**SYLLABUS**

###  FOR

**FOUR-YEAR B. TECH PROGRAMME**

**IN**

**INFORMATION TECHNOLOGY**

 **DEPARTMENT OF INFORMATION TECHNOLOGY**

**ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH**

#  (FORMERLY COLLEGE OF ENGINEERING & TECHNOLOGY)

**(An Autonomous and Constituent College of BPUT, Odisha) Techno Campus, MahalaxmiVihar, Ghatikia,**

**Bhubaneswar-751029, Odisha, INDIA** [**www.cet.edu.in**](http://www.cet.edu.in/)

**Ph. No.: 0674-2386075 (Off.), Fax: 0674-2386182**

**1stSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | BasicScience Course | UBSCH101 | CHEMISTRY | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 2 | Basic ScienceCourse | UBSMH102 | MATHEMATICS - I | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | EngineeringScience Course | UESCS103 | PROGRAMMINGFOR PROBLEM SOLVING | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | BasicScience Course | ULCCH101 | CHEMISTRY LAB | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 5 | Engineering ScienceCourse | ULCCS102 | PROGRAMMING FOR PROBLEMSOLVING LAB | 0 | 0 | 4 | 2 | 0 | 0 | 100 | 100 |
| 6 | Engineering ScienceCourse | ULCME103 | ENGINEERING GRAPHICS ANDDESIGN LAB | 1 | 0 | 4 | 3 | 0 | 0 | 100 | 100 |
| **7** | Humanities &SocialSciences | UHSMH105 | ENGLISH | 2 | 0 | 0 | 2 | 30 | 70 | 0 | 100 |
| **8** | HS | ULCMH104 | ENGLISH LAB | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
| 9 | MandatoryCourse | INDUCTION TRAINING(21DAYS) |  |  |  | 0 |  |  |  |  |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **800** |

## 2ndSEMESTER

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| --- | --- | --- | --- | --- | --- | --- |
| **Sl. No****.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Wee k** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **I****A** | **E****A** | **PA** | **Tota****l** |
| 1 | Basic ScienceCourse | UBSPH201 | PHYSICS | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 2 | Basic ScienceCourse | UBSMH20 2 | MATHEMATICS- II | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | Engineerin g ScienceCourse | UESEE203 | BASICELECTRICAL ENGG. | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 4 | Basic ScienceCourse | ULCPH201 | PHYSICS LAB | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 5 | Engineering Science Course | ULCEE202 | BASIC ELECTRICALENGG. LAB | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
| 6 | Engineering Science Course | ULCME205 | WORK SHOP/BASIC MANUFACTURING PROCESS LAB | 1 | 0 | 4 | 3 | 0 | 0 | 100 | 100 |
| 7 | Engineerin g ScienceCourse | UESIE202 | BASIC ELECTRONICS ENGINEERING | 2 | 0 | 0 | 2 | 30 | 70 | 0 | 100 |
| 8 | LAB Course | ULCIE202 | BASIC ELECTRONICS ENGINEERING LAB | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **800** |

**3rd SEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Core Course | UPCIT301 | Object Oriented Programmingusing JAVA | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | CoreCourse | UPCIT302 | Data structureusing C | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Core Course | UPCIT303 | Formal Language and AutomataTheory | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 4 | Engg.Science Course | UESIE312 | Digital Electronics | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Basic ScienceCourse | UBSMH301 | Mathematics -III | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 6 | Humanities ScienceCourse | UHSMH307 | Engineering Economics | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 7 | LabCourse | ULCIT301 | JAVA Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | LabCourse | ULCIT302 | Data structure Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **23** |  |  |  | **800** |

## 4thSEMESTER

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| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | CoreCourse | UPCIT401 | DiscreteMathematics | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | CoreCourse | UPCIT402 | Design & Analysisof Algorithm | 3 | 1 | 0 | 4 | 30 | 70 | 0 | 100 |
| 3 | Core Course | UPCIT403 | DatabaseManagement Systems | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 | Engg.Science Course | UESIT404 | ComputerOrganization and Architecture | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | HumanitiesScience Course | UHSMH406 | Organizational Behavior | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | LabCourse | ULCIT401 | ComputerOrganization Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 7 | LabCourse | ULCIT402 | Algorithm Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | LabCourse | ULCIT403 | Database Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 9 | MandatoryCourse | UMCCE401 | EnvironmentalScience | 2 | 0 | 0 | 0 | 30 | 70 | 0 | 100 |
|  |  |  | **Total** |  |  |  | **20.5** |  |  |  | **900** |
| **10** | **Summer Internship programme (4 to 8 weeks) is mandatory as per AICTE rule** |

**5thSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | CoreCourse | UPCIT501 | Operating System | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Core Course | UPCIT502 | ComputerNetworks | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | CoreCourse | UPCIT503 | Compiler Design | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Core Course | UPCIT504 | ArtificialIntelligence | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Programme Elective-I | UPEIT505UPEIT506 UPEIT507 | E-Commerce and ERPAdv Java/ Advanced Computer Architecure | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | Open Elective-I |  |  | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 7 | Lab Course | ULCIT501 | Operating SystemLab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | Lab Course | ULCIT502 | ComputerNetworks Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 9 | LabCourse | ULCIT503 | Compiler Design Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **22.5** |  |  |  | **900** |

**6thSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject****Code** | **Subject****Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |

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## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **L** | **T** | **P** |  | **IA** | **EA** | **PA** | **Total** |
| 1 | Core Course | UPCIT601 | Internet & WebTechnology | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Core Course | UPCIT602 | SoftwareEngineering | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Programme Elective-II | UPEIT601 UPEIT602 UPEIT603 | Data Mining/ Data Analytics/ ComputerVision | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Programme Elective-III | UPEIT604UPEIT605 UPEIT606 | Cloud Computing Computer Graphics SoftComputing | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Open Elective-II |  |  | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | Lab Course | ULCIT601 | IWT Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 7 | Lab Course | ULCIT602 | SoftwareEngineering Lab | 0 | 0 | 3 | 1.5 | 0 | 0 | 100 | 100 |
| 8 | Lab Course | ULCIT603 | Simulation Lab | 0 | 0 | 4 | 2 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20** |  |  |  | **800** |
| **9** | **Summer Internship programme (4 to 8 weeks) is mandatory as per AICTE rule** |

**7thSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching****Hours/Week** | **Credit** | **Maximum Marks** |
| **L** | **T** | **P** | **IA** | **EA** | **PA** | **Total** |
| 1 | Programme Elective-IV | UPEIT701/ UPEIT702/ UPEIT703 | Mobile Computing/ Real Time Systems/ Wireless Sensor Network | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 2 | Programme Elective-V | UPEIT704 UPEIT705UPEIT706 | Software Project Management Information RetrievalFault Tolerant System/ | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 3 | Programm e Elective- VI | UPEIT707 UPEIT708 UPEIT709 | Machine Learning/ Embedded Systems / Intrusion Detection System | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 4 | Open Elective-III |  |  | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 5 | Humanities ScienceCourse | UHSMH701 | Entrepreneurship Development | 3 | 0 | 0 | 3 | 30 | 70 | 0 | 100 |
| 6 | ProjectCourse | UPRIT701 | Minor Project Course | 0 | 0 | 8 | 4 | 0 | 0 | 100 | 100 |
| 7 | Seminar | USEIT701 | Seminar | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **20** |  |  |  | **700** |

**8thSEMESTER**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No****.** | **Subject Type** | **Subject Code** | **Subject Name** | **Teaching Hours/Week** | **Credi t** | **Maximum Marks** |
| **L** | **T** | **P** | **I****A** | **E****A** | **PA** | **Tota****l** |
| 1 | Project Course | UPRIT801 | Project Course / Internship | 0 | 0 | 24 | 12 | 0 | 0 | 100 | 100 |
| 2 | Core Course | UPCIT801 | Comprehensiv e VivaVoce | 0 | 0 | 2 | 1 | 0 | 0 | 100 | 100 |
|  |  |  | **Total** |  |  |  | **13** |  |  |  | **200** |

**List of Open Elective Courses offered by IT Department**

1. **Data Structure**
2. **Object Oriented Programming using C++**
3. **Java Programming**

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| --- |
| **OPEN ELECTIVE OFFERED BY OTHER BRANCHES TO "INFORMATION TECHNOLOGY"** |
| **OPEN ELECTIVE - I (5TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE501 | Fluid Mechanics |
| 2 | ELECTRICAL ENGINEERING | UOEEE501 | Industrial Electrical Systems |
| 3 | MECHANICAL ENGG. | UOEME501 | Thermodynamics and Heat Transfer |
| UOEME502 | Applied Thermal Engineering |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE501 | Digital Communication |
| 5 | COMPUTER SCIENCE ENGG | UOECS504 | Real-Time Systems |
| UOECS505 | Advance Algorithms |
| UOECS506 | Parallel & Distributed Systems |
| 6 | BIOTECHNOLOGY | UOEBT501 | Physiology for Engineers |
| 7 | FASHION TECHNOLOGY | UOEFT501 | Fundamental Techniques of Apparel Design |
| 8 | TEXTILE ENGG. | UOETE501 | Textile Structural composite |
| **OPEN ELECTIVE - II (6TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE601 | Mechanics of Solids |
| 2 | ELECTRICAL ENGINEERING | UOEEE601 | Renewable Energy Systems |
| 3 | MECHANICAL ENGG. | UOEME601 | Basic Manufacturing Process |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE601 | MICRO ELECTRO MECHANICAL SYSTEM (MEMS) |
| 5 | COMPUTER SCIENCE ENGG | UOECS609 | Cambinatorics & Graph Theory |
| UOECS610 | Human Computer Interaction. |
| 6 | BIOTECHNOLOGY | UOEBT601 | Introduction to Biopharmaceutical Technology |

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|  |  |  |  |
| --- | --- | --- | --- |
| 7 | FASHION TECHNOLOGY | UOEFT601 | Visual Art and Illustration Techniques |
| 8 | TEXTILE ENGG. | UOETE601 | Clothing Science and Technology |
| **OPEN ELECTIVE - III (7TH SEM)** |
| **Sl. No** | **Branch** | **Subject Code** | **Subject** |
| 1 | CIVIL ENGINEERING | UOECE701 | Composite Materials |
| 2 | ELECTRICAL ENGINEERING | UOEEE701 | Control System Design |
| 3 | MECHANICAL ENGG. | UOEME701 | Mechanics of Solids |
| 4 | INSTRUMENTATION & ELECTRONICS ENGG. | UOEIE701 | Satellite Communication |
| 5 | COMPUTER SCIENCE ENGG | UOECS709 | Big Data Analytics |
| UOECS710 | Information Retrieval |
| UOECS711 | Machine Learning |
| 6 | BIOTECHNOLOGY | UOEBT701 | Computational Biology |
| 7 | FASHION TECHNOLOGY | UOEFT701 | Fashion Photography |
| 8 | TEXTILE ENGG. | UOETE701 | Specialty Yarn and Fabric |

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**Chemistry(3-1-0) Code –UBSCH101**

#### Course Outcomes

At the end of this course, students will be able to:

1. Understand the basics of molecularinteractions.
2. Idea about organometallic and their catalyticapplications.
3. Understand basics of fuels and corrosionchemistry.

#### Module 1: (10 Hours)

QuantumChemistryandSpectroscopy:Basicconceptsandpostulatesofquantummechanics.Introduction to Schrodinger Wave Equation, Particle in a box: Energy levels, quantum numbers and selectionrule.

Spectroscopy: Lambert Beer’s Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications to colorimetry. Effect of conjugation on chromophores, Absorption by aromatic systems, introductory idea on Rotational and Vibrational Spectroscopy Principles and application to diatomic molecules.

The phase rule: Statement of Gibb’s phase rule and explanation of the terms involved, Phase diagram of onecomponentsystem-waterandsulfursystem,Condensedphaserule,Phasediagramoftwocomponent system - Eutectic Bi-Cdsystem

#### Module 2: (10 Hours)

Organometallics: Introduction to organometallics, EAN rule; classification, nomenclature and characteristics of organometallic compounds. Applications of organometallic compounds and catalyst in alkene isomerization hydrogenation and hydroformylation (detail mechanisms are to be excluded).

#### Module 3: (10 Hours)

Fuels: Classification of fuels, calorific value. (Determination by Dulong’s formula), G. C. V. and N. C. V. Liquid fuels: Classification of petroleum, refining of petroleum, Cracking, Knocking and anti-knocking, cetane and octane numbers. Unleaded petrol, synthetic petrol, power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG, Kerosene gas, Combustion calculation.

#### Module 4: (10 Hours)

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlementinboilers),Factorsaffecting,Metalcoatings-GalvanizingandTiming,Corrosioninhibitors, cathodicprotection.

#### Text Books:

1. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, PearsonIndia.
2. Introductory to Quantum Chemistry by A. K. Chandra, 4th Edition, McGraw HillEducation.
3. Fundamentals of Molecular & Spectroscopy by Banwell, Tata McGraw HillEducation.
4. Physical Chemistry by Gordon M. Barrow,McGraw-Hill
5. Engineering Chemistry, 12th Edition, Author: Wiley India Editorial Team PublishersWiley.
6. Engineering Chemistry: Fundamentals and Applications. Shikha Agarwal. Cambridge University Press.
7. Engineering Chemistry, Jain and Jain, Dhanpat RaiPublication.

#### Reference Books:

1. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, ThirdEdition.
2. Quantum Chemistry by Ira N. Levine, Pearson 7thEdition.
3. Molecular Spectroscopy, Ira N. Levine, John Wiley andSons
4. Modern Spectroscopy - A Molecular Approach, by Donald McQuarrie and John Simon,published by University ScienceBooks.
5. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford University Press, 6thedition.

 **Mathematics-I(3-1-0) Code-UBSMH102**

#### Course Outcomes

On successful completion of this course, the students will be able to:

1. Applytheprinciplesofdifferentialcalculustosolveavarietyofpracticalproblemsinengineering and appliedsciences.
2. Possess fundamental understanding of Fourier series and be able to give Fourier expansions of a function,
3. Apply the principles of vector calculus to solve a variety of basic problems in engineering and appliedscience,
4. Solve a variety of first order and higher order differential equations selecting from a variety of techniques covered in thesyllabus.

#### Module 1: (10 Hours)

Calculus:Asymptote,Curvature,Convergenceofsequenceandseries,testsforconvergence,powerseries, Taylor’s series, Fourierseries.

Partialdifferentiation,Taylor’stheoremforfunctionoftwovariables,MaximaandMinimaforfunctionof twovariables.

#### Module 2: (10 Hours)

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc length, gradient, divergence, curl.

Vector integral calculus: Line Integrals, Green Theorem, Surface integrals, Gauss theorem and Stokes Theorem.

#### Module 3: (10 Hours)

Differential Equation: Differential Equation: First order differential equations, Separable Equation, Exact differentialequation,lineardifferentialequation,Bernoulli’sequationandapplicationtoElectricalcircuits.

Lineardifferentialequationofsecondandhigherorder,Homogeneousequationwithconstantco-efficient, Euler-Cauchy equations, Solution by undetermined co-efficient, Solutions by variation of parameters, Modelling of electriccircuits.

#### Module 4: (10 Hours)

Series solution of differential equations, Power series method, Legendre equation and Legendre polynomials.

Laplace transformation and its use in getting solution to differential equations, Convolution, Integral Equations.

#### Text Books:

1. Differential Calculus by Santi Narayan and Mittal, Chapters 14, 15Publication.
2. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition,Wiley.
3. Higher Engineering Mathematics by B. V. Raman, McGraw HillsEducation.

#### Reference Books:

1. Engineering Mathematics by Pal and S. Bhunia, OxfordPublication.
2. Ordinary and Partial Differential equations by J. Sinha Roy and S. Padhy, KalyaniPublishers.
3. Advance Engineering Mathematics by P. V. O’Neil,Cengage.

**Programming for ProblemSolving (3-0-0) Code –UESCS103**

#### Module 1: (10 Hours)

Introduction to Programming, Introduction to components of a computer sys- tem (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

IdeaofAlgorithm:stepstosolvelogicalandnumericalproblems.RepresentationofAlgorithm:Flowchart/ Pseudo code with examples, From algorithms to programs; source code, variables (with data types) variables and memory lo- cations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions andprecedence

#### Module 2: (07 Hours)

Conditional Branching and Loops, Arrays (1-D, 2-D), Character arrays and Strings, Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems.

#### Module 3: (07 Hours)

Structure & Unions, defining structures and Array of Structures, Pointers, Idea of pointers, Defining pointers, Pointers to functions, Double pointers.

#### Module 4: (06 Hours)

Dynamicmemoryallocation,useofmalloc(),calloc(),realloc(),free().Storageclasses:local,global,static & register variables. File handling: reading & writing to afile.

#### Text Books:

1. Byron Gottfried, Schaum’s Outline of Programming with C, McGrawHill.
2. E. Balaguruswamy, Programming in ASI C, Tata McGrawHill.

#### Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

**ChemistryLab(0-0-3) Code –ULCCH101**

##### List of Experiments

***(At least 10 experiments should be done)***

**Experiment List:**

1. Determination of amount of sodium hydroxide and sodium carbonate in amixture.
2. Determination of total hardness of water by EDTAmethod.
3. Estimation of calcium in calcium inlimestone.
4. Determination of percentage of available chlorine in a sample of bleachingpowder.
5. Preparation ofPhenolphthalein.
6. Acid-Base Titration byPotentiometry.
7. Preparation of buffer solution and determination of pH of a buffersolution.
8. Standardization of KMnO4 using sodium oxalate. Determination of ferrous iron in Mohr’s salt by potassiumpermanganate.
9. Determination of partition coefficients of iodine between benzene andwater.
10. Determination of rate constant of acid catalyzed hydrolysisreaction.
11. Determination of concentration of a colored substance byspectrophotometer.
12. Determination of dissolved oxygen in a sample ofwater.
13. Determination of Viscosity of a lubricating oil by Red Woodviscometer.
14. Determination of Flash point of a given oil by Pensky-Marten’s flash pointapproach.
15. Determination of Critical Micelle concentration (CMC) of an ionic surfactant (Both cationic and anionic).

## Programming for Problem Solving Lab (0-0-4) Code – ULCCS102

##### List of Experiments

***(At least 10 experiments should be done)***

**Experiment List:**

1. Familiarization with programmingenvironment.
2. Simple computational problems using arithmeticexpressions.
3. Problems involving if-then-elsestructures.
4. Iterative problems e.g., sum ofseries.
5. 1-D Arraymanipulation.
6. Matrix problems, Stringoperations.
7. Simplefunctions.
8. Programming for solving Numerical methods problems(1).
9. Programming for solving Numerical methods problems(2).
10. Recursivefunctions.
11. Pointers andstructures.
12. Fileoperations.

**Engineering Graphics and Design (1-0-4) Code – ULCME103**

#### Module 1: (05 Hours)

Introduction: Introduction to Engineering Drawing, Drawing Instruments and their uses, Dimensioning, Scale, types of lines, Lettering. (1 sheet)

Orthographic Projection: Introduction to Projection, Projection types or methods (First angle and Third angle)

PlaneofProjection,Referenceline,orthographicProjectionofPoints(pointslocatedinallfourquadrants), Projection of Straight lines (first and third quad- rant only), traces of lines. (1sheet)

Orthographic Projection of Plane Surfaces in various positions (Triangle, Square, Rectangle, Rhombus, Pentagon, hexagon and Circle), Traces of a Plane. (1 sheet)

Introduction to Solids and Types of Solids, Orthographic Projection of Solids in different Positions. (1 sheet)

#### Module 2: (05 Hours)

Sections and Development of Lateral Surface of Solids: Sectional view (half section and full section), development of surfaces of right regular prisms, pyramids, cylinders and cones. (1 sheet)

Isometric Projection: Introduction, Isometric Scale, Isomeric projection of cube, right regular prism, cylinders and cones. (1 sheet)

Applications: Orthographic and sectional view of Machine components (Screw Thread, nut and bolt). (1 Sheet)

Auto CAD: Introduction to Auto CAD. Fundamental concepts.

#### Text Books:

1. Machine Drawing by N. D. Bhatt, V. M. Panchal, Charotar PublishingHouse.
2. Machine Drawing by N. D. Junarkar, PearsonEducation.
3. Machine Drawing with AutoCAD by Goutam Pohit and Goutam Ghosh, PearsonEducation.
4. Machine Drawing includes AutoCAD by Ajeet Singh, Tata McGrawHill.

**Physics(3-1-0) Code-UBSPH201**

#### Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Enhance the fundamental knowledge in Physics and its application relevant to various streams of Engineering andTechnology.
2. Understand interaction of light with matter through interference, diffraction and be able to distinguish ordinary light with a laser light and to realize propagation of lightpolarization.
3. Understand various crystal systems and their structures elaborately through opticalfibers.
4. Understand basic knowledge of quantummechanics.

#### Module 1: (16 Hours)

Classical Dynamics: Newton’s laws of motion, generalized coordinates, constraints, Principle of virtual work,D’Alembert’sPrinciple,Lagrangian,Actionprinciple,Lagrangeequationofmotion(noderivation) and its application to Simple Harmonic oscillator and simplependulum.

General properties of Matter: Stress, Strain, Hooks’ law, Young’s modulus.

Oscillation & Waves: Simple Harmonic Oscillation, damped harmonic oscillation, forced oscillator, resonance, coupled oscillation, concept of wave and wave equation.

Optics: Concept of interference, two source interference pattern, Biprism, Michelson Interferometer & measurementofwavelength.Diffraction:Huygensprinciple,Fresnel&Fraunhoferdiffraction,Zoneplate, Plane diffraction grating (formulaonly).

#### Module 2: (12 Hours)

Solid State Physics: Crystalline and amorphous solid, unit cell, Miller Indices, Reciprocal lattice, Bragg’s law, Brillouin’s zone, concept of fermions, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distribution function (only statement and formula), Concept of Fermions and Bosons. Classification of materials: metals, semiconductor and insulator in terms of band theory.

LASER and Fibre Optics: Principle and application, stimulated emission, population inversion, Lasing material (solid and gas), He-Ne laser, Rubi- LASER, Application of LASER (Engineering Application), Principle of optical fibre and its application to communication.

#### Module 3: (12 Hours)

Electromagnetism: Student will be familiarized with some basics used in vector calculus prior to development of Maxwell’s electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should sufficient.

1. Vector calculus: gradient of scalar field, divergence, curl of vector field (Only Physical significance) Gauss divergence theorem, Stoke’s theorem, Green’s theorem (Only Statements) and applications.
2. Gauss’s law of electrostatics in free space and in a medium and application (Only statements) electric displacement (D) magnetic Induction (B), Amperes circuital law (Only statements), displacement current,Faraday’slawofelectromagneticinduction(Onlystatements),BiotSavartsLaw(Onlystatements), Maxwell’s four electromagnetic equations, Wave equation for E and B fields in vacuum, Electromagnetic energy, Poynting vector (noderivation).

Quantum Physics: Elementary concepts of quantum physics formulation to deal with physical systems.

1. Need for Quantum Physics-Historical overviews, Particle aspects of radiation- Black body radiation, photoelectric effect, Compton scattering, pair production. (No derivations), Wave aspect of particles-matterwave,deBroglieHypothesis,HeisenbergUncertaintyprinciples-Statement,Interpretation and application to H-atom, Harmonic oscillator to calculate ground stateenergy.
2. Basic features of Quantum mechanics- Transition from deterministic to probabilistic, States of system-Wavefunction,probabilitydensity,superpositionprinciple,observablesandoperators,expectation values. Schrodinger equation- Time dependent and time independent, wavepackets.

#### Text Books:

1. L. Maharana, P. K. Panda, S. N. Dash, B. Ojha, Lectures in Engineering Physics,Pearson.

#### Reference Books:

1. An Introduction to Mechanics -D. Klippner & R. Kolenkow,TMH
2. Concepts of Modern Physics - ArthurBeiser.
3. Electricity & Magnetism -E. M.Purecell
4. Engineering Physics by D. K. Bhattacharya and Poonam Tandon, Oxford UniversityPress
5. Engineering Physics by D. R. Joshi, Mc GrawHill
6. Introduction to Electrodynamics- David J. Griffiths, PHIPublication
7. Optics- A. K.Ghatak
8. Physics-I for engineering degree students- B. B. Swain and P. K.Jena.
9. Quantum Mechanics -Powel &Craseman.
10. Quantum Physics -Gasiorowicz

**Mathematics-II(3-1-0) Code -UBSMH202**

***Course Outcome:***

On successful completion of this course, the students will be able to:

1. Use the basic concepts of vector and matrix algebra, including linear dependence / independence, basisanddimensionofasubspace,rankandnullityforanalysisofmatricesandsystemsoflinearequations,
2. Apply linear algebra techniques to solve various engineeringproblems,
3. Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational re-sources,
4. Compare different numerical methods with respect to accuracy and efficiency of thesolution.

#### Module 1: (10 Hours)

Matrices, vectors: addition and scalar multiplication, matrix multiplication: Linear systems of equations, linear independence, rank of a matrix, determinants, Cramer’s rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Vector space, linear dependence of vectors, basis, dimension.

#### Module 2: (10 Hours)

Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem, composition of linear maps, matrix associated with a linear map.

Eigenvalues, eigenvectors, symmetric, skew-symmetric and orthogonal matrices, Eigen basis, Diagonalization, Inner product spaces, Gram-Schmidt orthogonalization.

#### Module 3: (10 Hours)

Solution of polynomial and transcendental equations - Bisection method, Newton- Raphson methods and Regula-Falsi method.

Finite differences, Interpolation using Newton’s forward and backward difference formulae, Newton’s divided difference and Lagrange’s formulae, Numerical approximation of functions.

#### Module 4: (10 Hours)

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson’s 1/3rd and 3/8 rules, Gauss Legendre and Gauss quadrature rule.

Gauss Siedel iteration method for solving a system of linear equations Euler and modified Euler’s methods, Runge-Kutta methods.

#### Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & Sons Inc. 10thEdition
2. Linear algebra and its applications by Gilbert Strang, Cengagelearning.

#### Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, McGraw Hill Edu-cation.
2. Engineering Mathematics by Pal and S. Bhunia, OxfordPublication.
3. Advance Engineering Mathematics by P. V.O’Neil.
4. Introductory methods of numerical analysis by S. S. Sastry,PHI.

## Basic ElectricalEngineering(3-1-0) Code –UESEE203

This is a foundation course aimed to expose the students the basic and under- lying principles ofElectrical circuits, Electro-mechanical energy conversion andMeasurements.

#### Course Outcomes

At the end of this course, students will be able to:

1. Understand and analyse basic electric and magneticcircuits.
2. Analysis of Transient condition in DCcircuit.
3. Understand the basic of various types of electrical machines andmeasurements.
4. Explain the under-laying principle of generation, transmission and distribution of the electrical power.

#### Module 1: (10 Hours)

Fundamentals of Electric Circuits: Fundamentals of electrical circuit, Ohm’s law, Kirchhoff’s laws, series and parallel connections, Electric Power and sign conventions, circuit elements and their characteristics. Practical voltage and current sources. Source Conversion.

ResistiveNetworkAnalysis:nodevoltageandmeshcurrentmethods,supernodeandsupermeshmethods, delta-starandstar-deltaconversions,superpositionprinciple,Thevenin’sandNorton’stheorems.maximum powertransfer.

#### Module 2: (10 Hours)

Single phase AC circuits: Single phase emf generation, Representation of sinusoidal waveforms, average, effective, peak and rms values, j operators, phasor concept, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel) Instantaneous Power in AC Circuits, Real power, reactive power, apparent power, Power Factor, Power triangle, Complex Power.

Three-phase AC circuits: Three phase emf generation, Delta-star and star- delta conversions, voltage and currentrelationsinstaranddeltaconnections.solutionofthethreephasecircuitswithbalancedvoltageand balanced load conditions, phasor diagram, measurement of power in three phasecircuits.

Transient Analysis: Writing differential equations for circuits, DC steady state solutions of first order circuits.

#### Module 3: (10 Hours)

ElectricalMeasuringinstruments:Introduction,PMMCAmmetersandVoltmeterswithextensionofrange, Moving-Iron Ammeters and Voltmeters, Dynamometer type Wattmeter, Energymeter.

Magneticcircuits:MMF,flux,reluctance,inductance.ReviewofAmpereLaw,BiotSavartLaw.Magnetic field, Electricity and Magnetism, B-H characteristics and hysteresis loss, series and parallel magnetic circuits.

Transformers:Construction,operatingprinciple,emfequationandturnsratio.Typesoftransformer,phasor diagrams for no loadoperation.

#### Module 4: (10 Hours)

DCMachines:PrincipleofOperationofgeneratorandmotor,EMFequation,TorqueEquation,methodsof excitation. Speed equation of d.c. motor, speed control of d.c. shuntmotor.

Induction motor: construction of AC inductor machines, Revolving magnetic flux, torque and slip, synchronous speed.

Power Systems: Brief idea about various generating plants (Thermal, Hydel, and Nuclear), Transmission and Distribution of Electric Energy.

#### Text Books:

1. Electrical & Electronic Technology, E. Huges, Pearson, 9thEdition.
2. Electrical Engineering Fundamentals, Vincent Del Toro, 2nd Edition,PHI.

#### Reference Books:

1. C. L. Wadhwa,” Electrical Engineering”, New Age International Publishers, 2ndEdition.
2. Basic Electrical Engineering, A. Fitzgerald, D. E. Higginbotham and A. Grabel, TMH, 5thEd.

**English(2-0-0) Code -UHSMH205**

**Course Outcome**

At the end of this course, students will be able to:

1. Equipped with the theory and practice ofcommunication.
2. Equipped with both theoretical vocabulary and basic tools which will help them develop as better communicators.

Select literary texts and establish how these texts contribute to the afore- mentionedobjectives

#### Module 1: (08 Hours)

Introduction to Communication:

Importance of Communication in English, the process of communication and factors that influence the process of communication: Sender, receiver, channel, code, topic, message, context, feedback, ’noise’. Principles of Communication. Barriers to Communication & Communication Apprehension, Verbal (Spoken and Written) and non-verbal communication, Body language and its importance in communication.

#### Module 2: (07 Hours)

Phonetics and Functional Grammar:

Sounds of English: Vowels (Monophthongs and Diphthongs), Consonants, Syllable division, stress (word, contrastive stress) & intonation, MTI and problem sounds, Review of Parts of Speech, Subject and Predicate, Tense, Voice Change, Idioms and Phrasal Verbs.

(Note:Thisunitshouldbetaughtinasimple,non-technical,applicationorientedmanner,avoidingtechnical terms as fast aspossible.)

**Module 3: (05 Hours)** Reading Literature:

Prose:

* Stephen Leacock: My Financialcareer.
* Mahatma Gandhi: from My Experiments withTruth.
* O’Henry: The Last Leaf.

Poetry:

* Nissim Ezekiel:Professor.
* Jack Prelutsky: Be glad your nose is on yourface.
* Maya Angelou: Still I rise(Abridged).

**Basic Electronics Engineering Code- UESIE102**

**Module 1: (12 Hours)**

**Semiconductor Diodes:**

Semiconductor materials- intrinsic and extrinsic types, Ideal Diode, Terminal characteristics of diodes ( p-n junction under open circuit condition, p-n junction under forward bias and reverse bias condition)p-n junction in breakdown region, Diode small signal model, Zener diode and applications , Rectifier Circuits ( Half wave, Full wave centre tap and bridge rectifiers )

**Bipolar Junction Transistors (BJTs):**

Physical structure and operation modes**,** Active region operation of transistor**,**  D.C. analysis of transistor circuits**,**  Transistor as an amplifier**,**

**Module 2: (12 Hours)**

**BJT Biasing and Modeling:**

Biasing the BJT: fixed bias, emitter feedback bias and voltage divider bias**,** Basic BJT amplifier configuration: common emitter, common base andcommon collector amplifiers

**Field Effect Transistor:**

JFET-types, Operations and their Characteristics ,MOSFETs- types, Operations and their Characteristics

**Feedback Amplifiers and Oscillators:**

Types of feedback, Advantages of Negative feedback, Barkhausen criterion, RC oscillators (phase shift, Wien bridge), LC oscillators (Hartley)

**Extra (To be taught in Department level)**

Transistor as a switch: cut-off and saturation modes, High frequency model of BJT amplifier.

**Operation Amplifier (Op-amps):**

Ideal Op-amp, Differential amplifier: differential and common mode operation, common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, weightedsummer, integrator, differentiator

**Reference Books:**

1. A. S. Sedra and K. C. Smith, *Microelectronic Circuits: Theory and Applications*, 7th edition. Oxford, 2017.

2. B. Razavi, *Fundamentals of Microelectronics*, 2nd edition. Wiley-India, 2014.

3. R. L. Boylestad and L. Nashelsky, *Electronic Devices and Circuit Theory*, 11th edition. Pearson, 2013.

4. T. C. Carusone, D. Johns, and K. Martin, *Analog Integrated Circuit Design*, 2nd edition. Wiley-India, 2013.

5.  P. R. Gray, P. J. Hurst, S. H. Lewis, and R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, 5th edition. Wiley-India, 2009.

