**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**IDP (B.Tech + M.Tech / MBA)**
**COURSE STRUCTURE**
**Applicable From 2018-19 Admitted Batch**

## I YEAR I SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BSC | Mathematics - I | 3 | 1 | 0 | 4.0 |
| 2 | ESC | Basic Electrical Engineering | 3 | 1 | 0 | 4.0 |
| 3 | BSC | Engineering Chemistry | 3 | 0 | 0 | 3.0 |
| 4 | HSMC | English | 2 | 0 | 0 | 2.0 |
| 5 | ESC | Basic Electrical Engineering Lab | 1 | 0 | 3 | 2.5 |
| 6 | BSC | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 |
| 7 | HSMC | English Language and Communication Skills Lab | 0 | 0 | 2 | 1.0 |
| 8 | ESC | Engineering Workshop | 0 | 0 | 2 | 1.0 |
| **Total Credits** | | | **12** | **2** | **10** | **19.0** |

## I YEAR II SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BSC | Mathematics - II | 3 | 1 | 0 | 4.0 |
| 2 | BSC | Applied Physics | 3 | 1 | 0 | 4.0 |
| 3 | ESC | Programming for Problem Solving | 3 | 0 | 0 | 3.0 |
| 4 | ESC | Engineering Graphics | 1 | 0 | 4 | 3.0 |
| 5 | BSC | Applied Physics Lab | 0 | 0 | 3 | 1.5 |
| 6 | ESC | Programming for Problem Solving Lab | 0 | 0 | 3 | 1.5 |
| **Total Credits** | | | **10** | **2** | **10** | **17.0** |

## II YEAR I SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | ESC | Analog & Digital Electronics | 3 | 0 | 0 | 3.0 |
| 2 | PCC | Data Structures | 3 | 0 | 0 | 3.0 |
| 3 | PCC | Discrete Mathematics | 3 | 1 | 0 | 4.0 |
| 4 | PCC | Computer Organization & Architecture | 3 | 0 | 0 | 3.0 |
| 5 | PCC | Object Oriented Programming | 2 | 0 | 0 | 2.0 |
| 6 | ESC | Analog & Digital Electronics Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCC | Data Structures Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCC | Object Oriented Programming using C++ Lab | 0 | 0 | 3 | 1.5 |
| 9 | PCC | IT Workshop Lab | 0 | 0 | 3 | 1.5 |
| **T O T A L** | | | **14** | **1** | **12** | **21** |

## II YEAR II SEMESTER

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BSC | Computer Oriented Statistical Methods | 3 | 1 | 0 | 4.0 |
| 2 | HSMC | Business Economics & Financial Analysis | 3 | 0 | 0 | 3.0 |
| 3 | PCC | Operating Systems | 3 | 0 | 0 | 3.0 |
| 4 | PCC | Database Management Systems | 3 | 0 | 0 | 3.0 |
| 5 | PCC | Design and Analysis of Algorithms | 3 | 0 | 0 | 3.0 |
| 6 | PCC | Operating Systems Lab | 0 | 0 | 3 | 1.5 |
| 7 | PCC | Database Management Systems Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCC | Algorithms Lab using Java | 0 | 1 | 2 | 2.0 |
| 9 | MC | Environmental Science | 2 | 0 | 0 | 0 |
| **T O T A L** | | | **17** | **2** | **8** | **21.0** |

**III YEAR I SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PCC | Formal Languages & Automata Theory | 3 | 0 | 0 | 3.0 |
| 2 | PCC | Software Engineering | 3 | 0 | 0 | 3.0 |
| 3 | PCC | Computer Networks | 3 | 0 | 0 | 3.0 |
| 4 | PCC | Artificial Intelligence | 3 | 0 | 0 | 3.0 |
| 5 | PEC | Professional Elective-I | 3 | 0 | 0 | 3.0 |
| 6 | PEC | Professional Elective -II | 3 | 0 | 0 | 3.0 |
| 7 | PCC | Software Engineering Lab | 0 | 0 | 3 | 1.5 |
| 8 | PCC | Computer Networks Lab | 0 | 0 | 3 | 1.5 |
| 9 | HSMC | Advanced Communication Skills Lab | 0 | 0 | 2 | 1.0 |
| 10 | MC | Constitution of India | 2 | 0 | 0 | 0 |
| **T O T A L** | | | **20** | **0** | **8** | **22.0** |

**III YEAR II SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PCC | Machine Learning | 3 | 1 | 0 | 4.0 |
| 2 | PCC | Compiler Design | 3 | 1 | 0 | 4.0 |
| 3 | PCC | Web Technologies | 3 | 0 | 0 | 3.0 |
| 4 | PEC | Professional Elective - III | 3 | 0 | 0 | 3.0 |
| 5 | OEC | Open Elective-I (Humanities) | 3 | 0 | 0 | 3.0 |
| 6 | PCC | Machine Learning Lab using Python | 0 | 0 | 3 | 1.5 |
| 7 | PCC | Compiler Design & Web Technologies Lab | 0 | 0 | 4 | 2.0 |
| 8 | PCC | Professional Elective-III Lab | 0 | 0 | 3 | 1.5 |
| **T O T A L** | | | **15** | **2** | **10** | **22.0** |

**IV YEAR I SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | OEC (UG) | Open Elective - II | 3 | 0 | 0 | 3 |
| 2 | PEC (UG) | Professional Elective - IV | 3 | 0 | 0 | 3 |
| 3 | PCC (PG) | Advanced Algorithms | 3 | 0 | 0 | 3 |
| 4 | PCC (UG) | Information Security | 3 | 0 | 0 | 3 |
| 5 | PEC (PG) | Program Elective – I | 3 | 0 | 0 | 3 |
| 6 | PCC (PG) | Advanced Algorithms Lab | 0 | 0 | 4 | 2 |
| 7 | PCC (PG) | Information Security Lab | 0 | 0 | 4 | 2 |
| 8 | PW (UG) | Seminar | 0 | 0 | 2 | 1 |
| 9 | PW (UG) | Mini Project / Summer Internship | - | - | - | 2* |
| 10 | PW (UG) | Project Stage – I | 0 | 0 | 6 | 3 |
| 11 | AC(PG) | Audit Course -I | 2 | 0 | 0 | 0 |
| | | **Total Credits** | | | | **25** |
| | | **No. of Hours** | 17 | 0 | 16 | |

* To be carried out during summer break.

**IV YEAR II SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PEC (UG) | Professional Elective - V | 3 | 0 | 0 | 3 |
| 2 | PEC (UG) | Professional Elective - VI | 3 | 0 | 0 | 3 |
| 3 | PCC (PG) | Advanced Data Structures | 3 | 0 | 0 | 3 |
| 4 | PEC (PG) | Program Elective – II | 3 | 0 | 0 | 3 |
| 5 | PW | Research Methodology & IPR | 2 | 0 | 0 | 2 |
| 6 | PCC (PG) | Advanced Data Structures Lab | 0 | 0 | 4 | 2 |
| 7 | PW (UG) | Project Stage – II | 0 | 0 | 16 | 8 |
| 8 | PW (PG) | Mini Project with Seminar | 0 | 0 | 4 | 2 |
| 9 | AC(PG) | Audit Course –II | 2 | 0 | 0 | 0 |
| | | **Total Credits** | | | | **26** |
| | | **No. of Hours** | 16 | 0 | 24 | |

**V YEAR I SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PCC (PG) | Advanced Wireless and Mobile Networks | 3 | 0 | 0 | 3 |
| 2 | PCC (PG) | Data Analytics | 3 | 0 | 0 | 3 |
| 3 | PEC (PG) | Program Elective – III | 3 | 0 | 0 | 3 |
| 4 | PEC (PG) | Program Elective – IV | 3 | 0 | 0 | 3 |
| 5 | OEC (PG) | Open Elective | 3 | 0 | 0 | 3 |
| 6 | PCC (PG) | Data Analytics Lab | 0 | 0 | 4 | 2 |
| 7 | PW (PG) | Dissertation – I | 0 | 0 | 20 | 10 |
| | | **Total Credits** | | | | **27** |
| | | **No. of Hours** | 15 | | 24 | |

**V YEAR II SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | PW (PG) | Dissertation – II | 0 | 0 | 32 | 16 |
| | | **Total Credits** | | | | **16** |

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**IV YEAR I SEMESTER**

| S.No | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | OE-II(UG) | Open Elective - II | 3 | 0 | 0 | 3 |
| 2 | PEC-IV(UG) | Professional Elective - IV | 3 | 0 | 0 | 3 |
| 3 | PCC(UG) | UG (Lab) | 1 | 0 | 4 | 3 |
| 4 | PC-I(PG) | Business Statistics | 3 | 0 | 0 | 3 |
| 5 | PE-I | Business Law and Ethics | 3 | 0 | 0 | 3 |
| 6 | UG | Summer Internship / Seminar UG | 0 | 0 | 2 | 1 |
| 7 | UG | Mini Project (UG) | 0 | 0 | 0 | 2 |
| 8 | | Project stage –I (UG) | 0 | 0 | 6 | 3 |
| 9 | (Lab-I)PG | Business Communication Lab | 0 | 0 | 4 | 2 |
| 10 | (Lab-II)PG | Statistical analysis Lab using MS excel/SPSS | 0 | 0 | 4 | 2 |
| | AUDIT COURSE | Corporate Governance | 2 | 0 | 0 | 0 |
| | | **Total Credits** | | | | 25 |
| | | **No. of Hours** | 15 | | 20 | 35 |

**IV YEAR II SEMESTER**

| **S.No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **Credits** |
|---|---|---|---|---|---|---|
| 1 | PEC-V (UG) | Professional Elective - V | 3 | 0 | 0 | 3 |
| 2 | PEC-VI (UG) | Professional Elective - VI | 3 | 0 | 0 | 3 |
| 3 | PC-II | Financial Management | 3 | 0 | 0 | 3 |
| 4 | PE-II | Human Resource Management | 3 | 0 | 0 | 3 |
| 5 | | RM & IPR | 2 | 0 | 0 | 2 |
| 6 | | Project Stage –II (UG) | 0 | 0 | 16 | 8 |
| 7 | LAB-III(PG) | Professional Skill Development Lab | 0 | 0 | 4 | 2 |
| 8 | | Marketing Management & Research Mini Project with Seminar presentation | 2 | 0 | 0 | 2 |
| | | **Total Credits** | | | | 26 |
| | | **No. of Hours** | 16 | | 20 | 36 |

**V YEAR I SEMESTER**

| S.No | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | PC-III(PG) | Strategic Management | 3 | 0 | 0 | 3 |
| 2. | PE-III(PG) | Elective-I (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 3. | PE-IV(PG) | Elective-II(Finance / HRM/ Marketing/ Entrepreneurship) | 3 | 0 | 0 | 3 |
| 4. | PE-V(PG) | Elective-III (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 5. | PE-VI(PG) | Elective-IV (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 6. | | Dissertation -1 (PG) | | | 20 | 10 |
| 7. | LAB-IV(PG) | Mini Project & Seminar on Entrepreneurship(Lab) | 0 | 0 | 4 | 2 |
| | | **Total Credits** | | | | 27 |
| | | **No. of Hours** | 15 | | 24 | 39 |

**V YEAR II SEMESTER**

| S.No | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| | | | | | | |
| 1. | | Dissertation –II (PG) | 0 | 0 | 32 | 16 |
| | | **Total Credits** | | | | 16 |

**V YEAR I SEMESTER**

| S.No | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 8. | PC-III(PG) | Strategic Management | 3 | 0 | 0 | 3 |
| 9. | PE-III(PG) | Elective-I (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 10. | PE-IV(PG) | Elective-II(Finance / HRM/ Marketing/ Entrepreneurship) | 3 | 0 | 0 | 3 |
| 11. | PE-V(PG) | Elective-III (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 12. | PE-VI(PG) | Elective-IV (Finance/ HRM/ Marketing Entrepreneurship) | 3 | 0 | 0 | 3 |
| 13. | | Dissertation -1 (PG) | | | 20 | 10 |
| 14. | LAB-IV(PG) | Mini Project & Seminar on Entrepreneurship(Lab) | 0 | 0 | 4 | 2 |
| | | **Total Credits** | | | | 27 |
| | | **No. of Hours** | 15 | | 24 | 39 |

**V YEAR II SEMESTER**

| S.No | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2. | | Dissertation –II (PG) | 0 | 0 | 32 | 16 |
| | | **Total Credits** | | | | 16 |

**Professional Elective Core (PEC) Courses for CSE**

**Professional Elective-I**

1. Information Theory & Coding
2. Advanced Computer Architecture
3. Data Mining
4. Image Processing
5. Principles of Programming Languages

**Professional Elective -II**

1. Computer Graphics
2. Advanced Operating Systems
3. Informational Retrieval Systems
4. Advanced Databases
5. Natural Language Processing

**Professional Elective -III**

1. Concurrent Programming
2. Network Programming
3. Scripting Languages
4. Mobile Application Development
5. Software Testing Methodologies

**Professional Elective -IV**

1. Graph Theory
2. Embedded Systems
3. Semantic Web
4. Cloud Computing
5. Ad hoc & Sensor Networks

**Professional Elective -V**

1. Soft Computing
2. Distributed Computing
3. Parallel & Distributed Systems
4. Internet of Things
5. Software Process & Project Management

**Professional Elective - VI**

1. Computational Complexity
2. Mobile Computing
3. Neural Networks & Deep Learning
4. Cyber Forensics
5. Software Metrics & Measures

**Open Elective Courses (OEC)**

**Open Elective - I (Humanities)**

1. Entrepreneurship
2. Professional Practice, Law and Ethics
3. Cyber Laws & Ethics

**Open Elective – II (CSE)**

1. Data Structures
2. Artificial Intelligence
3. Python Programming
4. Java Programming

**Program Elective – I**

1. Software Architectures
2. Human Computer Interaction
3. Ethical Hacking

**Program Elective – II**

1. Distributed Databases
2. High Performance Computing
3. Optimization Techniques

**Program Elective – III**

1. Computer Vision
2. Distributed Trust & Blockchain Technology
3. Speech Processing

**Program Elective – IV**

1. Real Time Systems
2. Web Services & SOA
3. Game Theory

**Open Elective (PG) Offered By CSE**

1. Data Analytics
2. Advanced Data Structures

**Audit Course I & II**

1. English for Research paper writing
2. Soft Skills
3. Stress Management by YOGA
4. Personality development through Life Enlightenment Skills
5. Value Education
6. Disaster Management
   Professional Ethics

## Electives List (B.Tech + MBA)

**PE-I: Business** Law and Ethics /Business Environment/Quantitative Analysis and Business Decisions

**PE_II**: Human Resource Management /Production and Operation Management/Technology Management

**Specialization: Finance**

PE-III: Security Analysis and Portfolio Management

PE-IV: Strategic Management Accounting

PE-V: International Financial Management

PE-VI: Financial Institutions, Markets, and Services

**Specialization: Human Resource Management**

PE-III: Performance Management Systems

PE-IV: Management of Industrial Relations

PE-V: International Human Resource Management

PE-VI: Leadership and Change Management

**Specialization: Marketing**

PE-III Consumer Behaviour

PE-IV: Digital Marketing

Elective-III: International Marketing

PE-VI: Marketing of Services

**Specialization: Entrepreneurship**

PE-III: MSME Management

PE-IV: Entrepreneurial Finance

PE-V: Entrepreneurial Marketing

PE-VI: Creativity, Innovation and Entrepreneurship

## MATHEMATICS-I
## (LINEAR ALGEBRA AND CALCULUS)

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Pre-requisites:** Mathematical Knowledge of $12^{th}$ / intermediate level

**Objectives**

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigen values and Eigenvectors and to reduce the quadratic form to canonical form
4. Concept of Sequence.
5. Concept of nature of the series.
6. Geometrical approach to the mean value theorems and their application to the mathematical problems
7. Evaluation of surface areas and volumes of revolutions of curves.
8. Evaluation of improper integrals using Beta and Gamma functions.
9. Partial differentiation, concept of total derivative
10. Finding maxima and minima of function of two and three variables.

**Outcomes**

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
2. Find the Eigen values and Eigenvectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Analyze the nature of sequence and series.
5. Solve the applications on the mean value theorems.
6. Evaluate the improper integrals using Beta and Gamma functions
7. Find the extreme values of functions of two variables with/ without constraints.

**UNIT - I**
**MATRICES**

Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; Rrank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations, Gauss elimination method; Gauss Seidel Iteration Method.

**UNIT - II**
**EIGEN VALUES AND EIGEN VECTORS**

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

**UNIT - III**
**SEQUENCES& SERIES**
Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**UNIT - IV**
**CALCULUS**
Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT - V**
**MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)**
Definitions of Limit and continuity. Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional
dependence & independence, Maxima and Minima of functions of two variables and three variables using method of Lagrange multipliers.

**Textbooks:**
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

**References:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

## BASIC ELECTRICAL ENGINEERING

**Pre-requisites: --**

**Objectives**

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.

**Outcomes**

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations

**UNIT - I**
**D.C. CIRCUITS**
Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
Time-domain analysis of first-order RL and RC circuits.

**UNIT - II**
**A.C. CIRCUITS**
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT - III**
**TRANSFORMERS**
Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT - IV**
**ELECTRICAL MACHINES**
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.
Construction and working of synchronous generators.

**UNIT - V**
**ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**Textbooks:**

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

**References:**

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

## IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### ENGINEERING CHEMISTRY

**Objectives**

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
4. To acquire the skills pertaining to spectroscopy and to apply them for medical field etc.
5. To impart then knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

**Outcomes**

1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
2. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
3. The required skills to get clear concepts on basic spectroscopy and application to medical field etc.
4. The knowledge and configurational and conformational analysis of molecules and reaction mechanisms.

**UNIT - I**

**MOLECULAR STRUCTURE AND THEORIES OF BONDING**

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of $N_2$, $O_2$ and $F_2$ molecules. $\pi$ Molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

**UNIT - II**

**WATER AND ITS TREATMENT**

Introduction – hardness of water – Causes of hardness . Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complex metric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment. Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water. Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

**UNIT - III**

**ELECTROCHEMISTRY AND CORROSION**

Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using

quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion. Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings –Methods of coating- Hot dipping, cementation – methods of application. Electroless plating and Electroless plating of Copper.

**UNIT - IV**

**STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES**

Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation alanalysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of $S_N1$, $S_N2$ reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid.

Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

**UNIT - V**

**SPECTROSCOPIC TECHNIQUES AND APPLICATIONS**

Principles of electronic spectroscopy: Beer's Lamberts law, numerical problems. Types of electronic excitations. Applications of uv-visible spectroscopy. IR Spectroscopy: Principle, modes of vibrations, selection rules, Force constant, some common organic Functional groups wave no. regions (C-H,NH,OH, -COOH, C=0, C≡N, c+C and C≡C) Applications of IR Spectroscopy, H NMR ( NMR Spectroscopy) Principle of NMR spectroscopy Chemical shift, chemical shifts of some common organic protons. Introduction to MRI.

**Textbooks:**

1. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing company(P)Ltd.,New Delhi..
2. Text Book of Engineering Chemistry Shashi Chawla, Dhanpat Rai Publishing company(P)Ltd.,New Delhi..

**References:**

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
3. University Chemistry, by B.H. Mahan
4. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
5. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester** **L T P C**
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## ENGLISH

**INTRODUCTION**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development in the areas of Vocabulary, Grammar, Reading and Writing Skills, fostering ideas and practice of language skills in various contexts.*

**Learning Objectives**

The course will help students to

a. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
b. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
c. Develop study skills and communication skills in formal and informal situations.

**SYLLABUS**

- (**Note**: As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended,*** it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the class.)

**Unit –I**

**Vocabulary Building**: The Concept of Word Formation --The Use of Prefixes and Suffixes.
**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.
**Reading:** Reading and Its Importance- Techniques for Effective Reading.
**Basic Writing Skills:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence.

**Unit –II**

**Vocabulary:** Synonyms and Antonyms.
**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension.

**Writing:** Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume.

**Unit –III**

**Vocabulary**: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.
**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
**Reading:** Sub-skills of Reading- Skimming and Scanning
**Writing**: Writing Introduction and Conclusion - Essay Writing.

**Unit –IV**

**Vocabulary**: Standard Abbreviations in English
**Grammar:** Redundancies and Clichésin Oral and Written Communication.
**Reading**: Comprehension**-** Intensive Reading and Extensive Reading.
**Writing: Writing Practices**---Précis Writing.

**Unit –V**

**Vocabulary**: Technical Vocabulary and their usage
**Grammar:** Common Errors in English
**Reading:** Reading Comprehension-Exercises for Practice
**Writing:** **Technical Reports**- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Note:** *Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.*

References:

1. *Practical English Usage.* Michael Swan. OUP. Fourth Edition 2016.
2. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2018.
3. *English: Context and Culture* by Board of Editors published by Orient BlackSwan Pvt. Ltd.
4. *Remedial English Grammar.* F.T. Wood. Macmillan.2007.
5. On Writing Well. William Zinsser. Harper Resource Book. 2001
6. *Study Writing.* Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
7. *Exercises in Spoken English*. *Parts I –III. CIEFL, Hyderabad.* Oxford University Press

**Course Outcomes**

Students should be able to

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. The student will acquire basic proficiency in English including reading and listening comprehension, writing, and speaking skills.

## BASIC ELECTRICAL ENGINEERING LAB

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester**

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**Pre-requisites:** Basic Electrical Engineering

**Objectives**

1. To analyze a given network by applying various electrical laws and network theorem
2. To know the response of electrical circuits for different excitations
3. To calculate, measure and know the relation between basic electrical parameters.
4. To analyze the performance characteristics of DC and AC electrical machines

**Outcomes**

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters
4. Understand the basic characteristics of transformers and electrical machines.

