**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech. in ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**
**COURSE STRUCTURE & SYLLABUS (R22 Regulations)**
**Applicable from AY 2022-23 Batch**

**I YEAR I SEMESTER**

| S. No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | MA101BS | Matrices and Calculus | 3 | 1 | 0 | 4 |
| 2. | PH102BS | Applied Physics | 3 | 1 | 0 | 4 |
| 3. | CS103ES | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 4. | ME104ES | Engineering Workshop | 0 | 1 | 3 | 2.5 |
| 5. | EN105HS | English for Skill Enhancement | 2 | 0 | 0 | 2 |
| 6. | CS106ES | Elements of Computer Science & Engineering | 0 | 0 | 2 | 1 |
| 7. | PH107BS | Applied Physics Laboratory | 0 | 0 | 3 | 1.5 |
| 8. | CS108ES | Programming for Problem Solving Laboratory | 0 | 0 | 2 | 1 |
| 9. | EN109HS | English Language and Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 10. | *MC110 | Environmental Science | 3 | 0 | 0 | 0 |
| | | Induction Program | | | | |
| | | **Total** | **14** | **3** | **12** | **20** |

**I YEAR II SEMESTER**

| S. No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1. | MA201BS | Ordinary Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |
| 2. | CH202BS | Engineering Chemistry | 3 | 1 | 0 | 4 |
| 3. | ME203ES | Computer Aided Engineering Graphics | 1 | 0 | 4 | 3 |
| 4. | EE204ES | Basic Electrical Engineering | 2 | 0 | 0 | 2 |
| 5. | EC205ES | Electronic Devices and Circuits | 2 | 0 | 0 | 2 |
| 6. | CS206ES | Python Programming Laboratory | 0 | 1 | 2 | 2 |
| 7. | CH207BS | Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8. | EE208ES | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 9. | CS209ES | IT Workshop | 0 | 0 | 2 | 1 |
| | | **Total** | **11** | **3** | **12** | **20** |

**II YEAR I SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | AD301PC | Mathematical and Statistical Foundations | 3 | 1 | 0 | 4 |
| 2 | AD302PC | Digital Electronics | 3 | 0 | 0 | 3 |
| 3 | AD303PC | Data Structures | 3 | 0 | 0 | 3 |
| 4 | AD304PC | Object Oriented Programming through Java | 3 | 0 | 0 | 3 |
| 5 | AD305PC | Computer Organization and Architecture | 3 | 0 | 0 | 3 |
| 6 | AD306PC | Digital Electronics Lab | 0 | 0 | 2 | 1 |
| 7 | AD307PC | Introduction to Data Structures Lab | 0 | 0 | 2 | 1 |
| 8 | AD308PC | Java Programming Lab | 0 | 0 | 2 | 1 |
| 9 | AD309PC | Data visualization- R Programming/ Power BI | 0 | 0 | 2 | 1 |
| 10 | *MC310 | Constitution of India | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **0** | **10** | **20** |

**II YEAR II SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | AD401PC | Discrete Mathematics | 3 | 0 | 0 | 3 |
| 2 | AD402PC | Introduction to Artificial Intelligence | 3 | 0 | 0 | 3 |
| 3 | AD403PC | Database Management Systems | 3 | 0 | 0 | 3 |
| 4 | AD404PC | Operating Systems | 3 | 0 | 0 | 3 |
| 5 | AD405PC | Software Engineering | 3 | 0 | 0 | 3 |
| 6 | AD406PC | Operating Systems Lab | 0 | 0 | 2 | 1 |
| 7 | AD407PC | Database Management Systems Lab | 0 | 0 | 2 | 1 |
| 8 | AD408PC | Real-time Research Project/Field Based Research Project | 0 | 0 | 4 | 2 |
| 9 | AD409PC | Node JS/ React JS/ Django | 0 | 0 | 2 | 1 |
| 10 | *MC410 | Gender Sensitization Lab | 0 | 0 | 2 | 0 |
| | | **Total** | **15** | **0** | **12** | **20** |

**III YEAR I SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | AD501PC | Design and Analysis of Algorithms | 3 | 1 | 0 | 4 |
| 2 | AD502PC | Introduction to Data Science | 3 | 0 | 0 | 3 |
| 3 | AD503PC | Computer Networks | 3 | 0 | 0 | 3 |
| 4 | SM504MS | Business Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 5 | | Professional Elective-I | 3 | 0 | 0 | 3 |
| 6 | AD505PC | Introduction to Data Science using R Lab | 0 | 0 | 2 | 1 |
| 7 | AD506PC | Computer Networks Lab | 0 | 0 | 2 | 1 |
| 8 | EN508HS | Advanced English Communication Skills Lab | 0 | 0 | 2 | 1 |
| 9 | AD507PC | ETL-Kafka/Talend | 0 | 0 | 2 | 1 |
| 10 | *MC510 | Intellectual Property Rights | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **1** | **08** | **20** |

