basic principles of consumption production, exchange, distribution of remuneration to factors, pricing & public finance. Further, students are provided knowledge on completion of projects by optimizing production with limited resources & also to know infrastructure & development needs of a country to perform tasks accordingly.*

**Course Content**

Engineers & Economics: Meaning of economics, why engineers should know economics, important basics: consumption, production, exchange, distribution & public finance, cost of production & revenue through sales.

Consumption & Pricing: Cardinal & Ordinal approach to Utility, Laws of Diminishing Marginal Utility & Equi-marginal Utility, Demand: Meaning, Law, Types, Elasticity of Demand: Meaning & Degrees. Laws of Supply, Pricing of all products: Theory & practice.

Factors of Production & Markets: Land, Labour, Capital, Organization & Enterprise, Laws of Returns, Classification of Markets: Perfect & Imperfect competition including Monopoly, Discriminative Monopoly & Oligopoly.

Financial Aspects of Engineering: Money & Finance, An overview of Banking, Money Market, Capital Market, Public Finance & Private Finance, Direct & Indirect Taxes, Canons of Taxation, National Income.

Developmental Aspects of Engineering: Underdevelopment, Stages of economic development, Economic Growth, Growth Theories Economic Reforms: LPG. Application of financial accounting techniques for engineering projects.

**Text/Reference Books**


1. Textbook of Economic Theory. Stonier A. W. & Hague D. C. 5th Ed. Longman Higher Education. 1980.
2. Introduction to Positive Economics. Lipsey R. G. & Chrystal K. A. 8th Ed. Oxford University Press. 1995.
3. Business Economics (Micro). Shankar G. Nirali Prakashan. 2014.
4. Micro Economic Theory. Jhingan M. L. 7th Ed. Vrinda Publications Pvt. Limited. 2014.
5. Managerial Economics. Theory and Application. Mithani D. M. 7th Ed. Himalaya Publishing House Pvt. Ltd. 2013.
6. Micro economics. Pindyck R. S., Rubinfeld D. L. & Mehta P. L. 7th Ed. Pearson Education India. 2009.

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## Computer Science & Engineering

## Semester - V

## (Open Elective - II)

HU-351 L-T-P-C
Fun with Drama 0-2-0-2

**Objective:** *To stimulate imagination, cultural enrichment & explore multidimensional use of language through drama.*

**Course Content**

Script writing: Story, structure, character development, dialogue, visuals & language with emphasis on critical & analytical thinking, problem-solving & communication skills.

Direction: Techniques & art of play direction with emphasis on methods of actor coaching, rehearsal procedures & presentation of several scenes of varying dramatic styles.

Enactment: Controlled use of body & voice, analysis & interpretation of roles, characterization & emotional projection.

Analysis: Insightful analysis of various aspects of translating a play from script to stage, director's concepts, visual composition, attention to character development & narrative structure & power of the unspoken word.

**Text/Reference Books**


1. Drama Techniques in Language Learning. Maley A. & Duff A. 3rd Ed. Cambridge University Press. 2005.
2. Drama (Resource Book for Teachers). Wessels C. Oxford University Press. 1987.

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## Semester - V

## (Open Elective - II)

BM-370 L-T-P-C
Marketing Management 2-0-0-2

**Objective:** *Marketing is no longer a department charged with a limited number of tasks- it is a companywide undertaking. Marketing succeeds only when all departments work together to achieve goals. The syllabus is designed to serve as an introduction to the theory & practice of marketing to the engineering students. It will help them develop competencies in the use of the modern marketing techniques & their applications in design, development & commercialization of new products & services in the rapidly changing markets.*

**Course Content**

Introduction: Nature & scope of marketing; Importance of marketing as a business function; Marketing concepts – traditional & modern; Selling vs. marketing; Marketing mix & environment, Marketing Myopia.

Consumer Behaviour & Market Segmentation: Significance of consumer behavior; Market segmentation; concepts & importance; Bases for market segmentation.

Product: Concept of product, consumer & industrial goods; Product planning & development: Product life cycle concept, New Product Development, Product Differentiation & Positioning.

Branding: Role of brand & its Significance, Types of Brands, Challenges for Brands, Brand Equity.

Price: Importance of price in the marketing mix; Factors affecting price of a product/ service.

Distributions: Distribution channels; concept & role; Types of distribution channels; Factors affecting choice of a distribution channel.