**List of experiments/demonstrations:**

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits for DC excitation
4. Transient Response of RLC Series circuit for DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

**Textbooks:**

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

**References:**

1. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
2. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
3. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

## ENGINEERING CHEMISTRY LAB

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester**

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**Objectives**

The chemistry laboratory course consists of experiments related to the principles of chemistry required to the engineering student. The course will make the student to learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as an function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**Outcomes**

1. Determination of parameters like hardness and chloride content in water.
2. Estimation of rate constant of a reaction from concentration – time relationships.
3. Determination of physical properties like adsorption and viscosity.
4. Calculation of $R_f$ values of some organic molecules by TLC technique.

**List of Experiments:**

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of $Fe^{2+}$ by Potentiometry using $KMnO_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of $R_f$ values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

**References:**

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

## ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

| IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester | L | T | P | C |
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The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Objectives**

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence
5. To train students to use language appropriately for public speaking and interviews

**Learning Outcomes**

Students will be able to attain

1. Better understanding of nuances of English language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking skills with clarity and confidence which in turn enhances their employability skills

**Syllabus**

**English Language and Communication Skills Lab (ELCS) shall have two parts:**

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

**Listening Skills**

Objectives

1. To enable students, develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills**

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
   - Oral practice: Just A Minute (JAM) Sessions
   - Describing objects/situations/people
   - Role play – Individual/Group activities

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)**

**Exercise – I**

**CALL Lab**:

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

*Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

**ICS Lab**:

*Understand:* Communication at Work Place- Spoken vs. Written language.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – II**

**CALL Lab**:

*Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

**ICS Lab**:

*Understand:* Features of Good Conversation – Non-verbal Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise - III**

**CALL Lab:**

*Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

**ICS Lab**:

*Understand:* How to make Formal Presentations.

*Practice:* Formal Presentations.

**Exercise – IV**
**CALL Lab**:
*Understand:* Listening for General Details.
*Practice:* Listening Comprehension Tests.
**ICS Lab**:
*Understand:* Public Speaking – Exposure to Structured Talks.
*Practice:* Making a Short Speech – Extempore.
**Exercise – V**
**CALL Lab:**
*Understand:* Listening for Specific Details.
*Practice:* Listening Comprehension Tests.
**ICS Lab**:

1. Introduction to Interview Skills.
2. Common errors in speaking.

**Minimum Requirement of infrastructural facilities for ELCS Lab:**

1. **Computer Assisted Language Learning (CALL) Lab:**
   **The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**
*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**
   **The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

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## ENGINEERING WORKSHOP

**IDP (B.Tech. CSE &M.Tech./MBA) I Year I-Semester**

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Pre-requisites: **Practical skill**

**Objectives**

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
9. To understand the computer hardware and practice the Assembly of computer parts.
10. To practice the process of Installation of operating system windows.

**Outcomes**

1. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
2. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
3. Apply basic electrical engineering knowledge for house wiring practice.

I. TRADES FOR EXERCISES:

(Any **six** trades from the following with minimum of **two** exercises in each trade)

1. Carpentry – 2 Lectures
2. Fitting- 1Lecture
3. Tin-Smithy- 1Lecture
4. Black Smithy-1Lecture
5. House-wiring-1Lecture
6. Foundry- 2 Lectures
7. Plumbing-1Lecture

II. Trades for Demonstration & Exposure

1. Demonstration of power tools -1 Lecture
2. Welding – 2 Lecture
3. Machine Shop -2 Lectures

III. **IT Workshop I:** Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.

**IT Workshop II:** Installation of operating system windows and linux simple diagnostic exercises.

**Textbooks:**

1. Workshop Practice by B.L.Juneja Cengage Learning
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury.

## MATHEMATICS-II
## (ADVANCED CALCULUS)

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

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**Pre-requisites:** Mathematical Knowledge of $12^{th}$ / intermediate level

**Objectives**

1. Methods of solving the differential equations of first and higher order.
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions
4. The basic properties of vector valued functions and their applications to line, surface and volume integrals

**Outcomes**

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems
3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped
4. Evaluate the line, surface and volume integrals and converting them from one to another

**UNIT - I**
**FIRST ORDER ODE**
Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type

**UNIT - II**
**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}$, $\sin ax$ , $\cos ax$, polynomials in $x$, $e^{ax}V(x)$ and $x\,V(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

**UNIT - III**
**MULTIVARIABLE CALCULUS (INTEGRATION)**
Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.
**APPLICATIONS:**
Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).

**UNIT - IV**
**VECTOR DIFFERENTIATION**
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors

**UNIT - V**
**VECTOR INTEGRATION**
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications

**Textbooks:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006

**References:**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

## APPLIED PHYSICS

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

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**Objectives**

1. Understand basic principle of quantum mechanics
2. Gain the knowledge of carrier concentration and recombination process of semiconductor materials.
3. Learn about various types of optoelectronic devices
4. Various types of lasers and significance of optical fibers in communication system
5. Learn about material properties like dielectrics and magnetic materials.

**Outcomes**

1. Analyze the wave particle duality and about energy levels and uncertainty principle
2. Evaluate the mobility of charge carrier concentration of a given semiconductor material.
3. Justify how the graded index optical fiber is more efficient than step index optical fiber in fiber optic communication system.
4. Will be to learn about working of LED, solar cell and photo detector
5. Gain the knowledge and applications of dielectric and magnetic materials

**UNIT - I**
**QUANTUM MECHANICS**

Introduction to quantum physics, Black body radiation, Planck's law, photoelectric effect Compton effect, wave-particle duality, de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, particle in one dimensional box, potential barrier.

**UNIT - II**
**SEMICONDUCTOR PHYSICS**

Intrinsic and extrinsic semiconductors: Estimation of carrier-concentration, Dependence of Fermi level on carrier-concentration and variation with temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall Effect, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation and characteristics.

**UNIT - III**
**OPTOELECTRONICS**

Radiative, Non-radiative transitions and recombination mechanism in semiconductors, LED and Semiconductor lasers: Device structure, materials, Characteristics, Semiconductor photo-detectors: PIN and Avalanche detectors and their structure, Materials, Working principle and Characteristics, Solar cell: structure and Characteristics.

**UNIT - IV**
**LASERS AND FIBRE OPTICS**

Lasers: Introduction, Interaction of radiation with matter: Absorption, Spontaneous and Stimulated emission, Einstein coefficients, Characteristics of lasers: Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, applications of lasers. Fiber Optics: Introduction, Principle and Construction of an optical fiber, Acceptance angle, Numerical aperture, Types of fiber, losses associated with optical fibers, Basic components in optical fiber communication system, Applications of optical fibers.

**UNIT-V:**

**DIELECTRIC AND MAGNETIC PROPERTIES OF MATERIALS**

Dielectrics: Introduction, Types of polarizations (Electronic, Ionic and Orientation Polarizations) and calculation of their polarizabilities, internal fields in a solid, Clausius-Mossotti relation. Magnetism: Introduction, Bohr magneton, classification of Dia, Para and Ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domine theory, Soft and hard magnetic materials, Properties of anti-Ferro and ferri magnetic materials.

**Textbooks:**

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing.
2. Haliday and Resnick, Physics – wiley.

**References:**

1. Richard Robinett, Quantum Mechanics.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Gupta on NPTEL.
4. Introduction to Solid State Physics by Charles kittel, wiley student edition.
5. S.M. Sze, Semiconductor Devices: Physics and Technology, wiley (2008).

## PROGRAMMING FOR PROBLEM SOLVING

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

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**Objectives**

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

**Outcomes**

1. Write algorithms and to draw flowcharts for solving problems.
2. Translate the algorithms/flowcharts to programs (in C language).
3. Code and test a given logic in C programming language.
4. Formulate simple algorithms for arithmetic and logical problems.
5. Decompose a problem into functions and to develop modular reusable code.
6. Use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

**UNIT - I**

**INTRODUCTION TO COMPUTERS** – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

**INTRODUCTION TO C LANGUAGE** – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

**UNIT - II**

**STATEMENTS** – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

**DESIGNING STRUCTURED PROGRAMS**- Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

**UNIT-III:**

**ARRAYS AND STRINGS** – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

**UNIT - IV**

**POINTERS** – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

**INPUT AND OUTPUT** – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

**UNIT - V**

**DERIVED TYPES** – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

**SORTING AND SEARCHING** – Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

**Textbooks:**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

**References:**

1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C – A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

## ENGINEERING GRAPHICS

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

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**Pre-requisites:** Nil

**Objectives**

1. To provide basic concepts in engineering drawing.
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw sectional views and pictorial views of solids.

**Outcomes**

1. Preparing working drawings to communicate the ideas and information.
2. Read, understand and interpret engineering drawings.

**UNIT - I**

**INTRODUCTION TO ENGINEERING DRAWING**

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain, Diagonal and Vernier Scales.

**UNIT - II**

**ORTHOGRAPHIC PROJECTIONS:**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

**UNIT - III**

Projections of Regular Solids – Auxiliary Views.

**UNIT - IV**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

**UNIT - V**

**ISOMETRIC PROJECTIONS :**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non-isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

**Auto CAD:** Basic principles only

**Textbooks:**

1. Engineering Drawing, N.D. Bhatt, Charotar
2. Engineering Drawing and Graphics, Rane and Shah, Pearson Education.

**References:**

1. A Text Book of Engineering Drawing, Dhawan R K, S. Chand
2. Engineering Graphics With Auto CAD, James D Bethune, Pearson Education.
3. Engineering Graphics, K R Mohan, Dhanpat Rai.
4. Text book on Engineering Drawing, KL Narayana, P Kannaih, Scitech

## APPLIED PHYSICS LAB

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

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**Objectives**

1. To provide an experimental foundation for the theoretical concepts introduced in the lectures.
2. To teach how to make careful experimental observations and how to think about and draw conclusions from such data.
3. To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.

**Outcomes**

1. Make careful experimental observations and draw conclusions from such data.
2. Distinguish between inferences based on theory and the outcomes of experiments.
3. Write a technical report which communicates scientific information in a clear and concise manner.

**List of experiments:**

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall Effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.
11. BJT: Characteristics of NPN transistor.
12. Zener diode: To study the V-I Characteristics of Zener diode.

**Note:** Any 8 experiments are to be performed by each student

## PROGRAMMING FOR PROBLEM SOLVING LAB

**IDP (B.Tech. CSE &M.Tech./MBA) I Year II-Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Objectives**

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

**Outcomes**

1. Write algorithms and to draw flowcharts for solving problems.
2. Translate the algorithms/flowcharts to programs (in C language).
3. Code and test a given logic in C programming language.
4. Formulate simple algorithms for arithmetic and logical problems.
5. Decompose a problem into functions and to develop modular reusable code.
6. Use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

**Week 1:**

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
3. Write a C program to generate the first n terms of the sequence.
4. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
5. Write a C program to find the roots of a quadratic equation.

**Week 2:**

6. Write a C program to find the factorial of a given integer.
7. Write a C program to find the GCD (greatest common divisor) of two given integers.
8. Write a C program to solve Towers of Hanoi problem.
9. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

**Week 3:**

10. Write a C program to find both the largest and smallest number in a list of integers.
11. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices ii) Multiplication of Two Matrices

**Week 4:**

12. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
13. Write a C program to determine if the given string is a palindrome or not

14. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
15. Write a C program to count the lines, words and characters in a given text.

**Week 5:**

16. Write a C program to generate Pascal's triangle.
17. Write a C program to construct a pyramid of numbers
18. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
    $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$
    For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
    Print x, n, the sum
    Perform error checking.
    For example, the formula does not make sense for negative exponents – if n is less than 0.
    Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

**Week 6:**

19. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
20. Write a C program to convert a Roman numeral to its decimal equivalent.

**Week 7:**

21. Write a C program that uses functions to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers
    (Note: represent complex number using a structure.)

**Week 8:**

22. . i) Write a C program which copies one file to another.
    ii) Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)
23. . i) Write a C program to display the contents of a file.
    ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of
    the second are put in the third file)

**Week 9:**

24. Write a C program that implements the following sorting methods to sort a given list of integers in ascending
    order
    i) Bubble sort ii) Selection sort iii) Insertion sort

**Week 10:**

25. Write C programs that use both recursive and non recursive functions to perform the following searching

    Operations for a Key value in a given list of integers:

    i) Linear search ii) Binary search

**Textbooks:**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

**References:**

1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

## ANALOG AND DIGITAL ELECTRONICS

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Objectives**

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of components.
3. To give understanding of various types of amplifier circuits
4. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
5. To understand the concepts of combinational logic circuits and sequential circuits.

**Outcomes**

Upon completion of the Course, the students will be able to:

1. Know the characteristics of various components.
2. Understand the utilization of components.
3. Design and analyze small signal amplifier circuits.
4. Postulates of Boolean algebra and to minimize combinational functions
5. Design and analyze combinational and sequential circuits
6. Known about the logic families and realization of logic gates.

**UNIT - I: Diodes and applications**

Junction diode characteristics: Open circuited p-n junction, p-n junction as a rectifier, V-I characteristics, effect of temperature, diode resistance, diffusion capacitance, diode switching times, breakdown diodes, Tunnel diodes, photo diode, LED.

Diode Applications - clipping circuits, comparators, Half wave rectifier, Full wave rectifier, rectifier with capacitor filter.

**UNIT - II: BJTs**

Transistor characteristics: The junction transistor, transistor as an amplifier, CB, CE, CC configurations, comparison of transistor configurations, the operating point, self-bias or Emitter bias, bias compensation, thermal runaway and stability, transistor at low frequencies, CE amplifier response, gain bandwidth product, Emitter follower, RC coupled amplifier, two cascaded CE and multi stage CE amplifiers.

**UNIT - III: FETs and Digital Circuits**

FETs: JFET, V-I characteristics, MOSFET, low frequency CS and CD amplifiers, CS and CD amplifiers.

Digital Circuits: Digital (binary) operations of a system, OR gate, AND gate, NOT, EXCLUSIVE OR gate, De Morgan Laws, NAND and NOR DTL gates, modified DTL gates, HTL and TTL gates, output stages, RTL and DCTL, CMOS, Comparison of logic families.

**UNIT - IV: Combinational logic circuits**

Basic Theorems and Properties of Boolean Algebra, Canonical and Standard Forms, Digital Logic Gates, The Map Method, Product-of-Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Exclusive-OR Function, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

**UNIT - V: Sequential logic circuits**

Sequential Circuits, Storage Elements: Latches and flip flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Shift Registers, Ripple Counters, Synchronous Counters, Random-Access Memory, Read-Only Memory.

**Textbooks:**

1. Integrated Electronics: Analog and Digital Circuits and Systems, Jaccob Millman, Christos Halkias and Chethan D. Parikh, 2nd Edition, Tata McGraw-Hill Education, India, 2010.
2. Digital Design, Morris Mano and Michael D. Cilette, 5th Edition, Pearson, 2011.

**References:**

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.
2. Digital Principles, Roger L. Tokheim, 3rd Edition, Schaum's outline series, McGraw-Hill, 1994.

# DATA STRUCTURES

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## Prerequisites

1. A course on "Programming for Problem Solving "

## Objectives

1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms

## Outcomes

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

## UNIT - I

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

## UNIT - II

**Dictionaries**: linear list representation, skip list representation, operations - insertion, deletion and searching.

**Hash table representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

## UNIT - III

**Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**UNIT - IV**

**Graphs:** Graph Implementation Methods. Graph Traversal Methods.

**Sortings:** Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**

**Pattern matching and Tries:** Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**Textbooks:**

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

**References:**

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON.

# DISCRETE MATHEMATICS

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Prerequisites**

1. An understanding of Mathematics in general is sufficient.

**Objectives**

1. Introduces the elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

**Outcomes**

1. Ability to understand and construct precise mathematical proofs
2. Ability to use logic and set theory to formulate precise statements
3. Ability to analyze and solve counting problems on finite and discrete structures
4. Ability to describe and manipulate sequences
5. Ability to apply graph theory in solving computing problems

**UNIT - I**

**The Foundations: Logic and Proofs**

Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

**UNIT - II**

**Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations**

Sets, Functions , Sequences & Summations, Cardinality of Sets and Matrices

Relations**,** Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

**UNIT - III**

**Algorithms, Induction and Recursion**

Algorithms, The Growth of Functions, Complexity of Algorithms.

**Induction and Recursion**

Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

**UNIT - IV**

**Discrete Probability and Advanced Counting Techniques**

An Introduction to Discrete Probability . Probability Theory, Bayes' Theorem, Expected Value and Variance.

**Advanced Counting Techniques**

Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

**UNIT - V**

**Graphs**

Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

**Trees**

Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

**Textbooks:**

1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7th Edition, TMH.

**References:**

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2nd Edition, Pearson Education.
3. Discrete Mathematics- Richard Johnsonbaugh, 7Th Edition, Pearson Education.
4. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
5. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th Edition , Pearson Education,.

## COMPUTER ORGANIZATION AND ARCHITECTURE

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisites**

No prerequisites

**Co-requisite**

A Course on "Digital Logic Design and Microprocessors"

**Objectives**

1. The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

**Outcomes**

1. Understand the basics of instructions sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

**UNIT - I**

**Digital Computers:** Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

**Register Transfer Language and Micro operations:** Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

**Basic Computer Organization and Design:** Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

**UNIT – II**

**Micro Programmed Control:** Control memory, Address sequencing, micro program example, design of control unit.

**Central Processing Unit:** General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

**UNIT - III**

**Data Representation:** Data types, Complements, Fixed Point Representation, Floating Point Representation.

**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

**UNIT - IV**

**Input-Output Organization:** Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

**UNIT - V**

**Reduced Instruction Set Computer:** CISC Characteristics, RISC Characteristics.

**Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Arrey Processor.

**Multi Processors:** Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**Textbooks:**

1. Computer System Architecture, M. Moris Mano, 3rd Edition, Pearson/PHI.

**Reference:**

1. Computer Organization, Car Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Organization and Architecture, William Stallings 6th Edition, Pearson/PHI.
3. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

## OBJECT ORIENTED PROGRAMMING

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

**Prerequisites**

1. A course on "Programming for Problem Solving "

**Objectives**

1. Introduces object oriented programming concepts using the C++ language.
2. Introduces the principles of data abstraction, inheritance and polymorphism;
3. Introduces the principles of virtual functions and polymorphism
4. Introduces handling formatted I/O and unformatted I/O
5. Introduces exception handling

**Outcomes**

1. Able to develop programs with reusability
2. Develop programs for file handling
3. Handle exceptions in programming
4. Develop applications for a range of problems using object-oriented programming techniques

**UNIT - I**

**Object Oriented thinking** - Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts-Abstraction, Encapsulation, Inheritance and Polymorphism.

**C++ Basics:** Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References:.
Flow control statement- if, switch, while, for, do, break, continue, goto statements.
Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions.
Dynamic memory allocation and deallocation operators-new and delete, Preprocessor directives.

**UNIT - II**

**C++ Classes And Data Abstraction:** Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

**UNIT - III**

**Inheritance:** Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.
**Virtual Functions And Polymorphism:** Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

**UNIT - IV**

**C++ I/O:** I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

**UNIT-V**

**Exception Handling:** Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

**Textbooks:**

1. The Complete Reference C++, 4th Edition, Herbert Schildt, TMH.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

**References:**

1. The C++ Programming Language, B.Stroutstrup, 3rd Edition, Pearson Education.
2. OOP in C++, T.Gaddis, J.Walters and G.Muganda, 3rd Edition, Wiley DreamTech Press.
3. Object Oriented Programming in C++, R.Lafore, 3rd Edition, Galigotia Publications pvt ltd.
4. Computer Science, a Structured Programming Approach Using C++, B.A.Forouzan and R.F.Gilberg, Thomson.

## ANALOG AND DIGITAL ELECTRONICS LAB

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Objectives**

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of components.
3. To give understanding of various types of amplifier circuits
4. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
5. To understand the concepts of combinational logic circuits and sequential circuits.

**Outcomes**

Upon completion of the Course, the students will be able to:

1. Know the characteristics of various components.
2. Understand the utilization of components.
3. Design and analyze small signal amplifier circuits.
4. Postulates of Boolean algebra and to minimize combinational functions
5. Design and analyze combinational and sequential circuits
6. Known about the logic families and realization of logic gates.

**List of Experiments**

1. Full Wave Rectifier with & without filters
2. Common Emitter Amplifier Characteristics
3. Common Base Amplifier Characteristics
4. Common Source amplifier Characteristics
5. Measurement of h-parameters of transistor in CB, CE, CC configurations
6. Input and Output characteristics of FET in CS configuration
7. Realization of Boolean Expressions using Gates
8. Design and realization logic gates using universal gates
9. generation of clock using NAND / NOR gates
10. Design a 4 – bit Adder / Subtractor
11. Design and realization a Synchronous and Asynchronous counters using flip-flops
12. Realization of logic gates using DTL, TTL, ECL, etc.,

**Textbooks:**

1. Integrated Electronics: Analog and Digital Circuits and Systems, Jaccob Millman, Christos Halkias and Chethan D. Parikh, 2nd Edition, Tata McGraw-Hill Education, India, 2010.
2. Digital Design, Morris Mano and Michael D. Cilette, 5th Edition, Pearson, 2011.

**References:**

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.
2. Digital Principles, Roger L. Tokheim, 3rd Edition, Schaum's outline series, McGraw-Hill, 1994.

## DATA STRUCTURES LAB

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Prerequisites**

1. Course on "Programming for problem solving"

**Objectives**

1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

**Outcomes**

1. Ability to develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Ability to Implement searching and sorting algorithms

**List of Experiments**

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Bubble sort ii) Selection sort iii) Insertion sort
7. Write a program that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
   i) Linear search ii) Binary search

8. Write a program to implement the tree traversal methods

9. Write a program to implement the graph traversal methods

**Textbooks:**

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

**References:**

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON.