**III YEAR II SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | AD601PC | Automata theory and Compiler Design | 3 | 0 | 0 | 3 |
| 2 | AD602PC | Machine Learning | 3 | 0 | 0 | 3 |
| 3 | AD603PC | Big Data Analytics | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective – II | 3 | 0 | 0 | 3 |
| 5 | | Open Elective-I | 3 | 0 | 0 | 3 |
| 6 | AD604PC | Machine Learning Lab | 0 | 0 | 3 | 1.5 |
| 7 | AD605PC | Big Data Analytics Lab | 0 | 0 | 3 | 1.5 |
| 8 | AD606PC | Industrial Oriented Mini Project/ Internship/Skill Development Course (UI design-Flutter) | 0 | 0 | 4 | 2 |
| 9 | *MC609 | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **0** | **10** | **20** |

**Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.**

**IV YEAR I SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | AD701PC | Introduction to Predictive Analytics | 2 | 0 | 0 | 2 |
| 2 | AD702PC | Web and Social Media Analytics | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective -III | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective -IV | 3 | 0 | 0 | 3 |
| 5 | | Open Elective - II | 3 | 0 | 0 | 3 |
| 6 | AD703PC | Professional Practice, Law & Ethics | 2 | 0 | 0 | 2 |
| 7 | | Professional Elective -III Lab | 0 | 0 | 2 | 1 |
| 8 | AD704PC | Project Stage - I | 0 | 0 | 6 | 3 |
| | | **Total** | **14** | **0** | **12** | **20** |

**IV YEAR II SEMESTER**

| S. No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | | Professional Elective - V | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective – VI | 3 | 0 | 0 | 3 |
| 3 | | Open Elective – III | 3 | 0 | 0 | 3 |
| 4 | | Project Stage – II including Seminar | 0 | 0 | 22 | 11 |
| | | **Total** | **9** | **0** | **22** | **20** |

***MC – Satisfactory/Unsatisfactory**

**#Skill Course - 1 credit with 2 Practical Hours**

**Professional Elective-I**

| | |
|---|---|
| AD511PE | Graph Theory |
| AD512PE | Advanced Computer Architecture |
| AD513PE | Web Programming |
| AD514PE | Image Processing |
| AD515PE | Computer Graphics |

**Professional Elective - II**

| | |
|---|---|
| AD621PE | Software Testing Methodologies |
| AD622PE | Information Retrieval Systems |
| AD623PE | Pattern Recognition |
| AD624PE | Computer Vision and Robotics |
| AD625PE | Data Warehousing and Business Intelligence |

**Professional Elective - III**

| | |
|---|---|
| AD731PE | Internet of Things |
| AD732PE | Data Mining |
| AD733PE | Scripting Languages |
| AD734PE | Mobile Application Development |
| AD735PE | Cryptography and Network Security |

**# Courses in PE - III and PE - III Lab must be in 1-1 correspondence.**

**Professional Elective -IV**

| | |
|---|---|
| AD741PE | Quantum Computing |
| AD742PE | Expert Systems |
| AD743PE | Cloud Computing |
| AD744PE | Game Theory |
| AD745PE | Knowledge Representation and Reasoning |

**Professional Elective - V**

| | |
|---|---|
| AD851PE | Social Network Analysis |
| AD852PE | Federated Machine Learning |
| AD853PE | Augmented Reality & Virtual Reality |
| AD854PE | Web Security |
| AD855PE | Ad-hoc & Sensor Networks |

**Professional Elective – VI**

| | |
|---|---|
| AD861PE | Speech and Video Processing |
| AD862PE | Robotic Process Automation |
| AD863PE | Randomized Algorithms |
| AD864PE | Cognitive Computing |
| AD865PE | Semantic Web |

**Open Elective I:**

1. AD611OE: Fundamentals of AI
2. AD612OE: Machine Learning Basics

**Open Elective II:**

1. AD721OE: Introduction to Natural Language Processing
2. AD722OE: AI applications

**Open Elective III:**

1. AD831OE: Chatbots
2. AD832OE: Evolutionary Computing

## MA101BS: MATRICES AND CALCULUS

**B.Tech. I Year I Sem.**

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

**Pre-requisites:** Mathematical Knowledge at pre-university level

**Course Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

**Course outcomes:** After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigenvalues and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

**UNIT - I: Matrices** **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

**UNIT - II: Eigen values and Eigen vectors** **10 L**

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

**UNIT - III: Calculus** **10 L**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)** **10 L**

Definitions of Limit and continuity.