6. D. A. Neamen, *Electronic Circuits: Analysis and Design*, 3rd edition. Tata McGraw-Hill, 2008.

**Basic Electronics Laboratory Experiment List**

***List of Experiments***

***(At least 5 Experiments Should be done)***

|  |  |  |
| --- | --- | --- |
| **Sl No.** | **Name of the Experiment** | **Week** |
| 1 | Familiarization with electronic components & equipments (Active & Passive, Multi-meters, CROs and function generators) | 1 |
| 2 | Study of the characteristics of P-N junction diode and finding dynamic resistance. | 2 |
| 3 | Construction of half-wave rectifier and full wave rectifier circuits & study of their output waveforms by CRO and calculation of efficiency and ripple factor. | 3 |
| 4 | Study of the output characteristics of a Common Emitter Transistor | 4 |
| 5 | Design, setup and plot the frequency response of Common Source JFET/MOSFET amplifier and obtain the bandwidth. | 5 |
| 6 | Study of the characteristics of Zener diode. | 6 |
| 7 | Construction of clipper circuits & study of their output waveforms of positive clipper, negative clipper and two level clipper by CRO. | 7 |
| 8 | Construction of clamper circuits & study of their output waveforms of positive clamping, negative clamping by CRO. | 8 |

**PhysicsLab(0-0-3) Code –ULCPH201**

##### *List of Experiments*

***(At least 10 experiments should be done)***

**Experiment List:**

1. Determination of Young’s modulus by Searle’s method / Bending ofbeams.
2. Determination of Rigidity modulus by staticmethod.
3. Determination of surface tension by capillary risemethod.
4. Determination of acceleration due to gravity by Bar / Kater’spendulum.
5. Verification of laws of vibration of string usingsonometer.
6. Determination of wavelength of light by Newton’s ringapparatus.
7. Determination of grating element of a diffractiongrating.
8. Determination of wavelength of laser source by diffraction ratingmethod.
9. Determination of wavelength using MichelsonInterferometer.
10. Plotting of characteristic curve of a PN junctiondiode.
11. Plotting of characteristic curves ofBJT.
12. Determination of unknown resistance using MeterBridge.
13. Determine of reduction factor of the given tangentgalvanometer.
14. Determination of horizontal component of earth’s magnetic field by using tangentgalvanometer.
15. Determination of Hall coefficient using Hallapparatus.

## Basic Electrical EngineeringLab(0-0-2) Code-ULCEE202

##### *List of Experiments*

***(At least 10 experiments should be done)***

**Course Outcomes**

 At the end of the course the students are able to:

1. Learn about the working of different measuring instruments for measuring power, power factor, energyetc.
2. Verify different NetworkTheorems
3. Draw the Open Circuit Characteristics of dc generator andTransformer
4. Visualize the constructional details of differentmachines

**Experiment List:**

1. Basic safety precautions. Introduction and use of measuring instruments - voltmeter, ammeter, wattmeter, Rheostat, multi-meter,oscilloscope.
2. Connection and measurement of power consumption of an Incandescent, fluorescent, LED and CFL lamp and determination of power factor.
3. Power and power factor measurements in three phase system by two wattmetermethod.
4. Verification of super position, Thevenin and Norton’stheorem.
5. Plotting of B-H curve of different magnetic material and calculation of hysteresisloss.
6. Testing of a single-phase energy meter at different powerfactor.
7. Calculation of power and power factor in series R-L-C circuit excited by single-phase AC supply and draw the phasor diagram.
8. Determination of open circuit characteristics (OCC) of DC shuntgenerator.
9. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change involtage.
10. Observationoftheno-loadcurrentwaveformofatransformeronanoscilloscopeandmeasurement of primary and secondary voltages and currents, and power at differentload.
11. Demonstration of cut-out sections of machines: dc machine (commutator- brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ringarrangement).

## Workshop/Basic ManufacturingPractices(1-0-4) Code –UESME205

#### Module 1: (05 Hours)

Engineering materials: Classification of Engineering materials. Mechanical properties of Steel,Aluminum andPlastics.

Safety precautions in workshop.

Fitting: Knowledge of hand tools: V-block, Marking Gauge, Files, Hack Saw, Drills, Taps, Types of fitting.

#### Module 2: (05 Hours)

Welding: Study of electric arc welding tools & equipments, Models: Butt Joint, Lap Joint, T joint & L- joint.

Machining: Introduction to different machine tools: Lathe machine, Shaper machine and milling machine.

Brief introduction to other basic manufacturing processes like foundry, sheet metal operation and forming processes.

#### Text Books:

1. Elements of Workshop Technology, Vol. I and II by Hajrachoudhary, KhannaPublishers.
2. Workshop Technology by W. A. J. Chapman, VivaBooks.
3. Workshop Manual by Kannaiah/ Narayana,Scitech.

**EnglishLab(0-0-2) Code -ULCMH204**

##### *List of Experiments*

***(All the experiments should be done)***

**Course Outcome:**

At the end of the course the students are able to:

1. Acquaintedwiththeirstrengthandweaknessinexpressingthemselves,theirinterestsandacademic habits.
2. ImproveskillsofLSRW(Listening,Speaking,ReadingandWriting)throughmutualconversation and activities related to theseskills.
3. Promote the creative and imaginative practices before theteacher-trainer.

Lab sessions will give a platform for the students to indulge in activities based on the first two modules of theorytaughtintheclassroom.Allthelabclasseswillbedividedinsuchamannerthatallthefouraspects of language (LSRW) arecovered.

#### Experiment List:

1. Speaking: Ice-breaking and Introducing each other, Writing: Happiest and saddest moment of my life.
2. Listening: Listening practice (ear training): News clips, Movie clips, Presentation, Lecture or speech by a speaker, Speaking:Debate.
3. Reading: Reading comprehension, Writing: Creative writing (Short story: Hints to be given by teacher).
4. Reading:TopicsofGeneralawareness,CommonerrorsinEnglishusage,Writing:Constructionof different types ofsentences.
5. Speaking: Practice of vowel and consonant sounds, Writing: Practice of syllabledivision.
6. Speaking: My experience in the college/ or any other topic as per the convenience of the student, Writing: Phonemic transcription practice.
7. Listening: Practice of phonetics through ISIL system and also with the help of a dictionary, Speaking: Role-play ingroups.
8. Speaking: Practice sessions on Stress and Intonation, Writing: Practice sessions on Grammar (Tense and voicechange).
9. Speaking: Extempore, Writing: Framing sentences using phrasal verbs andidioms.
10. Watching a short English Movie, Writing: Critical analysis of themovie.

End-termAssignment:Studentsarerequiredtomakeaprojectofatleast5pagesonatopiconthefollowing broad streams: Technology, General awareness, Gender, Environment, Cinema, Books and the like. The assignment should involve data collection, analysis andreporting.

**THIRD SEMESTER**

**OBJECT ORIENTED PROGRAMMING USING JAVA**

|  |  |
| --- | --- |
| Prerequisites | Problem-solving approach Programming language, Data Structure,Database Engineering |
| Course Outcomes | * Understand the use of OOPsconcepts
* Able to solve real world problems using OOPtechniques.
* Understand the use ofabstraction.
* Understand the use of Packages and Interface injava.
* Develop and understand exception handling, multithreaded applications withsynchronization.
* Understand the use of CollectionFramework.
* Design GUI based applications and applets for webapplications.
 |

**Module I: 10 hrs**

**Object Oriented Programming Concepts**:- Objects and Classes , Abstraction , Encapsulation, Inheritance,Polymorphism, **OOP in Java** -Characteristics of Java ,The Java Environment, Java Source File,Structure,Compilation, **Fundamental Programming Structures in Java** – Defining classes in Java , constructors, methods ,access specifiers, static members ,Comments, Data Types, Variables, Operators, Control Flow, Method overloading, Arrays , Packages, Wrapper class, String class, StringBuffer class, StringTokenizer class, **Exceptions**-exception hierarchy , throwing and catching exceptions , built-in exceptions, creating own exceptions

**Module II: 8 hrs**

**Inheritance** – Super classes and sub classes ,Protected members , constructors in sub classes and super class, Method overriding, Dynamic method dispatch, Abstract classes and methods, final methods and classes ,**Interfaces**– defining an interface, implementing interface, differences between classes and interfaces ,extending interfaces , **Object class**-object cloning, **Inner classes**, **Input / Output Basics** – Streams , Byte streams and Character streams, Reading and Writing Files

**Module III: 8 hrs**

**Multi-threaded programming** – thread properties ,thread creation, thread life cycle ,interrupting threads , thread synchronization, **Generic Programming**- Motivation for generic programming , generic classes ,generic methods , generic code and virtual machine , inheritance and generics ,reflection and generics, **Collections:-**ArrayList, LinkedList, HashSet, TreeSet, Map, Stack

**Module IV: 10 hrs**

**Graphics programming**– Applet class, AWT event hierarchy, Containers:-Lightweight and heavyweight container

,Components – working with 2D shapes, Color class, Font class, and Image class, **Basics of event handling** – event handlers, different types of events and listener interfaces, Adapter classes, Introduction to Swing – Model-View Controller, Controller design pattern ,different components in swing, layout management,**JavaFX**

**TEXT BOOK:**

1. Java 2: The complete reference by Herbert Schildt, 9th Edition, McGraw Hill Education,2014.
2. Core Java for Beginners by Rashmi Kant Das, 3rd Edition,VikasPublication,2013

**REFERENCES:**

1. Programming With Java:A Primer By Balagurusamy, 3rd Edition, TMH,2007
2. Core Java: Fundamentals Volume –I by Cay S. Horstmann, Gary Cornel, 9th Edition, Prentice Hall, 2013.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

1. The Java Language Specification by [James Gosling,](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22James%2BGosling%22&source=gbs_metadata_r&cad=7) [Bill Joy,](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Bill%2BJoy%22&source=gbs_metadata_r&cad=7) [Guy L. Steele Jr.](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Guy%2BL.%2BSteele%2BJr.%22&source=gbs_metadata_r&cad=7), [Gilad Bracha,](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Gilad%2BBracha%22&source=gbs_metadata_r&cad=7) [Alex Buckley,](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Alex%2BBuckley%22&source=gbs_metadata_r&cad=7) Java SE 8 Edition Addison-Wesley Professional,2014.
2. Head First Java: A Brain-Friendly Guide By Kathy Sierra, Bert Bates, 2nd Edition, O’Reilly,2005

# DATA STRUCTURE USING C

|  |  |
| --- | --- |
| Prerequisites | C Programming, Basic Mathematics |
| Course Outcomes | * Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used byalgorithms
* Compare and contrast the benefits of dynamic and static datastructures implementations
* Design and implement an appropriate hashing function for anapplication
* Discuss the computational efficiency of the principal algorithms forsorting, searching, andhashing.
 |

**Module – I (12hrs)**

Introduction to data structures, Arrays and Row/Column major representation of Arrays, Sparse matrix, Stack: operation on stack, applications of stack. Queues: representation of queues, types of queues and application, Linked lists: Single linked lists, linked list representation of stacks and Queues, Operations on polynomials, double linked list, circular list.

**Module – II (12hrs)**

Trees: Binary tree, Binary search tree, AVL Tree,Threaded binary tree, General tree, Complete Binary Tree representation, B-tree, Binary Tree traversal methods, Manipulation of Expression through Binary tree, Operations on Binary Search tree and AVL tree

Graphs: Graph terminology, Representation of graphs, path matrix, BFS (breadth first search), DFS (depth first search), topological sorting

**Module –III (12hrs)**

Sorting and Searching techniques: Bubble sort, selection sort, Insertion sort, Quick sort, merge sort, Heap sort, Radix sort, Shell sort, Linear and binarysearch.

Hashing: Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, Double hashing, Rehashing, Memory allocation, garbage collection.

**Text Books:**

1. An introduction to data structures with applications by J. Tremblay and P. G. Sorenson, 2nd edition, McGraw HillEducation
2. Data Structures & Algorithms by GAV Pai, McGraw Hill,2008

**Reference Books:**

1. Data Structure using C by Tanenbaum, Pearson Education,2009
2. Data Structure- A Pseudo code approach with C by Gilberg and Forouzan, 2ndedition CengageLearning
3. Fundamentals of Data Structure in C by Horowitz, Sahani& Freed, 2nd edition, Universities Press,2008.
4. Data Structures with C by [Lipschutz](https://www.mheducation.co.in/catalogsearch/advanced/result/?authors=Seymour%20Lipschutz) (Schaum's Outline Series), McGraw Hill Education,2010
5. Introduction to Data Structures in C by Ashok N. Kamthane, Pearson,2009

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**FORMAL LANGUAGE AND AUTOMATA THEORY**

|  |  |
| --- | --- |
| Prerequisites | Computer Programming Language, Data structures and Algorithms. |
| Course Outcomes | * Understand Formal Languages and its applications.
* Understanding the Context free languages and grammars, and also NormalisingCFG.
* Understanding the minimization of deterministic and nondeterministic finiteautomata.
* Understand basic properties of Turing machines and computing with Turingmachines
* Understand the basic concepts of Complexity theory and Limits ofComputation.
 |

**Module –I (9 hours)**

**Fundamentals:** Strings, Alphabet, Languages, Operations on strings, Finite state machine, definitions, finite automaton model, acceptance of strings, deterministic finite automaton and non deterministic finite automaton, transition diagrams and transition table. Language recognizers: NFA with € transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without € transitions, NFA to DFA conversion, Minimisation of Finite Automata, equivalence between two FSM’s, Design of DFA, Finite Automata with output- Moore and Melay machines.

**Module II: (9 hours)**

**Regular Languages :** Regular sets, operators in regular expressions, identity rules, Building finite Automata from regular expressions, Arden’s theorem, Building Regular expression from Finite Automata, Pumping lemma for regular languages, Closure properties of regular sets, CYK Algorithm.

**Context Free Grammars:** Context free grammar, Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, derivation and Parse trees, and sentential forms, Right most and leftmost derivation of strings, Ambiguity, Elimination of Ambiguity, and Simplification of a CFG, Chomskey and Greibach Normal forms, Closure and Decision properties of CFL, Pumping lemma forCFL.

**Module III: (9 hours)**

**Push down Automata:** Push down automata, definition, and model, Components, Moves of a PDA, ID of a PDA, Design of a PDA, PDA to CFG and CFG to PDA conversion, Equivalence of CFL and PDA, Introduction to DCFL and DPDA.

**Turing Machine :** Turing Machine, definition, model, Components, Moves of TM,ID of TM, Design of a TM

,Computable functions, Recursively enumerable languages. Several of Turing Machine’s model, Church’s hypothesis, counter machine, types of Turing machines, Universal Turing Machine and Undecidable problems, Undecidability of post correspondence Problem. Linear bounded automata and context sensitive language, Chomsky’s Hierarchy of Languages.

**Module IV: (9 hours)**

**Primitive Recursive function:** Recursive functions, Cantor and Godel numbering, Ackermann’s function, Excursiveness of Ackermann and Turing computable functions. Church Turing Hypothesis, Recursive and Recursively enumerable sets, NP completeness: Definition of P and NP problems, NP complete and NP hard problems.

**TEXT BOOKS:**

1. Introduction to Automata Theory Languages and Computation by Hop croft and Ullman, 3rdEdition,Pearson Education,2009
2. Introduction to Theory of Computation by Michael Sipser, 3rdEdition, CENGAGELearning

**REFERENCES BOOKS:**

1. Introduction to Formal languages, Automata Theory and Computation by Kamala Krithivasan and Rama R, Pearson Education,2009.
2. Introduction to Computer Theory, Daniel I.A. Cohen, 2ndEdition, Wiley India,2008.
3. Theory of Computation by V.Kulkarni, Oxford University Press,2013.

**Abbreviations Used:L = Lectures, P = Practical or Laboratory, T = Tutorial**

## IA = Internal Assessment , PA = Practical Assessment, EA = End-Semester Assessment

1. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 3rd Edition, PHI,2007.

# JAVA LAB

|  |  |
| --- | --- |
| Prerequisites | Problem-solving approach Programming language, Data Structure |
| Course Outcomes | * Understand object, class, encapsulationconcept
* Use constructor, this keyword, method overloading,Arrays
* Use package, wrapper class, String class, StringBuffer class, StringTokenizerclass
* Understand the use ofabstraction.
* Understand the use of Packages and Interface injava.
* Develop and understand exception handling, multithreaded applications withsynchronization.
* Understand the use of CollectionFramework.
* Design GUI based applications and applets for webapplications.
 |

List of experiments to be done(Any 10)

1. Simple Java programs using control structures, class, object, access specifier, statickeyword.
2. Programs using constructor, this keyword, method overloading,Arrays
3. Programs using package, wrapper class, String class, StringBuffer class, StringTokenizerclass
4. Programs using Exception handling, Inheritance concept, finalkeyword
5. Programs using Abstract class, Interface, Object cloning, Inner class
6. Programs on reading and writing onfiles
7. Programs onMultithreading
8. Programs on ArrayList, LinkedList, Set, Map,Stack
9. Programs on 2D graphics using Applet andAWT
10. Programs on event handling and Layoutmanager
11. Programs onSwing
12. Programs onGenerics

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**DATA STRUCTURE LAB**

|  |  |
| --- | --- |
| Prerequisites | C Programming, Basics of Mathematics |
| Course Outcomes | * Understand elementary data structures such as stacks, queues,linked lists, trees andgraphs.
* Analyze the appropriate data structure for givenproblem.
* Apply different data structures to represent real worldproblems
* Implement different sorting and searchingalgorithms.
 |

**Experiment No.1**

1. Write a C program that implement Bubble Sort method to sort a given list of integers in ascendingorder.
2. Write a C program that implement merge Sort method to sort a given list of integers in ascendingorder.
3. Write a C program that implement Quick Sort method to sort a given list of integers in ascendingorder

**Experiment No.2**

1. WriteCprogramthatimplementtheLinearsearchoperationforaKeyvalueinagivenlistofintegers
2. Write C program that implement the Binary search operation for a Key value in a given list ofintegers

**Experiment No. 3**

1. Write a C program to create a stack using an array and perform (i) push operation (ii) popoperation
2. Write a C program that uses Stack operations to perform the following: i) Converting infix expression into postfix expression ii) Evaluating the postfixexpression

**Experiment No. 4**

1. Write a C program to create a queue and perform i) Rear ii) front iii)Traversal
2. Write a C program to create a circular queue and perform i) insertion ii) deletion iii) Traversal

**Experiment No. 5**

Write a C program to create a Deque and perform i) insertion ii) deletion iii) Traversal

**Experiment No. 6**

Write a C program that uses functions to perform the following operations on Single linked list: i) Creation ii) Insertion iii) Deletion iv) Traversal

**Experiment No. 7**

Write a C program that uses functions to perform the following operations on Double linked list: i) Creation ii) Insertion iii) Deletion

**Experiment No. 8**

Write a C program that uses functions to perform the following operations on Binary Tree:

i) Creation ii) Insertion iii) Deletion

**Experiment No.9**

Write a C program to implement the depth-first search algorithm.