## OBJECT ORIENTED PROGRAMMING USING C++ LAB

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Prerequisites**

1. A course on "Programming for Problem Solving "

**Objectives**

1. Introduces object oriented programming concepts using the C++ language.
2. Introduces the principles of data abstraction, inheritance and polymorphism;
3. Introduces the principles of virtual functions and polymorphism
4. Introduces handling formatted I/O and unformatted I/O
5. Introduces exception handling

**Outcomes**

1. Ability to develop applications for a range of problems using object-oriented programming techniques

### List of Experiments

1. Program: Write a C++ Program to display names, roll no's, and grades of 3 students who have appeared in the examination. Declare the class of name, roll no's and grade. Create an array of class objects. Read and display the contents of the array.

2. Program: Write a C++ program to declare *struct*. Initialize and display contents of member variables.

3. Program: Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.

4. Program: Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary)**.**

**5.** Program: Write a C++ to illustrate the concepts of console I/O operations.

6. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.

7. Program: Write a C++ program to allocate memory using *new* operator.

8. Write a C++ program to create multilevel inheritance. (Hint:classes A1,A2, A3)

9. Write a C++ program to create an array of pointers. Invoke functions using array objects.

10. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

**Textbooks:**

1. The Complete Reference C++, 4th Edition, Herbert Schildt, TMH.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch, Pearson Education.

**References:**

1. The C++ Programming Language, B.Stroutstrup, 3rd Edition, Pearson Education.
2. OOP in C++, T.Gaddis, J.Walters and G.Muganda, 3rd Edition, Wiley DreamTech Press.
3. Object Oriented Programming in C++, R.Lafore, 3rd Edition, Galigotia Publications pvt ltd.
4. Computer Science, a Structured Programming Approach Using C++, B.A.Forouzan and R.F.Gilberg, Thomson.

## IT WORKSHOP LAB

**IDP (B.Tech. CSE &M.Tech./MBA) II Year I-Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

**Objectives**

The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

**PC Hardware** introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible. Internet & World Wide Web** module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced. **Productivity tools** module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX. (**Recommended to use Microsoft office 2007 in place of MS Office 2003)**

**PC Hardware**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Task 5: Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

**Task 6: Software Troubleshooting:** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

**Internet & World Wide Web**

**Task1**: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2: Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3**: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**LaTeX and Word**

**Task 1 – Word Orientation**: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2: Using LaTeX and Word** to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Task 3: Creating project** abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4 : Creating a Newsletter** : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler -** Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

**Task 3: Performance Analysis** - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**LaTeX and MS/equivalent (FOSS) tool Power Point**

**Task1:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

**Task 2:** Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**References:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech

2. The Complete Computer upgrade and repair book, 3rd Edition, Cheryl A Schmidt, WILEY Dreamtech

3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

4. PC Hardware and A+Handbook, Kate J. Chase, PHI (Microsoft)

5. LaTeX Companion, Leslie Lamport, PHI/Pearson.

6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press , Pearson Education. Microsoft Office 2007: The Missing Manual - Chris Grover, Mathew MacDonald, E.A.Vander Veer O'reilly Media

## COMPUTER ORIENTED STATISTICAL METHODS

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**Pre-requisites:** No pre requisites, Foundation course

**Objectives:**

The aim of the course is to understand

1. The theory of Probability, and probability distributions of single and multiple random variables
2. The sampling theory and testing of hypothesis and making inferences
3. The regression and correlation

**Outcomes**

At the end of the course student is able to

1. Apply the concepts of probability and distributions to some case studies
2. Correlate the material of one unit to the material in other units
3. Resolve the potential misconceptions and hazards in each topic of study.

**UNIT - I**

**Probability:** Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule,

**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence, Joint Probability Distributions.

**UNIT - II**

**Mathematical Expectation:**Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

**Discrete Probability Distributions:** Introduction and Motivation, Binomial and Multinomial Distributions, Hypergeometric Distribution, Negative Binomial and Geometric Distributions, Poisson distribution.

**UNIT - III**

**Continuous Probability Distributions:** Continuous Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial, Gamma and Exponential Distributions, Chi-Squared Distribution, Beta Distribution, Lognormal Distribution.

**Fundamental Sampling Distributions:**Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of $S^2$, t –Distribution, F-Distribution.

**UNIT - IV**

**One and Two-Sample Estimation Problems:**Introduction, Statistical Inference, Classical Methods of Estimation.**Single Sample**: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits,Estimating the Variance,Estimating a Proportion.**Two Samples**: Estimating the Difference between Two Means, Paired Observations, Estimating the Difference between Two Proportions,Estimating the Ratio of Two Variances, Maximum Likelihood Estimation.

**One and Two-Sample Tests of Hypotheses:** Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, The Use of P-Values for Decision Making in Testing Hypotheses, Single Sample: Tests Concerning a Single Mean, Two Samples: Tests on Two Means, Choice of Sample Size for Testing Means, Graphical Methods for Comparing Means, One Sample: Test on a Single Proportion, Two Samples: Tests on Two Proportions, One- and Two-Sample Tests Concerning Variances.

**UNIT - V**

**Linear Regression and Correlation**

Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Choice of a Regression Model, Analysis-of-Variance Approach, Test for Linearity of Regression: Data with Repeated Observations, Correlation.

**Textbooks:**

1. Probability & Statistics For Engineers & Scientists, Ronald E. Walpole,Raymond H. Myers,Sharon L. Myers,Keying Ye, 9th Edition, Pearson

**References:**

1. Fundamentals Of Probability And Statistics For Engineers, T.T. Soong, John Wiley & Sons, Ltd, 2004.
2. Fundamentals of Mathematical statistics, S C Gupta and V K Kapoor, Khanna publications.
3. Probability and statistics for Engineers and scientists, Sheldon M Ross, academic press,.

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**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**

**Objective**

To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

**Outcome**

To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

**UNIT - I**

**Introduction to Engineering Economics-** Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

**UNIT - II**

**Macro Economic Concepts:** National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

**UNIT - III**

**Production, Cost, Market Structures & Pricing:**

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV**

**Capital Budgeting Techniques:** Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques-

Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

**UNIT - V**

**Introduction to Accounting:** Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. ( Simple Problems).

**Textbooks:**

1. Engineering Economics, Principles, Henry Malcom Steinar, McGraw Hill Pub.
2. Business Economics - Theory and Applications, D.D.Chaturvedi, S.L.Gupta, International Book House Pvt. Ltd. 2013.
3. Accounting, Jain and Narang, Kalyani Publishers.
4. Cost Accounting, Arora, M.N, Vikas Publication.
5. Financial Management, S.N.Maheshwari, Vikas Publishing House.

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## OPERATING SYSTEMS

**Prerequisites**

1. A course on "Computer Programming and Data Structures"
2. A course on "Computer Organization and Architecture"

**Objectives**

1. Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
2. Introduce the issues to be considered in the design and development of operating system
3. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Outcomes**

1. Will be able to control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computer and their respective roles in computing.
3. Ability to recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

**UNIT - I**

**Operating System Introduction**, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

**UNIT - II**

**Process and CPU Scheduling** - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

**System call interface for process management**-fork, exit, wait, waitpid, exec

**UNIT - III**

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

**Process Management and Synchronization** - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.

**Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

**UNIT - IV**

**Memory Management and Virtual Memory** - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

**UNIT - V**

**File System Interface and Operations** -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl, system calls.

**Textbooks:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

**References:**

1. Operating Systems – Internals and Design Principles, Stallings, 5th Edition, Pearson Education/PHI, 2005.
2. Operating System A Design Approach-Crowley,TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

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**DATABASE MANAGEMENT SYSTEMS**

**Prerequisites**

1. A course on "Data Structures"

**Objectives**

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

**Outcomes**

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.

Familiarity with database storage structures and access techniques

**UNIT - I**

**Database System Applications:** A Historical Perspective, File Systems versus a DBMS**,** the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

**Introduction to Database Design**: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

**UNIT - II**

**Introduction to the Relational Model**: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.

Relational Algebra**,** Tuple relational Calculus, Domain relational calculus.

**UNIT - III**

**SQL: Queries, Constraints, Triggers:**form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

**Schema refinement**: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal

forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

**UNIT - IV**

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

**UNIT - V**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

**Textbooks:**

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

**References:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Edition.
2. SQL The Complete Reference, James R. Groff, Paul N. Weinberg, 3rd Edition,
3. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
4. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.

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## DESIGN AND ANALYSIS OF ALGORITHMS

**Prerequisites**

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"

**Objectives**

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets.
3. Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
4. Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

**Outcomes**

1. Ability to analyze the performance of algorithms
2. Ability to choose appropriate data structures and algorithm design methods for a specified application
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

**UNIT - I**

**Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

**Divide and conquer**: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

**UNIT - II**

**Disjoint Sets**: Disjoint set operations, union and find algorithms

**Backtracking**: General method, applications, n-queen's problem, sum of subsets problem, graph coloring

**UNIT - III**

**Dynamic Programming**: General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

**UNIT - IV**

**Greedy method:** General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

**UNIT - V**

**Branch and Bound**: General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**NP-Hard and NP-Complete problems**: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

**Textbook:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharan,University Press.

**References:**

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
2. Introduction to Algorithms, second edition,T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

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## OPERATING SYSTEMS LAB
## (Using UNIX/LINUX)

**Prerequisites**

1. A course on "Programming for Problem Solving"
2. A course on "Computer Organization and Architecture"

**Co-requisite**

1. A course on "Operating Systems"

**Objectives**

1. To provide an understanding of the design aspects of operating system concepts through simulation
2. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

**Outcomes**

1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls

### List of Experiments

1. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms
   a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques
   a) Paging b) Segmentation

**Textbooks:**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

**References:**

1. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005,
1. Pearson Education/PHI
2. Operating System A Design Approach-Crowley,TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education

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## DATABASE MANAGEMENT SYSTEMS LAB

**Co-requisites**

1. Co-requisite of course "Database Management Systems"

**Objectives**

1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation

**Outcomes**

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.

Develop solutions for database applications using procedures, cursors and triggers

### List of Experiments

1) Concept design with E-R Model
2) Relational Model
3) Normalization
4) Practicing DDL commands
5) Practicing DML commands
6) Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7) Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8) Triggers (Creation of insert trigger, delete trigger, update trigger)
9) Procedures
10) Usage of Cursors

**Textbooks:**

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

**References:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 7th Edition.
2. SQL The Complete Reference, James R. Groff, Paul N. Weinberg, 3rd Edition,
3. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
4. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.

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## ALGORITHMS LAB USING JAVA

**Prerequisites**

1. A Course on "Data Structures"
2. A Course on "Objected Oriented Programming through Java"

**Objectives**

1. It covers various concepts of java programming language
2. It introduces searching and sorting algorithms
3. It introduces the feasible and optimal solutions by using the different design methods

**Outcomes**

1. Develop the feasible and optimal solutions by using Greedy and dynamic programming.
2. Able to design the searching algorithms

**List Of Programs:**

1. Write a program to implement n-Queen's problem
2. Write a program to implement Optimal Binary Search Tree
3. Write a program to implement 0/1 Knapsack problem by using Dynamic Programming
4. Write a program to implement Greedy Knapsack problem
5. Write a program to implement Prim's minimum cost spanning tree by using Greedy Method
6. Write a program to implement Kruskal's minimum cost spanning tree by using Greedy Method
7. Write a program to implement Job sequencing with deadlines by using Greedy Method
8. Write a program to implement Single source shortest path problem by using Greedy Method

**Textbook:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharan,University Press.

**References:**

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
2. Introduction to Algorithms, second edition,T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.

3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons
4. Java The Complete Reference, Herbert Schildt's, 9th Edition, TATA McGRAW – HILL.

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**ENVIRONMENTAL SCIENCE**
**(Mandate Course)**

**Pre-Requisites:** NIL

**Objectives:**

1. Creating the awareness about environmental problems among students.
2. Imparting basic knowledge about the environment and its allied problems.
3. Developing an attitude of concern for the environment.
4. Motivating students to participate in environment protection and environment improvement.

**Outcomes:**

At the end of the course, it is expected that students will be able to:

1. Identify and analyze environmental problems as well as the risks associated with these problems
2. Understand what it is to be a steward in the environment
3. Studying how to live their lives in a more sustainable manner

**UNIT-I:**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES:** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**UNIT–II:**

**ECOSYSTEMS:** Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT–III:**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

**UNIT–IV:**

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

**UNIT–V:**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development - Urban problems related to energy -Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics:

Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies -Wasteland reclamation. –Consumerism and waste products. - Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act - Issues involved in enforcement of environmental legislation. -Public awareness.

**Textbooks:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission., Universities Press
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**References:**

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

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**FORMAL LANGUAGES AND AUTOMATA THEORY**

**Objectives**

1. To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
2. To introduce the fundamental concepts of formal languages, grammars and automata theory.
3. Classify machines by their power to recognize languages.
4. Employ finite state machines to solve problems in computing.
5. To understand deterministic and non-deterministic machines.
6. To understand the differences between decidability and undecidability.

**Outcomes**

1. Able to understand the concept of abstract machines and their power to recognize the languages.
2. Able to employ finite state machines for modeling and solving computing problems.
3. Able to design context free grammars for formal languages.
4. Able to distinguish between decidability and undecidability.
5. Able to gain proficiency with mathematical tools and formal methods.

**UNIT - I**

**Introduction to Finite Automata:**Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata**:Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA, Moore and Melay machines

**UNIT - II**

**Regular Expressions**: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages**,: Statement of the pumping lemma, Applications of the Pumping Lemma.

**Closure Properties of Regular Languages**: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

**UNIT - III**

**Context-Free Grammars:**Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. **Push Down Automata**: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

**UNIT - IV**

**Normal Forms for Context- Free Grammars**:Eliminating useless symbols, Eliminating €-Productions. Chomsky Normal form ,Griebech Normal form.

**Pumping Lemma for Context-Free Languages:** Statement of pumping lemma, Applications

**Closure Properties of Context-Free Languages**:Closure properties of CFL's, Decision Properties of CFL's

**Turing Machines**: Introduction to Turing Machine,Formal Description, Instantaneous description, The language of a Turing machine

**UNIT - V**

**Types of Turing machine:** Turing machines and halting

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

**Textbooks:**

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

**References:**

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.

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## SOFTWARE ENGINEERING

**Objectives**

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

**Outcomes**

1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**UNIT - I**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths.

**A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.

**UNIT - II**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**System models:** Context models, behavioral models, data models, object models, structured methods.

**UNIT - III**

**Design Engineering:** Design process and design quality, design concepts, the design model.

**Creating an architectural design:** software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**UNIT - IV**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.
**Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

**UNIT - V**
**Metrics for Process and Products:** Software measurement, metrics for software quality.
**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.
**Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**Textbooks:**
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc GrawHill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson Education.
3. The Unified Modeling Language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

**References:**
1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Eductaion.

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## COMPUTER NETWORKS

**Prerequisites**

1. A course on "Programming for problem solving"
2. A course on "Data Structures"

**Objectives**

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

**Outcomes**

1. Gain the knowledge of the basic computer network technology.
2. Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms.
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

**UNIT - I**

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

**Physical Layer:** Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

**UNIT - II**

**Data link layer:** Design issues, framing, Error detection and correction.

**Elementary data link protocols:** simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

**Sliding Window protocols:** A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols.

**Medium Access sub layer:** The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

**UNIT - III**

**Network Layer:** Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

**UNIT - IV**

**Transport Layer:** Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

**UNIT - V**

**Application Layer** –Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

**Textbook:**

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**References:**

1. An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

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## ARTIFICIAL INTELLIGENCE

**Prerequisites**

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"
3. A course on "Design and Analysis of Algorithms"
4. A course on "Mathematical Foundations of Computer Science"
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

**Objectives**

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Outcomes**

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimaate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.

Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

**UNIT - I**

**Problem Solving by Search-I**

Introduction to AI, Intelligent Agents

**Problem Solving by Search –II:**

Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching wih Partial Observations, Online Search Agents and Unknown Environment .

**UNIT - II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:**
Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems :**
Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:**
Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs , Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining , Effective Propositional Model Checking , Agents Based on Propositional Logic.

**UNIT - III**
**Logic and Knowledge Representation**

**First-Order Logic:**
Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:**
Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:**
Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**UNIT - IV**
**Planning**

**Classical Planning:**

Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World :**

Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning,.

**UNIT - V**

**Uncertain knowledge and Learning**

**Uncertainty:**

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:**

Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning ; Dempster-Shafer theory.

**Learning:**

Forms of Learning, Supervised Learning, Learning Decision Trees.Knowledge in Learning : Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

**Textbooks:**

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education.

**References:**

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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## INFORMATION THEORY & CODING
**(Professional Elective - I)**

**Prerequisite**
1. Digital Communications

**Objectives:**
1. To acquire the knowledge in measurement of information and errors.
2. Understand the importance of various codes for communication systems
3. To design encoder and decoder of various codes.
4. To known the applicability of source and channel codes

**Outcomes:**
Upon completing this course, the student will be able to
1. Learn measurement of information and errors.
2. Obtain knowledge in designing various source codes and channel codes
3. Design encoders and decoders for block and cyclic codes
4. Understand the significance of codes in various applications

**UNIT - I**
**Coding for Reliable Digital Transmission and storage**
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
**Source Codes:** Shannon-fano coding, Huffman coding

**UNIT - II**
**Linear Block Codes:** Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

**UNIT - III**
**Cyclic Codes :** Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

**UNIT - IV**
**Convolutional Codes :** Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

**UNIT - V**

**BCH Codes:** Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

**Textbooks:**

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing 1989

**References:**

1. Digital Communications, John G. Proakis, 5th Edition, TMH 2008.
2. Introduction to Error Control Codes, Salvatore Gravano, Oxford
3. Error Correction Coding – Mathematical Methods and Algorithms, Todd K.Moon, 2006, Wiley India.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

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## ADVANCED COMPUTER ARCHITECTURE
## (Professional Elective - I)

**Prerequisites:** Computer Organization

**Objectives**

1. To impart the concepts and principles of parallel and advanced computer architectures.
2. To develop the design techniques of Scalable and multithreaded Architectures.
3. To Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems

**Outcomes**

Gain knowledge of

1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

**UNIT - I**

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

**UNIT - II**

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

**UNIT - III**

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

**UNIT - IV**

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector

Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5,

**UNIT - V**

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

**Textbook:**

1. Advanced Computer Architecture, Kai Hwang, 2nd Edition, Tata McGraw Hill Publishers.

**References:**

1. Computer Architecture, J.L.Hennessy and D.A. Patterson, 4th Edition, ELSEVIER.
2. Advanced Computer Architectures, S.G.Shiva, Special Indian edition, CRC,Taylor &Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G.Hager and G.Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D.Sima, T .Fountain, P.Kacsuk, Pearson education.
5. Computer Architecture, B.Parhami, Oxford Univ. Press.

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## DATA MINING
**(Professional Elective – I)**

### Prerequisites
1. A course on "Database Management Systems"
2. Knowledge of probability and statistics

### Objectives
1. It presents methods for mining frequent patterns, associations, and correlations.
2. It then describes methods for data classification and prediction, and data–clustering approaches.
3. It covers mining various types of data stores such as spatial, textual, multimedia, streams.

### Outcomes
1. Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Apply preprocessing methods for any given raw data.
3. Extract interesting patterns from large amounts of data.
4. Discover the role played by data mining in various fields.
5. Choose and employ suitable data mining algorithms to build analytical applications
6. Evaluate the accuracy of supervised and unsupervised models and algorithms.

### UNIT - I
**Data Mining**

Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns–Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

### UNIT – II
**Association Rule Mining**

Mining Frequent Patterns–Associations and correlations– Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

### UNIT – III
**Classification**

Classification and Prediction– Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

**UNIT – IV**

**Clustering And Applications**

Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods,–Hierarchical Methods– Density–Based Methods,–Grid–Based Methods, Outlier Analysis.

**UNIT - V**

**Advanced Concepts**

Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases–.Mining Object– Spatial– Multimedia–Text and Web data– Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

**Textbooks:**

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics –Margaret H Dunham, PEA.

**References:**

1. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten and Eibe Frank, 2nd Edition, Morgan Kaufmann, 2005.

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## IMAGE PROCESSING
## (Professional Elective - I)

### Prerequisites

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.
2. A course on "Computational Mathematics"
3. A course on "Computer Oriented Statistical Methods"

### Objectives

1. Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
2. The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

### Outcomes

1. Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
2. Demonstrate the knowledge of filtering techniques.
3. Demonstrate the knowledge of 2D transformation techniques.
4. Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

### UNIT - I

**Digital Image Fundamentals:** Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

### UNIT - II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

### UNIT - III

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT - IV**

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

**UNIT - V**

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

**Textbook:**

1. Digital Image Processing: R.C. Gonzalez & R.E. Woods, 2nd Edition, Addison Wesley/ Pearson Education, 2004.

**References:**

1. Fundamentals of Digital Image Processing, A.K.Jain , PHI.
2. Digital Image Processing using MAT LAB, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing, William K. Pratt, 3rd Edition, John Wilely, 2004.