Communications: Techniques of promotion; Integrated Marketing Communications; Advertising: Role & Significance. Media & their relative merits & limitations, Public Relations & Personal Selling.

E-marketing management: Overview of e-commerce, E-marketing: Role of IT in marketing, E-Marketing-mix, Emerging technology trends & their implications for marketing, Social media & marketing, E-CRM & building relationship.

**Text/Reference Books**


1. Marketing Management- A south Asian Perspective. Kotler P., Keller K., Koshy A. & Jha M. 12th Ed. Pearson Education. 2007.
2. Marketing Management. Kotler P. & Keller K. Prentice Hall. 2003.
3. Fundamentals of Marketing. Stanton W. J., Michael E. J. & Walker B. J. McGraw-Hill International. 1997.
4. Principles of Marketing. Kotler P. & Armstrong G. Pearson Education. 2007.
5. Fundamentals of Marketing. Stanton W. J. 5th Ed. McGraw-Hill, New York. 1978.
6. Marketing Environment: Planning, Implementation and Control, the Indian context. Ramaswamy V. S. & Namakumari S. Mcmillan. 1990.

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## Semester - VII

## (Open Elective - III)

BT-471 L-T-P-C
Bioprocess Technology 3-0-0-3

**Objective:** *A* bioprocess *is a specific process that uses complete living cells or their components to obtain desired products which is an importance part of biotechnology industry. This course is designed to make a learner efficient in bioprocess calculations & to impart knowledge of different technology used in bioprocess.*

**Course Content**

Bioprocessing v/s chemical processing, Substrates for bioconversion processes Inoculum development. Process technology for production of primary metabolites: such as baker's yeast, ethanol, citric acid, amino acids, polysaccharides & plastics, Microbial production of industrial enzymes such as glucose isomerase, cellulase, amylase, protease etc., Production of secondary metabolites: penicillin & cephalosporin etc.

**Text/Reference Books**


1. Encyclopedia of Bioprocess Technology. Michael F. & Stephen D. John Wiley & Sons.1999.
2. Principles of Fermentation Technology. Stanbury P. F., Whitaker A. & Hall S. J. 2nd Ed. Elsevier.1995.
3. Microbial biotechnology: Fundamentals of Applied Microbiology. Glazer A. N. & Nikaido H. 2nd Ed. W.H. Freeman & Company. 1995.

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## Semester - VII

## (Open Elective - III)

CE-462 L-T-P-C
Air Pollution & Industrial Waste Management 3-0-0-3

**Objective:** *To give understanding of air pollution & its impact, modeling of dispersion of pollutant, control measures, types of waste from different industries & their management.*

**Course Content**

Air Pollutants, their sources & harmful effects on the environment; Meteorology as applied to air pollution & dispersion of air pollutants, Air quality & emission standards, Removal of gaseous & particulate matter. Sources & types of wastes; solid, liquid & gaseous wastes; Water use in industry, industrial water quality requirements; Control & removal of specific pollutants in industrial wastewaters from dairy, fertilizer, distillery, tannery, sugar, pulp & paper, iron & steel, metal plating etc.

**Text/Reference Books**


1. Air Pollution-Its Origin and Control. Wark K. & Warner C. F. Harper & Row New York. 1981.
2. Air Pollution Control Engineering. Nevers N. D. McGraw-Hill International Ed. 1985.
3. Zero Pollution for Industry: Waste Minimization through Industrial Complexes. Nemerow N. L. John Wiley & Sons.1995.
4. Liquid Waste of Industry: Theoy, Practices and Treatment. Nemerow N L. Addison-Wesley. 1971.
5. Wastewater Treatment for Pollution Control. Arceivala S. J. Tata McGraw-Hill. 1999.
6. Industrial Water Pollution Control. Eckenfelder W. W. McGraw-Hill. 2000.

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## Semester - VII

## (Open Elective - III)

CS-458 L-T-P-C
Information Retrieval 3-0-0-3

**Objective:** *This course deals with the basic information retrieval approaches to perform the various types of searching, indexing & retrieval from structured or unstructured data & their applications.*

**Course Content**

Introduction: concepts & terminology of information retrieval systems, Information Retrieval vs. Information Extraction; Indexing: inverted files, encoding, Zipf's Law, compression, boolean queries; Fundamental IR models: Boolean, Vector Space, probabilistic, latent semantic indexing, query processing & refinement techniques; Performance Evaluation: precision, recall, F-measure; Classification: Rocchio, Naive Bayes, k-nearest neighbors, support vector machine; Clustering: partitioning methods, k-means clustering, hierarchical; Introduction to advanced topics: search, relevance feedback, ranking, query expansion.