**Experiment No.10**

Write a C program to implement the breadth-first search algorithm.

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**Engineering Economics (3-0-0)**

##### Prerequisites:

1. Mathematics.
2. BasicEconomics.

##### Module 1: (10 Hours)

Engineering Economics: Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand: Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Demand Estimation and Forecasting, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production: Production function, Laws of returns: Law of variable proportion, Law of returns to scale.

##### Module 2: (10 Hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking: Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank. Inflation: Meaning of inflation, types, causes, measures to control inflation.

National Income: Definition, Concepts of national income, Method of measuring national income.

##### Module 3: (10 Hours)

Time value of money: Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects: Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.

Depreciation: Depreciation of capital assert, causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

##### Text Books:

1. Riggs, Bedworth and Randhwa,” Engineering Economics”, McGraw Hill EducationIndia.
2. Deviga Vengedasalam,” Principles of Economics”, Oxford UniversityPress.
3. William G. Sullivan, Elin M. Wicks, C. Patric Koelling,” Engineering Economy”,Pearson.
4. R. Paneer Selvam,” Engineering Economics”,PHI.
5. S. P. Gupta,” Macro Economics”,TMH.
6. S. B. Gupta,” Monetary Economics”, Sultan Chand andCo.

# Mathematics-III (3-1-0)

##### Prerequisites:

1. Mathematics-I
2. Mathematics-II

##### Course Outcomes

On successful completion of this course, the students will be able to:

1. Have a fundamental knowledge of the concepts of probabilitytheory.
2. Do correlation and regression and fitting of different types ofcurves.
3. Applysamplingtheoryandtheoryofestimationinvariousengineeringproblemsanddovarious

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tests of hypothesis and significance.

1. Use calculators and tables to perform simple statistical analyses for small samples and use popular statistics packages, such as SAS, SPSS, S-Plus, R or MATLAB to perform simple and sophisticated analyses for largesamples.

##### Module 1: (10 Hours)

Probability: Introduction, Probability of an event, additive rule & multiplication rule, conditional probability, Bayes’ rule, random variable, discrete and continuous probability distribution, Joint probability distribution, Mathematical expectations, Variance and Co- variance of random variables, Mean and Co- variance of linear combination of random variables, Chebyshevtheorem.

##### Module 2: (10 Hours)

Discrete Probability Distribution: Binomial & Multinomial, Hyper- geo- metric, Geometric, Poisson distribution.

Continuous Probability Distribution: Uniform, Normal, Exponential Distribution, Weibull’s Distribution, Chi-square Distribution, Sampling Distribution: Sampling Distribution of S2, t Distribution, F Distribution.

##### Module 3: (10 Hours)

Estimation of parameter: methods of estimation, Estimating the mean of a single sample, Standard error, Prediction interval, Tolerance limits, Estimating the difference between means of two samples, estimating proportion and variance of single sample, Estimating the difference between two proportions and variances of two samples, maximum likelihood estimation.

##### Module 4: (10 Hours)

Testing of hypothesis: one and two tailed test, test on a single mean when variance is known & variance is unknown. Test on two means, test on single mean and two mean populations. One and two sample test for variance. χ2 test for goodness of fit and test for independence.

Introduction to linear regression: Simple regression models, method of least squares, Properties of least square estimators, Inferences concerning the regression coefficients, Coefficients of determination and its application.

Statistical quality control (Simple Idea only)

##### Text Books:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers & Keying Ye,” Probability & Statistics for Engineers & Scientists”, Eighth Edition, 2007, Pearson Education Inc., NewDelhi.
2. Jay L. Devore,” Probability and Statistics for Engineering and Sciences”, Seventh Edition, Thomson/CENGAGE Learning India Pvt.Ltd.

##### Reference Books:

1. William Mendenhall, Robert J. Beaver & Barbara M. Beaver,” Introduction to Probability and Statistics”, 13th Edition, 2009, CENGAGE Learning India Pvt. Ltd., NewDelhi.
2. T. Veerarajan,” Probability, Statistics and Random Processes”, Tata McGrawHill
3. Ronald Deep,” Probability and Statistics”, AcademicPress

# DIGITAL ELECTRONICS

**Prerequisites:** Basic concepts of number system, Basic knowledge of electronic circuits

## Course Outcomes:

At the end of the course, a student will be able to:

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* 1. Convert different type of codes and number systems which areused in digital communication and Computer systems and Employ the codes and number systems converting circuits and Compare different types of logic families.
	2. Analyze different types of digital electronic circuit using various mapping andlogical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematicalmethods.
	3. Design different types of digital electronic circuits (with and withoutmemory element) for particular operation, within the realm of economic,performance, efficiency, user friendly and environmentalconstraints.
	4. Design & analyze synchronous sequential logiccircuits
	5. Use HDL & appropriate EDA tools for digital logic design andsimulation

**Module I (15 Hrs)**

**Introduction:**Number system and its representation in binary, octal, decimal and hexadecimal systems and its conversion, 1's and 2's complement representation of numbers, binary multiplication anddivision.

**Logic Gates:** Functions, representations and truth tables of logic gates. Universal logic gates, Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and DeMorgan’s Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 4 variables, prime implicants Quine– McCluskey techniques, Binary codes and different types of Code Conversions. Error correcting and detecting code.

**Combinational Circuits**: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Serial and Parallel Adders, BCD Adder, Comparators, Multiplexers, Demultiplexers, different types of MUX designing circuits, Encoder, Decoder.

## Module II (12 Hrs)

**Sequential Logic Design:** Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Algorithmic State Machines charts.

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**Module III (8 Hrs)**

### **Algorithmic State Machines:** Salient features of the ASM chart-Simple examples- System design using data path and control subsystems- control implementations example of Weighing machine.

#### Textbook(s):

1. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Ed., Pearson Education,2008.
2. C.H. Roth, "Fundamentals of Logic Design", 5th Ed. Cengage Learning,2004.
3. John F. Wakerly, “Digital Design: Principles & Practices”, 3rd Ed,PHI.
4. A Anand Kumar, “Fundamentals of Digital Circuits”, 2nd Ed.,PHI.

**Reference Book(s):**

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition,2009.
2. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition,2002.
3. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition,2006.
4. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill,1989

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**FOURTH SEMESTER**

# COMPUTER ORGANIZATION AND ARCHITECTURE

|  |  |
| --- | --- |
| Prerequisites | Computer fundamentals, Number Systems, Digital Electronics |
| Course Outcomes | * Understand the theory and architecture of central processingunit.
* Analyze design issues in terms of speed, technology, cost andperformance.
* Demonstrate how to perform the different arithmetic operations on integers and floating-point numbers using two’s complement and IEEE floating point representation.
* Exemplify in a better way the memory system and systemorganization.
 |

**Module – I (12 Hrs)**

Basic Structure of Computers : Computer Architecture vs Computer Organization, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance

Machine Instructions and Programs : Memory Locations and Addresses, Big-Endian and Little-Endian Assignments, Memory Operations, Instruction Set: Instruction Format, Instruction Types(RISC and CISC architecture), Instruction Execution and Straight-Line Sequencing, Branching, Addressing Modes, Basic Input/Output Operations, Subroutines, AdditionalInstructions.

**Module – II (12 Hrs)**

Arithmetic :Fixed point and Floating point representation, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-Operand Multiplication- Booth’s algorithm , Fast Multiplication, Integer Division

Basic Processing Unit : Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Microprogrammed Control.

**Module – III (12 Hrs)**

Memory System : Basic Concepts, Memory Hierarchy, Cache Memory, Cache Memory Mapping Functions, Replacement Algorithms

Multiple-Bus Organization: IO bus - SCSI bus, ISA bus, Bus Control – Synchronous bus, Asynchronous bus, Bus Arbitration

**Text Books:**

1. Computer Architecture and Organization : John P.Hayes, McGraw Hill, 3rdEdition,2012
2. Computer Architecture and Organization: William Stallings, Pearson Education 10thEdition,2017
3. Computer Organization: Carl Hamacher, ZvonkoVranesic, SafwatZaky, McGraw Hill, 5thEdition,2002

**Reference Books:**

1. Computer System Architecture: Morris M. Mano, PHI, 3rdedition,2007
2. Computer Architecture and Organization: Design Principles and Applications By Govindarajalu, 8th Reprint, TMH

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**DESIGN AND ANALYSIS OF ALGORITHM**

|  |  |
| --- | --- |
| Prerequisites | Mathematics, Basic program design concepts (e.g., pseudocode), Data structure |
| Course Outcomes | * Analyze the performance ofalgorithms.
* Choose appropriate algorithm design techniques for solvingproblems.
* Understand how the choice of data structures and the algorithm design methods impact the performance ofprograms.
* Clear up troubles the usage of set of rules design methods including the divide and conquer, dynamic programming, backtracking and greedyapproach
* Find approximate polynomial solution for NP categoryproblem
 |

**Module- I (9 Hours)**

Introduction to design and analysis of algorithms, Asymptotic analysis of algorithms, Growth of Functions, Recurrences, solution of recurrences by substitution, Recursion Tree and Master methods

Design & Analysis of Divide and conquer algorithms:- Merge sort, Quick sort , Strassen’s matrix multiplication

**Module – II (9 Hours)**

Greedy Algorithms - Elements of Greedy strategy, Activity- selection Problem, Fractional knapsack problem, Huffman codes

Dynamic programming algorithms: - Elements of dynamic programming, The principle of optimality, Matrix-chain multiplication, Longest common subsequence, Assembly-line scheduling, String matching :-Naive String matching algorithm, Rabin-Karp algorithm

**Module – III(10 Hours)**

Data structure for disjoint sets:- Disjoint set operations, Linked list representation, Disjoint set forests

Graph Algorithms: -Breadth First Search and Depth-First Search, Minimum Spanning Trees, Kruskal and Prim's algorithms, Single Source Shortest Path (Bellman-ford and Dijkstra's algorithms), All Pairs Shortest Paths (Floyd – Warshall Algorithm).

NP Completeness:-Polynomial time solving, Polynomial time verification, NP - Completeness and reducibility, NP Complete problems (without proof):-Circuit Satisfiability problem, Hamiltonian cycle problem, Travelling Salesman Problem, Vertex Cover Problem

**Module – IV (08 Hours)**

Back tracking algorithm:-Knapsack problem, N-queen problem, Graph Coloring Branch and Bound algorithm: - 0/1 knapsack algorithm, 15-puzzle

Polynomials and Fast Fourier Transform (FFT)

**Text Book:**

* 1. Introduction to algorithms by T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein, 3rdEdition, MIT Press, 2009.
	2. Computer Algorithms by Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, 2nd Edition, Silicon Press, 2008

**Reference Book:**

1. Fundamentals of algorithms by Gilles Brassard, Paul Brately:, Pearson India ,2015
2. Algorithm Design by Goodrich, Tamassia, WileyIndia
3. The Algorithm Design Manual, Steven S. Skiena, Second Edition,Springer

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**DATABASE MANAGEMENT SYSTEM**

|  |  |
| --- | --- |
| Prerequisites | Elementary set theory, concepts of relations and functions,, Data Structure,Algorithm, Programming Languages |
| Course Outcomes | * Explain the underlying concepts of Data Basetechnology.
* Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra andSQL.
* **Understand** the concepts of transaction processing and represent the issues &technology relate to concurrency and recovery in multi userEnvironment.
* **F**amiliar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, andhashing.
 |

##### Module I: (9 Hours)

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

##### Module II (9 Hours)

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Network and Object Oriented Data models, Storage Strategies: Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, and File Organizations &Indexes.

##### Module III: (9 Hours)

Relational Algebra, Tuple & Domain Relational Calculus, Relational Query Languages: SQL and QBE. Database Design: Database development life cycle (DDLC), Automated design tools, Functional dependency and Decomposition, Join strategies, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF, and BCNF, Multi-valued Dependencies, 4NF&5NF. Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization, Query cost estimation.

##### Module IV: (9 Hours)

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure, Types of Database Recovery, Recovery techniques, Fundamental concepts on Object-Oriented Database, Data warehousing & Data Mining and Big data and No SQL

##### Text Book:

1. Database System Concepts by Sudarshan&Korth, 6th edition, McGraw-Hill Education,2011.
2. Fundamentals of Database System by Elmasari&Navathe, Pearson Education,2008.

##### References Books:

1. Database Management Systems by R. Ramakrishnan, 3rd edition, McGraw-Hill Education,2003.
2. Database Management Systems By R.Panneerselvam , 3rd Edition, PHI,2018
3. Introduction to Database Management Systems By AtulKahate,PEARSON

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**COMPUTER ORGANIZATION LAB**

|  |  |
| --- | --- |
| Prerequisites | Basic Knowledge of Computer |
| Course Outcomes | * Understand how to implement memory chips, boards, modules and caches.
* Understand the basics of hardwired and micro-programmed controlof the CPU.
* Learn about various I/O devices and the I/Ointerface.
 |

### Experiment 1 - To recognize various components of PC Experiment 2 - Dismantling and assembling a PC. Experiment 3 - Study of Motherboard

Experiment 4 - Study of SMPS Experiment 5 - Study of Printer Experiment 6 - Study of Microprocessor

Experiment 7 - Design and verify Half-Adder & Full-Adder using VHDL code. Experiment 8 - Design and verify multiplexer & de-multiplexer using VHDL code. Experiment 9 - Simulation of ALU using VHDL code.

Experiment 10 - Simulation of CPU using VHDL code.

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**ALGORITHM LAB**

|  |  |
| --- | --- |
| Prerequisites | Mathematics, Basic program design concepts (e.g., pseudocode), Datastructure |
| Course Outcomes | * Analyze the performance of algorithms.
* Choose appropriate algorithm design techniques for solvingproblems.
* Use design methods including the divide and conquer in problemsolving
* Use dynamic programming approach in problemsolving
* Use greedy approach in problemsolving
 |

### Implementation and Analysis of (Any 10)

* 1. Linear Search and Binary SearchAlgorithm
	2. Quick Sort and Merge SortAlgorithm
	3. Heap SortAlgorithm
	4. Matrix Chain MultiplicationAlgorithm
	5. Longest Common SubsequenceAlgorithm
	6. Fractional KnapsackAlgorithm
	7. Huffman CodeAlgorithm
	8. Breadth First Search and Depth First SearchAlgorithm
	9. Kruskal Algorithm and Prim’sAlgorithm
	10. Bellman Ford Algorithm/Floyd-WarshallAlgorithm
	11. Dijkstra’sAlgorithm
	12. Rabin-Karp pattern matchingalgorithm

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**DATABASE LAB**

|  |  |
| --- | --- |
| Prerequisites | Elementary set theory, concepts of relations and functions,, Data Structure,Algorithm, Programming Languages |
| Course Outcomes | * Design and implement a database schema for given problemdomain.
* Implement a query database using DDL/DMLcommand.
* Programming on triggers, packagesfunctions.
* Design the programs on JDBC &ODBC using VB/VC++.
 |

### Use of SQL syntax: insertion, deletion, join, updation usingSQL.

1. Programs on join statements and SQL queries including whereclause.
2. Programs on procedures andfunctions.
3. Programs on databasetriggers
4. Programs onpackages.
5. Programs on data recovery using check pointtechnique.
6. Concurrency control problem using lockoperations.
7. Programs on ODBC using either VB orVC++.
8. Programs on JDBC. (1class)
9. Programs on embedded SQL using C / C++ as hostlanguage

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**Organizational Behaviour (3-0-0)**

##### Prerequisites:

1. English.

##### Module 1: (10 Hours)

The study of Organizational Behaviour: Definition, Meaning, Why study OB; Learning - Principles of learning and learning theories; Personality- Meaning, Determinants, Types, Personality and OB; Perception- Perceptual Process, perceptual errors, Importance of perception in organizations; Motivation- Nature and Importance, Theories of motivation (Herzberg, Maslow, McGregor).

##### Module 2: (10 Hours)

Group level: Groups in Organizations -Nature, Types, Reasons behind forming groups, Determinants, factors contributing to Group Cohesiveness, Group Decision Making- Process, advantages and disadvantages; Team- Effective Team Building; Types of Leadership- Effective Leadership, Styles of leadership, Leadership Theories-Trait Theory and Contingency Theory, Leadership and Followership; Conflict- Healthy Vs Unhealthy conflict, Conflict Resolution Techniques.

##### Module 3: (10 Hours)

Structural level: Organizational Culture: culture and organizational effective- ness; Organizational Change: Types of change, Reasons to change, Resistance to change and to manage resistance. Introduction to organizational development.