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## PRINCIPLES OF PROGRAMMING LANGUAGES
## (Professional Elective-I)

**Prerequisites**
1. A course on "Mathematical Foundations of Computer Science"
2. A course on "Computer Programming and Data Structures"

**Objectives**
1. Introduce important paradigms of programming languages
2. To provide conceptual understanding of high level language design and implementation
3. Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages; and scripting languages

**Outcomes**
1. Acquire the skills for expressing syntax and semantics in formal notation
2. Identify and apply a suitable programming paradigm for a given computing application
3. Gain knowledge of and able to compare the features of various programming languages

**UNIT - I**

**Preliminary Concepts**: Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade-Offs, Implementation Methods, Programming Environments

**Syntax and Semantics:** General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs

**UNIT - II**

**Names, Bindings, and Scopes**: Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants

**Data Types**: Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types, List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence

**Expressions and Statements:** Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment

**Control Structures** – Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

**UNIT - III**

**Subprograms and Blocks:** Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines

**Implementing Subprograms**: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping

**Abstract Data Types:** The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

**UNIT - IV**

**Concurrency:** Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency.

Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

**UNIT - V**

**Functional Programming Languages:** Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

**Logic Programming Language:** Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.

**Scripting Language:** Pragmatics, Key Concepts, Case Study: Python – Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (Text Book 2)

**Textbooks:**

1. Concepts of Programming Languages, Robert .W. Sebesta,10th Edition, Pearson Edtn
2. Programming Language Design Concepts, D. A. Watt, Wiley Dreamtech, 2007.

**References:**

1. Programming Languages, A.B. Tucker, R.E. Noonan, 2nd Edition, TMH.
2. Programming Languages, K. C.Louden, 2nd Edition, Thomson, 2003

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**COMPUTER GRAPHICS**
**(Professional Elective - II)**

**Prerequisites**

1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
2. A course on "Computer Programming and Data Structures"

**Objectives**

1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

**Outcomes**

1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Be able to design basic graphics application programs, including animation
3. Be able to design applications that display graphic images to given specifications

**UNIT - I**

**Introduction:** Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

**Output primitives**: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), mid-point circle and ellipse algorithms

**Polygon Filling**: Scan-line algorithm, boundary-fill and flood-fill algorithms

**UNIT - II**

**2-D geometrical transforms**: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems

**2-D viewing**: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland – Hodgeman polygon clipping algorithm.

**UNIT - III**

**3-D object representation**: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

**UNIT - IV**

**3-D Geometric transformations**: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

**3-D viewing**: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

**UNIT - V**

**Computer animation**: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

**Visible surface detection methods**: Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods

**Textbooks:**

1. Computer Graphics *C version*, Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

**References:**

1. Procedural elements for Computer Graphics, David F Rogers, 2nd Edition, Tata Mc Graw Hill.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

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## ADVANCED OPERATING SYSTEMS
## (Professional Elective - II)

### Objectives

1. To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
2. Hardware and software features that support these systems.

### Outcomes

1. Understand the design approaches of advanced operating systems
2. Analyze the design issues of distributed operating systems.
3. Evaluate design issues of multi processor operating systems.
4. Identify the requirements Distributed File System and Distributed Shared Memory.
5. Formulate the solutions to schedule the real time applications.

### UNIT - I

**Architectures of Distributed Systems:** System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. **Theoretical Foundations:** Inherent Limitations of a Distributed System, Lamport's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

### UNIT - II

**Distributed Mutual Exclusion:** The Classification of Mutual Exclusion Algorithms, **Non-Token –Based Algorithms:** Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm, **Token-Based Algorithms:** Suzuki-Kasami's Broadcast Algorithm, Singhal's Heurisric Algorithm, Raymond's Heuristic Algorithm.

### UNIT - III

**Distributed Deadlock Detection:** Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

### UNIT - IV

**Multiprocessor System Architectures**: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures **Multi Processor Operating Systems**: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues , Threads , Process Synchronization , Processor Scheduling.

**Distributed File Systems:** Architecture, Mechanisms for Building Distributed File Systems, Design Issues

**UNIT - V**

**Distributed Scheduling:** Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration

**Distributed Shared Memory:** Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

**Textbook:**

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjan G. Shivaratri, Tata McGraw-Hill Edition 2001

**References:**

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

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**INFORMATION RETRIEVAL SYSTEMS**
**(Professional Elective - II)**

**Prerequisites**

1. Data Structures

**Objectives**

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

**Outcomes**

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to design different document clustering algorithms
3. Implement retrieval systems for web search tasks.
4. Design an Information Retrieval System for web search tasks.

**UNIT - I**

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

**UNIT - II**

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

**UNIT - III**

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

**UNIT - IV**

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

**UNIT - V**

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

**Textbook:**

1. Information Storage and Retrieval Systems – Theory and Implementation, Gerald J. Kowalski, Mark T. Maybury, 2nd Edition, Springer.

**References:**

1. Information Retrieval Data Structures and Algorithms, Frakes, W.B., Ricardo Baeza-Yates, Prentice Hall, 1992.
2. Information Storage & Retrieval, Robert Korfhage, John Wiley & Sons.
3. Modern Information Retrieval, Yates and Neto, Pearson Education.

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**ADVANCED DATABASES**
**(Professional Elective - II)**

**Prerequisites**

1. A course on "Database Management Systems"

**Objectives**

1. The purpose of the course is to enrich the previous knowledge of database systems and exposing the need for distributed database technology to confront with the deficiencies of the centralized database systems.
2. Introduce basic principles and implementation techniques of distributed database systems.
3. Equip students with principles and knowledge of parallel and object oriented databases.
4. Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

**Outcomes**

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.

Understand the design aspects of object oriented database system and related development.

**UNIT - I**

**Introduction;** Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.

**Distributed DBMS Architecture**: Architectural Models for Distributed DBMS, DDMBS Architecture.

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

**UNIT - II**

**Query processing and decomposition**: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.

**Distributed query Optimization**: Query optimization, centralized query optimization, distributed query optimization algorithms.

**UNIT - III**

**Transaction Management**: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

**UNIT - IV**

**Distributed DBMS Reliability**: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning.

**Parallel Database Systems**: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

**UNIT - V**

**Distributed object Database Management Systems**: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

**Object Oriented Data Model** : Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

**Textbooks:**

1. Principles of Distributed Database Systems, M.Tamer OZSU and Patuck Valduriez, Pearson Edn. Asia, 2001.
2. Distributed Databases, Stefano Ceri and Giuseppe Pelagatti, McGraw Hill.

**References:**

1. Database Systems: The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, 2nd Edition, Pearson International Edition

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**NATURAL LANGUAGE PROCESSING**
**(Professional Elective - II)**

**Prerequisites**

1. Data structures, finite automata and probability theory

**Objectives**

1. Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

**Outcomes**

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms
5. Able to design different language modeling Techniques.

**UNIT - I**

**Finding the Structure of Words:** Words and Their Components, Issues and Challenges, Morphological Models

**Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

**UNIT - II**

**Syntax Analysis:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

**UNIT - III**

**Semantic Parsing:** Introduction, Semantic Interpretation, System Paradigms, Word Sense

Systems, Software.

**UNIT - IV**

Predicate-Argument Structure, Meaning Representation Systems, Software.

**UNIT - V**

**Discourse Processing:** Cohension, Reference Resolution, Discourse Cohension and Structure

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

**Textbooks:**

1. Multilingual natural Language Processing Applications : From Theory to Practice, Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval, Tanvier Siddiqui, U.S. Tiwary

**Reference:**

1. Speech and Natural Language Processing, Daniel Jurafsky & James H Martin, Pearson Publications

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## SOFTWARE ENGINEERING LAB

**Prerequisites**

1. A course on "Programming for Problem Solving"

**Co-requisite**

1. A Course on "Software Engineering"

**Objectives**

1. To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

**Outcomes**

1. Ability to translate end-user requirements into system and software requirements
2. Ability to generate a high level design of the system from the software requirements
3. Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

### List of Experiments

**Do the following 8 exercises for any two projects given in the list of sample projects or any other projects:**

1) Development of problem statement.
2) Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3) Preparation of Software Configuration Management and Risk Management related documents.
4) Study and usage of any Design phase CASE tool
5) Performing the Design by using any Design phase CASE tools.
6) Develop test cases for unit testing and integration testing
7) Develop test cases for various white box and black box testing techniques.

**Sample Projects:**

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing

9. E-book management System.
10. Recruitment system

**Textbooks:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc GrawHill International Edition.
2. Software Engineering, Ian Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

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## COMPUTER NETWORKS LAB

**Objectives**

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance
3. To analyze the traffic flow and the contents of protocol frames

**Outcomes**

1. Implement data link layer farming methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.
4. Implement Encoding and Decoding techniques used in presentation layer
5. To be able to work with different network tools

### List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. **Wireshark**
    i. Packet Capture Using Wire shark
    ii. Starting Wire shark
    iii. Viewing Captured Traffic
    iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap

13. Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion

v. Simulate to Compare Data Rate& Throughput.
vi. Simulate to Plot Congestion for Different Source/Destination
vii. Simulate to Determine the Performance with respect to Transmission of Packets

**Textbook:**

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

**References:**

1. An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

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**ADVANCED ENGLISH COMMUNICATION SKILLS LAB**

## 1. Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

## 2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

## 3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**4. Minimum Requirement:**

**The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:**

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

**5. Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**( KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)

**6. Books Recommended:**


1. **Effective Technical Communication** by M Asharaf Rizvi**.** McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. **Academic Writing: A Handbook for International Students b**y Stephen Bailey, Routledge, 5th Edition
3. **Learn Correct English – A Book of Grammar, Usage and Composition** by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
4. **Professional Communication** by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Handbook for Technical Communication** by David A. McMurrey& Joanne Buckley. 2012. Cengage Learning.
9. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. **Job Hunting by** Colm Downes, Cambridge University Press 2008.
11. **English for Technical Communication for Engineering Students,** Aysha Vishwamohan**, Tata Mc Graw-Hil 2009.**

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## CONSTITUTION OF INDIA
## (Mandate Course)

**Objectives**

1. To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

**Outcomes**

1. To discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. To Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956

**UNIT – I**

**History of Making of the Indian Constitution:** History, Drafting Committee, ( Composition & Working)

**UNIT – II**

**Philosophy of the Indian Constitution:** Preamble, Salient Features

**UNIT - III**

**Contours of Constitutional Rights &Duties:**

Fundamental Rights
Right to Equality
Right to Freedom
Right against Exploitation
Right to Freedom of Religion
Cultural and Educational Rights
Right to Constitutional Remedies
Directive Principles of StatePolicy
Fundamental Duties.

**UNIT – IV**

**Organs of Governance:**

Parliament
Composition
Qualifications and Disqualifications
Powers and Functions

President
Governor
Council of Ministers
Judiciary, Appointment and Transfer of Judges, Qualifications
Powers and Functions

**UNIT – V**

**Local Administration:**

District's Administration head: Role and Importance,
Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
Pachayati raj: Introduction, PRI: Zila Pachayat.
Elected officials and their roles, CEO ZilaPachayat: Position and role.
Block level: Organizational Hierarchy (Different departments),
Village level: Role of Elected and Appointed officials,
Importance of grass root democracy

**UNIT – VI**

**Election Commission:**

Election Commission: Role and Functioning.
Chief Election Commissioner and Election Commissioners.
State Election Commission: Role and Functioning.
Institute and Bodies for the welfare of SC/ST/OBC and women.

**Textbooks:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
4. M. P. Jain, Indian Constitution Law, 7th Ed., Lexis Nexis, 2014.

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**MACHINE LEARNING**

**Prerequisites**

1. Data Structures
2. Knowledge on statistical methods

**Objectives**

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.

**Outcomes**

1. Understand the concepts of computational intelligence like machine learning
2. Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
3. Understand the Neural Networks and its usage in machine learning application.

**UNIT - I**

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

**Decision Tree Learning –** Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

**UNIT - II**

**Artificial Neural Networks-1–** Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

**Artificial Neural Networks-2-** Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

**Evaluation Hypotheses –** Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

**UNIT - III**

**Bayesian learning –** Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

**Computational learning theory –** Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

**Instance-Based Learning**- Introduction, *k*-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

**UNIT- IV**

**Genetic Algorithms** – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

**Learning Sets of Rules** – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

**Reinforcement Learning** – Introduction, the learning task, *Q*–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

**UNIT - V**

**Analytical Learning-1**- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

**Analytical Learning-2-**Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

**Combining Inductive and Analytical Learning** – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

**Textbook:**

1. Machine Learning, Tom M. Mitchell,vMcGraw-Hill

**Reference:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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## COMPILER DESIGN

**Prerequisites**

1. A course on "Formal Languages and Automata Theory"
2. A course on "Computer Organization and architecture"
3. A course on "Computer Programming and Data Structures"

**Objectives**

1. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
2. Topics include phases of compiler, parsing, syntax directd translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

**Outcomes**

1. Demonstrate the ability to design a compiler given a set of language features.
2. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
3. Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
4. Design and implement LL and LR parsers
5. Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
6. Design algorithms to generate machine code.

**UNIT - I**

**Introduction:** The structure of a compiler, the science of building a compiler, programming language basics

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

**UNIT - II**

**Syntax Analysis:** Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

**UNIT - III**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

**UNIT - IV**

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

**Code Generation:** Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

**UNIT - V**

**Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

**Text Book:**

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.

**References:**

1. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

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## WEB TECHNOLOGIES

**Objectives**

1. To introduce PHP language for server side scripting
2. To introduce XML and processing of XML Data with Java
3. To introduce Server side programming with Java Servlets and JSP
4. To introduce Client side scripting with Javascript and AJAX.

**Outcomes**

1. Gain knowledge of client side scripting, validation of forms and AJAX programming
2. Have understanding of server side scripting with PHP language
3. Have understanding of what is XML and how to parse and use **XML** Data with Java
4. To introduce Server side programming with Java Servlets and JSP

**UNIT- I**

**Introduction to PHP:** Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

**File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

**UNIT- II**

**HTML Common tags**- List, Tables, images, forms, Frames; Cascading Style sheets;

**XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

**UNIT - III**

**Introduction to Servlets:** Common Gateway Interface (CGt), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

**UNIT - IV**

**Introduction to JSP:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

**UNIT - V**

**Client side Scripting:** Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

**Textbooks:**

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

**References:**

1. Web Programming, building internet applications, Chris Bates, 2nd Edition, Wiley Dreamtech
2. Java Server Pages, Hans Bergsten, SPD O'Reilly,
3. Java Script, D.Flanagan, 6th Edition, O'Reilly Media.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W.Sebesta, 4th Edition, Pearson.
6. Internet and World Wide Web — How to program, Dietel and Nieto, Pearson.

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**CONCURRENT PROGRAMMING**
**(Professional Elective - III)**

**Prerequisites**

1. A course on "Operating Systems"
2. A course on "Java Programming"

**Objectives**

1. To explore the abstractions used in concurrent programming

**Outcomes**

1. Ability to implement the mechanisms for communication and co-ordination among concurrent processes.
2. Ability to understand and reason about concurrency and concurrent objects
3. Ability to implement the locking and non-blocking mechanisms
4. Ability to understand concurrent objects

**UNIT - I**

Introduction - Shared Objects and Synchronization, A Fable, Properties of Mutual Exclusion, The Moral, The Producer–Consumer Problem, The Harsh Realities of Parallelization.
Mutual Exclusion - Time, Critical Sections, 2-Thread Solutions, The Peterson Lock, The Filter Lock, Lamport's Bakery Algorithm.

**UNIT - II**

Concurrent Objects - Concurrency and Correctness, Sequential Objects, Quiescent consistency, Sequential Consistency, Linearizability, Linearization Points, Formal Definitions
Linearizability, Compositional Linearizability, The Nonblocking Property, Progress conditions, Dependent Progress Conditions, The Java Memory Model, Locks and synchronized Blocks, Volatile Fields, Final Fields.

**UNIT - III**

Synchronization Operations, Consensus Numbers, Consensus Protocols, The compareAndSet() Operation, Introduction Universality, A Lock-Free Universal, Construction Wait-Free Universal Construction, Spin Locks , Test-And-Set Locks

**UNIT - IV**

Linked Lists: The Role of Locking, Introduction, List-Based Sets, Concurrent Reasoning, Coarse-Grained Synchronization, Fine-Grained Synchronization, Optimistic Synchronization, Lazy Synchronization, Non-Blocking Synchronization

**UNIT - V**

Concurrent Queues and the ABA Problem, Concurrent Stacks and Elimination, Transactional Memories

**Textbooks:**

1. The Art of Multiprocessor Programming, Maurice Herlihy and Nir Shavit, 1st Edition, Morgan Kaufmman Publishers, Indian Reprint 2012.

**References:**

1. Java Concurrency in Practice by Brian Goetz, Tim Peierls, Joshua Block, Joseph Bowbeer, David Holmes and Doug Lea, 1st Edition, Addison Wesley, 2006.
2. Concurrent Programming in Java™: Design Principles and Patterns, Doug Lea, 2nd Edition, Addison Wesley, 1999.

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**NETWORK PROGRAMMING**
**(Professional Elective - III)**

**Objectives**

1. To understand inter process and inter-system communication
2. To understand socket programming in its entirety
3. To understand usage of TCP/UDP / Raw sockets
4. To understand how to build network applications

**Outcomes**

1. To write socket API based programs
2. To design and implement client-server applications using TCP and UDP sockets
3. To analyze network programs

**UNIT - I**

**Introduction to Network Programming:** OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

**Sockets :** Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

**UNIT - II**

**TCP client server :** Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

**Elementary UDP sockets**: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

**I/O Multiplexing:** I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server,

**UNIT - III**

**Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

**Advanced I/O Functions**-Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued?, Sockets and Standard I/O, T/TCP: TCP for Transactions.

**UNIT - IV**

**Elementary name and Address conversions:** DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

**Daemon Processes and inetd Superserver –** Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function

**Broadcasting**- Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function Using Broadcasting, Race Conditions

**Multicasting**- Introduction, Multicast Addresses, Multicasting versus Broadcasting on A LAN, Multicasting on a WAN, Multicast Socket Options, mcast_join and Related Functions, dg_cli Function Using Multicasting, Receiving MBone Session Announcements, Sending and Receiving, SNTP: Simple Network Time Protocol, SNTP (Continued)

**UNIT - V**

Raw Sockets-Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program, An ICMP Message Daemon,

Datalink Access- Introduction, BPF: BSD Packet Filter, DLPI: Data Link Provider Interface, Linux: **SOCK_PACKET, libpcap**: Packet Capture Library, Examining the UDP Checksum Field.

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

**Textbooks:**

1. UNIX Network Programming, W. Richard **Stevens**, Bill Fenner, Andrew M. Rudoff, Pearson Education
2. UNIX Network Programming, W.Richard Stevens, 1st Edition, PHI.

**References:**

1. UNIX Systems Programming using C++ T CHAN, PHI.
2. UNIX for Programmers and Users, Graham GLASS, King abls, 3rd Edition, Pearson Education
3. Advanced UNIX Programming, M. J. ROCHKIND, 2nd Edition, Pearson Education

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**SCRIPTING LANGUAGES**
**(Professional Elective - III)**

**Prerequisites**

1. A course on "Computer Programming and Data Structures"
2. A course on "Object Oriented Programming Concepts"

**Objectives**

1. This course provides an introduction to the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

**Outcomes**

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
3. Acquire programming skills in scripting language

**UNIT - I**

Introduction : Ruby ,Rails, The structure and Excution of Ruby Programs ,Package Management with RUBYGEMS, Ruby and web : Writing CGI scripts , cookies, Choice of Webservers ,SOAP and webservices

RubyTk – Simple Tk Application ,widgets , Binding events , Canvas ,scrolling

**UNIT - II**

Extending Ruby : Ruby Objects in C , the Jukebox extension, Memory allocation ,Ruby Type System , Embedding Ruby to Other Languages , Embedding a Ruby Interperter

**UNIT - III**

Introduction to PERL and Scripting

Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages,Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

**UNIT - IV**

Advanced perl

Finer points of looping, pack and unpack, filesystem, eval, datastructures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

**UNIT - V**

**TCL**

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

**Tk**

Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

**Textbooks:**

1. The World of Scripting Languages , David Barron,Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

**References:**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP,J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl,Larry Wall,T.Christiansen and J.Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J.P.Flynt, Cengage Learning.

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## MOBILE APPLICATION DEVELOPMENT
## (Professional Elective - III)

**Prerequisites**

1. Acquaintance with JAVA programming
2. A Course on DBMS

**Objectives**

1. To demonstrate their understanding of the fundamentals of Android operating systems
2. To improves their skills of using Android software development tools
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform
4. To demonstrate their ability to deploy software to mobile devices
5. To demonstrate their ability to debug programs running on mobile devices

**Outcomes**

1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Student will be able to develop, deploy and maintain the Android Applications.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

**UNIT - IV**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared PReferences: – Creating shared pReferences:, saving and retrieving data using Shared Preference

**UNIT - V**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Textbooks:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**References:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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**SOFTWARE TESTING METHODOLOGIES**
**(Professional Elective - III)**

**Prerequisites**

1. A course on "Software Engineering"

**Objectives**

1. To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To develop skills in software test automation and management using latest tools.

**Outcomes**

Design and develop the best test strategies in accordance to the development model.

**UNIT - I**

**Introduction**: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs

**Flow graphs and Path testing:** Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT - II**

**Transaction Flow Testing**: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
**Domain Testing**: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

**UNIT - III**

**Paths, Path products and Regular expressions:** path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
**Logic Based Testing:** overview, decision tables, path expressions, kv charts, specifications.

**UNIT - IV**

**State, State Graphs and Transition testing**: state graphs, good & bad state graphs, state testing, Testability tips.

**UNIT - V**

**Graph Matrices and Application**: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

**Textbooks:**

1. Software Testing techniques, Baris Beizer, 2nd Edition, Dreamtech.

2. Software Testing Tools, Dr.K.V.K.K.Prasad, Dreamtech.

**References:**

1. The craft of software testing, Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World, Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing, Meyers, John Wiley.

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## MACHINE LEARNING LAB USING PYTHON

**Objective**

The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

**Outcomes**

After the completion of the "**Machine Learning**" lab, the student can able to:

1. understand complexity of Machine Learning algorithms and their limitations;
2. understand modern notions in data analysis oriented computing;
3. be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
4. Be capable of performing experiments in Machine Learning using real-world data.