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**UNIT-V: Multivariable Calculus (Integration) 8 L**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

**REFERENCE BOOKS:**

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

## PH102BS: APPLIED PHYSICS

**B.Tech. I Year I Sem.**

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

**Pre-requisites:** 10 + 2 Physics

**Course Objectives:** The objectives of this course for the student are to:

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

**Course Outcomes:** At the end of the course the student will be able to:

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

**UNIT - I: QUANTUM PHYSICS AND SOLIDS**

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

**UNIT - II: SEMICONDUCTORS AND DEVICES**

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

**UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS**

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

**UNIT - IV: NANOTECHNOLOGY**

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

**UNIT - V: LASER AND FIBER OPTICS**

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumping methods- ruby laser, He-Ne laser , $CO_2$ laser, Argon ion Laser, Nd:YAG laser-semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

**TEXT BOOKS:**

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"-S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

**REFERENCE BOOKS:**

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

**CS103ES: PROGRAMMING FOR PROBLEM SOLVING**

**B.Tech. I Year I Sem.**

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

**Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

**Course Outcomes:** The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

**UNIT - I: Introduction to Programming**

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode with examples, Program design and structured programming

**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

**UNIT - II: Arrays, Strings, Structures and Pointers:**

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

**UNIT - III: Preprocessor and File handling in C:**

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

**UNIT - IV: Function and Dynamic Memory Allocation:**

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

**UNIT - V: Searching and Sorting:**
Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

**TEXT BOOKS:**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

**REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

## ME104ES: ENGINEERING WORKSHOP

**B.Tech. I Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 1 | 3 | 2.5 |

**Pre-requisites**: Practical skill

**Course Objectives:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes**: At the end of the course, the student will be able to:

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

**1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

**TEXT BOOKS:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

**REFERENCE BOOKS:**

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

## EN105HS: ENGLISH FOR SKILL ENHANCEMENT

**B.Tech. I Year I Sem.**

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

**Course Objectives:** This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Course Outcomes:** Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**

Chapter entitled '***Toasted English*' by R.K.Narayan** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

**Vocabulary**: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT - II**

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

**UNIT - III**

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

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

**UNIT - IV**

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Standard Abbreviations in English
**Grammar:** Redundancies and Clichés in Oral and Written Communication.
**Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice
**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

**UNIT - V**

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Technical Vocabulary and their Usage
**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)
**Reading:** Reading Comprehension-Exercises for Practice
**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

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

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended,*** besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

**TEXT BOOK:**

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

**REFERENCE BOOKS:**

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

## CS106ES: ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

**B.Tech. I Year I Sem.**

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**Course Objective:** To provide an overview of the subjects of computer science and engineering.

**Course Outcomes:**

1. Know the working principles of functional units of a basic Computer
2. Understand program development, the use of data structures and algorithms in problem solving.
3. Know the need and types of operating system, database systems.
4. Understand the significance of networks, internet, WWW and cyber security.
5. Understand Autonomous systems, the application of artificial intelligence.

**UNIT – I**

**Basics of a Computer** – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

**UNIT – II**

**Software development** – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures – definition, types of data structures

**UNIT – III**

**Operating systems:** Functions of operating systems, types of operating systems, Device & Resource management

**Database Management Systems**: Data models, RDBMS, SQL, Database Transactions, data centers, cloud services

**UNIT – IV**

**Computer Networks:** Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensor networks, vehicular networks, 5G communication.

World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Online social networks.

Security – information security, cyber security, cyber laws

**UNIT – V**

**Autonomous Systems:** IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development, natural language processing, image and video processing.

Cloud Basics

**TEXT BOOK:**

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

**REFERENCE BOOKS:**

1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
4. Elements of computer science, Cengage.