##### Text Books:

1. Stephens P. Robbins, Organizational Behaviour, PHI.
2. K. Aswatthappa, Organizational Behaviour,HPH.

##### Reference Books:

1. Kavita Singh, Organizational Behaviour, Pearson.
2. D. K. Bhattacharya, Organizational Behaviour, OUP.
3. Pradeep Khandelwal, Organizational Behaviour,TMH.
4. Keith Davis, Organizational Behaviour, McGraw Hill.
5. Nelson Quick, ORGB, CengageLearning.

## Course Objectives:

**Environmental Science 4th Sem**

### Understanding the importance of ecological balance for sustainabledevelopment.

* + Understanding the impacts of developmental activities and mitigationmeasures
	+ Understanding the environmental policies andregulations

**Course Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn help in

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### sustainable development

|  |
| --- |
| **UNIT – I**An Introduction to – Multidisciplinary nature of Environmental Studies. The Earth and Biosphere (The Earth Science)**Ecology:** Concept and Principle of Ecology, Ecological Succession, Population Ecology, Community Ecology, Relationship, Human Ecology, Origin and Evolution of Life, Plant and Speciation.**Ecosystems: Definition, Properties, Function and Structure of Ecosystem.** Ecological Balance: Cause, Food chains, food webs, Flow of Energy, Ecological Pyramids, Types of Ecosystem: Land, Aquatic and Artificial ecosystem. Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, Degradation of Ecosystem.Bio-diversity and Conservation**Natural Resources:** Classification of Resources, Conservation of Resources, Environmental Degradation, Equitable use of Resources for Sustainable Life styles, Role of Individual in Conservation of natural Resources.**Water Resources: Sources,** Status of World and Indian’s Water Resources, Over Utilization of Water, Conservation, Flood and Control measure,Others.Mineral Resources. Land Resources, Energy Resources, Food Resources, etc.: Classification, Conservation, Environmental Impacts. |
| **UNIT – II****Environmental Pollution:** Types of Pollution and Control Measures, Role of Individual in Pollution Prevention.**Waste Management:** MSW, WM Techniques, Agricultural Solid Waste Management and Legislation on Solid Waste management.**Disaster Management:** Objectives, Type of Disaster. Elements, Organisational Set- up, NDMA, Preparedness, Mitigation, Prevention, Response.**Environment and Development:** Social Issues, environmental Ethics, Sustainable Development, Sustainable Energy and materials, Environmental Challenges,: Climate Change, Green House Effect, Global Warming, Ozone Layer Depletion, Protection of Ozone Layer, Acid Rain, EL Nino, Waste land and itsReclamationHuman Population and the Environment: Pupation Growth and Explosion, Pupation Growth and Environment, Family Welfare Programme, Women and Child welfare, HIV/ AIDS, Environment and Health, Human Rights, Value of Education.**Resettlement and Rehabilitation:** Introduction, Social Impact Assessment, Methodology of SIA, |

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|  |
| --- |
| Land Acquisition and Impact, Stake holder participation and consultation, Socio-economic Issue,, Mitigation Measure.Rehabilitation Action Plan, Legal Frame work, Training and capacity Building, Grievance and Redressal Mechanism. |
| **UNIT - III****Environmental Protection**: Introduction, International efforts, Government Effort, environmental Organisations, Public Awareness, Environmental Education and Training, Green Building, Clean Development Mechanism, carbon Credits.Environmental Legislation: Environmental Legal Framework, environmental Protection Act, 1986, the Air Act 1981, Water Act 1974, Wild Life Act, 1972, Forest Conservation Act, 1980.**Environmental Management:** Environmental Impact Assessment, TOR for EIA, EIA Methodology (Brief), Baseline Data, Environmental Clearance, MoEF Notification Dated September 2006, Stake holder in EIA ProcessEnvironment Management and EMP: Introduction, Issues covered, Environmental Management System- ISO-14000, Institution and Implementation Arrangement, Mitigation measures, Environmental Monitoring, Environmental Auditing. |

**TEXT BOOKS:**

### EnvironmentalStudies(Concept,Impacts,Mitigationandmanagement)byM.P.PooniaandS.

C. Sharama, Khana Book Publishing Co. (P) T Ltd. 2019 Edition

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University GrantsCommission.
2. Environmental Studies by R. Rajagopalan, Oxford UniversityPress.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. NewDelhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt.Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIAedition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.

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**FIFTH SEMESTER**

**OPERATING SYSTEM**

|  |  |
| --- | --- |
| Prerequisites | Basics of Computer, Programming Languages, Computer Organisation, DataStructure and Algorithms |
| Course Outcomes | * Understand role of Operating System in terms of process, memory, fileand I/O management.
* Apply and analyse the concept of a process, thread, mutual exclusionand deadlock.
* Evaluate performance of process scheduling algorithms andIPC.
* Apply and analyse the concepts of memory management techniques.Evaluate the performance of memory allocation and replacementtechniques.
* Apply and analyze different techniques of file and I/Omanagement.
 |

**MODULE-I 12 Hours**

**INTRODUCTION TO OPERATING SYSTEM:** Basics of Computer System Architecture and Organization, Simple Batch Systems, Multiprogramming and Time Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems, Operating System Services, Operating System Operations, System calls, Operating System Structures

**PROCESS MANAGEMENT:** Process Concept, Process Scheduling, Operation on Processes, Interprocess communication, Threads, Multithreading Models, Thread Libraries, Threading Issues, Process Scheduling Basic concepts, scheduling criteria, scheduling algorithms, Thread Scheduling.

**MODULE-II 12 Hours**

**PROCESS SYNCHRONIZATION:** The Critical section problem, Peterson’s solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors.

**DEADLOCKS:** System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock.

MEMORY MANAGEMENT: Memory Management strategies, Logical versus Physical Address space, swapping, contiguous Allocation, Paging, Segmentation.

Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms, Allocation of frames, Thrashing, Demand Segmentation.

**MODULE-III 11 Hours**

STORAGE MANAGEMENT: File System Concept, Access Methods, File System Structure, File System Structure, File System Implementation, Directory implementation, Efficiency and Performance, Recovery, Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, I/O System Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operation.

**TEXT BOOK:**

1. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009.
2. Operating Systems: Internals And Design Principles- William Stallings, 6th Edition, Pearson,2009

**REFERENCE BOOK:**

1. Principles of Operating Systems-[Naresh Chauhan,](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor%3A%22Naresh%2BChauhan%22&source=gbs_metadata_r&cad=3) Oxford University Press,2014
2. Modern Operating Systems – Andrew S. Tanenbaum, 3rd Edition,PHI
3. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMHEdition
4. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition,Pearson

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**COMPUTER NETWORKS**

|  |  |
| --- | --- |
| Prerequisites | Digital Electronics, Computer Organization |
| Course Outcomes | * Describe the functions of each layer in OSI and TCP/IPmodel.
* Explain the functions of Application layer and Presentation layer paradigmsand Protocols.
* Describe the Session layer design issues and Transport layer services. Classify the routing protocols and analyze how to assign the IP addresses for the givennetwork.
* Describe the functions of data link layer and explain theprotocols.
* Explain the types of transmission media with real timeapplications
 |

**Module -I (12Hrs)**

Overview of Data Communication Networks, Protocols and standards, OSI Reference model,TCP/IP Protocol. Physical Layer: Analog Signals, Digital Signals, Data Rate Limits, Transmission Impairment, Data rate limit, Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion, Transmission modes, Analog Transmission: Digital-to-Analog conversion, Analog-to-Analog conversion, Multiplexing: Frequency Division Multiplexing (FDM), Wave Division Multiplexing(WDM), Time Division Multiplexing (TDM), Transmission Media: Guided Media (Twisted-Pair Cable, Coaxial Cable and Fiber-Optic Cable) and unguided media (wireless), Switching: Circuit Switched Network, Datagram Network, Virtual-Circuit Network , Telephone Network, Dial-up Modems and Digital Subscriber Lines.

**Module-II (9Hrs)**

Error Detection and correction: Types of Errors, Error Detection mechanism (Linear codes, CRC, Checksum), Error Correction mechanism: Hamming Encoding. Data Link Control and Protocols: Flow and Error Control, Stop-and- Wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC and Point-to-Point Protocol, Multiple Access: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA).Wired LANs (Ethernet): Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

**Module-III (9Hrs)**

Wireless LANs: IEEE 802.11 and Bluetooth. Connecting Devices: Passive Hub, Repeater, Active Hub, Bridge, Two layers Switch, Router, Three layers Switch, Gateway. Virtual Circuit Networks: Frame Relay, Architecture & layers, ATM: Design goals, Architecture &layers. Network Layer: IPV4 addresses, IPV6 addresses, Internet Protocol: Internetworking, IPV4 datagram, IPV6 packet format and advantages. Network Layer Protocols: ARP, RARP, IGMP and ICMP. Routing: Unicast Routing Protocols and Multicast Routing Protocols. Transport Layer: Process to Process Delivery, User Datagram Protocol (UDP) and Transmission Control Protocol(TCP).

**Module-IV (06Hrs)**

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer (FTP), Security services: Message confidentiality, integrity, authentication, non-repudiation, entity authentication, digital signature, key management

**TextBooks:**

1. Data Communications and Networking, Behrouz A. Forouzan,(5th Edition) TataMcGraw-Hill.
2. Computer Networks, A. S. Tannenbum, D. Wetherall,(5th Edition) Prentice Hall, Imprint ofPearson.

**Reference Book:**

1. Network for Computer Scientists & Engineers, Zheng, Oxford UniversityPress.
2. Computer Networks A system Approach, Larry L, Peterson and Bruce S. Davie,Elsevier.
3. Computer Networks, Natalia Olifer, Victor Olifer, WilleyIndia.
4. Data and Computer Communications, William Stallings, PrenticeHall,Pearson.

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**COMPILER DESIGN**

|  |  |
| --- | --- |
| Prerequisites | Theory of Computation, Programming Language, Data structures and Algorithms. |
| Course Outcomes | Understand basics of Compiler Design. Explain different translationLanguage.Understand DFA's, context free grammars, parse trees and abstract syntaxtrees. Understand various parsingtechniquesUnderstand the importance of Code Optimization, Code generation. |

##### Module-1: 12 Hrs

Overview of the Translation Process: A Simple Compiler, Difference between interpreter, assembler and compiler. Overview and use of linker and loader, types of Compiler, Analysis of the Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers, Front-end and Back-end of compiler, pass structure. Lexical Analyzer: Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization ofDFA

##### Module-2: 12 Hrs

Parsing Theory: Top Down and Bottom up Parsing Algorithms, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators, Automatic Generation of Parsers. Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, Syntax Directed Definitions and translation schemes. Error Recovery: Error Detection & Recovery, Ad-Hoc and Systematic Methods

Intermediate Code Generation: Different Intermediate Forms, Syntax Directed Translation Mechanisms and Attributed Mechanisms and Attributed Definition.

##### Module-3: 12 Hrs

Code Generation: Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use Information, A Simple Code Generator, Register Allocation and Assignment, The DAG Representation of Basic Blocks, Peephole Optimization, Generating Code from DAGs, Dynamic Programming Code-Generation Algorithm, Code Generator Generators. Code Optimization: Global Data Flow Analysis, A Few Selected Optimizations like Command Sub Expression Removal, Loop Invariant Code Motion, Strength Reduction etc.

##### Text Books:

1. Compilers: Principles, Techniques and Tools By Aho, Lam, Sethi, and Ullman, Second Edition, Pearson, 2014
2. Compilers: Principles, Techniques and Tools By Aho, Sethi, and Ullman, Addison-Wesley,1986

##### Reference Books:

1. Compiler Design in C By Allen I. Holub,Prentice-Hall/Pearson.
2. Advanced Compiler Design and Implementation By Muchnick, Morgan and Kaufmann,1998

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**ARTIFICIAL INTELLIGENCE**

|  |  |
| --- | --- |
| Prerequisites | Basic Mathematics, Discrete Mathematics, Programming Languages,Algorithms |
| Course Outcomes | * Develop a basic understanding of AI building blocks presented in intelligent agents.
* Choose an appropriate problem solving method and knowledge representation technique.
* Design models for reasoning with uncertainty as well as the use ofunreliable information.
* Design and develop the AI applications in real worldscenario.
 |

##### Module 1 : (12 Hrs)

Introduction to AI, AI Technique, Level of the Model, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs. Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Solution space search , Beam search Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis, Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation, Using Predicate Logic: First Order Logic (FOL),Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction. Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, ControlKnowledge.

##### Module 2: (12 Hrs)

Symbolic Reasoning Under Uncertainty: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, Breadth-first Search. Weak and Strong Slot-and-Filler Structures: Semantic Nets, Frames, Conceptual Dependency Scripts, CYC. Game Playing: The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening. Planning: The Blocks World, Components of a Planning System, Goal Stack Planning, Sussman's Anomaly, Nonlinear Planning Using Constraint Posting, Hierarchical Planning Other Planning Techniques. Understanding: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.

##### Module 3 : (12 Hrs)

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking. Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

##### Text Book:

* 1. Elaine Rich, Kevin Knight, &Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rded.,2009

##### Reference Books:

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson,PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1sted.2011
3. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 2ndedition.

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**E COMMERCE AND ERP**

|  |  |
| --- | --- |
| Prerequisites | Computer Fundamentals |
| Course Outcomes | * Learn about electronic commerce development, deployment andutilization
* Understand EDI operation and various E-businessstrategies.
 |

##### Module –I (12 Hrs)

Introduction to E-commerce : Traditional Commerce and E-Commerce, Categories of E-Commerce, Framework of E-Commerce, Elements of E-Commerce: Network Infrastructure, Information Distribution Technology, Network Multimedia Content Publishing Technology, Security and Encryption, Payment Services, Business Service Infrastructure, Public Policy and Legal Infrastructure

Technology Infrastructure : Internet Protocols

Web Server Software : Web Server Basics, Software for Web Servers, Basic Functions of E-Commerce Software

##### Module–II (12 Hrs)

Security Threats to E-Commerce, Implementing E-Commerce Security

Selling on the Web: Revenue Models for Selling on the Web, Revenue Strategy Issues, Website Usability Marketing on the Web: Web Marketing Strategies, Customer Relationship Intensity and Life-Cycle Segmentation, Advertising on the Web

##### Module–III (12 Hrs)

Business-to-Business Strategies : Electronic Data Interchange (EDI), Electronic Marketplaces Web Auctions, Mobile Commerce, Virtual Communities

Payment Systems for E-commerce : Online payments Basics, Payment Cards, Electronic Cash, Electronic Wallets, Stored-Value Cards

##### Textbooks

1. Ecommerce, Gary P. Schneider, 4th Edition, CengageLearning
2. Electronic Commerce: Framework Technologies & Applications, Bharat Bhasker,TMH

##### Reference Books

1. Electronic Commerce: A Manager’s Guide, Kalakota & Whinston,Pearson
2. E-commerce: Concepts, models & strategies, C.V.S Murthy, HimalayaPublishing.

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**ADVANCED JAVA**

|  |  |
| --- | --- |
| Prerequisites | Programming languages C, C++, JAVA |
| Course Outcomes | * Understanding on Client-Server Architecture and TCP/IPprogramming
* Developing Web Applications using dynamic web pages and server- side programming through Servlets andJSPs
* Accessing Database from a Java Application usingJDBC
* Developing distributed business applications usingRMI
 |

##### UNIT I (12 hrs)

Enterprise Application Architecture, Enterprise Java Technologies, Web Applications, Servlet Overview, Servlet API, Writing HelloWorld Program using Servlet, Servlet Life Cycle, Configuring Servlet in web.xml, Retrieving information from Request object, HTML form processing using Servlet, Servlet Initialization, Session tracking, Cookies, Database Access using Servlet, Error Handling, Servlet Collaboration, Forward verses Redirect.

Overview of JSP, JSP Advantages, JSP Application Models: JSPModel1 and Model 2 architectures, Life Cycle of a JSP page, JSP Elements, JSP Comments, Scripting in JSP, Directives, Implicit Objects, Action Tags, JSP and Java Beans, Introduction to JSTL, Introduction to JSP Expression Language.

##### UNIT II (10 hrs)

Introduction to JSF, Features, Benefits of JSF, JSF Architecture, JSF Elements, Request Processing Life Cycles, JSF HTML tags, JSF Core tags, Standard UI components, Managed Beans, Event handling, Page Navigation, convertors, validators, Expression Language, Using AJAX with JSF, sending AJAX Request;

##### UNIT III (14 hrs)

Enterprise JavaBeans Technology: EJB Component Architecture, Role of EJB& its life cycle, Types of Beans, Session Beans, Stateless and Stateful beans, Message Driven Bean, Life Cycle, Managing Transactions in EJB;

Understanding Java Persistence: Object Relational Mapping, Java Persistence API, Benefits, components of JPA, Entity, Entity manager, Persistence unit, Life cycle of Entity, Entity Relationships, querying entities, Java Persistence Query Language, performing CRUD operations using JPA; Introducing Hibernate.