### List of Experiments

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is theprobability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)

2. Extract the data from database using python

3. Implement k-nearest neighbours classification using python

4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

| VAR1 | VAR2 | CLASS |
|---|---|---|
| 1.713 | 1.586 | 0 |
| 0.180 | 1.786 | 1 |
| 0.353 | 1.240 | 1 |
| 0.940 | 1.566 | 0 |
| 1.486 | 0.759 | 1 |
| 1.266 | 1.106 | 0 |
| 1.540 | 0.419 | 1 |
| 0.459 | 1.799 | 1 |
| 0.773 | 0.186 | 1 |

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no -> highRisk
high golf trading married forties yes -> lowRisk
low speedway transport married thirties yes -> medRisk
medium football banking single thirties yes -> lowRisk
high flying media married fifties yes -> highRisk
low football security single twenties no -> medRisk
medium golf media single thirties yes -> medRisk
medium golf transport married forties yes -> lowRisk
high skiing banking single thirties yes -> highRisk
low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

**Textbooks:**

1. Machine Learning, Tom M. Mitchell,vMcGraw-Hill
2. A Complete Introduction to the Python Language, Mark Summerfield, 2nd Edition.
3. Python The Complete Reference, Martin C. Brown, Brandon A. Nordin.

**References:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

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## COMPILER DESIGN AND WEB TECHNOLOGIES LAB

**Prerequisites**

1. A Course on "Objected Oriented Programming through Java"
2. A Course on "Formal Languages & Automata Theory"

**Co-requisites**

1. A course on "Web Technologies"

**Objectives**

1. To provide hands-on experience on web technologies
2. To develop client-server application using web technologies
3. To introduce server side programming with Java servlets and JSP
4. To understand the various phases in the design of a compiler.
5. To understand the design of top-down and bottom-up parsers.
6. To understand syntax directed translation schemes.
7. To introduce lex and yacc tools.

**Outcomes**

1. Design and develop interactive and dynamic web applications using HTML, CSS, JavaScript and XML
2. Apply client-server principles to develop scalable and enterprise web applications.
3. Ability to design, develop, and implement a compiler for any language.
4. Able to use lex and yacc tools for developing a scanner and a parser.
5. Able to design and implement LL and LR parsers.

### List of Experiments

Compiler Design Experiments

1. Write a LEX Program to scan reserved word & Identifiers of C Language
2. Implement Predictive Parsing algorithm
3. Write a C program to generate three address code.
4. Implement SLR(1) Parsing algorithm
5. Design LALR bottom up parser for the given language

<program> ::= <block>
<block> ::= { <variabledefinition> <slist> }
| { <slist> }
<variabledefinition> ::= int <vardeflist> ;

<vardeflist> ::= <vardec> | <vardec> , <vardeflist>
<vardec> ::= <identifier> | <identifier> [ <constant> ]
<slist> ::= <statement> | <statement> ; <slist>
<statement> ::= <assignment> | <ifstatement> | <whilestatement>
| <block> | <printstatement> | <empty>
<assignment> ::= <identifier> = <expression>
| <identifier> [ <expression> ] = <expression>
<ifstatement> ::= if <bexpression> then <slist> else <slist> endif
| if <bexpression> then <slist> endif
<whilestatement> ::= while <bexpression> do <slist> enddo
<printstatement> ::= print ( <expression> )
<expression> ::= <expression> <addingop> <term> | <term> | <addingop> <term>
<bexpression> ::= <expression> <relop> <expression>
<relop> ::= < | <= | == | >= | > | !=
<addingop> ::= + | -
<term> ::= <term> <multop> <factor> | <factor>
<multop> ::= * | /
<factor> ::= <constant> | <identifier> | <identifier> [ <expression>]
| ( <expression> )
<constant> ::= <digit> | <digit> <constant>
<identifier> ::= <identifier> <letterordigit> | <letter>
<letterordigit> ::= <letter> | <digit>
<letter> ::= a|b|c|d|e|f|g|h|i|j|k|l|m|n|o|p|q|r|s|t|u|v|w|x|y|z
<digit> ::= 0|1|2|3|4|5|6|7|8|9
<empty> has the obvious meaning
Comments (zero or more characters enclosed between the standard C/Java-style comment brackets /*...*/) can be inserted. The language has rudimentary support for 1-dimensional arrays. The declaration int a[3] declares an array of three elements, referenced as a[0], a[1] and a[2]. Note also that you should worry about the scoping of names.
A simple program written in this language is:

```
{ int a[3],t1,t2;
  t1=2;
  a[0]=1; a[1]=2; a[t1]=3;
  t2=-(a[2]+t1*6)/(a[2]-t1);
  if t2>5 then
    print(t2);
  else {
    int t3;
    t3=99;
    t2=-25;
    print(-t1+t2*t3);   /* this is a comment
                        on 2 lines */
  }
  endif
}
```

Web Technologies Experiments

1. Write a PHP script to print prime numbers between 1-50.
2. PHP script to
    a. Find the length of a string.
    b. Count no of words in a string.
    c. Reverse a string.
    d. Search for a specific string.
3. Write a PHP script to merge two arrays and sort them as numbers, in descending order.
4. Write a PHP script that reads data from one file and write into another file.
5. Develop static pages (using Only HTML) of an online book store. The pages should resemble: www.amazon.com. The website should consist the following pages.
    a) Home page
    b) Registration and user Login
    c) User Profile Page
    d) Books catalog
    e) Shopping Cart
    f) Payment By credit card
    g) Order Conformation
6. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
7. Create and save an XML document on the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
8. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
9. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

**Textbooks:**

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

**References:**

1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Compiler Construction, Louden, Thomson.
5. Web technologies, Black Book, Dreamtech press.

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## CONCURRENT PROGRAMMING LAB
## (Professional Elective - III)

1. Design and implement Two-thread mutual exclusion algorithm (Peterson's Algorithm) using multithreaded programming.
2. Design and implement Filter Lock algorithm and check for deadlock-free and starvation-free conditions using multithreaded programming.
3. Design and implement Lamport's Bakery Algorithm and check for deadlock-free and starvation-free conditions using multithreaded programming.
4. Design and implement Lock-based concurrent FIFO queue data structure using multithreaded programming.
5. Design a consensus object using read–write registers by implementing a deadlock-free or starvation-free mutual exclusion lock. ( Use CompareAndSet( ) Premitive).
6. Design and implement concurrent List queue data structure using multithreaded programming. (Use Atomic Primitives)
7. Design and implement concurrent Stack queue data structure using multithreaded programming. (Use Atomic Primitives)
8. Design and implement concurrent FIFO queue data structure using multithreaded programming. (Use Atomic Primitives)

**Textbooks:**

1. The Art of Multiprocessor Programming, Maurice Herlihy and Nir Shavit, 1st Edition, Morgan Kaufmman Publishers, Indian Reprint 2012.

**References:**

1. Java Concurrency in Practice by Brian Goetz, Tim Peierls, Joshua Block, Joseph Bowbeer, David Holmes and Doug Lea, 1st Edition, Addison Wesley, 2006.
2. Concurrent Programming in Java™: Design Principles and Patterns, Doug Lea, 2nd Edition, Addison Wesley, 1999.

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## NETWORK PROGRAMMING LAB
## (Professional Elective - III)

### Objectives

1. To understand inter process and inter-system communication
2. To understand socket programming in its entirety
3. To understand usage of TCP/UDP / Raw sockets
4. To understand how to build network applications

### Outcomes

1. To write socket API based programs
2. To design and implement client-server applications using TCP and UDP sockets
3. To analyze network programs

### List of Experiments

1. Implement programs for Inter Process Communication using PIPE, Message Queue and Shared Memory.
2. Write a programme to create an integer variable using shared memory concept and increment the variable simultaneously by two processes. Use semaphores to avoid race conditions.
3. Design TCP iterative Client and server application to reverse the given input sentence
4. Design TCP iterative Client and server application to reverse the given input sentence
5. Design TCP client and server application to transfer file
6. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call “select”
7. Design a TCP concurrent server to echo given set of sentences using poll functions
8. Design UDP Client and server application to reverse the given input sentence
9. Design UDP Client server to transfer a file
10. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.
11. Design a RPC application to add and subtract a given pair of integers

### Textbooks:

1. UNIX Network Programming, by W. Richard **Stevens**, Bill Fenner, Andrew M. Rudoff, Pearson Education.

2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

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## SCRIPTING LANGUAGES LAB
## (Professional Elective - III)

**Prerequisites :** Any High level programming language (C,C++)

**Objectives**

1. To Understand the concepts of scripting languages for developing web based projects
2. To understand the applications the of Ruby , TCL , Perl scripting languages

**Outcomes**

1. Ability to understand the differences between Scripting languages and programming languages
2. Able to gain some fluency programming in Ruby, Perl, TCL

### List of Experiments

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby scirpt to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for Sorting a list using a comparison function
14. Write a TCL script to (i)create a list (ii )append elements to the list (iii)Traverse the list (iv)Concatenate the list
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shift

b) Unshift
c) Push

19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

**Textbooks:**

1. The World of Scripting Languages , David Barron,Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

**References:**

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP,J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl,Larry Wall,T.Christiansen and J.Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J.P.Flynt, Cengage Learning.

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## MOBILE APPLICATION DEVELOPMENT LAB

**(Professional Elective - III)**

**Prerequisites:** --- NIL---

**Objectives**

1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

**Outcomes**

1. Student understands the working of Android OS Practically.
2. Student will be able to develop user interfaces.
3. Student will be able to develop, deploy and maintain the Android Applications.

**List of Experiment**

1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the

user should be verified with the database and an appropriate dialog should be shown to the user.

9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
13. Create an application that shows the given URL (from a text field) in a browser.

**Textbooks:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**References:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

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## SOFTWARE TESTING METHODOLOGIES LAB

**(Professional Elective - III)**

**Prerequisites**

A basic knowledge of programming.

**Objectives**

1. To provide knowledge of Software Testing Methods.
2. To develop skills in software test automation and management using latest tools.

**Outcome**

1. Design and develop the best test strategies in accordance to the development model.

### List of Experiments

1. Recording in context sensitive mode and analog mode
2. GUI checkpoint for single property
3. GUI checkpoint for single object/window
4. GUI checkpoint for multiple objects
5. a) Bitmap checkpoint for object/window
   b) Bitmap checkpoint for screen area
6. Database checkpoint for Default check
7. Database checkpoint for custom check
8. Database checkpoint for runtime record check
9. a) Data driven test for dynamic test data submission
   b) Data driven test through flat files
   c) Data driven test through front grids
   d) Data driven test through excel test
10. a) Batch testing without parameter passing
    b) Batch testing with parameter passing
11. Data driven batch
12. Silent mode test execution without any interruption
13. Test case for calculator in windows application

**Textbooks:**

1. Software Testing techniques, Baris Beizer, 2nd Edition, Dreamtech.
2. Software Testing Tools, Dr.K.V.K.K.Prasad, Dreamtech.

**References:**

1. The craft of software testing, Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World, Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing, Meyers, John Wiley.

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## DATA STRUCTURES
**(Open Elective - II)**

**Prerequisites**

1. A course on "Programming for Problem Solving "

**Objectives**
1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms

**Outcomes**
1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

**UNIT - I**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**UNIT - II**

**Dictionaries**: linear list representation, skip list representation, operations - insertion, deletion and searching.

**Hash table representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

**UNIT - III**

**Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

**UNIT - IV**

**Graphs:** Graph Implementation Methods. Graph Traversal Methods.

**Sortings:** Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**

**Pattern matching and Tries:** Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

**Textbooks:**

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

**References:**

1. Data structures: A Pseudocode Approach with C, 2 nd edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

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**ARTIFICIAL INTELLIGENCE**
**(Open Elective - II)**

**Prerequisites**

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"
3. A course on "Design and Analysis of Algorithms"
4. A course on "Mathematical Foundations of Computer Science"
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

**Objectives**

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
3. To learn different knowledge representation techniques.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Outcomes**

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimaate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

**UNIT - I**
**Problem Solving by Search-I**
Introduction to AI, Intelligent Agents

**Problem Solving by Search –II:**
Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching wih Partial Observations, Online Search Agents and Unknown Environment .

**UNIT - II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:**

Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems :**

Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:**

Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs , Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining , Effective Propositional Model Checking , Agents Based on Propositional Logic.

**UNIT - III**

**Logic and Knowledge Representation**

**First-Order Logic:**

Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:**

Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:**

Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**UNIT - IV**

**Planning**

**Classical Planning:**

Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World :**

Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning,.

**UNIT - V**
**Uncertain knowledge and Learning**
**Uncertainty :**

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:**
Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning ; Dempster-Shafer theory.

**Learning:**
Forms of Learning, Supervised Learning, Learning Decision Trees.Knowledge in Learning : Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

**Textbooks:**

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education.

**References:**

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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**PYTHON PROGRAMMING**
**(Open Elective - II)**

**Objectives:**

This course will enable students to

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

**Outcomes:**

The students should be able to:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists,Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

**UNIT – I**

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Mapping and Set Types

**UNIT – II**

FILES: File Objects,File Built-in Function [ open() ], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

**UNIT – III**

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

**UNIT – IV**

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

WEB Programming: Introdution, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI,Web (HTTP) Servers

**UNIT – V**

Database Programming:
Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules

**Textbook:**

1. Core Python Programming, Wesley J. Chun, 2nd Edition, Pearson.

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# JAVA PROGRAMMING
**(Open Elective-II)**

**Prerequisites**
1. A course on "Computer Programming & Data Structures"

**Objectives**
1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and AWT

**Outcomes**
1. Develop Programs with reusability
2. Develop programs to handle multitasking
3. Develop programs to handle exceptions
4. Develop applications for a range of problems using object-oriented programming techniques
5. Design simple Graphical User Interface applications

**UNIT - I**

**Object oriented thinking and Java Basics**- Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class.

**UNIT - II**

**Inheritance, Packages and Interfaces** – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Exploring java.io.

**UNIT - III**

**Exception handling and Multithreading--** Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.
String handling, Exploring java.util.

**UNIT - IV**

**Event Handling**: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.
The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box group, choices, lists, dialog box, handling menus, layout manager: layout manager types – border, grid, flow, card and grid bag.

**UNIT - V**

**Multi Threading:** Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

**Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

**Textbooks:**

1. Java the complete reference, Herbert Schildt, 7th Edition, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Eduction.

**References:**

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.

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**GRAPH THEORY**
**(Professional Elective - IV)**

**Prerequisites**

1. An understanding of Mathematics in general is sufficient.

**Outcomes**:

1. know some important classes of graph theoretic problems;
2. be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
3. be able to describe and apply some basic algorithms for graphs;
4. be able to use graph theory as a modelling tool.

**UNIT - I**

**Introduction-**Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

**UNIT - II**

**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra‟s shortest path algorithm, Floyd-Warshall shortest path algorithm.

**UNIT - III**

**Trees**- Definitions and characterizations, Number of trees, Cayley‟s formula, Kirchoﬀ-matrix-tree theorem, Minimum spanning trees, Kruskal‟s algorithm, Prim‟s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury‟s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

**UNIT - IV**

**Independent sets coverings and matchings–** Introduction, Independent sets and coverings: basic equations,Matchings in bipartite graphs, Hall‟s Theorem, K¨onig‟s Theorem, Perfectmatchings in graphs, Greedy and approximation algorithms.

**UNIT - V**

**Vertex Colorings**- Basic definitions, Cliques and chromatic number, Mycielski‟s theorem, Greedy coloring algorithm, Coloring of chordal graphs,Brooks theorem, **Edge Colorings**, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**Textbooks:**

1. Graph Theory, J. A. Bondy and U. S. R. Murty. volume 244 of Graduate Texts in Mathematics. Springer, 1st Edition, 2008.
2. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Elsevier.

**References:**

1. Lecture Videos**:** http://nptel.ac.in/courses/111106050/13
2. Introduction To Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan ,TMH
4. Introduction to Graph Theory, Wilson Robin j, PHI
5. Graph Theory With Applications To Engineering And Computer Science ,Narsing Deo,PHI
6. Graphs - An Introductory Approach, Wilson and Watkins

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## EMBEDDED SYSTEMS
**(Professional Elective - IV)**

**Prerequisites**
1. A course on "Digital Logic Design and Microprocessors"
2. A course on "Computer Organization and Architecture"

**Objectives**
1. To provide an overview of principles of Embedded System
2. To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

**Outcomes**
1. Expected to understand the selection procedure of processors in the embedded domain.
2. Design procedure of embedded firm ware.
3. Expected to visualize the role of realtime operating systems in embedded systems.
4. Expected to evaluate the correlation between task synchronization and latency issues

**UNIT - I**
**Introduction to Embedded Systems:**
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of E bedded Systems, Characteristics and Quality attributes of Embedded Systems.

**UNIT - II**
**The Typical Embedded System:**
Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components.

**UNIT - III**
**Embedded Firmware Design and Development:**
Embedded Firmware Design, Embedded Firmware Development Languages, Programming in Embedded C.

**UNIT - IV**
**RTOS Based Embedded System Design:**
Operating System basics, Types of Operating Systems, Tasks, Process, Threads, Multiprocessing and Multi tasking, Task Scheduling, Threads-Processes-Scheduling putting them together, Task Communication, Task Synchronization, Device Drivers, How to choose an RTOS

**UNIT - V**
**Integration and Testing of Embedded Hardware and Firmware:**
Integration of Hardware and Firmware, Boards Bring up

**The Embedded System Development Environment:**
The Integrated Development Environment(IDE), Types of files generated on Cross-Compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

**Textbook:**

1. Introduction to Embedded Systems Shibu K V, 2nd Edition, Mc Graw Hill

**References:**

1. Embedded Systems Architecture, Programming and Design Rajkamal, TATA McGraw-Hill
2. Embedded Systems Design - A Unified Hardware/Software Introduction, Frank Vahid and Tony Givargis, John Wiley
3. Embedded Systems, Lyla, Pearson
4. An Embedded Software Primer, David E.Simon, Pearson Education Asia, First Indian Reprint 2000.

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**SEMANTIC WEB**
**(Professional Elective – IV)**

**Objectives**

1. To learn Web Intelligence
2. To learn Knowledge Representation for the Semantic Web
3. To learn Ontology Engineering
4. To learn Semantic Web Applications, Services and Technology

**Outcomes**

1. Ability to understand Semantic Web
2. Ability to learn SOAP, UDDI
3. Ability to handle multiple web services using Orchestration
4. Ability to experiment with XML Technologies
5. Ability to construct and use Ontologies

**UNIT - I**

Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

**UNIT - II**

**Web Services:** Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

**UNIT - III**

**Resource Description Framework:** Features, Capturing Knowledge with RDF.

**XML Technologies:** XPath , The Style Sheet Family: XSL, XSLT, and XSLFO, XQuery, XLink , XPointer . XInclude, XMLBase, XHTML, XForms, SVG.

**UNIT - IV**

**Taxonomies and Ontologies:** Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

**UNIT - V**

**Semantic Web Application:** Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base.

**Semantic Search Technology:** Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle

**Textbooks:**

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst , Kevin T. Smith, Wiley Publishing, Inc.
2. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience

**References:**

1. Semantic Web Technologies , Trends and Research in Ontology Based Systems, J.Davies, R.Studer, P.Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T.Segaran, C.Evans,J.Taylor, O'Reilly,SPD.

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## CLOUD COMPUTING
**(Professional Elective - IV)**

**Prerequisites**

1. A course on "Computer Networks"
2. A course on "Operating Systems"
3. A course on "Distributed Systems"

**Objectives**

1. This course provides an insight into cloud computing
2. Topics covered include- distributed system models, different cloud service models, service oriented architectures, cloud programming and software environments, resource management.

**Outcomes**

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the ways in which the cloud can be programmed and deployed.
3. Understanding cloud service providers.

**UNIT - I**

**Computing Paradigms:** High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

**UNIT - II**

**Cloud Computing Fundamentals**: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

**UNIT - III**

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

**UNIT - IV**

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

**UNIT - V**

**Cloud Service Providers:** EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

**Textbooks:**

1. Essentials of cloud Computing : K.Chandrasekhran , CRC press, 2014

**References:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing , Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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## AD HOC & SENSOR NETWORKS
**(Professional Elective - IV)**

**Prerequisites**
1. A course on "Computer Networks"
2. A course on "Mobile Computing"

**Objectives**
1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

**Outcomes**
1. Ability to understand the state of the art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN.
3. Ability to conduct further research in the domain of ASN

**UNIT - I**

**Introduction to Ad Hoc Networks -** Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

**Routing in MANETs -** Criteria for classification, Taxonomy of MANET routing algorithms, Topology-based routing algorithms-**Proactive**: DSDV; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies:** Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

**UNIT - II**

**Data Transmission -** Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting: Tree-based:** AMRIS, MAODV; **Mesh-based:** ODMRP, CAMP; **Hybrid:** AMRoute**,** MCEDAR.

**UNIT - III**

**Geocasting:** Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR**.**
TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT - IV**

**Basics of Wireless, Sensors and Lower Layer Issues**

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

**UNIT - V**

**Upper Layer Issues of WSN**

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

**Textbooks:**

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 ( Morgan Kauffman).

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**ADVANCED ALGORITHMS**

**Prerequisites**

1. A course on "Computer Programming & Data Structures"
2. A course on "Advanced Data Structures & Algorithms"

**Objectives**

1. Introduces the recurrence relations for analyzing the algorithms
2. Introduces the graphs and their traversals.
3. Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force , Transform and Conquer approaches) and mention problems for which each technique is appropriate;
4. Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
5. Introduces string matching algorithms
6. Introduces linear programming.