**Text/Reference Books**


1. An Introduction to Information Retrieval. Manning C. D., Raghavan P. & Schtze H. Cambridge University Press. 2009.
2. Modern Information Retrieval. Ricardo B. Y. & Berthier R. N. 1st Ed. Addison-Wesley Publishing Co. 1999.
3. Information Retrieval: Algorithms and Heuristics. Grossman D. A. & Frieder O. Springer – The Information Retrieval Series. 2004.

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## Semester - VII

## (Open Elective - III)

CS-462 L-T-P-C
Management Information Systems & E-Commerce 3-0-0-3

**Objective:** *The course aims at acquainting students with the fundamentals of information systems & their application in the various areas of business. It also provides an overview of the emerging domain of e-commerce, its concepts, issues & technologies.*

**Course Content**

Management Information Systems: Need, Purpose & Objectives- Contemporary Approaches to MIS: Business processes & Information Systems –Information systems function in Business-Use of Information Systems for competitive advantage - MIS as an instrument for the organizational change: Management issues – Types of Business Information Systems.

Enhancing Decision Making: Information, Management & Decision Making - Models of Decision Making - Classical, Administrative & Herbert Simon's Models - Attributes of information & its relevance to Decision Making - Types of information, Decision Support Systems - Group Decision Support Systems –- Executive Support Systems

E-commerce: Introduction, Definition of e-commerce, emergence of Internet, commercial use of Internet, history of e-commerce, advantages & disadvantages of e-commerce.

Business models for e-commerce: B2C, B2B, C2C, C2B, brokerage model, aggregator model, info-mediaries, communities, value-chain model, manufacturer model, advertising model, subscription & affiliate model.

Enabling technologies: Internet Client server applications, networks, Uniform Resource Locator (URL), search engines, software agents, Internet Service Providers(ISP), broadband technologies, Electronic Data Interchange(EDI).

E-marketing: characteristics, methods, e-marketing value-chain, site adhesion, browsing behavior model, e-advertising, e-branding, e-marketing strategies.

E-security: Security risks, risk management issues, legal & ethical issues, security mechanisms, encryption, digital signature, digital certificates.

E-payment systems: token-based system, card-based system, e-cash. E-cheque, e-banking, risks, data protection.

**Text/Reference Books**


1. Management Information Systems. Laudon & Laudon, 7th Ed. Pearson Education Asia.
2. E-commerce: An Indian Perspective. Joseph P. T. 2nd Ed. Prentice Hall India. 2007.
3. Management Information Systems. Bagchi N. 1st Ed. Vikas Publishing. 2010.

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## Semester - VII

## (Open Elective - III)

EE-465 L-T-P-C
Energy Conversion Process 3-0-0-3

**Objective:** *To get acquainted the students with various energy conversion processes used in non-conventional energy sources.*

**Course Content**

Physics of photovoltaic energy conversion in P-N junctions. Effect of physical properties of photovoltaic converters; Performance characteristics of different types of photovoltaic devices; Design considerations & manufacturing processes; Regulations & efficiency of conversion. Charge carriers & thermoelectric phenomena; Thomson, Peltier, Seebech effect; Kelvin's relations; Thermoelectric energy conversion; Materials, size & capacity; Performance analysis & optimized design of thermoelectric devices. Physics of thermionic emission; Operation of high level vacuum & low pressure thermionic converters; Vacuum & gas-filled converters; Thermionic nuclear reactors; Heat pipes. Basic principles of Magneto hydrodynamic power generation; Hall effect; Ionization & seeding; Faraday, Segmented electrode, Hall & Cross-connected generators, Open & closed cycles; Liquid metal MHD. Fuel cells, Thermodynamics of Fuel Cells. Performance Analysis. Low, medium, high temperature Fuel Cells.

**Text/Reference Books**


1. Energy Conversion Systems. Begamudre R. D. 1st Ed. New Age Pub. 2000.
2. Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/SIMULINK & the Role of Soft Computing Techniques (Green Energy and Technology) Sumathi S., Kumar A. L. & Surekha P. Springer. 2015.