Overview of SOA, Web Services, Types of Web Service, Building Web services with JAX-WS;

##### Text Books:

1. Java Server Programming (Java EE 7) Black Book, by DT Editorial Services, Dreamtech Press, 2015.

##### References:

1. Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Kim Haase, William Markito, “The Java EE 7 Tutorial”, 5th Edition, Addison-Wesley Professional, Pearson India,2014.
2. Advanced Java Technology by MT Savaliya, Dreamtech Press,2015.
3. David Geary, Cay S. Horstmann, “Core Java Server Faces”, Third Edition, 2010, Pearson Education, Inc. NewDelhi.

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**ADVANCED COMPUTER ARCHITECTURE**

|  |  |
| --- | --- |
| Prerequisites | Programming and Data structures, Basic knowledge of Computer organization. |
| Course Outcomes | * Understand the Concept of Parallel Processing and itsapplications
* Implement the Hardware for ArithmeticOperations
* Analyze the performance of different scalarComputers
* Develop the Pipelining Concept for a given set ofInstructions
* Distinguish the performance of pipelining and non pipelining environment in a processor
 |

**Module 1: (12Hrs)**

### **Processor Architecture :**Evolution of Microprocessors, Instruction set processor design, Principles of processor performance, Instruction-level Parallelism, RISC and CISC architectures, Pipelining fundamentals, Arithmetic and instruction pipelining, Pipeline hazards, Minimizing pipeline stalls, Branch Prediction, superscalar and superpipelined architectures.

**Module 2:(12Hrs)**

**Memory and I/O Architecture :**Hierarchical memory technology; Multi-level caches, Data and Instruction caches, Cache optimizations, Memory Management hardware, I/O systems: Peripheral and Processor-Memory buses, Split transaction buses ,USB.

**Module 3:(12Hrs)**

Multiprocessor Architecture :Basic multiprocessor architecture, Cache coherence, multithreaded processors, VLIW processor architectures. Array and vector processors. Case studies :MIPS architecture, Intel Series of processors, Pentium’s Internally RISC and externally CISC, Hyper threading, SPARC and ARM processors.

**Text Book**

1. David A. Patterson and John L. Hennessy, Computer Organization and Design, Elsevier, FourthEdition
2. John Paul Shen and MikkoLipasti, Modern Processor Design, Tata McGrawHill.

**Reference Books**

1. DezsoSima, Terence Fountain, and Peter Kacsuk, Advanced Computer Architecture:A Design Space Approach, by AddisonWesley
2. John L. Hennessy & David A. Patterson, Computer Architecture, A Quantitative Approach 4th Edition, MorganKaufmann.
3. Hwang &Jotwani, Advance Computer Architecture,TMH

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**OPERATING SYSTEM LAB**

|  |  |
| --- | --- |
| Prerequisites | Working knowledge of computers, Programming languages |
| Course Outcomes | * Familiarize students with the architecture of Unix OS andUnix Commands.
* Develop and debug, C programs created on UNIXplatforms.
* Implement CPU scheduling algorithms and Bankers algorithm used for deadlock avoidance andprevention.
* Implement page replacement and memory managementalgorithms.
 |

### Basic UNIXCommands.

* 1. Linux Administrative commands.
	2. UNIX ShellProgramming.
	3. Programs on process creation and synchronization, inter process communication including shared memory, pipes andmessages.
	4. Programs on process synchronization, (DinningPhilosopher problem / Cigarette Smoker problem / Sleeping barberproblem)
	5. Programs on UNIX Systemcalls.
	6. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)
	7. Simulation of Banker’s Algorithm for Deadlock Avoidance,Prevention
	8. Program for FIFO, LRU, and OPTIMAL page replacementalgorithm.
	9. Programs onMultithreading

**COMPUTER NETWORKS LAB**

|  |  |
| --- | --- |
| Prerequisites | Digital Electronics, Working knowledge of computers |
| Course Outcomes | * Analyze and simulate various networking protocols andmechanisms
* Use tools to simulate real life networkdevices
 |

1. Study of various network devices and networktopologies
2. Implementation of cross-wired and straight-through cable using crimpingtool
3. IP address configuration, network setup, troubleshooting and various network management commands
4. Building Class A, B and C networks using packet tracersoftware
5. Implementation of sub-netting concept using packet tracingsoftware
6. Simulation of Hub Vs Switch networks by means of throughput and collision analysis using networksimulator
7. Simulation of CSMA/CA Vs CSMA/CD using networksimulator
8. Implementation of LSR and DVR routing protocols using networksimulator
9. Installation of “ns2” in Linuxenvironment
10. Basic wired and wireless topology in ns2environment
11. Write a programme to retrieve the MAC address of a system using Address ResolutionProtocol
12. Write a programme to find the class of a given IP address, subnet mask and address range of that subnet

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**COMPILER DESIGN LAB**

|  |  |
| --- | --- |
| Prerequisites | Theory of Computation, Programming Language, Data structures andAlgorithms. |
| Course Outcomes | * Understand the working of lex and yac ccompiler for debugging ofprogs.
* Understand and define the role of lexical analyser,use of regular expression and transitiondiagram.
* Understand and use context free grammar and parse treeconstruction.
* Learn and use new tools and technologies used for designing acompiler.
* Develop progs for solving parseproblems.
* Learn how to write progs that executefaster.
 |

##### (Any 10 Experiments)

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C/LEXlanguage.
2. Write a program to identify whether a given line is a comment ornot.
3. Write a program to recognize strings under 'a', 'a\*b+', 'abb'.
4. Write a program to test whether a given identifier is valid ornot.
5. Write a program to simulate lexical analyzer for validatingoperators.
6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generatingTools.
7. Write a program for implementing the functionalities of predictive parser for the mini Language.
8. Write a program for constructing of LL (1)parsing
9. Write a program for constructing recursive descentparsing.
10. Write a program to implement LALRparsing.
11. Write a program to implement operator precedenceparsing
12. Write a program to implement Program semantic rules to calculate the expression thattakes an expression having digits, + and \* and computes thevalue.
13. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree forthe minilanguage.
14. Write a program to generate the code for the following three address codestatements. A =B + C and W = X – Y
15. Write a program to generate code for the following three address codestatements W =(A+B)\*C

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**SIXTH SEMESTER**

**INTERNET AND WEB TECHNOLOGY**

|  |  |
| --- | --- |
| Prerequisites | Computer Networking |
| Course Outcomes | * Analyze a web page and identify its elements andattributes
* Create web pages using HTML and Cascading StyleSheets
* Build dynamic web pages using JavaScript (Client sideprogramming).
* Create XML documents andSchemas.
 |

**Module –I (12Hours)**

Introduction, Evolution of Internet, WEB2.0, Understanding the WWW and the Internet, Emergence of Web, Protocols: TCP/IP, UDP, HTTP, Internet Addressing Scheme – Ipv4 & IPv6, Domain Name Server, Building Web Sites: Planning for designing Web pages, Model and structure for a Website, Developing Websites, Web Servers, Web Browsers.

HTML: Introduction, SGML, DTD (Document Type Definition). Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website. HTML5: Migration, New Elements, Semantics, Canvas, SVG, Multimedia.

##### Module –II (12Hours)

CSS: Syntax, Class Selector, Id Selector, External, inline and Internal Style Sheets, div & span tags. DOM HTML DOM, inner HTML, Dynamic HTML (DHTML). CSS3: Rounded Corners, Border Images, Gradients, Shadows, 2D and 3D Transforms, Transitions, Animations, BoxSizing

Java Script: JAVA Script Programming Fundamentals, Statements, Expressions, Operators, Popup Boxes, Control Statements, Try…. Catch Statement, Throw Statement, Objects of JavaScript: Date object, array object, Boolean object, math object. Email and password validations. Writing Java Applets, Life cycle of applet, Design a login page using applets. Events and Event Handlers: General Information about Events, Defining Event Handlers, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onMove, onReset, onSelect, onSubmit, onUnload

##### Module –III (12 Hrs)

What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, writing a simple XML File, Creating a Document type definition, Documents & Data, Defining Attributes & Entities in the DTD, Defining Parameter Entities & conditional Sections, Designing an XML datastructure.

CGI/PERL: Introduction to CGI/Perl, Testing & Debugging Perl /CGI Script, Using Scalar variables and operators in Perl/CGI. PHP: Starting to script on server side, Arrays function and forms

INTERNET SECURITY & FIREWALLS: Types of Viruses, Client Server Security Threats, Data & Message Security, Encrypted Documents and Emails, Proxy Application Gateways, FIirewalls, AAA (Authentication, Authorization and Accounting).

##### Textbooks-

1. Web Warrior Guide to Web Design Technologies, Don Gosselin, Joel Sklar & others,Cengage Learning India,2011
2. Programming the World Wide Web, Robert W Sebesta,8th edition, Pearson,2015
3. Web Technologies, Uttam K Roy,Oxford,2010

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**SOFTWARE ENGINEERING**

|  |  |
| --- | --- |
| Prerequisites | Knowledge of computer, problem Solving Skills, Object OrientedProgramming Concepts |
| Course Outcomes | * Develop a thorough understanding of software development lifecycle principles
* Able to design and plan software solutions to problems using an object- orientedstrategy
* Able to develop and apply testing strategies for softwareapplications
* Develop an estimation of the cost, quality, and management issues involvedin softwareconstruction
 |

##### Module I (12 hours)

**Software Process Models:** Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, V model, Agile models: Extreme Programming, and Scrum.

**Software Requirements Engineering:** Requirement Gathering and Analysis, Functional and Non- functional requirements, Software Requirement Specification (SRS), IEEE 830 guidelines, Decision tables and Decisiontrees.

##### Module II (12 hours)

**Structured Analysis & Design:** Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering. **Function–Oriented software design:** Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces **Coding and Software Testing Techniques:** Coding, Code Review, documentation. **Testing:** - Unit testing, Black-box Testing, White- box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regressiontesting.

##### Module III (12 hours)

**Software Reliability and Software Maintenance:** Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse. **Software Size Metrics:** LOC Function Point, **COCOMO Model:** Basic COCOMO Model, Intermediate COCOMO model, Complete COCOMO model. Emerging Topics: Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS), CORBA.

##### Text Book:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.

##### Reference Books:

1. Software Engineering, A Practitioner’s Approach, Roger S. Pressman, TMGHill.
2. Software Engineering, I. Sommerville, 9th Ed. , PearsonEducation.

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**DATA MINING**

|  |  |
| --- | --- |
| **Prerequisites** | Data Structures and Algorithms, Database, SQL |
| **Course Outcomes** | * Understand the fundamentals of data warehousing and datamining
* Design data warehouses and define specific OLAP operations foranalysis
* Apply data mining techniques like classification, prediction,clustering
* Gain knowledge about complex data types and spatial datamining.
 |

##### Module - I (12 Hours)

**Introduction to Data warehousing**: Definition and Characteristic, Need for data warehousing, Evolution of Decision support System, Building blocks of data warehouse, data warehouses and data marts, metadata in the data warehouse, Data warehousing Architecture, Data warehousing implementation, Business and data warehouse

**Data Warehouse Modelling and Design**: Multidimensional data model, Data cube, Schemas for multidimensional data models (Star, Snowflake, Fact Constellation), OLAP, OLAP Operations, OLAP Models(ROLAP, MOLAP, HOLAP), OLAP vs OLTP, Benefits of Data Warehousing

##### Module - II (12 Hours)

**Introduction to Data Mining**: KDD Process, Data mining Functionalities, Classification of data mining systems, data mining task primitives, Integration of data mining system with data warehouse, Data Preprocessing (data summarization, data cleaning, data integration and transformation, data reduction, datadiscretization)

**Association Rule Mining**: Mining frequent patterns, associations, correlations (market basket analysis), Frequent Itemset Mining, (Apriori algorithm, FP-Growth), Correlation Analysis (Chi-square, Lift), Kinds of associationrules

##### Module - III (12Hours)

**Classification**: Classification vs Prediction, issues, Decision tree induction, Attribute Selection Measures, Tree Pruning, Rule based classification, classification by Back Propagation, Bayseian Classification, Support VectorMachines

**Cluster Analysis**: Data in cluster analysis, Categorization of clustering methods, partitioning methods (k- means, k-medoids), hierarchical methods(AGNES, DIANA, BIRCH),density based methods (DBSCAN, OPTICS), Outlier Analysis

##### Text Books:

1. Data Mining: Concepts and techniques: Han, Camber and Pei, Elsevier (3rdEdition).
2. Data Mining & Data Warehousing Using OLAP: Alex & Stephen, McGrawHill

##### Reference books:

1. Data Mining Techniques and Applications by Hongbo Du,Cengage
2. Data Mining: Arun Pujari, UniversityPress
3. Data Mining –a Tutorial based primer by R.J.Roiger, M.W.Geatz, PearsonEducation.
4. Data Warehousing: ReemaThareja, Oxford UniversityPress
5. Data warehousing Fundamentals: PaulrajPonniah, WilleyIndia.

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**DATA ANALYTICS**

|  |  |
| --- | --- |
| Prerequisites | Linear algebra, calculus, probability theory, statistics, and programming languages |
| Course Outcomes | * Demonstrate the ability to think critically in making decisions based on data and deepanalytics.
* Demonstrate the ability to use technical skills in predicative andprescriptive modeling to support businessdecision-making.
* Demonstrate effective communication skills that facilitate theeffective presentation of analysisresults.
* Execute real-time analytical methods on streaming datasets to react quickly to customer needs
 |

**MODULE I: 12 Hrs**

Introduction: Data Analytics, Data Mining and Knowledge Discovery, Data and Relations: The Iris Data Set, Data Scales, Set and Matrix Representations, Relations, Dissimilarity Measures, Similarity Measures, Sequence Relations, Sampling and Quantization, Data Preprocessing: Error Types, Error Handling, Data Transformation.

**MODULEII: 12 Hrs**

Data Visualization: Principal Component Analysis, Multidimensional Scaling, Sammon Mapping, Correlation: Linear Correlation, Correlation and Causality, Chi-Square Test for Independence, Regression: Linear Regression, Linear Regression with Nonlinear Substitution, Robust Regression, Neural Networks, Radial Basis Function Networks,Cross-Validation.

**MODULE III: 12 Hrs**

Forecasting: Recurrent Models, Autoregressive Models, Classification: Classification Criteria, Naive Bayes Classifier, Linear Discriminant Analysis, Support Vector Machine, Nearest Neighbor Classifier, Learning Vector Quantization, Decision Trees, Clustering: Cluster Partitions, Sequential Clustering, Prototype-Based Clustering, Fuzzy Clustering, Relational Clustering, Cluster Tendency Assessment, Cluster Validity, Some Optimization Methods: Optimization with Derivatives, Gradient Descent, Lagrange Optimization.

##### TEXT BOOKS:

Thomas A. Runkler, Data Analytics Models and Algorithms for Intelligent Data Analysis, Springer, 2012.

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**COMPUTER VISION**

|  |  |
| --- | --- |
| Prerequisites | Computer Graphics |
| Course Outcomes | * Identify basic concepts, terminology, theories, models and methods in the field of computervision
* Describe known principles of human visualsystem
* Describe basic methods of computer vision related to multi-scale representation, edgedetection
 |

**Module-I (12 hours)**

### Digital Image Fundamentals: Basic Concepts, Imaging geometry, translation, scaling, rotation, Image formation, Geometric Camera Models, Image digitization, Image types, Color Images, color models, Digital Image Properties: metrics and topological properties of digital images, histograms, visual properties.

Image pre-processing: Pixel brightness transformation, Local pre-processing.

**Module-II (12 hours)**

Image segmentation: Fundamentals, point, line detection, basic edge detection techniques, Hough transform, Thresholding, basic global threholding, optimal thresholding using Otsu’s method, multi-spectral thresholding, Region based segmentation, region growing, region splitting andmerging.

Shape representation and descriptors: Region identification, Contour or boundary-based representation and descriptors, chain codes, boundary length, curvature, bending energy, signature, Fourier descriptor.

**Module-III (12 hours)**

Region-based representation and descriptors, area, Euler’s number, eccentricity, elongatedness, rectangularity, direction, compactness, moments, covex hull Object and Pattern Recognition: Pattern and pattern classes, Matching, minimum distance or nearest neighbor classifier, matching by correlation, Optimum statistical classifier, Neural network classifier.

**TEXT BOOK**

1. Milan Sonka, Vaclav Hlavac and Roger Boyele, Image processing, analysis, and machine vision. 3e, Cengage Learning, 2014.

**REFERENCE BOOKS:**

1. Rafael C. Gonzalez and Richard E. Woods. "Digital image processing”PearsonEducation
2. Computer Vision A modern approach, David A. Forsyth and Jean Ponce, PearsonEducation

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**CLOUD COMPUTING**

|  |  |
| --- | --- |
| Prerequisites | Computer Networking, Operating System |
| Course Outcomes | * Define Cloud Computing and memorize the different Cloud service and deployment models
* Describe importance of virtualization along with theirtechnologies.
* Use and Examine different cloud computingservices
* Analyze the components of open stack & Google Cloud platform and understand Mobile CloudComputing
* Describe the key components of Amazon webService
* Design & develop backup strategies for cloud data based onfeatures.
 |

**Module-1 : (12 hrs)**

**Introduction:** Cloud-definition, benefits, usage scenarios, Functioning of Cloud Computing – Cloud Architecture – Types of Clouds – Business models around Clouds – Major Players in Cloud Computing – issues in Clouds , Risks Involved in Cloud Computing.