**Outcomes**

1. Ability to analyze the performance of algorithms
2. Ability to choose appropriate data structures and algorithm design methods for a specified application
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs

**UNIT - I**

**Introduction:** Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.

**Advanced Design and Analysis Techniques:** Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

**UNIT - II**

**Greedy Algorithms** - Huffman Codes, Activity Selection Problem. Amortized Analysis.

**Graph Algorithms:** Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms..

**UNIT - III**

**Sorting Networks:** Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network.

**Matrix Operations**- Strassen's Matrix Multiplication, Inverting matrices, Solving system of linear Equations

**UNIT - IV**

**String Matching:** Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth- Morris - Pratt algorithm.

**UNIT- V**

**NP-Completeness and Approximation Algorithms:** Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Sales person problem

**Textbooks:**

1. Introduction to Algorithms," T.H. Cormen, C.E. Leiserson ,R.L. Rivest, and C. Stein, 3rd Edition, PHI.

**References:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

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## INFORMATION SECURITY

**Prerequisites**

1. A Course on "Computer Networks and a course on Mathematics

**Objectives**

1. To understand the fundamentals of Cryptography
2. To understand various key distribution and management schemes
3. To understand how to deploy encryption techniques to secure data in transit across data networks
4. To apply algorithms used for secure transactions in real world applications

**Outcomes**

1. Demonstrate the knowledge of cryptography, network security concepts and applications.
2. Ability to apply security principles in system design.
3. Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

**UNIT - I**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security.

Classical Encryption Techniques, DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

**UNIT - II**

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

Message authentication and Hash Functions, Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

**UNIT - III**

Digital Signatures, Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service.

Email Security: Pretty Good Privacy (PGP) and S/MIME.

**UNIT - IV**

IP Security:
Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

**UNIT - V**

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

**Textbooks:**

1. Cryptography and Network Security (principles and approaches), William Stallings, 4th Edition, Pearson Education.

**References:**

1. Network Security Essentials (Applications and Standards), William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

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## SOFTWARE ARCHITECTURES
**(Program Elective - I)**

**Pre Requisite**

1. A course On "Software Engineering"

**Objectives**

1. To understand the concept of software architecture
2. To understand the design, documentation of software Architecture and Reconstruct.
3. To understand importance of Architecture Evaluation and Methods.
4. To understand reusability of Architecture

**Outcomes**

1. Students can Design, document and Reconstruct Software Architecture
2. Students have profound knowledge on Software Architecture
3. Students can evaluate Architecture
4. Students can reuse the Architecture

**UNIT - I**
**Envisioning Architecture**
The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

A-7E – A case study in utilizing architectural structures

**UNIT - II**
**Creating an Architecture**
Understanding Quality Attributes, Achieving qualities, Architectural styles and patterns

Air Traffic Control – a case study in designing for high availability

**UNIT - III**
Designing the Architecture, Documenting software architectures, Reconstructing Software Architecture

Flight Simulation – a case study in Architecture for Integrability

**UNIT - IV**
Analyzing Architectures
Architecture Evaluation, Architecture design decision making, ATAM, CBAM.
The Nightingale System - a case study in Applying the ATAM
The NASA ECS Project – a case study in Applying the CBAM

**UNIT - V**

Moving from one system to many

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Celsius Tech – a case study in product line development

**Textbooks:**

1. Software Architecture in Practice, Len Bass, Pau Clements & Rick Kazman, 2nd Edition, Pearson Education,2003.

**References:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, 2nd Edition, Pearson education, 2003

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# Human Computer Interaction

**(Program Elective - I)**

**Objectives:**

1. To understand the design principles of developing a Human Computer Interface (HCI).
2. To learn tools and devices required for designing a good interface

**Outcomes**:

1. Acquire knowledge on principles and components of HCI.
2. Analyze product usability evaluations and testing methods
3. Design an effective user interface for software application using the building tools and techniques

**UNIT - I**

**Introduction:** Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design

**The graphical user interface:** Popularity of graphics, direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

**UNIT - II**

**Design process:** Human interaction with computers, important of human characteristics in design, human considerations in design, Human interaction speeds, understanding business junctions.

**UNIT - III**

**Screen Designing :** Interface design goals, Screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

**UNIT - IV**

**Windows**: Window characteristics, components of a window, presentation styles, types, management, organizing window functions, operations

Selection of device based and screen based controls.

**UNIT - V**

Write clear text and messages, create meaningful Graphics, Icons, Images, Choose proper colors

**Interaction Devices:**

Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

**Textbooks:**

1. The Essential Guide To User Interface Design, Wilbent. O. Galitz , 2nd Edition, Wiley India Edition
2. Designing The User Interface, Ben Sheiderman, 3rd Edition, Addison-Wesley

**Reference:**

1. The Essential Of User Interface Design, Alan Cooper, Wiley – Dream Tech Ltd., 2002.

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# ETHICAL HACKING

**(Program Elective – I)**

**Prerequisites**

1. A course on "Operating Systems"
2. A course on "Computer Networks"
3. A course on "Network Security and Cryptography"

**Objectives**

1. The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
2. The course includes-Impacts of Hacking; Types of Hackers; Information Security Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

**Outcomes**

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack
3. Understand the role of politics, inherent and imposed limitations and metrics for planning of a test
4. Comprehend the dangers associated with penetration testing

**UNIT – I**

**Introduction:** Hacking Impacts, The Hacker

**Framework:** Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration

**Information Security Models:** Computer Security, Network Security, Service Security, Application Security, Security Architecture

**Information Security Program**: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

**UNIT – II**

**The Business Perspective**: Business Objectives, Security Policy, Previous Test Results, Business Challenges

**Planning for a Controlled Attack**: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

**UNIT – III**

**Preparing for a Hack**: Technical Preparation, Managing the Engagement
**Reconnaissance**: Social Engineering, Physical Security, Internet Reconnaissance

**UNIT - IV**

**Enumeration:** Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase
**Exploitation:** Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

**UNIT - V**

**Deliverable**: The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation
**Integration:** Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion

**Textbook:**

1. The Ethical Hack: A Framework for Business Value Penetration Testing, James S. Tiller, Auerbach Publications, CRC Press

**References:**

1. Ethical Hacking and Countermeasures Attack Phases, EC-Council, Cengage Learning
2. Hands-On Ethical Hacking and Network Defense, Michael Simpson, Kent Backman, James Corley, Cengage Learning.

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**ADVANCED ALGORITHMS LAB**

**Objective**

The student can able to attain knowledge in advance algorithms.

**Outcomes**

The student can able to analyze the performance of algorithms

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement solution for knapsack problem using Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement Rabin Karp algorithm.
8. Implement KMP algorithm.
9. Implement Harspool algorithm
10. Implement max-flow problem.

**Textbooks:**

1. Introduction to Algorithms," T.H. Cormen, C.E. Leiserson ,R.L. Rivest, and C. Stein, 3rd Edition, PHI.

**References:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz,Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia, John wiley and sons.
4. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.

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## INFORMATION SECURITY LAB

**Prerequisites**

1. A Course on "Computer Networks"

**Co-requisite**

1. A course on "Network Security and Cryptography"

**Objective:**

1. To get practical exposure of Cryptography algorithms

**Outcome:**

1. Get the skill to provide security services like authentication confidentiality to the real systems.
2. Get the knowledge to solve security issues in day to day life.

**List of Experiments**

1. Perform an Experiment for port scanning with nmap
2. Setup a honepot and monitor the honipot on the network
3. Instal a jcrpt tool(or any other eqvivalent ) and demonstrate Asymmetric ,Symmetric crypto algorithm ,Hash and Digital/PKI signatures studied in theory Network security and management
4. Using snort perform realtime traffic analysis and packet logging
5. Generate minimum 10 passwords of length 12 cahracters using open ssl command
6. Perform practical approach to implement Footprinting-Gathering target information using Dmitry-Dmagic,UAtester
7. Write a program to perform encryption and decryption using the following substitution ciphers.
8. Caeser cipher
9. Play fair cipher
10. Hill Cipher
11. Write a program to implement the DES algorithm.
12. Write a program to implement RSA algorithm.
13. Calculate the message digest of a text using the SHA-1 algorithm.
14. Working with sniffers for monitoring network communication (Wireshark).
15. Configuring S/MIME for email communication.
16. Using Snort, perform real time traffic analysis and packet logging.

**Textbooks:**

1. Cryptography and Network Security (principles and approaches), William Stallings, 4th Edition, Pearson Education.

**References:**

1. Network Security Essentials (Applications and Standards), William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

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## SOFT COMPUTING
**(Professional Elective - V)**

**Objectives**

1. Familiarize with soft computing concepts
2. Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
3. Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques
4. Learn the concepts of Genetic algorithm and its applications
5. Acquire the knowledge of Rough Sets.

**Outcomes**

On completion of this course, the students will be able to:

1. Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
2. Understand fuzzy logic and reasoning to handle and solve engineering problems
3. Apply the Classification and clustering techniques on various applications.
4. Understand the advanced neural networks and its applications
5. Perform various operations of genetic algorithms, Rough Sets.
6. Comprehend various techniques to build model for various applications

**UNIT - I**

**Introduction to Soft Computing:** Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

**UNIT - II**

**Fuzzy Systems:** Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

**UNIT - III**

Fuzzy Decision Making, Particle Swarm Optimization,

**UNIT - IV**

**Genetic Algorithms:** Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

**UNIT - V**

Rough Sets, Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

**Textbooks:**

1. Soft Computing – Advances and Applications, B.K. Tripathy and J. Anuradha – Cengage Learning, 2015

**References:**

1. Principles of Soft Computing, S. N. Sivanandam & S.N.Deepa, 2nd Edition, Wiley India, 2008.
2. Genetic Algorithms-In Search, optimization and Machine learning, David E. Goldberg, Pearson Education.
3. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani, Pearson Education 2004.
4. Fuzzy Sets & Fuzzy Logic, G.J. Klir & B. Yuan, PHI, 1995.
5. An Introduction to Genetic Algorithm, Melanie Mitchell, PHI, 1998.
6. Fuzzy Logic with Engineering Applications, Timothy J. Ross, McGraw- Hill International Editions, 1995

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## DISTRIBUTED COMPUTING
**(Professional Elective - V)**

**Objectives**
1. Foundation of cooperative distributed systems engineering
2. Supporting technologies with a special attention to agent-oriented paradigm
3. Service-oriented computing and grid computing
4. The implementation component includes a term-project

**UNIT - I**
**Introduction:** The different forms of computing, The strengths and weaknesses of Distributed computing, Operating system concepts relevant to distributed computing, the architecture of distributed applications. Paradigms for Distributed Applications, choosing a Paradigm for an application (trade-offs).

**UNIT - II**
**Cluster Computing:** Parallel computing overview, cluster computing – Introduction, Cluster Architecture, parallel programming models and Paradigms, Applications of Clusters.

**UNIT - III**
**Grid Computing:** Introduction, Grid Computing Anatomy – Architecture, Architecture and relationship to other Distributed Technologies, Grid computing road map. Merging the Grid services Architecture with the Web Services Architecture.

**UNIT - IV**
Open Grid Service Architecture – Introduction, Architecture, and Goal, Sample Use cases: Commercial Data Center, National Fusion Collaboratory, Online Media, and Entertainment. OGSA platform Components, Open Grid Services Infrastructure.

**UNIT - V**
Globus GT 3 Toolkit – Architecture, Programming Model, A sample implementation, High Level services, OGSI.NET Middleware Solutions.

**Textbooks:**
1. Grid Computing, Joshy Joseph & Craig Fellenstein, Pearson education, 2004
2. Distributed Computing, Principles and Applications, M. L. Liu, Pearson Education, 2004
3. High Performance Cluster Computing, Rajkumar Buyya, Pearson education.

**References:**
1. Grid Computing – Making the global infrastructure a reality, Fran Berman, Geoffrey C Fox, Anthony J G Hey, Wiley India, 2010.

2. A Networking Approach to Grid Computing, D.Minoli, Wiley & sons, 2006.
3. Grid Computing: A Practical Guide to Technology and Applications, A.Abbas, Firewall Media, 2008.

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## PARALLEL & DISTRIBUTED SYSTEMS

**(Professional Elective - V)**

**UNIT - I**

**Parallel and Distributed Computing: State-of-the-Art and Emerging Trends:** Introduction.- The Benefits and Needs for Parallel High Performance Computing.- Parallel and Distributed Systems.- Programming Environment.- Theoretical Foundations

**The Design of Efficient Parallel Algorithms:** Introduction.- Parallel Models and Algorithms.- Sorting.- Matrix Multiplication.- Computing the Convex Hull.- Pointer-Based Data Structures.- Conclusions.

**UNIT - II**

**Languages for Parallel Processing:**Motivation for Parallel Languages.- New Programming Paradigms.- Language Extensions.- Data-Parallel Languages.- Library-based Approaches.- Future Directions

**Architecture of Parallel and Distributed Systems:** Introduction.- Superscalar Processors.- Uniprocessors vs. Multiprocessors.- Memory Consistency and Memory Coherency.- Bus-Based Shared-Memory Multiprocessors.- Non Bus-Based Shared-Memory Multiprocessors.- From Physically-Shared to Logically-Shared Address Space.- Inputs/Outputs in Parallel and Distributed Systems.- Conclusions

**UNIT - III**

**Parallel Operating Systems:** Introduction.- Classification of Parallel Computer Systems.- Operating Systems for Symmetric Multiprocessors.- Operating Systems for NORMA Environment.-Scalable Shared Memory Systems

**Management of Resources in Parallel Systems:** Introduction.- Classical Approaches.- Scheduling Multiprocessor Tasks.- Scheduling Uni-Processor Tasks with Communication Delays.- Scheduling Divisible Tasks

**Tools for Parallel Computing: A Performance Evaluation Perspective:**Introduction.- Motivation.- Environment Design.- Parallel Performance Paradigms.- Performance Observability.- Performance Diagnosis.- Performance Perturbation.- Summary.

**UNIT - IV**

**Parallel Database Systems and Multimedia Object Servers:** Introduction.- Parallel Database Systems.- Multimedia Object Servers

**Networking Aspects of Distributed and Parallel Computing:** Introduction.- Computer Networks for Distributed Computing.-Performance Evaluation of Network Interfaces.- Access to Networks with a Specific QoS.- Networking APIs.- Future of the Networks for HPC.

**UNIT - V**

**Multimedia Applications for Parallel and Distributed Systems:**What Is Multimedia?.- Digital Audio and Video Compression Techniques.- Parallel and Distributed Systems for Multimedia.- Multimedia Applications.- Conclusions.

**Textbooks:**

1. Handbook on Parallel and Distributed Processing Series: International Handbooks on Information Systems Blazewicz, J.; Ecker, K.; Plateau, B.; Trystram, D. (Eds.)

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## INTERNET OF THINGS
**(Professional Elective - V)**

### Objectives

1. To introduce the terminology, technology and its applications
2. To introduce the concept of M2M (machine to machine) with necessary protocols
3. To introduce the Python Scripting Language which is used in many IoT devices
4. To introduce the Raspberry PI platform, that is widely used in IoT applications
5. To introduce the implementation of web based services on IoT devices

### Outcomes

1. Interpret the impact and challenges posed by IoT networks leading to new architectural models.
2. Compare and contrast the deployment of smart objects and the technologies to connect them to network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Elaborate the need for Data Analytics and Security in IoT.
5. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

### UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

### UNIT - II

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

### UNIT - III

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**UNIT - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**UNIT - V**

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

**Textbooks:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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## SOFTWARE PROCESS & PROJECT MANAGEMENT

**(Professional Elective - V)**

### Objectives

1. To acquire knowledge on software process management
2. To acquire managerial skills for software project development
3. To understand software economics

### Outcomes

1. Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
2. Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
3. Design and develop software product using conventional and modern principles of software project management

### UNIT - I

Software Process Maturity

Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.

Process Reference Models

Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

### UNIT - II

Software Project Management Renaissance

Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.

Life-Cycle Phases and Process artifacts

Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures.

### UNIT - III

Workflows and Checkpoints of process

Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.

Process Planning

Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

**UNIT - IV**

Project Organizations

Line-of- business organizations, project organizations, evolution of organizations, process automation.

Project Control and process instrumentation

The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

**UNIT - V**

CCPDS-R Case Study and Future Software Project Management Practices

Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions .

**Textbooks:**

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

**References:**

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education,2000
2. Process Improvement essentials, James R. Persse, O'Reilly,2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition,TMH,2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly,2007
6. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

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## COMPUTATIONAL COMPLEXITY
**(Professional Elective - VI)**

### Prerequisites

1. A course on "Computer Programming and Data Structures"
2. A course on "Discrete Structures and Graph Theory"

### Objectives

1. Introduces to theory of computational complexity classes
2. Discuss about algorithmic techniques and application of these techniques to problems.
3. Introduce to randomized algorithms and discuss how effective they are in reducing time and space complexity.
4. Discuss about Graph based algorithms and approximation algorithms
5. Discuss about search trees

### Outcomes

1. Ability to classify decision problems into appropriate complexity classes
2. Ability to specify what it means to reduce one problem to another, and construct reductions for simple examples.
3. Ability to classify optimization problems into appropriate approximation complexity classes
4. Ability to choose appropriate data structure for the given problem
5. Ability to choose and apply appropriate design method for the given problem

### UNIT - I

Computational Complexity: Polynomial time and its justification, Nontrivial examples of polynomial-time algorithms, the concept of reduction (reducibility), Class P Class NP and NP-Completeness, The P versus NP problem and why it's hard

### UNIT - II

Algorithmic paradigms: Dynamic Programming – Longest common subsequence, matrix chain multiplication, knapsack problem, Greedy – 0-1 knapsack, fractional knapsack, scheduling problem, Huffman coding, MST, Branch-and-bound – travelling sales person problem, 0/1 knapsack problem, Divide and Conquer – Merge sort, binary search, quick sort.

### UNIT - III

Randomized Algorithms: Finger Printing, Pattern Matching, Graph Problems, Algebraic Methods, Probabilistic Primality Testing, De-Randomization Advanced Algorithms:,

**UNIT - IV**

Graph Algorithms: Shortest paths, Flow networks, Spanning Trees; Approximation algorithms, Randomized algorithms. Approximation algorithms: Polynomial Time Approximation Schemes.

**UNIT - V**

Advanced Data Structures and applications: Decision Trees and Circuits, B-Trees, AVL Trees, Red and Black trees, Dictionaries and tries, Maps, Binomial Heaps, Fibonacci Heaps, Disjoint sets, Union by Rank and Path Compression

**Textbooks:**

1. Introduction to Algorithms, T. Cormen, C. Leiserson, R. Rivest and C. Stein, 3rd Edition, McGraw-Hill, 2009.
2. Randomized Algorithms, R. Motwani and P. Raghavan, Cambridge University Press, 1995.
3. Analysis of Algorithms: An Active Learning Approach, J. J. McConnell, Jones & Bartlett Publishers, 2001.
4. Art of Computer Programming, Volume 3, Sorting and Searching D. E. Knuth, 2nd Edition, Addison-Wesley Professional, 1998.
5. Algorithms, S. Dasgupta, C. H. Papadimitriou and U. V. Vazirani, McGraw-Hill, 2008.

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## MOBILE COMPUTING
**(Professional Elective - VI)**

**Prerequisites**

1. A course on "Computer Networks"

**Objectives**

1. To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
2. To understand the typical mobile networking infrastructure through a popular GSM protocol
3. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
4. To understand the database issues in mobile environments & data delivery models.
5. To understand the ad hoc networks and related concepts.
6. To understand the platforms and protocols used in the mobile environment.

**Outcomes**

1. Able to think and develop new mobile application.
2. Able to take any new technical issue related to this new paradigm and come up with a solution(s).
3. Able to develop new ad hoc network applications and/or algorithms/protocols.
4. Able to understand & develop any existing or new protocol related to the mobile environment

**UNIT - I**

**Introduction**

Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

**UNIT - II**

**(Wireless) Medium Access Control (MAC)**

Motivation for a specialized MAC (Hidden and exposed terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

**Mobile Network Layer**

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

**UNIT - III**

**Mobile Transport Layer**

Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

**Database Issues**

Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models.

**UNIT - IV**

**Data Dissemination and Synchronization**

Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods.

**UNIT - V**

**Mobile Ad hoc Networks (MANETs)**

Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

**Textbooks:**

1. Mobile Communications, Jochen Schiller, Addison-Wesley, 2nd Edition, 2009.
2. Mobile Computing, Raj Kamal, Oxford University Press, 2007, ISBN: 0195686772

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## NEURAL NETWORKS & DEEP LEARNING
**(Professional Elective - VI)**

**Objectives**

1. To introduce the foundations of Artificial Neural Networks
2. To acquire the knowledge on Deep Learning Concepts
3. To learn various types of Artificial Neural Networks
4. To gain knowledge to apply optimization strategies

**Outcomes**

1. Ability to understand the concepts of Neural Networks
2. Ability to select the Learning Networks in modeling real world systems
3. Ability to use an efficient algorithm for Deep Models
4. Ability to apply optimization strategies for large scale applications

**UNIT-I**

**Artificial Neural Networks** Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

**UNIT-II**

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

**UNIT - III**

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

**UNIT - IV**

**Regularization for Deep Learning**

Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

**UNIT - V**

**Optimization for Train Deep Models**

Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms

**Applications**

Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

**Textbooks:**

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

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## CYBER FORENSICS
**(Professional Elective - VI)**

**Prerequisites**
1. Network Security

**Objectives**
1. A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
2. In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime.
3. According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes.