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## Semester - VII

## (Open Elective - III)

ME-465 L-T-P-C
Solar Energy & Applications 3-0-0-3

**Objective:** *This course discusses solar energy as an important alternative to conventional sources of energy- its generation & utilization.*

**Course Content**

The energy crisis- causes & options, renewable & non-renewable forms of energy & their characteristics, solar energy option availability & land area requirements. Solar radiation outside the earth atmosphere & at the earth`s surface, instruments for measuring solar radiation, solar radiation geometry, basic earth-sun angles, fluxon tilted surfaces. Liquid flat-plate collectors design & performance parameters, solar air heaters, concentrating collectors, solar ponds & energy storage. Solar thermal power generation: low, medium & high temperature cycles, solar cooling, drying & desalination, solar air & water heating, solar passive architecture. Solar photovoltaic power generation: mono crystalline, polycrystalline & amorphous cells, Fabrication & performance of SPV modules. Indirect methods of solar energy utilization: biomass, wind, wave &ocean thermal energy conversion technologies. Economic considerations.

**Text/Reference Books**


1. Solar Energy principles of thermal collection and storage. Sukhatme. Tata McGraw-Hill.1996.
2. Solar Energy fundamental sand applications. Garg & Prakash. Tata McGraw-Hill. 1997.

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**Semester - VII**

**(Open Elective - III)**

PH-451 L-T-P-C
Nanotechnology 3-0-0-3

**Objective:** *The objective of this course is to discuss why & how changes occur in the properties of bulk materials when their size approaches a billionth of a meter & to understand the basics of nanostructures, nanotubes, nano-electronic devices, nanobiotechnology, nanomachines etc.*

**Course Content**

Basics of low dimensional (0D, 1D, 2D) structures, Quantum dots wires & wells, Nanoparicles-free & dispersed, Nanocrystalline & nanostructured films, Self-organized structures; Nanostructures for optical & electronic applications, Quantum dot diodes, lasers & detectors, Single electron devices & logic applications, Optical computing & Information processing; Carbon based nanostructures, Electrical, mechanical & chemical properties of carbon nanotubes, Sensors & drug delivery vehicles, Data processing; Bulk nanostructured material & Photonic crystals; Nanostructures for Magnetic applications, Giant & Colossal Magnetoresistance. Nanostructured ferromagnetism, Random Access Memories; Nanostructures for catalysis & hydrogen storage, Nanoclays, colloids & hydrogen storage nano materials. Organic & Biological nanostructures. Nanomachines & supra molecular devices.

**Text/Reference Books**


1. Introduction to Nanotechnology. Poole Jr. C. P. & Owens F. J. 1st Ed. Wiley-India Edition. 2007.
2. Nanotechnology: Principles & Practices. Kulkarni S. K. 3rd Ed. Springer. 2014.
3. Introduction to nanoelectronics. Mitin V. V., Kochelap V. A. & Stroscio M. A. 1st Ed. Cambridge University Press. 2007.
4. Nanoelectronics & Nanosystems. Goser K., Glosekotter P. & Dienstuhl J. 2nd Ed. Springer. 2009.

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## Semester - VII

## (Open Elective - III)

PH-453 L-T-P-C
Chaos in Engineering Systems 3-0-0-3

**Objective:** *The objective of this course is to introduce the importance of nonlinearity & its ubiquity in engineering systems. The various techniques/tools used to understand the dynamics of nonlinear systems with examples from various engineering disciplines shall be discussed.*

**Course Content**

Introduction to chaos. Various examples of chaos in engineering systems, electrical systems (Van Der Pol oscillator); Fluid mechanical systems (Lorenz equations, Aeroelastic flutter), Vibration (Duffing equation), Chemical reactions (Belousov-Zhabotinski reaction) etc. Basic concepts in the mathematical treatment of non linear systems. Note: The emphasis in this course will be on developing a physical understanding of chaotic systems. There will be computer simulation demonstration.

**Text/Reference Books**


1. Chaos and Non-linear dynamics. Hilborn R. 2nd Ed. Oxford University Press. 2001.
2. Non-linear dynamics and chaos. Strogatz S. H. 1st Ed. Perseus books. 2001.
3. Non-linear dynamics. Lakshmanan M. & Rajsekar S. 1st Ed. Springer. 2003.