## PH107BS: APPLIED PHYSICS LABORATORY

**B.Tech. I Year I Sem.**

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**Course Objectives:** The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

**Course Outcomes:** The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

**LIST OF EXPERIMENTS:**

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

***Note:*** *Any 8 experiments are to be performed.*

**REFERENCE BOOK:**

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

## CS108ES: PROGRAMMING FOR PROBLEM SOLVING LABORATORY

**B.Tech. I Year I Sem.**

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*[Note:The programs may be executed using any available Open Source/ Freely available IDE*
*Some of the Tools available are:*
*CodeLite: https://codelite.org/*
*Code:Blocks: http://www.codeblocks.org/*
*DevCpp : http://www.bloodshed.net/devcpp.html*
*Eclipse: http://www.eclipse.org*
*This list is not exhaustive and is NOT in any order of preference]*

**Course Objectives:** The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

**Course Outcomes:** The candidate is expected to be able to:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

**Practice sessions:**

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.

**Simple numeric problems:**

a. Write a program for finding the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f. 5 x 2 = 10
g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

**Expression Evaluation:**

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value.
i. 1-x/2 +x^2/4-x^3/6
j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+…….+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

**Arrays, Pointers and Functions:**

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
c. Write a C program that uses functions to perform the following:
d. Addition of Two Matrices
e. Multiplication of Two Matrices
f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
g. Write C programs that use both recursive and non-recursive functions
h. To find the factorial of a given integer.
i. To find the GCD (greatest common divisor) of two given integers.
j. To find x^n
k. Write a program for reading elements using a pointer into an array and display the values using the array.
l. Write a program for display values reverse order from an array using a pointer.
m. Write a program through a pointer variable to sum of n elements from an array.

**Files:**

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program that does the following:
   It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)
   Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)
   The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

**Strings:**

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
d. To insert a sub-string into a given main string from a given position.
e. To delete n Characters from a given position in a given string.
f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
h. Write a C program to count the lines, words and characters in a given text.