**Outcomes**
1. Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
2. It gives an opportunity to students to continue their zeal in research in computer forensics

**UNIT- I**
Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –Steps - Activities in Initial Response, Phase after detection of an incident

**UNIT-II**
Initial Response and forensic duplication , Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as AdmissibleEvidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive

**UNIT - III**
**Forensics analysis and validation**: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

**Network Forensics:** Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

**UNIT -IV**
**Current Forensic tools:** evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and

server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

**Cell phone and mobile device forensics**: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

**UNIT- V**

**Working with Windows and DOS Systems**: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

**Textbooks:**

1. Incident Response and computer forensics, Kevin Mandia, Chris Prosise, Tata McGrawHill, 2006.
2. Computer Forensics, Computer Crime Investigation, John R. Vacca, Firewall Media, New Delhi.
3. Computer Forensics and Investigations, Nelson, Phillips Enfinger, Steuart, cengage Learning

**References:**

1. Real Digital Forensics, Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.

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## SOFTWARE METRICS AND MEASURES
**(Professional Elective – VI)**

**Objectives**

The student should be able to

1. Understand the basic techniques of data collection and how to apply them
2. Learn software metrics that define relevant metrics in a rigorous way.

**Outcomes**

At the end the student will be able to

1. Perform some simple statistical analysis relevant to software measurement data.
2. Use from practical examples both the benefits and limitations of software metrics for quality control and assurance

**UNIT - I**

**Measurement Theory**

Fundamentals of measurement – Measurements in Software Engineering – Scope of Software metrics – Measurement theory – Goal based framework – Software measurement validation.

**UNIT - II**

**Data Collection And Analysis**

Empirical investigation – Planning experiments – Software metrics data collection – Analysis methods – Statistical methods.

**UNIT - III**

**Product Metrics**

Measurement of internal product attributes – Size and structure – External product attributes – Measurement of quality.

**UNIT - IV**

**Quality Metrics**

Software quality metrics – Product quality – Process quality – Metrics for software maintenance – Case studies of Metrics Program – Motorola – HP and IBM.

**UNIT - V**

**Management Metrics**

Quality management models – Rayleigh Model – Problem Tracking report (PTR) model – Reliability growth model – Model evaluation – Orthogonal defect classification.

**Textbooks:**

1. Software Metrics, Normal. E – Fentor Shari Lawrence Pfllegar, International Thomson Computer Press, 1997.
2. Software Metrics ; A Rigorous approach Fenter Norman, E., Chapmen & Hall, London, 1991.

**References:**

1. Metric and Models in Software Quality Engineering, Stephen H.Kin, Addison Wesley, 1995.
2. Measuring Software Process, William. A. Florac and Aretitor D Carletow, Addison – Wesley, 1995.

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## ADVANCED DATA STRUCTURES

**Prerequisites**

1. A course on " Data Structures"

**Objectives**

1. Introduces the heap data structures such as leftist trees, binomial heaps, fibonacci and min-max heaps
2. Introduces a variety of data structures such as disjoint sets, hash tables, search structures and digital search structures

**Outcomes**

1. Ability to select the data structures that efficiently model the information in a problem
2. Ability to understand how the choice of data structures impact the performance of programs
3. Can Design programs using a variety of data structures, including hash tables, search structures and digital search structures

**UNIT - I**

**Heap Structures**

Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

**UNIT - II**

**Hashing and Collisions**

Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

**UNIT - III**

**Search Structures**

OBST, AVL trees, Red-Black trees, Splay trees,

**Multiway Search Trees**

B-trees., 2-3 trees

**UNIT - IV**

**Digital Search Structures**

Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

**UNIT - V**

**Pattern matching**

Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String , Harspool, Rabin Karp

**Textbooks:**

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

**References:**

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

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## DISTRIBUTED DATABASES

**(Program Elective - II)**

**Prerequisites**

1. A course on "Database Management Systems"

**Objectives**

To acquire knowledge on parallel and distributed databases and its applications.

1. To study the usage and applications of Object Oriented databases.
2. To learn the modeling and design of databases
3. To acquire knowledge on parallel and distributed databases and its applications.
4. Equip students with principles and knowledge of parallel and object oriented databases.
5. Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

**Outcomes**

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object oriented database system and related development.
4. Abilty to write global queries for distributed databases.

**UNIT - I**

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels Of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design

**UNIT - II**

Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries

**UNIT - III**

The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions

Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

**UNIT - IV**

Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection

**UNIT - V**

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects

Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multidatabase Concurrency Control, Multidatabase Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies

**Textbooks:**

1. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti,TMH.
2. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition.

**References:**

1. Distributed Database Systems,Chanda Ray,Pearson.
2. Distributed Database Management Systems,S.K.Rahimi and Frank.S.Haug, Wiley.

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## HIGH PERFORMANCE COMPUTING

**(Program Elective - II)**

**Prerequisites**

1. Computer Organization & Architecture
2. Operating System Programming

**Objectives**

1. To Improve the system performance
2. To learn various distributed and parallel computing architecture
3. To learn different computing technologies

**Outcomes**

1. Understanding the concepts in grid computing
2. Ability to set up cluster and run parallel applications
3. Ability to understand the cluster projects and cluster OS
4. Understanding the concepts of pervasive computing & quantum computing.

**UNIT - I**

**Grid Computing:** Data & Computational Grids, Grid Architectures And Its Relations To Various Distributed Technologies. Autonomic Computing, Examples Of The Grid Computing Efforts (IBM).

**UNIT - II**

**Cluster Computing at a Glance:** Introduction, A Cluster Computer and its Architecture, Cluster Classifications, Commodity Components for clusters, Network Services/Communication SW, Cluster Middleware and SSI, RMS, Programming Environments and Tools, Cluster Applications

**Cluster Setup & Its Administration :** Introduction, Setting up the cluster, Example Cluster System – Beowlf;

**Lightweight Messaging Systems:** Introduction, Latency Bandwidth Evaluation of Communication performance, Traditional Communication Mechanisms for clusters, Lightweight Communication Mechanisms

**UNIT - III**

**Job and Resource Management Systems :** Need of Job management, Components and Architecture. **Scheduling Parallel Jobs on Clusters :** Introduction, Rigid Jobs with process migration, Malleable Jobs with Dynamic Parallelism, Communication-Based Coscheduling, Batch Scheduling. **Cluster Operating Systems:** COMPaS

**UNIT - IV**

**Pervasive Computing Concepts & Scenarios**: Hardware & Software; Human – Machine Interface.

**Device Connectivity:** Java For Pervasive Devices; Application Examples.

**UNIT - V**

Classical Vs Quantum Logic Gates; One, Two & Three Qubit Quantum Gates; Fredkin & Toffoli Gates; Quantum Circuits; Quantum Algorithms.

**Textbooks:**

1. Grid Computing, J. Joseph & C. Fellenstien, Pearson Education
2. High Performance Cluster Computing, Raj kumar Buyya, pearson Education.
3. Pervasive Computing, J. Burkhardt et.al, Pearson Education
4. Approaching Quantum Computing Marivesar, Pearson Education.

**References:**

1. The Grid 2: Blue Print for a New Computing Infrastructure, Ian Foster and Carl Kesselman, 2nd Edition, The Elsevier Series.
2. Quantum computing and Quantum Information, Neilsen & Chung L:, Cambridge University Press.
3. A networking approach to Grid Computing , Minoli , Wiley

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**OPTIMIZATION TECHNIQUES**
**(Program Elective - II)**

**Prerequisites**

1. A course on "Mathematics"

**Objectives**

1. This course explains various optimization problems and the techniques to address those problems.
2. To study Linear Programming, dynamic programming and optimization Techniques etc.
3. To understand the theory of games.

**Outcomes**

1. Gain the knowledge of optimization techniques
2. Get the skill to apply Optimization techniques to address the real time problems .

**UNIT – I**
Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.
**Allocation:** Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

**UNIT – II**
**Transportation Problem** – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.
**Assignment problem** – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

**UNIT - III**
**Sequencing** – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines
**Replacement:** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

**UNIT - IV**
**Theory Of Games:** Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

**Inventory:** Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

**UNIT - V**

**Waiting Lines:** Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

**Dynamic Programming:**

Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

**Textbooks:**

1. Operation Research, J.K.Sharma, MacMilan.
2. Introduction to O.R , Taha, PHI

**References:**

1. Operations Research: Methods and Problems, Maurice Saseini, Arhur Yaspan and Lawrence Friedman
2. Operations Research, A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi, Pearson Education.
3. Operations Research, Wagner, PHI Publications.
4. Introduction to O.R, Hillier & Libermann, TMH.

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## RESEARCH METHODOLOGIES & IPR

### Objective

1. Introduce research paper writing and induce paper publication skills.
2. Give the introduction to Intellectual Property Rights

### Outcomes

Gain the sound knowledge of the following important elements:

1. Ability to distinguish research methods
2. Ability to write and publish a technical research paper
3. Ability to review papers effectively
4. IPR and Patent filing

**UNIT - I**

**Introduction**

Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research; Ethics in Research.

Research Formulation and Literature Review:

Problem Definition and Formulation; Literature Review; Characteristics of Good Research Question; Literature Review Process.

**UNIT - II**

**Data Collection**

Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.

**Data Analysis**

Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Samplings

**UNIT - III**

**Research Design**

Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

**Hypothesis Formulation and Testing**

Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision; Types of Errors; ROC Graphics.

**UNIT - IV**

**Test Procedures**

Parametric and Non Parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis

**Presentation of the Research Work**

Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References:; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

**UNIT - V**

**Law of Patents, Patent Searches, Ownership, Transfer Patentability Design Patents**

Double Patenting – Patent Searching – Patent Application Process – Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents. Ownership Rights – Sole and Joint Inventors – Inventions Made by Employees and Independent Contractors – Assignment of Patent Rights – Licensing of Patent Rights – Invention Developers and Promoters.

Patent Infringement, New Developments and International Patent Law

**Direct Infringement**

Inducement to Infringe – Contributory Infringement – First Sale Doctrine – Claims Interpretation – Defenses to Infringement – Remedies for Infringement – Resolving an Infringement Dispute – Patent Infringement Litigation. New Developments in Patent Law

**Textbooks:**

1. Research Methodology. Methods & Technique : Kothari. C.R.
2. Intellectual Property – Copyrights, Trademarks, and Patents by Richard Stim, Cengage Learning

**References:**

1. Practical Research : planning and Design, Paul D. Leedy and Jeanne E. Ormrod, 8th Edition.
2. A Hand Book of Education Research, NCTE
3. Methodology of Education Research, K.S. Sidhu.
4. Tests, Measurements and Research methods in Behavioural Sciences, A.K. Singh.
5. Statistical Methods, Y.P. Agarwal.
6. Methods of Statistical Ananlysis, P.S Grewal.
7. Fundamentals of Statistics, S.C. Gupta, V.K. Kapoor.
8. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning.

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## ADVANCED DATA STRUCTURES LAB

**Prerequisites**

1. A course on Computer Programming & Data Structures"

**Objectives**

1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
4. Introduces sorting and pattern matching algorithms

**Outcomes**

1. Ability to select the data structures that effeciently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

**List of Programs**

1. Write a program to perform the following operations:
   a) Insert an element into a binary search tree.
   b) Delete an element from a binary search tree.
   c) Search for a key element in a binary search tree.
2. Write a program for implementing the following sorting methods:
   a) Merge sort b) Heap sort c) Quick sort
3. Write a program to perform the following operations:
   a) Insert an element into a B- tree.
   b) Delete an element from a B- tree.
   c) Search for a key element in a B- tree.
4. Write a program to perform the following operations:
   a) Insert an element into a Min-Max heap
   b) Delete an element from a Min-Max heap
   c) Search for a key element in a Min-Max heap
5. Write a program to perform the following operations:
   a) Insert an element into a Lefiist tree
   b) Delete an element from a Leftist tree
   c) Search for a key element in a Leftist tree

6. Write a program to perform the following operations:
   a) Insert an element into a binomial heap
   b) Delete an element from a binomial heap.
   c) Search for a key element in a binomial heap
7. Write a program to perform the following operations:
   a) Insert an element into a AVL tree.
   b) Delete an element from a AVL search tree.
   c) Search for a key element in a AVL search tree.
8. Write a program to perform the following operations:
   a) Insert an element into a Red-Black tree.
   b) Delete an element from a Red-Black tree.
   c) Search for a key element in a Red-Black tree.
9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer pattern matching algorithm.

**Textbooks:**

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

**References:**

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

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## ADVANCED WIRELESS AND MOBILE NETWORKS

**Prerequisites**

1. A course on "Computer Networks"
2. A course on "Mobile Computing"

**Objectives**

1. To understand the concepts of sensor networks
2. To understand the MAC and transport protocols for ad hoc networks
3. To understand the security of sensor networks
4. To understand the applications of adhoc and sensor networks

**Outcomes**

1. Ability to understand the state of the art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
2. Ability to solve the issues in real-time application development based on ASN
3. Ability to conduct further research in the domain of ASN

**UNIT – I**

Personal Area Networks:
Introduction, Design Challenges, Applications, MAC Layer Issues

**UNIT – II**

Wireless MESH Networks:
Introduction, Design Challenges, Applications, MAC Layer Issues

**UNIT – III**

Mobile Ad hoc Networks:
Introduction, Design Challenges, Applications, Routing Layer Issues, Routing Protocols

**UNIT – IV**

Vehicular Ad hoc Networks:
Introduction, Design Challenges, Applications, Routing Layer Issues, Routing Protocols

**UNIT – V**

Wireless Sensor Networks:
Introduction, Design Challenges, Applications, MAC Layer Schemes, Routing Protocols.

**Textbooks:**

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 ( Morgan Kauffman)

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## DATA ANALYTICS

**Objectives**

1. To explore the fundamental concepts of data analytics.
2. To learn the principles and methods of statistical analysis
3. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
4. To understand the various search methods and visualization techniques.

**Outcomes**

After completion of this course students will be able to

1. Learn basics of R language and learn how to use R to handle the files with data.
2. Understand different files formats like .csv and .txt and learn how access these files.
3. Design Data Architecture
4. Understand various Data Sources

**UNIT – I**

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

**UNIT – II**

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**UNIT – III**

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**UNIT – IV**

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

**UNIT – V**

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**Textbooks:**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

**References:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand RajaramanMilliway Labs Jeffrey D Ullman Stanford Univ.

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# COMPUTER VISION

**(Program Elective - III)**

## Objectives

1. To review image processing techniques for computer vision
2. To understand shape and region analysis
3. To understand Hough Transform and its applications to detect lines, circles, ellipses
4. To understand three-dimensional image analysis techniques
5. To understand motion analysis
6. To study some applications of computer vision algorithms

## Outcomes

Upon Completion of the course, the students will be able to

1. To implement fundamental image processing techniques required for computer vision
2. To perform shape analysis
3. To implement boundary tracking techniques
4. To apply chain codes and other region descriptors
5. To apply Hough Transform for line, circle, and ellipse detections
6. To apply 3D vision techniques
7. To implement motion related techniques
8. To develop applications using computer vision techniques

## UNIT - I
## Image Processing Foundations

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

## UNIT - II
## Shapes And Regions

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion –boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

## UNIT - III
## Hough Transform

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object

detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location– GHT for feature collation

**UNIT - IV**
**3D Vision And Motion**
Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based

representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – splinebased motion – optical flow – layered motion

**UNIT - V**
**Applications**
Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

**Textbook:**

1. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.

**References:**

1. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.
2. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
4. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.
5. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.

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**DISTRIBUTED TRUST & BLOCK CHAIN TECHNOLOGY**
**(Program Elective - III)**

**Prerequisites**

1. Knowledge in security and applied cryptography;
2. Knowledge in distributed databases

**Objectives**

1. Give an introduction to block chain technology and Cryptocurrency

**Outcomes**

1. Learn about research advances related to one of the most popular technological areas today.

**UNIT- I**

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

**UNIT- II**

Extensibility of Blockchain concepts , Digital Identity verification , Block chain Neutrality , Digital art , Blockchain Environment

**UNIT- III**

Blockchain Science :Gridcoin , Folding coin, Blockchain Genomics ,Bitcoin MOOCs

**UNIT - IV**

Currency ,Token ,Tokenizing ,Campuscoin , Coindrop as a strategy for Public adoption, Currency Mut iplicity , Demurrage currency

**UNIT - V**

Technical challenges , Business model challenges , Scandals and Public perception , Government Regulations

**Textbook**

1. Blockchain Blue print for Economy by Melanie Swan
2. Blockchain Basics: A Non-Technical Introduction, DaniDrescher 1st Edition.

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# SPEECH PROCESSING

**(Program Elective - III)**

**Prerequisites**

1. A course on "Computer Oriented Statistical Methods"
2. Generally, a basic knowledge of linear algebra, and probability and statistics and programming experience in one high-level language is required.

**Objectives**

1. The aim of the course is to make the students to understand the basic characteristics of the speech signal with regard to the production and perception of speech by humans.
2. To describe the basic techniques and practical aspects of speech analysis.
3. To make the students to understand different speech processing applications such as speech recognition and speaker recognition.

**Outcomes**

1. Ability to understand and describe the mechanisms of speech production.
2. Ability to determine the speech sounds from the acoustic characteristics.
3. Ability to analyze the speech signal in time and frequency domains, and in terms of the parameters of a source-filter model.
4. Ability to design a simple speech processing system that recognizes a limited number of isolated words; and a simple speaker recognition system.

**UNIT - I**

**Fundamentals of Digital Speech Processing**: Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform Lossless Tube Model, Effect of Losses In Vocal Tract, Effect of Radiation at Lips, Digital Models for Speech Signals.

**UNIT - II**

**Time Domain Models for Speech Processing:** Introduction, Window Considerations, Short-Time-Energy and Average Magnitude Short Time Average Zero Crossing Rate, Speech Vs Silence Discrimination Using Energy and Zero Crossing, Pitch Period Estimation using a Parallel Processing Approach, The Short Time Autocorrelation Function, The Short Time Average Magnitude Difference Function, Pitch Period Estimation using The Autocorrelation Function.

**UNIT - III**

**Linear Predictive Coding (LPC) Analysis:** Basic Principles of Linear Predictive Analysis, The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky

Decomposition Solution for Covariance Method, Durbin's Recursive Solution For the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection Using LPC Parameters, Formant Analysis Using LPC Parameters.

**UNIT - IV**

**Automatic Speech & Speaker Recognition:** Basic Pattern Recognition Approaches, Parametric Representation of Speech, Evaluating the Similarity of Speech Patterns, Isolated Digit Recognition System, Continuous Digit Recognition System

**Hidden Markov Model (HMM) For Speech:** Hidden Markov Model (HMM) for Speech Recognition, Viterbi algorithm, Training and Testing using HMMS.

**UNIT - V**

**Speaker Recognition:** Recognition techniques, Features that Distinguish Speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Overview of speech enhancement , speech synthesis.

**Textbooks:**

1. Digital Processing of Speech Signals: L.R Rabinar and R W Jhaung, 1978, Pearson Education.
2. Digital Processing of Speech Signals: L.R. Rabiner and S. W. Schafer, Pearson Education.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., Wiley India, 2000.

**References:**

1. Discrete Time Speech Signal Processing: Principles and Practice, Thomas F. Quateri, 1st Edition, Pearson Education.
2. Speech & Audio Signal Processing: Ben Gold & Nelson Morgan, 1st Edition, Wiley.

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## REAL TIME OPERATING SYSTEMS
## (Program Elective - IV)

**Prerequisites**

1. Basics of operating system; Basics of Embedded system

**Objectives**

1. The aim of the course to discuss the issues in real time operating systems, importance of deadlines and concept of task scheduling.
2. Student will be able to understand and design real time operating systems.

**Outcome**

1. Ability to design the real time embedded systems using the concepts of RTOS.

**UNIT – I**

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,( open, create, close, lseek, read, write), Process Control ( fork, vfork, exit, wait, waitpid, exec).

**UNIT – II**

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

**UNIT – III**

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

**UNIT – IV**

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

**UNIT – V**

Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, and Tiny OS.

**Textbook:**

1. Real Time Concepts for Embedded Systems, Qing Li, Elsevier, 2011

**References:**

1. Embedded Systems- Architecture, Programming, and Design, Rajkamal, 2007, TMH.

2. Advanced UNIX Programming, W. Richard Stevens, Stephan A. Rago, 2nd Edition, Pearson.
3. Embedded Linux: Hardware, Software and Interfacing, Dr. Craig Hollabaugh, 1st Edition, Pearson.

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# WEB SERVICES & SOA

**(Program Elective - IV)**

## Pre-requisites

1. The course assumes a reasonable comfort and background about Information Technology and Management Information Systems.

## Objectives

1. To gain understanding of the basic principles of service orientation
2. To learn service oriented analysis techniques
3. To learn technology underlying the service design
4. To learn the concepts such as SOAP, registering and discovering services.

## Outcomes

At the end of this course, students are expected to gain the following learning:

1. Get the foundations and concepts of service based computing
2. Advocate the importance and means of technology alignment with business
3. Understanding the basic operational model of web services,
4. Gain the knowledge of key technologies in the service oriented computing arena
5. Apply and practice the learning through a real or illustrative project/case study.

## UNIT - I

Evolution and Emergence of Web Services – Evolution of distributed computing. Core distributed computing technologies – client/server, CORBA, JAVA RMI, Micro Soft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

## UNIT - II

Web Service Architecture – Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non functional service description, WSDL1.1 Vs WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL.

## UNIT - III

Brief Over View of XML – XML Document structure, XML namespaces, Defining structure in XML documents, Reuse of XML schemes, Document navigation and transformation. SOAP :

Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

**UNIT – IV**

Registering and Discovering Services : The role of service registries, Service discovery, Universal Description, Discovery, and Integration, UDDI Architecture, UDDI Data Model,

Interfaces, UDDI Implementation, UDDI with WSDL, UDDI specification, Service Addressing and Notification, Referencing and addressing Web Services, Web Services Notification.

**UNIT - V**

SOA and web services security considerations, Network-level security mechanisms, Application-level security topologies, XML security standards, Semantics and Web Services, The semantic interoperability problem, The role of metadata, Service metadata, Overview of .NET and J2EE, SOA and Web Service Management, Managing Distributed System, Enterprise management Framework, Standard distributed management frameworks, Web service management, Richer schema languages, WS-Metadata Exchange.