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## Semester - VIII

## (Open Elective - IV)

BT-475 L-T-P-C
Bioremediation Technology 3-0-0-3

**Objective:** *This course is designed to learn advance technology which use microorganisms & plants to remediate polluted & contaminated sites e.g. Industrial waste water, sewage etc. as well as to make students learn about emerging technologies in this area.*

**Course Content**

General Introduction, toxic chemicals in the environment, Xenobiotic compounds, Properties, toxicity & types of toxicity, classification of toxicants in environment; atmospheric toxicants; Conventional remediation, thermal, chemical & physical processes, role of microorganisms in pollutant degradation, Bioremediation: process, classification: *In situ* & *Ex situ* bioremediation; constrains & priorities of bioremediation; evaluation of bioremediation; factors affecting process of bioremediation, methods in determining biodegradability; contaminant availability for biodegradation. Microbial remediation & phytoremediation, Impact of biotechnology on bioremediation & global application of bioremediation technologies & case studies, Emerging Environmental Biotechnologies: Bioleaching, Biosorption Biotransformation, Biomonitoring, Microbial fuel cells.

**Text/Reference Books**


1. Cell biology, Genetics, Molecular Biology Evolution & Ecology. Verma P. S. & Agarwal V. K. S. Chand publication. 2005.
2. Environmental Biotechnology. Shrinivas T. New Age International (P) Limited. 2008.

3. General Microbiology. Stanier R.Y., Michael D. & Edward A. 2nd Ed. McMillan Publications. 1989.
4. Environmental Biotechnology. Foster C. F. & John W. D. A. Ellis Horwood Ltd. 1987.
5. Biotechnology & Biodegradation: Advances in Applied Bitoechnology Series. Karrely D. Vol -4. Gulf Publications Co. 1989.
6. Bioremediation engineering; design & application. John C.1st Ed. McGraw-Hill.
7. Introduction to Envionmental Biotechnology. Chatterjee A. K. 3rd Ed. PHI Learning Pvt. Ltd. 2011.
8. Environmental Biotechnology. Joganand S. N. 4th Ed. Himalaya Publishing. 2015.

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## Semester - VIII

## (Open Elective - IV)

CE-464 L-T-P-C
Environmental Management 3-0-0-3

**Objective:** *To develop the understanding of various environmental management techniques, legal procedure in India, development of environmental friendly industries, environmental audits & concept of green buildings.*

**Course Content**

The need for environmental awareness & protection in both natural & man-made systems – effects on atmosphere, water, ecological systems & quality of life. Environmental Impact Assessment & Integrated Environmental Management, Practical applications – cradle to grave concept, life cycle analysis & clean technologies. Environmental Audit, Compliance Audit; Concept of ISO & ISO 14000. Needs of developing countries. Governmental standards for Environmental Protection. Emerging Global Environmental Issues. Environmental Legislation.

**Text/Reference Books**


1. Environmental Impact Analysis Handbook. John R. G. & David W. C. McGraw-Hill. 1980.
2. Environmental Management in South Africa. Fuggle R. F. & Rabie M. A. Juta & Co. Ltd., Johannesburg. 1991.
3. Pollution – Causes, Effects and Control. Harrison R. M. WhitstableLithop Ltd. 1990.
4. Environmental Impact Assessment. Canter L. W. McGraw-Hill. 1996.

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## Semester - VIII

## (Open Elective - IV)

CS-459 L-T-P-C
Statistical Simulation & Data Analysis 3-0-0-3

**Objective:** *The course is designed to discuss the methods to simulate the statistical inferences obtained from the various datasets. The course discusses the various data analysis methods available & their usage in generating inference from the datasets.*

**Course Content**

Introduction to probability distributions. Basics of estimation & testing of hypothesis (frequentist approach, Bayesian approach).

Different censoring schemes: Type-I, Type-II, hybrid, progressive. Different models & EM algorithm: mixture model; bivariate distributions; cure rate model; competing risk model.

Generating random sample: discrete & continuous multivariate distributions (multinomial, multivariate normal, multivariate exponential); acceptance rejection principle; Monte Carlo markov chain (metropolis Hastings algorithm, Gibbs sampler ); Convergence of MCMC : Harris irreducibility, recurrence, minorization, limit theory for Harris recurrent markov chains.