**Miscellaneous:**

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * * *
                                 4 4 4 4    * *
                                            *
```

**Sorting and Searching:**

a. Write a C program that uses non recursive function to search for a Key value in a given
b. list of integers using linear search method.
c. Write a C program that uses non recursive function to search for a Key value in a given
d. sorted list of integers using binary search method.
e. Write a C program that implements the Bubble sort method to sort a given list of
f. integers in ascending order.
g. Write a C program that sorts the given array of integers using selection sort in descending order
h. Write a C program that sorts the given array of integers using insertion sort in ascending order
i. Write a C program that sorts a given array of names

**TEXT BOOKS:**

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

**REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

## *EN109HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

**B.Tech. I Year I Sem.**

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The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Course Objectives:**

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

**Course Outcomes:** Students will be able to:

- ✓ Understand the nuances of English language through audio- visual experience and group activities
- ✓ Neutralise their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

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

**a. Computer Assisted Language Learning (CALL) Lab**

**b. Interactive Communication Skills (ICS) Lab**

**Listening Skills:**

Objectives

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

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

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

**Speaking Skills:**

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

**Exercise – I**
**CALL Lab**:
*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
*Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
**ICS Lab**:
*Understand:* Spoken vs. Written language- Formal and Informal English.
*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – II**
**CALL Lab**:
*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*
**ICS Lab**:
*Understand:* Features of Good Conversation – Strategies for Effective Communication.
*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise - III**
**CALL Lab:**
*Understand:* Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*
**ICS Lab**:
*Understand:* Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise – IV**
**CALL Lab**:
*Understand:* Listening for General Details.
*Practice:* Listening Comprehension Tests - *Testing Exercises*
**ICS Lab**:
*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**Exercise – V**
**CALL Lab:**
*Understand:* Listening for Specific Details.
*Practice:* Listening Comprehension Tests -*Testing Exercises*
**ICS Lab**:
*Understand:* Group Discussion
*Practice:* Group Discussion

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

**1. Computer Assisted Language Learning (CALL) Lab:**

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

**System Requirement (Hardware component):**

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

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

**Source of Material (Master Copy):**

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press.

***MC110: ENVIRONMENTAL SCIENCE**

**B.Tech. I Year I Sem.**

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**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**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 helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
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 INDIA edition.
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, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

## MA201BS: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

**B.Tech. I Year II Sem.**

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**Pre-requisites:** Mathematical Knowledge at pre-university level

**Course Objectives:** To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

**Course outcomes:** After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

**UNIT-I: First Order ODE** **8 L**

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

**UNIT-II: Ordinary Differential Equations of Higher Order** **10 L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in $x$, $e^{ax}V(x)$ and $x\,V(x)$, method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits

**UNIT-III: Laplace transforms** **10 L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

**UNIT-IV: Vector Differentiation** **10 L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration** **10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

**REFERENCE BOOKS:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

## CH202BS: ENGINEERING CHEMISTRY

**B.Tech. I Year II Sem.**

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

**Course Objectives:**

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

**Course Outcomes:**

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

**UNIT - I: Water and its treatment: [8]**

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of $F^-$ ion by ion- selective electrode method.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

**UNIT – II Battery Chemistry & Corrosion** [8]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion:** Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

**UNIT - III: Polymeric materials: [8]**

Definition – Classification of polymers with examples – Types of polymerization –
addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

**Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

**Rubbers:** Natural rubber and its vulcanization.

**Elastomers:** Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

**Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

**UNIT - IV: Energy Sources: [8]**

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

**UNIT - V**: **Engineering Materials: [8]**

**Cement:** Portland cement, its composition, setting and hardening.

**Smart materials and their engineering applications**

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

**REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

## ME203ES: COMPUTER AIDED ENGINEERING GRAPHICS

**B.Tech. I Year II Sem.**

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**Course Objectives:**

- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

**Course Outcomes:** At the end of the course, the student will be able to:

- Apply computer aided drafting tools to create 2D and 3D objects
- sketch conics and different types of solids
- Appreciate the need of Sectional views of solids and Development of surfaces of solids
- Read and interpret engineering drawings
- Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

**UNIT – I:**

**Introduction to Engineering Graphics:** Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

**UNIT- II:**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

**UNIT – III:**

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

**UNIT – IV:**

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

**UNIT – V:**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

**TEXT BOOKS:**

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

**REFERENCE BOOKS:**

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**Note:** - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

## EE204ES: BASIC ELECTRICAL ENGINEERING

**B.Tech. I Year II Sem.**

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**Prerequisites**: Mathematics

**Course Objectives:**

- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Understand and analyze basic Electrical circuits
- Study the working principles of Electrical Machines and Transformers
- Introduce components of Low Voltage Electrical Installations.

| Course Objectives | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| To understand DC and Single & Three phase AC circuits. | 3 | 2 | 1 | | 2 | 0 | 0 | 1 | 2 | 0 | 1 | 2 |
| To study and understand the different types of DC, AC machines and Transformers. | 3 | 2 | 1 | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 1 | 1 |
| To import the knowledge of various electrical installations and the concept of power, power factor and its improvement. | 3 | 2 | 0 | | 3 | 0 | 0 | 0 | 1 | 2 | 1 | 1 |

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| Understand and analyse basic Electrical circuits | 3 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 2 |