**Cloud Services:** Types of Cloud services: Software as a service – Platform as a Service – Infrastructure as a Service – database as a Service – Monitoring as a Service – Communication as services, Service providers – Google, Amazon, Microsoft Azure, IBM,Salesforce

**Cloud Service Administration**- Service Level Agreements and Monitoring-Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling SoftwareDependencies.

**Module-2: (12 hrs)**

**Collaborating Using Cloud Services:** Email Communication over the Cloud – CRM Management – Project Management – Event Management – Task Management – Calendar – Schedules – Word Processing – Presentation – Spreadsheet – Databases – Desktop – Social Networks and Groupware, Work Loan Management in Cloud.

**Virtualization For Cloud:** Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties – Interpretation and binary translation, HLL VM – Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

**Module-3: (12 hrs)**

**Data & Cloud Storage:** Enterprise Data Storage(SAN,NAS),Cloud File System,Cloud Data stores & Data management for cloud storage.

**Security, Standards and Applications:** Security in Cloud: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed Management Task Force – Standards for application Developer – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

**Cloud Computing Platforms & tools**: Eucalyptus – Nimbus – Open Nebula, CloudSim,Apache,Hadoop,Map Reduce

**Text Books:**

1. JohnRittinghouseandJamesRansome,“CloudComputing,Implementation,ManagementandStrategy”,CRC Press,2009.
2. Cloud Computing Principles & Paradigms By Buyya, Brobery &Goscinni(Wiley).
3. Cloud Computing By Srinivasan &Suresh(Pearson).

**References:**

1. Michael Miller, “Cloud Computing: Web-Based Applications That Change the Way You Workand Collaborate”, Que Publishing, August 2008.
2. James E Smith and Ravi Nair, “Virtual Machines”, Morgan Kaufmann,2006.
3. David E. Y. Sarna, “Implementing and Developing Cloud Application”, CRC press2011.

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**COMPUTER GRAPHICS**

|  |  |
| --- | --- |
| Prerequisites | Basic Mathematics, Programming Languages, Algorithms |
| Course Outcomes | * Understand the basics of computer graphics, different graphics systemsand applications of computergraphics.
* Discuss various algorithms for scan conversion and filling of basic objects andtheir comparativeanalysis.
* Use of geometric transformations on graphics objects and their applicationin compositeform.
* Extract scene with different clipping methods and its transformation tographics displaydevice.
 |

**Module – I (10 hours)**

Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices. Output Primitives: Line drawing Algorithms: DDA and Bresenham’s Line Algorithm, Circle drawing Algorithms: Midpoint Circle Algorithm and Bresenham’s Circle drawing Algorithm. Two Dimensional Geometric Transformation: Basic Transformation (Translation, Rotation, Scaling) Matrix Representation, Composite Transformations, Reflection, Shear, Transformation between coordinate systems.

## Module – II (10 hours)

Two Dimensional Viewing: Window-to- View Port Coordinate Transformation. Line Clipping (Cohen- Sutherland Algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm) Aliasing and Antialiasing, Half Toning, Thresholding, Dithering. Polygon Filling: Seed Fill Algorithm, Scan line Algorithm. Two Dimensional Object Representations: Spline Representation, Bezier Curves, B-Spline Curves. Fractal Geometry: Fractal Classification and Fractal Dimension.

## Module – III (8 hours)

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, Reflections, shear, Composite Transformation. Projections: Parallel Projection, Perspective Projection. Visible Surface Detection Methods: Back-Face Detection, Depth Buffer, A- Buffer, Scan- Line Algorithm, PaintersAlgorithm.

## Module – IV (8 hours)

Illumination Models: Basic Models, Displaying Light Intensities. Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading, Phong Shading. Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, Methods of Controlling Animation, Morphing. Introduction to Virtual Reality and AugmentedReality.

## Textbook:

1. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education, Seventh Impression 2008

## Reference Books:

1. Computer Graphics Principle and Practice, J.D. Foley, A. Dam, S.K. Feiner, Addison Wesley, 2nd Edition.
2. Procedural Elements of Computer Graphics, David Rogers, TMH.
3. Computer Graphics: Algorithms and Implementations, D.P Mukherjee, D. Jana,PHI.
4. Computer Graphics, Z. Xiang, R. A. Plastock, Schaum’s Outlines , McGrowHill.

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**SOFT COMPUTING**

|  |  |
| --- | --- |
| Prerequisites | Evolutionary Computation, Probabilistic Reasoning |
| Course Outcomes | * Apply soft computing methodology for a particularproblem
* Apply neural networks to pattern classification and regressionproblems
* Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
* Apply genetic algorithms to combinatorial optimizationproblems
 |

##### Module I: (12 hrs)

**Fundamentals of Neural Network**:- Introduction to Soft Computing, Neural Network, Neural Network Application, Neural Network Architecture

Simple Neural Network:- Perceptron, McCulloh Pitt Model, Adaline, Madaline, Hebb’s Net, Back propagation Neural Network, Auto associative and Hetero associative network, Kohen self-organizing map, Artificial Resonance Theory

##### Module II: (8 hrs)

**Fuzzy Logic: -** : Fuzzy Logic: Crisp and Fuzzy sets, membership functions, Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations, Propositional and predicate logic, fuzzy mapping rules and implications, Fuzzy models, Applications.

##### Module III: (10 hrs)

**Nature Inspired Algorithms**: Introduction, Genetic algorithms, Differential evolution, Particle swarm optimization, Ant colony optimization, Bacteria Foraging Optimization, Cuckoo search.

##### Module IV: (6 hrs)

**Hybrid Systems**: Integration of neural networks, fuzzy logic and genetic algorithms.

##### Text/ Reference books:

1. S. Rajasekaran and G.A. Vijaylakshmi Pai, Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India, 2003.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall of India, 2004.

##### Reference books:

1. N.P. Padhy and S.P. Simon, Soft Computing: With Matlab Programming, Oxford University Press, 2015.
2. Xin-She Yang: Nature Inspired Optimization Algorithms,Elsevier,2014
3. D. E. Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, 1989.
4. Lauren Fausett: Fundamentals of Neural network-Architecture, Algorithm, Application , Pearson,2004

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**INTERNET AND WEB TECHNOLOGIES LAB**

|  |  |
| --- | --- |
| Prerequisites | Programming Languages |
| Course Outcomes | * Design and implement dynamic websites with good aesthetic sense of designing
* Create a static website using HTML and add dynamic functionality to it by using javaScript.
* Create dynamic website on real worldproblems.
 |

**Experiment 1 :** Basic HTML using images links, Lists. **Experiment 2 :** Basic HTML using Tables and frames. **Experiment 3 :** Design the web page using form elements. **Experiment 4 :** Design a web page by using HTML 5

**Experiment 5 :** Use different types of styles in a page. Use inline, internal and external style sheets.

**Experiment 6 :** Design a web page by using CSS3

**Experiment 7 :** Embedding the JavaScript in to Web pages. Usage of concepts and functions, array and objects.

**Experiment 8 :** Form validation using JavaScript

**Experiment 9 :** DTD and XML implementations in web designing concepts

**Experiment 10:** Create the small web site using web2.0 concepts.

# SOFTWARE ENGINEERING LAB

|  |  |
| --- | --- |
| Prerequisites | Knowledge of computer, problem Solving Skills, Object OrientedProgramming Concepts |
| Course Outcomes | * Classifying the requirements and preparing software requirement documents for analyzing theprojects.
* Understanding the different designtechniques
* Implementation of UML Modeling, Use casedesign
* Learning the use of tools like Rational Rose or Argo UML(opensource)
 |

**Experiment 1:** Develop requirements specification for a given problem. The requirements Specification should include both functional and non-functional requirements

**Experiment 2:** Develop DFD Model (Level 0, Level 1 DFD) of the sample problem **Experiment 3:** Develop DFD model (Level 2) and data dictionary of the sample problem **Experiment 4:** Develop UML Use case model for a problem (Use of a CASE tool any of

Rational rose, Argo UML, or Visual Paradigm etc. is required)

**Experiment 5:** Develop Class diagrams **Experiment 6:** Develop Sequence Diagrams **Experiment 7:** Develop Collaboration Diagrams **Experiment 8:** Develop Activity Diagram Diagrams **Experiment 9:** Develop State ChartDiagrams

**Experiment 10:** Develop code for the developed class model using Java & testing

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**SEVENTH SEMESTER**

**MOBILE COMPUTING**

|  |  |
| --- | --- |
| **Prerequisites** | Computer Network, Data Communication, Operating System |
| **Course Outcomes** | * Explain the basic concepts of wireless network and wirelessgenerations.
* Demonstrate the different wireless technologies such as CDMA,GSM, GPRSetc
* Describe and judge the emerging wireless technologies standards suchas WLL, WLAN, WPAN,WMAN.
* Explain the design considerations for deploying the wirelessnetwork infrastructure.
 |

**Module - I** (12 hours)

**Introduction:** Three Tier Architecture Mobile Computing Architecture, Evolution of Wireless Technology

**Cellular System**: Cell, Cluster, Cell Splitting, Frequency Reuse, Channel Assignment Strategies, Components of Cellular System, Operation of Cellular System

**Personal Communications Services (PCS)**: PCS Architecture, mobility management.

**Global System for Mobile Communication (GSM)**: Overview, Architecture, Network signaling, Channels, Mobility Management.

**General Packet Radio Services (GPRS)**: Architecture, GPRS Interfaces, Network Protocols

**Module - II** (12 hours)

**Wireless LAN (WLAN):** Application, Requirement, IEEE 802.11(Ad-hoc Mode, Infrastructure Mode, Protocol Architecture), Bluetooth (Piconet, Scatternet, Protocol Stack, Bluetooth Profile)

**Wireless Application Protocol (WAP):** WAP Gateway and Protocols, wireless mark up Languages (WML),

**Wireless Local Loop (WLL):** WLL Configuration, Architecture, WLL Technologies.

**IMT 2000:** Vision, IMT-2000 Family, W-CDMA and CDMA 2000

**Module - III** (12 hours)

**Satellite System:** Introduction, Types of Satellite System (HEO, MEO, LEO), Satellite System Architecture, Case Studies: IRIDIUM, GLOBALSTAR and ICO

**Virtual Private Network (VPN):** Features, Goals, Working, Remote Access VPN, Site to Site VPN, VPN Protocols, Requirements

**Mobile IP & Cellular IP:** Goals & Working, **Mobile OS:** Windows CE, Windows Mobile OS, Symbian OS

##### Text Books:

1. Mobile Communication: J. Schiller, 2ND Edition, PearsonEducation

nd

1. Mobile Computing: AsokeTalukdar, 2 Edition,TMH.

##### Reference Books:

1. Fundamentals of Mobile Computing, Prashanta Kumar Patnaik and Rajib Mall, PHI, 2nd Edition, 2015
2. Mobile Computing: P.K. Patra, S.K. Dash, 2nd Edition, ScitechPublications.
3. Mobile Computing, Raj Kamal, 2nd Edition, Oxford UniversityPress

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**REAL TIME SYSTEMS**

|  |  |
| --- | --- |
| Prerequisites | Operating Systems, Computer Networks, Database |
| Course Outcomes | * Develop real-time algorithm for taskscheduling.
* To understand the working of real-time operating systems and real-time database.
* To work on design and development of protocols related to real-time communication.
 |

##### MODULE-1 ( 12Hrs )

Introduction: What is real time, Applications of Real-Time systems, A basic model of Real-time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modeling timing constraints Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Issues Associated withRMA.

##### MODULE-2 (12Hrs)

Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real- time tasks. Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP. Important features of PCP. Some issues in using a resource sharing protocol. Handling task dependencies. Scheduling Real- time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

##### MODULE-3 (12Hrs)

Commercial Real-time operating systems: Time services, Features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX-RT, A survey of contemporary Real-time operating systems. Benchmarking real-time systems. Real-time Databases: Example applications of Real-time databases. Review of basic database concepts, Real-time databases, Characteristics of temporal data. Concurrency control in real- time databases. Commercial real-time databases. Real time Communication: Basic concepts, Examples of applications, Real-time communication in a LAN and Real-time communication over packet switched networks.

##### Text Book:

Real-time Systems Theory and Practice by Rajib Mall, Pearson Publication, 2008.

##### Reference BOOK:

1. Jane W. S. Liu, Real-Time Systems, Pearson Education,2000.
2. C.M. Krishna and K.G. Shin, Real-Time Systems,TMH.

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**WIRELESS SENSOR NETWORKS**

|  |  |
| --- | --- |
| Prerequisites | Computer Networks, Operating system, Mobile Computing |
| Course Outcomes | * Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensortechnology
* Learn key routing protocols for sensor networks and main designissues
* Learn transport layer protocols for sensor networks, and designrequirements
* Understand the Sensor management , sensor network middleware, operating systems
 |

##### Module I : (12hrs)

**Introduction:** Introduction to Wireless Sensor Networks, Node architecture, Advantages of Sensor Networks, Application of Sensor Networks, Challenges and Constraints.

**Node Architecture:** Sensing Subsytem, Processor Subsystem, Communication Interfaces

**Operating System:** Functional Aspects, Non-functional Aspects, Prototypes(Tiny OS, SOS, Contiki, Lite OS)

##### Module II : (12 hrs)

**Physical Layer:** Basic components, Source and Channel Encoding, Modulation, Signal Propagation. **MAC Layer:** Wireless MAC Protocols (CSMA, MACA, MACAW), Characteristics of MAC protocols in Sensor Networks, Contention-Free MAC protocols( TRAMA, YMAC, LEACH), Contention-Based MAC protocols(PAMAS, SMAC, TMAC), Hybrid MACprotocols.

**Network Layer:** Classification of Routing Protocol, Routing metrics, Flooding and gossiping, Data- Centric routing (SPIN, Directed Diffusion, Gradient), Proactive routing (DSDV, OLSR), On-Demand routing (AODV, DSR), Hierarchical routing, Location-Based routing (UNICAST, MULTICAST, GAF), QoS-Based routing protocols

##### Module III: (12hrs)

**Localization:** Ranging Techniques, range based localization, Range Free Localization, event Based Localization

**Time Synchronization:** Reasons and challenges for time synchronization, Basics of time synchronization, Time synchronization protocols – Receiver Broadcast Synchronization, Timing-Sync Protocol for Sensor Networks and Flooding Time SynchronizationProtocol.

##### Text Books :

1. Fundamentals of Wireless Sensor Network: Theory and Practice: Waltenegus Dargie and Christian Poellabauer, Wiley Publication,2010.
2. Networking Wireless Sensors: BhaskarKrismachari, Cambridge UniversityPress

##### References Books:

1. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking2004
2. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati, Springer

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**SOFTWARE PROJECT MANAGEMENT**

|  |  |
| --- | --- |
| Prerequisites | Software Engineering |
| Course Outcomes | * Estimate project cost and perform cost-benefit evaluation amongprojects
* Perform project scheduling, activity network analysis and riskmanagement
* Apply schedule and cost control techniques for project monitoring including contract management.
* Apply quality models in software projects for maintaining software quality andreliability.
 |

##### Module I: Project Evaluation and Planning (12Hrs)

Introduction to Software Project Management : Software Projects vs Other Types of Projecr, Activities in Software Project Management, Evaluation of Individual Projects(Cost–Benefit Analysis, Cash Flow Forecasting), Cost Benefit Evaluation Techniques, Risk Evaluation , Software Effort Estimation : COCOMO 2, Cost Estimation, Staffing pattern, Effect of schedule compression, Capers Jones estimating rules of thumb, Activity Planning : Objectives of Activity Planning, Sequencing and Scheduling Activities, Network Planning Models, Critical path analysis,.

##### Module 2: Monitoring and Control (12Hrs)

Collecting Data, , project termination review, Visualizing Progress, Cost Monitoring, Earned Value analysis, Change Control, Software Configuration Management (SCM), Managing Contracts : Types Of Contracts, Stages In Contract Placement, Typical Terms of A Contract, Contract Management and Acceptance.

##### Module 3: Quality Management and People Management (12Hrs)

Introduction, Understanding Behavior, Organizational Behaviour, Selecting The Right Person For The Job, Motivation, The Oldman – Hackman Job Characteristics Model, Stress, Health And Safety, Working in Teams : Decision Making, Organization and team structures, Leadership, ISO and CMMI models, Testing and Software reliability.

##### Text Book :

1. Bob Hughes, Mike Cotterell, “Software Project Management”, Fifth Edition, Tata McGraw Hill, 2011.

##### Reference Books :

1. Royce, “Software Project Management”, Pearson Education,1999.
2. Robert K. Wysocki, Effective Software Project Management, Wiley,2009.

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**INFORMATION RETRIEVAL**

|  |  |
| --- | --- |
| Prerequisites | Data Structures and Files Database management systems, Query Processing,Data Mining |
| Course Outcomes | * Understand the concept of Informationretrieval.
* Deal with storage and retrieval process of text and multimediadata.
* Evaluate performance of any information retrievalsystem.
* Understand importance of recommendersystem.
* Understandconceptofmultimediaanddistributed informationretrieval.
 |

##### Module-I: 12Hours

Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram.IR Models: Boolean Model, Vector Model

Storage: Inverted file, Suffix trees &suffix arrays, Signature Files, Scatter storage or hash addressing, Clustered files.