Resampling techniques: jackknife; bootstrap. Hidden Markov Model (forward-backward algorithm, Viterbi algorithm, Baum-welch algorithm). Artificial Neural Network: framework, topology (feed forward neural network, recurrent neural network), training of ANN (supervised, unsupervised, reinforced learning), robustness. Genetic Algorithm: single objective GA, multi-objective NSGA.

**Text/Reference Books**


1. Simulation. Ross S. M. 4th Ed. Academic Press. 2006.
2. Data Analysis and Decision Making. Albright S. C., Winston W. L., Zappe C. J., Hinrichs C. & Rogove J. South-Western Publisher. 2002.
3. Data Analysis, Optimization and Simulation Modeling. Albright B. 4th Ed. Cengage. 2012.

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## Semester - VIII

## (Open Elective - IV)

EC-473 L-T-P-C
Robotics & Automation 3-0-0-3

**Objective:** *To introduce the basic concepts, parts of robots & types of robots & to make the student familiar with the various drive systems for robot & various applications of robots, justification & implementation of robot.*

**Course Content**

Introductory Concepts: Introduction to robotics, robotics history & development, classification of robotics, robotics applications & current research trends in robotics. Basic Components of Robotics Systems: Robotics manipulators & mechanisms actuators-pneumatics, hydraulics & electrics, sensors classifications, internal & external sensors.

Kinematics: Introduction to robotic manipulators, position & orientation of object space, robots coordinate transforms, Forward position analysis, Denavit-Hartenberg representation & parameter calculation, inverse position analysis & parameter calculation.

Euler angles & computation of parameters for different robot configurations.

Statics: Force & moment balance, recursive calculation, equivalent joint torque.

Dynamics: Inertia properties, Euler-Lagrange formulation, Newton-Euler formulation, recursive Newton-Euler algorithm, dynamic algorithm, recursive robot dynamics.

Control: control techniques, second order linear system, feedback control system & performance of feedback control system, robotic joints & joint controller, non-linear trajectory control.

Motion planning: General consideration in path description & generation, Joint space planning, Cartesian space planning, position & orientation trajectory, point to point planning, continuous path generation.

Introduction to robotic vision, image representation & analysis, template matching edge detection, space analysis, prospective transformation, camera calibration, image compression techniques.

**Text/Reference Books**


1. Introduction to Robotics. Saha S. K. Tata McGraw-Hill. 2009.
2. Introduction to robotics: Mechanics and control. Craig J. J. Addition Wesley Longman Publishing Co. 1989.
3. Introduction to Robotics (Analysis, Control, Applications). Niku S. B. 2nd Ed. Wiley India. 2011.
4. Robot Dynamics & Control. Spong M. W. & Vidyasagar M. Wiley. 1989.
5. Industrial Robotics & Manufacturing Automation. Groover M. P. Tata McGraw-Hill. 1998.

## Detailed Syllabus for B. Tech. Degree Programme in Computer Science & Engineering

## Semester - VIII

## (Open Elective - V)

BT-472 L-T-P-C
Bioelectronics & Biosensors 3-0-0-3

**Objective:** *This course imparts the knowledge of Biosensors, types of biosensors & their applications in online monitoring of bioprocesses.*

**Course Content**

Biosensors: components of biosensors, advantages & limitations; types of biosensors; biocatalysis based biosensors, bioaffinity based biosensors & microorganisms based biosensors, biologically active material & analyte. Types of membranes used in biosensor constructions. Design of enzyme electrodes & their applications as biosensors in industry such as health care & environment**.** Transducers in biosensors: piezoelectric, semiconductor, impedimetric, mechanical & molecular electronics based transducers. chemiluminiscene - based biosensors principles & applications; calorimetric, optical, potentiometric / amperometric conductrometric / resistormetric transducers; biosensors in clinical chemistry, medicine & health care, biosensors for veterinary, agriculture & food. Low cost- biosensor for online & environmental monitoring, Molecular electronics**,** assembly of photonic biomolecular memory store, information processing; commercial prospects for biomolecular computing systems.