| Study the working principles of Electrical Machines and Transformers | 3 | 2 | 1 | 0 | 3 | 1 | 0 | 1 | 1 | 2 | 1 | 2 |
| Introduce components of Low Voltage Electrical Installations. | 3 | 2 | 1 | 1 | 3 | 2 | 0 | 0 | 1 | 0 | 2 | 2 |

**UNIT-I:**

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

**UNIT-II:**

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

**UNIT-III:**

**Transformers:** Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT-IV:**

**Electrical Machines:** Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

**UNIT-V:**

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

**TEXT BOOKS:**

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

**REFERENCE BOOKS:**

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989

## EC205ES: ELECTRONIC DEVICES AND CIRCUITS

**B.Tech. I Year II Sem.**

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**Course Objectives:**

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices.

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

1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the role of special purpose devices and their applications.

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | - | - | 1 | 1 | - | - | - | - | 1 |
| CO2 | 3 | 2 | 3 | - | - | 2 | 1 | - | - | - | - | 1 |
| CO3 | 3 | 3 | 3 | - | - | 2 | 1 | - | - | - | - | 1 |

**UNIT - I**

**Diodes:** Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

**UNIT - II**

**Diode Applications:** Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

**UNIT - III**

**Bipolar Junction Transistor (BJT):** Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

**UNIT - IV**

**Junction Field Effect Transistor (FET):** Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

**UNIT – V**

**Special Purpose Devices:** Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

**TEXT BOOKS:**

1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

**REFERENCE BOOKS:**

1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018.

## CS206ES: PYTHON PROGRAMMING LABORATORY

**B.Tech. I Year II Sem.**

| L | T | P | C |
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**Course Objectives:**

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

**Course Outcomes:** After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples

**Week -1:**

1. i) Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii) Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. 
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points
4. Read name, address, email and phone number of a person through keyboard and print the details.

**Week - 2:**

1. Print the below triangle using for loop.
   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval (use break)

**Week - 3:**

1. i) Write a program to convert a list and tuple into arrays.
   ii) Write a program to find common values between two arrays.
2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.
3. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

**Week - 4:**

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

i). Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

3. i) Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
ii) Remove the given word in all the places in a string?
iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
4. Writes a recursive function that generates all binary strings of n-bit length

**Week - 5:**

1. i) Write a python program that defines a matrix and prints
ii) Write a python program to perform addition of two square matrices
iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
3. Use the structure of exception handling all general purpose exceptions.

**Week-6:**

1. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritances.
3. Write a python code to read a phone number and email-id from the user and validate it for correctness.

**Week- 7**

1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

**Week - 8:**

1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOKS:**

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

**REFERENCE BOOKS:**

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage

## CH207BS: ENGINEERING CHEMISTRY LABORATORY

**B.Tech. I Year II Sem.**

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**Course Objectives:** The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**Course Outcomes:** The experiments will make the student gain skills on:

- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

**List of Experiments:**

**I. Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

**II. Conductometry:** Estimation of the concentration of an acid by Conductometry.

**III. Potentiometry:** Estimation of the amount of $Fe^{+2}$ by Potentiomentry.

**IV. pH Metry:** Determination of an acid concentration using pH meter.

**V. Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon – 6.

**VI. Lubricants:**

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

**VII. Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

**VIII. Virtual lab experiments**

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

**REFERENCE BOOKS:**

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

## EE208ES: BASIC ELECTRICAL ENGINEERING LABORATORY

**B.Tech. I Year II Sem.**

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**Prerequisites**: Basic Electrical Engineering

**Course Objectives:**

- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

| Course Objectives | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach | 3 | 2 | 1 | | 2 | 0 | 0 | 1 | 2 | 0 | 1 | 2 |
| To study the transient response of various R, L and C circuits using different excitations | 3 | 2 | 1 | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 1 | 1 |
| To determine the performance of different types of DC, AC machines and Transformers | 3 | 2 | 0 | | 3 | 0 | 0 | 0 | 1 | 2 | 1 | 1 |

| Course Outcomes | Program Outcomes | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| Verify the basic Electrical circuits through different experiments | 3 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 2 |
| Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods | 3 | 2 | 1 | 0 | 3 | 1 | 0 | 1 | 1 | 2 | 1 | 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyse the transient responses of R, L and C circuits for different input conditions | 3 | 2 | 1 | 1 | 3 | 2 | 0 | 0 | 1 | 0 | 2 | 2 |

**List of experiments/demonstrations:**

**PART- A (compulsory)**

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

**PART-B (any two experiments from the given list)**

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

**TEXT BOOKS:**

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

**REFERENCE BOOKS:**

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

## CS209ES: IT WORKSHOP

**B.Tech. I Year II Sem.**

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

**Course Outcomes:**

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

**PC Hardware**

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

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

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

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

**Internet & World Wide Web**

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

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

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

**Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**LaTeX and WORD**

**Task 1 – Word Orientation**: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX

and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

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

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

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

**Excel**

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

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

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

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**Powerpoint**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**REFERENCE BOOKS:**

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, *Pearson Education.*

## AD301PC: MATHEMATICAL AND STATISTICAL FOUNDATIONS

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Prerequisites:** Mathematics courses of first year of study.

**Course Objectives:**

- The Number Theory basic concepts useful for cryptography etc
- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making inferences
- Stochastic process and Markov chains.