Searching strategies: Boolean Search, Serial search, cluster based retrieval, Query languages, Types of queries, Patterns matching, structural queries.

##### Module-II: 12Hours

Index Construction, Dynamic indexing index compression, vector space retrieval, similarity search Probabilistic IR: Probabilistic information retrieval, Language model of information retrieval, Bottom-up and top-down parsing paradigms, clustering and visualization via embedding

##### Module-III: 12Hours

Learning in IR: Supervised Learning, Evaluating text classifiers, Nearest neighbors learners, Bayesian Learners, Hypertext Classification, Semi supervised learning

Recommender Systems: Collaborative Filtering and Content Based Recommendation of Documents and Products, Information Extraction and Integration: Extracting Data from Text. Semantic Web, Collecting and Integrating Specialized Information on the web.

##### Text Books

1. Yates & Neto, "Modern Information Retrieval", PearsonEducation,ISBN81-297-0274-6.
2. Heiner Stuckenschmidt, Frank van Harmelen, “Information Sharing on the Semantic Web”,Springer International Edition, ISBN3-540-20594-2.
3. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze “Introduction to Information Retrieval ”, Cambridge University Press, ISBN978-0-521-86571-5

##### Reference Books

1. Markleven, “Introduction to search engines and web navigation”, John Wiley andsons
2. V. S. Subrahamanian, Satish K. Tripathi “Multimedia information System”, Kulwer Academic Publisher.
3. Chabane Djeraba, ”Multimedia mining A high way to intelligent multimedia documents”, Kulwer Academic
4. Stefan Buttcher, Charles L.A. Clarke, Gordon V. Cormack, Information Retrieval Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London,England,2010.

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**FAULT TOLERANT SYSTEMS**

|  |  |
| --- | --- |
| **Prerequisites** | Digital electronics, Computer Architecture, operating systems, Computernetworks |
| **Course outcome** | Learn and design fault tolerant systems which are need of the future |

##### Module-I : 12 Hrs

BASIC TERMS:

Definition of fault tolerance, Redundancy, Applications of fault-tolerance, Fundamentals of dependability.

Attributes: Reliability, availability, safety, Impairments: faults, errors and failures, Means: fault prevention, removal and forecasting

DEPENDABILITY EVALUATION:

Common measures: failures rate, mean time to failure, mean time to repair, etc. Reliability block diagrams, Markov processes

##### Module-II: 12 Hrs

REDUNDANCY:

Hardware redundancy, Redundancy schemes, Evaluation and comparison, Applications, Information redundancy, Codes: linear, Hamming, cyclic, unordered, arithmetic, etc., Encoding and decoding techniques, Applications, Time redundancy

##### Module-III : 12 Hrs

PROGRAMMING:

Software fault tolerance, Specific features, Software fault tolerance techniques: N-version programming, recovery blocks, self-checking software, etc.

##### Text Books

1. Anderson, T., and P.A. Lee, Fault-Tolerant Principles and Practices,Prentice-Hall
2. Hwang, K., and F.A. Briggs, Computer Architecture and Parallel Processing,McGraw-Hill.
3. Jalote, P.Fault-Tolerance in Distributed Systems, ISBN 0-13-301367-7,Prentice-Hall,

##### Reference Books

1. Johnson, B.W., Design and Analysis of Fault-Tolerant Systems, AddisonWesely
2. Leveson, Nancy G., Safeware, system safety and computers, AddisonWesely.
3. Pradhan, D.K., Fault-Tolerant Computing — Theory and Techniques, (2 Volumes),Prentice-Hall.
4. Pradhan, Dhiraj K., Fault-Tolerant Computer System Design, ISBN 0-13-057887-8,Prentice-Hall

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**Entrepreneurship Development (3-0-0)**

##### Prerequisites:

1. Organizational Behaviour.
2. English.

##### Module 1: (06 Hours)

Entrepreneurship: Concept of Entrepreneurship and Intrapreneurship, Types of Entrepreneur, Nature and Importance, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality & Traits and Entrepreneurial Skills.

##### Module 2: (08 Hours)

Entrepreneurial Environment, Identification of Opportunities, Converting Business, Opportunities into reality. Start-ups and business incubation, Skill Development. Setting up a Small Enterprise. Issues relating to location, Environmental Problems and Industrial Policies and Regulations.

##### Module 3: (08 Hours)

Basics of Accounting, Terms: Assets, Liabilities, Equity, Revenue, Expense, Working capital, Marketing Mix and STP.

HRM: Concepts and Function, Labour Laws- Factories Act, Organizational sup- port services - Central and State Government, Incentives and Subsidies.

##### Module 4: (08 Hours)

Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Government in reviving sick industries.

##### Text Books:

1. Entrepreneurship Development and Management, Vasant Desai, HPH.
2. Entrepreneurship Management, Bholanath Dutta, ExcelBooks.
3. Entrepreneurial Development, Sangeeta Sharma, PHI.
4. Entrepreneurship, Rajeev Roy, Oxford UniversityPress.

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**EIGHTH SEMESTER**

**MACHINE LEARNING**

|  |  |
| --- | --- |
| **Prerequisites** | Probability, Linear Algebra, Programming Languages |
| **Course outcome** | * Identify the characteristics of datasets and compare the trivial data and big data for variousapplications.
* Implement machine learning techniques and computing environment that are suitable for the applications underconsideration.

•Solve problems associated with batch learning and online learning,* Integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop andmapreduce.
 |

##### Module 1:(9 hrs)

**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, version spaces and the CANDIDATE-ELIMINATION, Inductive Bias **Decision tree learning:** Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

##### Module 2:(11 hrs)

**Artificial Neural Networks:** Introduction, biological motivation, neural network representation, appropriate problem for neural network learning, Perception, multilayer networks and the back propagation algorithm,

Linear Regression, Support vector machine, kernel function and kernelSVM.

##### Module 3:(8 hrs)

**Bayesian learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, maximum likelihood and least-squared error hypotheses, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, example to illustrate Naïve Bayes classifier

**Instance-Based Learning:** Introduction, K-Nearest Neighbor Learning, Radial Basis Functions **Module 4:(8 hrs)**

**Clustering:** k-means, adaptive hierarchical clustering, Gaussian mixture model, computational learning theory, PAC learning model, sample complexity, VC dimension, ensemble learning.

**Learning Set of Rules:** Introduction, sequential covering algorithms, learning rule sets, learning First order Rules, learning sets of first order rules, inverting resolution

##### TEXT BOOK

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

##### REFERENCE BOOKS

1. Introduction to Machine Learning Edition 2, byEthemAlpaydin
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MITPress,2012.

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**EMBEDDED SYSTEM**

|  |  |
| --- | --- |
| **Prerequisites** | Digital electronics, Computer Architecture, operating systems, Computernetworks |
| **Course outcome** | * Describe the differences between the general computing system andtheembedded system, also recognize the classification of embeddedsystems..
* Aware of the architecture of the ATOM processor and its programming aspects (assemblyLevel)
* Aware of interrupts, hyper threading and softwareoptimization.
* Design real time embedded systems using the concepts of RTOS.
 |

**Module I(12hrs)**

### **Introduction:** Embedded System, Application and characteristics of embedded systems, Overview of Processors and hardware units in embedded system, embedded software in a system, Examples of Embedded system. Design metrices of Embeddedsystem.

**ARM:** ARM Microcontroller, ARM pipeline, Instruction Set Architecture ISA: Registers, Data Processing Instructions, Data Transfer Instructions, Multiplications instructions, Software interrupt, Conditional execution, branch instruction, Swap instruction, THUMB instructions.

**Module II(12hrs)**

**Device and Device drivers:** I/O devices, Timer and Counting devices, Serial peripheral interfaces,, IIC, RS232C,RS422,RS485, Universal serial bus, USB Interface, USB Connector, IrDA, CAN, Bluetooth, ISA, Parallel Peripheral Interfaces, PCI, PCI-X

**FPGA:** Field Programmable Devices, Programmability of FPGA, FPGA Logic Block, FPGA Design Flow

**Module –III (12 hrs)**

**Modelling Techniques:** Software and programming concept: Processor selection for An embedded system, State chart, SDL, Petri-Nets, Unified Modeling Language (UML).Hardware software co-design. Hardware and software partitioning: K-L partitioning, Partitioning using genetic algorithm .**Low power embedded system design:** Dynamic power dissipation, Static power dissipation, Power reduction techniques.

**Text Books:**

1. “Embedded system architecture, programming and design” By Raj Kamal,TMH.
2. “Embedded System Design ” by Santanu Chattopadhay,PHI

**Reference Books:**

1. “Hardware software co-design of Embedded systems” By Ralf Niemann,KulwerAcademic.
2. “Embedded real time system programming” By Sriram V Iyer, PankajGupta,TMH

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**INTRUSION DETECTION SYSTEMS**

|  |  |
| --- | --- |
| Prerequisites | Computer Networks, Firewall, Classification Techniques |
| Course outcome | * Understand fundamental concepts of Network ProtocolAnalysis
* Demonstrate the skill to capture and analyze networkpackets.
* Use various protocol analyzers and Network Intrusion Detection Systems
 |

##### Module-I

History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based informationsources.

##### Module-II

Intrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis, techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis

##### Module-III

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes

##### Module-IV

Working with Snort Rules, Rule Headers, Rule Options, The SnortConfiguration File etc. Plug-in, Preprocessors and Output Modules, Using Snort with MySQL , Agent development for intrusion detection, Architecture models of IDs and IPs.

##### Text Books:

Rafeeq Rehman: “Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID,” Prentice Hall

##### Reference Books:

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: “Intrusion Detection and Correlation Challenges and Solutions”, 1st Edition,Springer
2. Carl Endorf, Eugene Schultz and Jim Mellander “Intrusion Detection & Prevention”, 1st Edition, Tata McGraw-Hill,
3. Stephen Northcutt, Judy Novak: “Network Intrusion Detection”, 3rdEdition, New RidersPublishing,
4. T. Fahringer, R. Prodan, “A Text book on Grid Application Development and Computing Environment”. 6th Edition, KhannaPublishers

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**DATA STRUCTURE**

|  |  |
| --- | --- |
| Prerequisites | C Programming, Basic Mathematics |
| Course Outcomes | * To understand and remember algorithms and its analysisprocedure.
* To understand basic data structures such as arrays linked lists, stacks and queues.
* To compute the complexity of variousalgorithms.
* To solve problem involving graphs, trees andheaps
 |

##### Module – I (12hrs)

**Introduction:** Definition of data structure, data structure operations. Algorithms: Complexity, Time Space Complexity, Asymptotic Notations for Complexity ofAlgorithms.

**Arrays**: Introduction, Linear arrays, Representation of linear arrays in memory, Address calculation of using row and column major ordering, Traversing linear arrays, Inserting and Deleting, Multidimensional arrays: Representation of Two-Dimensional arrays in memory, Pointers: Pointers arrays, Sparse matrix , Memory allocation, Garbage collection

**Stacks:** Definition, Array representation of stacks, Linked representation of stacks, Polish notation, operation on stack, applications of stack.

##### Module – II (12hrs)

**Queues:** Definition, Array representation of Queues, Linked representation of Queues, types of queues.

**Linked Lists:** Linked Lists, Representation of Linear Lists in memory, Traversing a Linked List, Searching a linked List, , Insertion into a linked list, Deletion from linked list, Circular linked lists, Doubly linkedlists

**Tree:** Introduction and Definition of Trees, Tree Terminology, Binary Tree, Representing Binary Tress in Memory, Traversing Binary Tree: Preorder, In-order, Post-ordered traversal, Binary Search trees, AVL trees, B-Trees

##### Module –III (12hrs)

Graph: Introduction, Graph theory terminology: Graph and multigraphs. Directed Graphs, Sequential representation of graphs: Adjacent matrix, Path matrix, Linked representations of a Graph, Operations on Graphs: Searching in a Graph, Inserting in a graph, traversing a graph: Breadth- First search, Depth first search.

Sorting and Searching techniques: Bubble Sort, Insertion sort, Quick Sort, Selection sort, Merge-sort, Heap sort, Linear & binary search.

Hashing: Hashing techniques, hash function, linear probing, quadratic probing, double hashing

##### Text Books:

1. Seymour Lipschutz and G A Vijayalakshmi Pai, “Data Structures”, Tata Mc GrewHills,2010
2. Data Structures Using C – A.M. Tenenbaum(PHI),2009

##### Reference Books:

1. Data Structures Using C by E Balagurusamy, McGraw Hill,2013

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1. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson, 2nd edition, McGraw HillEducation

# DATA BASE ENGINEERING

|  |  |
| --- | --- |
| Prerequisites | Programming Language, Algorithm, Elementary Set Theory |
| Course Outcomes | * Understand, appreciate and effectively explain the underlying conceptsof Data Basetechnology.
* Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra andSQL.
* Explain the concepts of transaction processing and represent the issues &technology relate to concurrency and recovery in multi userEnvironment.
 |

##### Module I: (12 hours)

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages. Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

##### Module II: (12 hours)

Relation Query Languages, Relational Algebra and Relational Calculus, SQL. Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Query Processing Strategy.

##### Module III: (12 hours)

Transaction processing: Recovery and Concurrency Control. Locking and Timestamp based Schedulers. Database Recovery System: Types of Data Base failure & Types of Database Recovery, Recovery techniques, Data warehousing & Data Mining

##### Text Books:

1. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education)
2. Fundamentals of Database System by Elmasari & Navathe- PearsonEducation

##### Reference Books:

1. An introduction to Database System – Bipin Desai, GalgotiaPublications
2. Database System: concept, Design & Application by S.K.Singh (PearsonEducation)

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**DATA MINING**

|  |  |
| --- | --- |
| **Prerequisites** | Database, Data Structures |
| **Course Outcomes** | * Understand the fundamentals of data warehousing and datamining
* Design data warehouses and define specific OLAP operations foranalysis
* Apply data mining techniques like classification, prediction,clustering
* Learn about application of data mining in various real lifescenario
 |

##### Module – I (12hrs)

The Compelling Need for data warehousing: Escalating Need for strategic information, failures of Past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse, Dimensional analysis

##### Module – II (12hrs)

OLAP in the Data Warehouse:

Demand for Online analytical processing, need for multidimensional analysis, fast access and powerful calculations, limitations of other analysis methods, OLAP is the answer, OLAP definitions and rules, OLAP characteristics, major features and functions, general features, dimensional analysis, what are hypercube? Drill-down and roll-up, slice-and-dice or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, ROLAP versus MOLAP, OLAP implementation considerations **Module –III (12hrs)**

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining, applications in retail industry, applications in telecommunications industry, applications in banking and finance, social impacts of data mining

##### Text Books:

1. Jiawei Han, Micheline Kamber, and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition,Elsevier.
2. Reema Thareja, Data Warehousing, Oxford UniversityPress.

##### Reference Books:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint2007
2. Vikram Pudi& P. Radha Krishna, Data Mining, Oxford UniversityPress.
3. Paulraj Ponniah “Data Warehousing Fundamentals for IT Professionals”, 2nd Edition, , John Wiley Publishers

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##### OBJECT ORIENTED PROGRAMMING USING C++

|  |  |
| --- | --- |
| Prerequisites | C Programming, Basic Mathematics |
| Course Outcomes | * Understand the difference between object oriented programming and procedural oriented language and data types inC++.
* Understand how to implement the features of C++ like abstraction, Operator overloading, inheritance,Polymorphism
 |

**Module – I (12hrs)**

Introduction to object oriented programming systems, Introduction to C++, Structure of C++ program, Creating the source file, Compiling and linking. Token, Expressions and Control Structures: Token, Keyword, Identifiers and constants, Types of data type, variables declaration and initialization, reference variable. Operators in C++. Functions in C++: Introduction, Function prototyping, call by reference, Inline function, Default argument, Const argument, Recursion, Function Overloading, Friend and virtual function.

##### Module – II (12hrs)

Classes and Object: Introduction, Specifying a class, Defining member function, C++ program with class

, making an outside function inline, Private member function, Arrays within class, memory allocation of object, Static data members, static member function, Array of objects, Array as function argument, Returning object. Constructors and Destructors: Introduction, Constructors, parameterized Constructors, Multiple constructors in a class, Constructor with default argument, Dynamic initialization of object, copy constructor, Dynamic constructor, destructor Operator Overloading: Defining Operator Overloading, Rules of Operator Overloading, Overloading with Unary and Binary Operators**.**

##### Module –III (12hrs)

Inheritance: Defining Derived Classes, Single Inheritance, Making Private member Inheritable, Multilevel Inheritance, Multipath Inheritance**,** Hierarchical Inheritance**,** Hybrid Inheritance**,** virtual Base Class, Abstract Class. Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to object, this pointer, polymorphism, pointer to derived classes, virtual function, pure virtual function, virtual constructor and destructors. Template: Class Templates, Function Templates Exception Handling: Try, throw, and catchmechanism

##### Text Books:

1. Object Oriented Programming with C++, E. Balagurusamy, McGraw-HillEducation
2. ANSI and Turbo C++, Ashoke N. Kamthane, PearsonEducation

##### Reference Books:

1. Object Oriented Programming with C++, ReemaThareja, Oxford UniversityPress.
2. C++ the Complete Reference, H Schildt, McGraw-HillEducation

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