**Text/Reference Books**


1. Biosensors for Environmental Monitoring. Bilitewski U. & Turner. A. P. F. Harwood. 2000
2. Biotechnology the Science & Business. Harwood, Moses V. & Cape. R. E. Academic Publisher London.1991
3. Biosensors for Analytical Monitoring. Rogers K. R. & Mascini M. EPA Biosensors Group. 2001.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VIII

## (Open Elective - V)

CS-461 L-T-P-C
Soft Computing 3-0-0-3

**Objective:** *This course deals with soft computing concepts, neural networks, fuzzy logic, use of heuristics based on human experience, genetic algorithm & its applications to soft computing , optimization problems to text analytics.*

**Course Content**

Introduction to Soft Computing: Rationale & Basics of Learning: Neural Networks: Multi-layer Feed-forward Networks, Recurrent Networks, Self-organizing Networks; Fuzzy Logic: Basics, inference scheme, Neuro-Fuzzy systems; Evolutionary Algorithms: GA & Optimization, Evolutionary Systems, Genetic Programming; Introduction to Rough Sets, Rough-Fuzzy representations, Belief Networks; Principles of SVM; Research based applications.

**Text/Reference Books**


1. Soft Computing: Fundamentals and Applications. Pratihar D. K. Narosa. 2015.
2. Neuro Fuzzy and Soft Computing. Jang J. S. R., Sun C. T. & Mizutani E. PHI. 2004.
3. Principles of Soft Computing. Sivanandam S. N. & Deepa S. N. 2nd Ed. Wiley. 2007.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VIII

## (Open Elective - V)

EE-466 L-T-P-C
Hydro Power Generation 3-0-0-3

**Objective:** *To get acquainted the students with various factors & control of hydro power plants.*

**Course Content**

Types of Hydro plants subsystems of hydro plant, turbines, hydro alternates hydro plant. Auxiliaries, control of hydro power, micro hydel systems & special problems in hydro plants.

**Text/Reference Books**


1. Hydro Plant Electrical Systems. David C. M. HCI Publications. 1999.
2. Hydro-electric and Pumped Storage Plants. Jog M. G. 1st Ed. New Age Pub. 1989.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VIII

## (Open Elective - V)

| | |
|---|---|
| MA-453 | L-T-P-C |
| Mathematical Statistics | 3-0-0-3 |
| Pre-requisite | MA-254 / MA-451 |

**Objective:** *To introduce the fundamental techniques of Sampling, Estimation & Hypothesis testing & illustrate these techniques with applications.*

**Course Content**

Review of Random variables. Order Statistics. Random sampling**.** The Central Limit Theorem. Sampling Distribution related to normal distribution**.** Point estimation. Bais & mean square errors of point estimators. Properties of point estimation & Methods of estimation**.** Confidence intervals. Large sample & small sample confidence intervals. Hypothesis testing. Common large sample tests p values. Small sample hypothesis tests. Power of tests & Neyman-Pearson Lemma.

**Text/Reference Books**


1. Statistical methods (Vol. II). Das N. G. 1st Ed. McGraw-Hill. 2009.
2. Probability statistics and random processes. Veerarajan T. 3rd Ed. Tata McGraw-Hill Education. 2008.
3. Higher Engineering Mathematics. Ramana B. V. 1st Ed. Tata McGraw-Hill Education. 2006.
4. Fundamentals of mathematical statistics. Gupta S. C. & Kapoor V. K. 11th Ed. S. Chand & Sons. 2002.

## Detailed Syllabus for B. Tech. Degree Programme
## in
## Computer Science & Engineering

## Semester - VIII

## (Open Elective - V)

ME-467 L-T-P-C
Total Quality Management 3-0-0-3

**Objective:** *This course discusses total quality is a description of the culture, attitude & organization of a company that aims to provide & continue to provide its customers with products & services that satisfy the needs.*

**Course Content**

Quality Concepts: Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods & Techniques for manufacture, Inspection & control of product, Quality in sales & services, Guarantee, analysis of claims.

Quality Management: Organization structure & design, Quality function, decentralization, Designing & fitting organization for different types products & company, Economics of quality value & contribution, Quality cost, optimizing quality cost, seduction programme. Human Factor in Quality: Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error & corrective methods. Control Charts: Theory of control charts, measurement range, construction & analysis of R charts, process capability study & use of control charts.

Attributes of Control Charts: Defects, construction & analysis off-chart, improvement by control chart, variable sample size, construction & analysis of C-chart. Defects Diagnosis & Prevention : Defect study, identification & analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in

the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle. IS0-9000 & its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details

**Text/Reference Books**


1. Total Quality management. LaI H. Wiley Eastern Limited. 1990.
2. Beyond Total Quality Management. Bounds G. McGraw-Hill. 1994.
3. TQM in New Product manufacturing. Menon H. G. McGraw-Hill. 1992.