**Course Outcomes:** After learning the contents of this course, the student must be able to

- Apply the number theory concepts to cryptography domain
- Apply the concepts of probability and distributions to some case studies
- Correlate the material of one unit to the material in other units
- Resolve the potential misconceptions and hazards in each topic of study.

**UNIT - I**

**Greatest Common Divisors and Prime Factorization:** Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers
**Congruences:** Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences

**UNIT - II**

**Simple Linear Regression and Correlation:** Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study
**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.
**Discrete Probability Distributions:** Binomial Distribution, Poisson distribution.

**UNIT - III**

**Continuous Probability Distributions:** Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial
**Fundamental Sampling Distributions:** Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t–Distribution, F-Distribution.

**UNIT - IV**

**Estimation & Tests of Hypotheses:** Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

**UNIT - V**

**Stochastic Processes and Markov Chains:** Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, nstep transition probabilities, Markov chain, Steady state condition, Markov analysis.

**TEXT BOOKS:**

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1

2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

**REFERENCE BOOK:**

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

## AD302PC: DIGITAL ELECTRONICS

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Course Objectives:** This course aims at through understanding of binary number system, logic gates, combination logic and synchronous and asynchronous logic.

**UNIT - I:**

**BOOLEAN ALGEBRA AND LOGIC GATES:** Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.

Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

**UNIT - II:**

**GATE – LEVEL MINIMIZATION:** The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive – Or function.

**UNIT - III:**

**COMBINATIONAL LOGIC:** Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

**UNIT - IV:**

**SEQUENTIAL LOGIC:** Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure**.** Registers, shift Registers, Ripple counters, synchronous counters, other counters.

**UNIT - V**

**MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC:** Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices.

Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

**TEXT BOOKS:**

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill Edition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

**REFERENCE BOOKS:**

1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

## AD303PC: DATA STRUCTURES

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Prerequisites:** Programming for Problem Solving

**Course Objectives**

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

**Course Outcomes**

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

**UNIT - I**

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

**UNIT - II**

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

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

**UNIT - III**

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

**UNIT - IV**

Graphs: Graph Implementation Methods. Graph Traversal Methods.

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

**UNIT - V**

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

**TEXT BOOKS:**

1. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

**REFERENCE BOOK:**

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning.

## AD304PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Course Objectives**

- To Understand the basic object-oriented programming concepts and apply them in problem solving.
- To Illustrate inheritance concepts for reusing the program.
- To Demonstrate multitasking by using multiple threads and event handling
- To Develop data-centric applications using JDBC.
- To Understand the basics of java console and GUI based programming

**Course Outcomes**

- Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
- Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
- Use multithreading concepts to develop inter process communication.
- Understand the process of graphical user interface design and implementation using AWT or swings.
- Develop applets that interact abundantly with the client environment and deploy on the server.

**UNIT - I**

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

**UNIT - II**

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

**UNIT - III**

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, Exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

**UNIT - IV**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

**UNIT - V**

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

**TEXT BOOKS:**

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

**REFERENCE BOOKS:**

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

## AD305PC: COMPUTER ORGANIZATION AND ARCHITECTURE

**B.Tech. II Year I Sem.**

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**Co-requisite:** A Course on "Digital Electronics".

**Course Objectives**

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

**Course Outcomes**

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

**UNIT - I**

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

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

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

**UNIT - II**

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

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

**UNIT - III**

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

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

**UNIT - IV**

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

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

**UNIT - V**

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.
Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

**TEXT BOOK:**

1. Computer System Architecture – M. Morris Mano, Third Edition, Pearson/PHI.

**REFERENCE BOOKS:**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, V th Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4 th Edition, PHI/Pearson.

## AD306PC: DIGITAL ELECTRONICS LAB

**B.Tech. II Year I Sem.**

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**Course Outcomes:** Upon Completing This Course, the students will be able to:

- Acquire the knowledge on numerical information in different forms and Boolean Algebra Theorems.
- Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
- Design and Analyze Sequential Circuits for various cyclic functions.
- Characterize logic families analyze them for the purpose of AC and DC parameters.

| Course | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 1 | 2 | 1 | - | - | 1 | - | - | 2 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 1 | - | - | 1 | - | - | 2 |
| CO3 | 2 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | - | 1 |
| CO4 | 3 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - |

**LIST OF EXPERIMENTS:**

1. Realization of Logic circuit to generate r's Complement using Logic Gates.
2. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
3. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using full adder.
4. Designing a 2 – bit Comparator using AND, OR and NOT gates. Realize 4 – bit Comparator using 2 – bit Comparators.
5. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX.
6. Implement the given Boolean function using the given MUX(ex: code converters).
7. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder.
8. Implement the given Boolean function using given Decoders.
9. Convert Demultiplexer to Decoder and vice versa.
10. Verification of truth tables of flip flops using different clocks (level triggering, positive and negative edge triggering) also converts the given flip flop from one type to another.
11. Designing of Universal n-bit shift register using flip flops and Multiplexers. Draw the timing diagram of the Shift Register.
12. Design a Synchronous binary counter using D-flipflop /given flip flop.
13. Design Asynchronous counter for the given sequence using given flip flops.
14. Designing of MOD 8 Counter using JK flip flops.

**Major Equipment required for Laboratories:**

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

## AD307PC: INTRODUCTION TO DATA STRUCTURES LAB

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Prerequisites:** A Course on "Programming for problem solving".