**Textbooks:**

1. Web Services & SOA Principles and Technology, 2nd Edition, Michael P. Papazoglou.
2. Developing Java Web Services, R. Nagappan, R. Skoczylas, R.P. Sriganesh, Wiley India.
3. Developing Enterprise Web Services, S. Chatterjee, J. Webber, Pearson Education.

**References:**

1. XML, Web Services, and the Data Revolution, F.P.Coyle, Pearson Education.
2. Building web Services with Java, S. Graham and others, 2nd Edition, Pearson Education.
3. Java Web Services, D.A. Chappell & T. Jewell, O'Reilly, SPD.
4. Java web Services Architecture, McGovern, et al., Morgan Kaufmann Publishers, 2005.
5. J2EE Wer Services, Richard Monson-Haefel, Pearson Education.

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# GAME THEORY

**(Program Elective - IV)**

**UNIT - I**

Introduction- Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation

Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

**UNIT - II**

Mixed, Correlated, and Evolutionary Equilibrium -Mixed Strategy Nash Equilibrium Interpretations of Mixed Strategy Nash Equilibrium Correlated Equilibrium Evolutionary Equilibrium

Rationalizability and Iterated Elimination of Dominated Actions-Rationalizability Iterated Elimination of Strictly Dominated Actions ,Iterated Elimination of Weakly Dominated Actions

**UNIT - III**

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge , Can People Agree to Disagree? , Knowledge and Solution Concepts, The Electronic Mail Game

**UNIT - IV**

Extensive Games with Perfect Information -Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy , Two Notable Finite Horizon Games , Iterated Elimination of Weakly Dominated Strategies

Bargaining Games -Bargaining and Game Theory , A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions

**UNIT - V**

Repeated Games - The Basic Idea Infinitely Repeated Games vs.\ Finitely Repeated Games Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game

**Textbooks:**

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press
2. Game Theory, Roger Myerson, Harvard University Press
3. Game Theory, D. Fudenberg and J. Tirole, MIT Press

**References:**

1. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.,
2. Games and Decisions, R.D. Luce and H. Raiffa, , New York: John Wiley and Sons.,
3. Game Theory, G. Owen, 2nd Edition, New York: Academic Press,

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# DATA ANALYTICS LAB

**(Data Analytics Using R)**

## Objectives

1. To provide an overview of a new language R used for data Analytics.
2. To present the basic techniques for extracting information from large datasets
3. To familiarize students with how various statistics like mean median etc. can be collected for data exploration.
4. Predict outcomes with supervised learning techniques and Unearth the patterns with unsupervised techniques

## Outcomes

After completion of this course students will be able to

1. Learn basics of R language and learn how to use R to handle the files with data.
2. Understand different files formats like .csv and .txt and learn how access these files.
3. Design Data Architecture
4. Understand various Data Sources

## List of Experiments

1. Demonstrate data cleaning – missing values
2. Implement data normalization (min-max, z-score)
3. Implement attribute subset selection for data reduction
4. Demonstrate outlier detection
5. Perform analytics on any standard data set
6. Implement linear regression
7. Implement logistic regression
8. Construct decision tree for weather data set
9. Analyze time-series data
10. Work on any data visualization tool

## Textbooks:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

## References:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.

2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand RajaramanMilliway Labs Jeffrey D Ullman Stanford Univ.

## JNTUH COLLEGE OF ENGINEERING HYDERABAD

**IDP (B.Tech. CSE & MBA) IV Year I-Semester** **L T P C**
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## BUSINESS STATISTICS

**Objective**

1. To understand the basic statistical tools for analysis & interpretation of qualitative& quantitative data.

**Outcomes**

Students will be able to understand

1. Conceptual overview of Statistics
2. To apply, analyze various simple & advanced statistical tools
3. To interpret data through statistical tools.

**UNIT – I**

Introduction to Statistics – Functions of Statistics and Managerial Applications of Statistics, Relationship with other subjects. Measures of central Tendency- Mean, Median, Mode, Geometric Mean and Harmonic Mean.

**UNIT – II**

Measures of Dispersion - Range, Quartile deviation, Mean Deviation, Standard deviation and coefficientof variation. Skewness: Karl Pearson's co-efficient of skewness, Bowley's co-efficient ofskewness, Kelley's co-efficient of skewness, Kurtosis.

**UNIT – III**

a) Tabulation of Univariate, Bivariate and multivariate data, Data classification and tabulation, Diagrammatic and graphical representation of data. One dimensional, Two dimensional and three-dimensional diagrams and graphs

b) Small Sample Tests- t-Distribution-properties and applications, testing for one and two means, paired t-test.

**UNIT – IV**

a) Analysis of Variance -One Way and Two-Way ANOVA (with and without Interaction). Chi-Square distribution: Test for a specified Population variance, Test for Goodness of fit, Test for Independenceof Attributes.

b) Correlation Analysis-Scatter diagram, Positive and Negative correlation, limits for coefficient of Correlation, Karl Pearson's coefficient of correlation, Spearman's Rank correlation, concept of Multiple and partial Correlation, Regression Analysis-Concept, least square fit of a linear regression,two lines of regression, Properties of regression coefficients.

**UNIT – V**

Time Series Analysis-Components, Models of Time Series–Additive, Multiplicative and Mixed models; Trend Analysis-Free hand curve, Semi averages, moving averages, Least Square methods and Index numbers – introduction, Characteristics and uses of index numbers, types of index numbers, unweighted price indexes, weighted price indexes, Tests of adequacy and consumer price indexes.

**Textbooks:**

1. P.C. Tulsian, Bharat Jhunjhnuwala, Business Statistics, S. Chand, 2016.
2. Levin R.I., Rubin S. David, Statistics for Management, 7e Pearson, 2015.
3. Anderson, Sweeney, Williams, Camm, Cochran, Statistics for Business Economics, Cengage 12e, 2014.
4. J. K Sharma, Business Statistics, 4e, Vikas Publishing House, 2015.
5. Beri, Business Statistics, 1e, Tata McGraw Hill, 2015.
6. Gupta S.C., Fundamentals of Statistics, 6e, Himalaya Publishing House, 2015.

## JNTUH COLLEGE OF ENGINEERING HYDERABAD

**IDP (B.Tech. CSE & MBA) IV Year I-Semester**

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## BUSINESS LAW AND ETHICS

**Objective**

1. To understand the Legal and Regulatory Framework for doing business in India.

**Outcomes**

Students will be able to understand

1. Business Laws related to incorporating a company
2. Importance of Ethics in Business
3. Cyber Crime and Legal Aspects.

**UNIT – I**

Companies Act, 2013: Steps and procedure for incorporation of the company, Appointment of Directors, Powers, duties, & liabilities of Directors, Company Meetings, Resolutions, Winding-up of a Company.

**UNIT – II**

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract.

Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

**UNIT – III**

Negotiable Instruments Act - 1881: Negotiable Instruments- Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics, Types of endorsements, Holder-Holder in due course, Discharge of Parties. Introduction to Goods and Services Tax (GST).

**UNIT – IV**

Business Ethics: The Changing Environment: Business Ethics-why does it matter? ; Levels of Business Ethics-Five Myths about Business Ethics-can Business Ethics be taught and trained? stages of Moral development Kohlberg's study-carol Gilligan's Theory-Principles of Ethics.

**UNIT – V**

Cyber Crime: The Legal Landscape - Need for cyber laws in the Indian context - The Indian IT Act challenges to Indian Law and cyber crime scenario in Indian – issues and Challenges in Cyber Crime.

**Textbooks:**

1. Ravinder Kumar, Legal Aspects of Business, 4e,Cengage Learning, 2016.
2. P.P.S.Gogna, Company Law, S.Chand, 2016.
3. RSN Pillai, Bagavathi, Legal Aspects of Business, S.Chand, 2016.
4. Akhileshwar Pathak , Legal Aspects of Business, Tata McGraw Hill, 3e, 2011.
5. Nina Godbole & Sunit Belapure, Cyber Security, Wiley India, 2012.

## JNTUH COLLEGE OF ENGINEERING HYDERABAD

**IDP (B.Tech. CSE & MBA) IV Year I-Semester**

## BUSINESS COMMUNICATIONS (LAB)

**Course Objective:** To understand the importance of oral and written communication and its applications in Business.

**Course Outcome:** Students will be able to understand a) the importance of Communication in Business b) to develop writing skills and presentation c) writing business proposals and letters d) application of business communication in the self development process.

**UNIT - I:**

Introduction: Introduction to Business Communication, Communication Barriers, Communication Media Choices, Inter cultural and Team Communication, Interpersonal Communication, Non-Verbal Communication, Listening, Communication through Social Media, Business Meetings.

**UNIT - II:**

Developing Business Writing Skills: Importance of Writing Business Communication, Process of Writing, Process of Revision, Writing positive and Neutral Messages, Persuasive Messages, Bad News Messages, Business Letter Writing, Kinds of Business Letters, Business Memos.

**UNIT - III:**

Business Reports and Proposals: Writing the report, planning the Report, Steps in writing Business Reports, Parts of a Report, Corporate Report and Business Proposal.

**UNIT - IV:**

Oral and Employment Communication: The role of Business Presentations, Planning and organizing presentations, Team Presentations, online Presentations. Understanding Yourself , Career, Goal Setting, Preparing Resume, Resume Formats, Writing Covering Letters, and Enquiry mails, Preparing for the job interview, Practicing Business etiquettes.

**UNIT - V:**

Contemporary Aspects in Communication: Mass Media, Public Relations Management, Cross Cultural and Global Communication, Communication in Information Technology, e-Business related operations.

**Suggested readings:**

1. Ober Newman, Communicating in Business, Cengage Learning, 2015.
2. P. Subba Rao, B. Anita Kumar, C. Hima Bindu, Business Communication, Cengage Learning India. Pvt. Ltd. 2012.
3. Stephen Bailey, Academic Writing for International students of Business, Routledge, 2013.

4. Rajendra Pal, J S Korlahahi, Essentials of Business Communication, Sultan Chand & Sons, New Delhi, 2013.
5. Sailesh Sen Gupta, Business and Managerial Communication, PHI, 2011.

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**

**B.TECH IDP (MBA) (IV Year I SEM)**

**STATISTICAL ANALYSIS LAB USING SPSS / EXCEL(LAB)**

**Course aim:** The course aims is to understand MS Excel for applying statistical tools learnt in RMSA.

**Learning Outcome:** The learning outcome is that the students should be able to:

- Analyse the data to draw inference for decision making.
- Understand application of statistical measures of central tendency.
- Understand application of ANOVA.
- Analyse trends.
- Test hypotheses.

**Syllabus - PART A**

**About EXCEL**

1. Introduction, Uses of Excel, New functions and features of excel 2007.
2. Getting started with excel: Opening a blank or new workbook, general organization.
3. Highlights and main functions: Home, Insert, page layout, formulas.
4. Highlights and main functions: Data, review, view, add-inns.
5. Using the Excel help function.

**General EXCEL Lessons**

6. Customizing the Quick Access Toolbar.
7. Creating and Using Templates.
8. Working with Data: Entering, Editing, Copy, Cut, Paste, Paste Special.
9. Formatting Data and Using the Right Mouse Click.
10. Saving, Page Setup, and Printing.
11. Using Headers and Footers.
12. Manipulating Data, using Data Names and Ranges, Filters and Sort and Validation Lists.
13. Data from External Sources.
14. Using and Formatting Tables.
15. Basic Formulas and Use of Functions.
16. Data Analysis Using Charts and Graphs.
17. Managing, Inserting, and Copying Worksheets.
18. Securing the Excel Document (Protect Cells and Workbook).

**ADVANCED EXCEL LESSONS**

19. Advanced Formulas and Functions.
20. Advanced Worksheet Features.
21. Advanced Data Analysis using PivotTables and Pivot Charts.

## PART B – STATISTICAL TOOLS FOR EXECUTION USING EXCEL

I. Tabulation, bar diagram, Multiple Bar diagram, Pie diagram, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation.
II. Correlation, regression lines.
III. t- test, F-test, ANOVA one way classification, chi square test, independence of attributes.
IV. Time series: forecasting Method of least squares, moving average method.
V. Inference and discussion of results.

**Suggested Readings:**

1. Glyn Davis & Branko Pecar "Business Statistics Using Excel" Oxford University Press, 2012.
2. David Whigham "Business Data Analysis Using Excel'' Oxford University Press, 2012.
3. Winstion "Excel 2010 Data Analysis and Business Modelling" PHI Learning Private Limited.
4. Bajpai "Business Statistics" Pearson, 2013.
5. D P Apte : Statistical Tools for Managers USING MS EXCEL, Excel, 2012.
6. Bruce Bowerman, Business Statistics in Practice, TMH, 5/e 2012.
7. Shelly, MS Office, 2007, Cengage, 2009.
8. Robert H Carver, Doing Data Analysis with SPSS, Cengage, 2013.

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**

**B.TECH IDP (MBA) (IV Year I SEM)**

**CORPORATE GOVERNANCE (AUDIT COURSE)**

**Course Objective**: To understand the growing importance of Corporate Governance in Indian and Global Context.

**Course Outcome**: Students will be able to understand a) Need for Corporate Governance in India b) Codes and Committees in Corporate Governance c) Role of Board in Corporate Governance d) Stakeholder perspective of Corporate Governance.

**UNIT - I**: Corporate Governance: Introduction to Corporate Governance - Major Corporate Governance Failures- Need for Corporate Governance - Corporate Governance in India, Theories of Corporate Governance - Agency Theory, Stewardship Theory, and Stakeholder Theory – Convergence- Problems of Governance in Companies.

**UNIT - II**: Corporate Governance codes and committees – Global reporting initiative – OECD Principles - Cadbury Committee Report - Kumara Mangalam Birla Committee Report – Nares Chandra Committee Report - Narayana Murthy Committee Report - SEBI Clause 49 GuidelinesCorporate Governance Committees - Role of capital Markets, Regulator, Government in Corporate Governance.

UNIT - III: Board and Leadership- The board of Directors, Structure of the Board, role of the board, Role, duties and responsibilities of Directors, Types of Directors, Board as a learning organization, Leveraging Good Governance for Competitive Advantage. Conflicts of Interest, Remedial Actions. Governance Ratings- Merits and Demerits.

UNIT - IV: Models of Corporate Governance- Affect of Context and culture on corporate governance-Anglo Saxon Model- The UK Common wealth principles based Model- The German Model - The Japanese Business Network Model- Indian Model of corporate governance- forces for convergence and differentiation in corporate governance.

UNIT – V: Whistle-blowing and CSR in Corporate Governance: The Concept of whistle-blowing; types of whistle-blowers; whistle-blower policy; the whistle-blower legislation across countries; developments in India. Corporate Social Responsibility (CSR): Corporate philanthropy; CSR-an overlapping concept;corporate sustainability reporting; CSR through triple bottom line; relation between CSR and corporate governance; environmental aspect of CSR; CSR initiatives in India.

**Suggested Readings:**

1. Sateesh Kumar, Corporate Governance, Oxford University Press, 2015.
2. Christine A. Mallin, Corporate Governance, Oxford University Press, 4e, South Asia Edition, 2016.
3. Bob Tricker, Corporate Governance Principles, Policies, and Practices, Oxford University Press, 2015.
4. N. Balasubramanian, Corporate Governance and Stewardship, TMH, 2012.
5. C. Fernando, Corporate Governance, Principles, Policies and Practices, Pearson, 2012.
6. Sharma, J.P., Corporate Governance and Social Responsibility of Business, Ane Books Pvt. Ltd, New Delhi

## JNTUH COLLEGE OF ENGINEERING HYDERABAD

## B.TECH IDP (MBA) (IV Year II SEM)

## FINANCIAL MANAGEMENT

*The students need Discounting Table and Annuity tables for the examination.

**Course Objective**: To understand the basic decisions taken by a finance manager in a Corporate.

FM helps in understanding the use of resources efficiently, effectively and economically.

**Course Outcome:** Students will be able to understand a) Goals of financial function b) Investment criteria and decision process c) capital structure and Dividend Decisions d) Asset Liability management

**UNIT- I:** The Finance Function: Nature and Scope; Evolution of finance function – Its new role in the contemporary scenario –Goals of finance function – maximizing vs. satisfying; Profit vs. Wealth vs. Welfare; the Agency relationship and costs; Risk-Return trade off; Concept of Time Value of Money – Future Value and Present value and the basic valuation model.

**UNIT - II:** The Investment Decision: Investment decision process- Project generation, project evaluation, project selection and project Implementation. Developing Cash Flow; Data for New Projects; Capital Budgeting Techniques –Traditional and DCF methods. The NPV vs. IRR Debate; Approaches for reconciliation. Capital budgeting decision under conditions of risk and uncertainty.

Cost Of Capital: Concept and measurement of cost of capital, Debt vs. Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital- Importance of cost of capital in capital budgeting decisions.

**UNIT- III:** Capital Structure and Dividend Decisions: Capital structure vs. financial structure - Capitalization, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Indifference Point/Break even analysis of financial leverage, Capital structure Theories –The Modigliani Miller Theory, NI, NOI Theory and Traditional Theory –A critical appraisal.

Dividend Decisions: Dividends and value of the firm - Relevance of dividends, the MM hypothesis, Factors determining Dividend Policy - dividends and valuation of the firm - the basic models – forms of dividend - Declaration and payment of dividends. Bonus shares, Rights issue, share-splits, Major forms of dividends – Cash and Bonus shares. Dividends and valuation; Major theories centered on the works of Gordon, Walter and Lintner. A brief discussion on dividend policies of Indian companies.

**UNIT- IV:** Working Capital Management and Finance: Working Capital Management: Components of working capital, gross vs. net working capital, determinants of working capital needs, the operating cycle approach. Planning of working capital, Financing of working capital through Bank finance and Trade Credit, regulation of bank finance.

**UNIT - V:** Management of Current Assets: Management of cash – Basic strategies for cash management, cash planning, cash budget, cash management techniques/processes. Marketable securities: characteristics, selection criterion, Management of receivables- Credit policy, credit evaluation of individual accounts, monitoring receivables, factoring. Management of inventory- Inventory management process, Inventory control systems, analysis of investment in inventory.

Corporate Restructuring: Corporate Mergers, Acquisitions and Takeovers: Types of Mergers, Economic rationale of Mergers, motives for Mergers, Financial evaluation of Mergers.

**Suggested Readings:**

1. I M Pandey, Financial Management, 11 e, Vikas Publications , 2015.
2. M.Y Khan, P K Jain, Financial Management-Text and Problems, TMH, 2015.
3. James C Van Horne, Sanjay Dhamija, Financial Management and Policy, Pearson
4. Education, New Delhi.
5. Eugene F.Brigham Michael C. Ehrhardt, Financial Management, Cengage Learning, 12e,
6. 2012.
7. Arindam Banerjee, Financial Management, Oxford Publications, 2016.
8. Rajesh Kothari, Financial Management A contemporary Approach, Sage publications, 2017.

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**
**B.TECH IDP (MBA) (IV Year II SEM)**
**HUMAN RESOURCE MANAGEMENT(PE-II)**

**Course Objective:** To understand various functions of HRM and able to manage the human resources of any organization effectively.

**Course Outcome:** Students will be able to understand a) Basic HR concepts b) process of recruitment and selection, c) Learning and development d) Performance Management and Compensation e) Employee retention strategies f) importance of employee welfare and grievances.

**UNIT - I:**

Introduction of HRM: Introduction to HRM – Line Managers – HR Role and responsibilities – New Approaches to Organizing HR – Globalization & Competition Trends – Technological Trends – Trends in Nature of Work – Workforce and Demographic Trends – Economic Challenges – High Performance Work System's – Labor Legislation in India – Equal Employment Opportunity – HR Score Card developed. Human Resource Information System.

**UNIT - II:**

Recruitment and Selection: Basics of Job Analysis and talent Management process – Methods for Collecting Job Analysis Information – Job Descriptions and specifications – Job Satisfaction – Job Enlargement, Job Enrichment, Job Rotation, HR Planning – Recruitment & Selection Process – Planning & Forecasting of human resources – Sources of Recruitment – Recruitment on Diverse Work Force – Employee Testing and Selection – Basic types of Interviews – Errors in Interviews

**UNIT - III:**

Training and Developing and Performance Management – Importance of Training and Development – Training process - Analyzing Training needs & Designing the program – Implementation of training programmes – training methods – Management development process – Evaluation of training and development programmes. Performance Management - Concept of Performance management and appraisal, the performance appraisal process, Techniques for Performance Appraisal – Career Management.

**UNIT - IV:**

Compensation and Employee welfare – Basic factors in determining pay rates – Job evaluation methods - Establishing pay rates – Pricing Managerial and Professional Jobs – Performance based pay -Benefits – Insurance – Retirement Benefits – Employee Welfare facilities. Salient features of Workmen Compensation Act & Minimum Wages Act.

**UNIT - V:**

Employee Relations – Labor Movement – Collective Bargaining Process – Grievances – Grievances handling procedure – Employee Separation – Employee Safety and Health – Occupational Safety Law – Work Place Health Hazards Problems & Remedies – Salient features of Industrial Disputes Acts 1947 – Factories Act.

**Suggested Readings:**

1. Gary Dessler, Biju Varkkey, Human Resource Management, 4e, Pearson 2017.
2. Robert L.Mathis, John H.Jackson, Manas Ranjan Tripathy,Human Resource Management,Cengage Learning 2016.
3. Uday Kumar Haldar, Juthika Sarkar, Human Resource Management, Oxford University Press2013.
4. K. Aswathappa, Human Resource Management, Text and Cases, TMH, 2011.
5. Sharon Pande and Swapnalekha Basak, Human Resource Management, Text and Cases,,Vikas Publishing , 2e, 2015.