**Course Objectives:**

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

**Course Outcomes:**

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

**List of Experiments:**

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Quick sort ii) Heap sort iii) Merge sort
7. Write a program to implement the tree traversal methods( Recursive and Non Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Implement a Pattern matching algorithms using Boyer- Moore, Knuth-Morris-Pratt

**TEXT BOOKS:**

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

**REFERENCE BOOK:**

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

## AD308PC: JAVA PROGRAMMING LAB

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Course Objectives:**

- To understand OOP principles.
- To understand the Exception Handling mechanism.
- To understand Java collection framework.
- To understand multithreaded programming.
- To understand swing controls in Java.

**Course Outcomes:**

- Able to write the programs for solving real world problems using Java OOP principles.
- Able to write programs using Exceptional Handling approach.
- Able to write multithreaded applications.
- Able to write GUI programs using swing controls in Java.

**List of Experiments:**

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]

3. Write a Java program to handle checked and unchecked exceptions. Also, demonstrate the usage of custom exceptions in real time scenario.

4. Write a Java program on Random Access File class to perform different read and write operations.

5. Write a Java program to demonstrate the working of different collection classes. [Use package structure to store multiple classes].

6. Write a program to synchronize the threads acting on the same object. [Consider the example of any reservations like railway, bus, movie ticket booking, etc.]

7. Write a program to perform CRUD operations on the student table in a database using JDBC.

8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]

**REFERENCE BOOKS:**

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

## AD309PC: DATA VISUALIZATION - R PROGRAMMING/ POWER BI

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Course Objectives:**

- Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
- To discern patterns and relationships in the data.
- To build Dashboard applications.
- To communicate the results clearly and concisely.
- To be able to work with different formats of data sets.

**Course Outcomes:** At the end of the course a student should be able to

- Understand How to import data into Tableau.
- Understand Tableau concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world
- problems.

**Lab Problems:**

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts(line, bar charts, Tree maps),Using the Show me panel.

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.

7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.

10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

**REFERENCE BOOKS:**

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

## *MC310: CONSTITUTION OF INDIA

**B.Tech. II Year I Sem.**

| L | T | P | C |
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**Course Objectives:** Students will be able to:

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

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

**Unit - 1** History of Making of the Indian Constitution- History of Drafting Committee.
**Unit - 2** Philosophy of the Indian Constitution- Preamble Salient Features
**Unit - 3** Contours of Constitutional Rights & Duties - Fundamental Rights

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

**Unit - 4** Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**Unit - 5** Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**Unit - 6** Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Suggested Reading:**

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

## AD401PC: DISCRETE MATHEMATICS

**B.Tech. II Year II Sem.**

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

**Course Objectives:**

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

**Course Outcomes:**

- Understand and construct precise mathematical proofs
- Apply logic and set theory to formulate precise statements
- Analyze and solve counting problems on finite and discrete structures
- Describe and manipulate sequences
- Apply graph theory in solving computing problems

**UNIT - I**

**Mathematical logic:** Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

**UNIT - II**

**Set theory:** Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

**UNIT - III**

**Algebraic Structures:** Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

**UNIT - IV**

**Elementary Combinatorics:** Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

**UNIT - V**

**Graph Theory:** Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

**REFERENCE BOOKS:**

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

## AD402PC: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

**B.Tech. II Year II Sem.**

| L | T | P | C |
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**Prerequisite:** Knowledge on Data Structures.

**Course Objectives:**

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

**Course Outcomes:**

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

**UNIT - I**

**Introduction to AI -** Intelligent Agents, Problem-Solving Agents,
**Searching for Solutions** - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

**UNIT-II**

**Games** - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic-** Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**

**First-Order Logic -** Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.
**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

**UNIT-IV**

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

**UNIT-V**

**Probabilistic Reasoning:**
Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## AD403PC: DATABASE MANAGEMENT SYSTEMS

**B.Tech. II Year II Sem.**

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**Prerequisites**: A course on “Data Structures”.

**Course Objectives:**

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

**Course Outcomes:**

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

**UNIT - I**

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

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

**UNIT - II**

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

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

**UNIT - III**

**SQL:** QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

**Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

**UNIT - IV**

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

**UNIT - V**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

B+ Trees: A Dynamic Index Structure.

**TEXT BOOKS:**

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition

2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

**REFERENCE BOOKS:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

## AD404PC: OPERATING SYSTEMS

**B.Tech. II Year II Sem.**

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**Prerequisites:**

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

**Course Objectives:**

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

**Course Outcomes:**

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

**UNIT - I**

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

**Process -** Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

**UNIT - II**

**CPU Scheduling** - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

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

**UNIT - III**

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

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## AD405PC: SOFTWARE ENGINEERING

**B.Tech. II Year II Sem.**

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**Course Objectives**

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

**Course Outcomes**

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

**UNIT - I**

**Introduction to Software Engineering**: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

**UNIT - II**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
**Requirements engineering process**: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**UNIT - III**

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

**UNIT - IV**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.
Metrics for Process and Products: Software measurement, metrics for software quality.

**UNIT - V**

**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

**TEXT BOOKS:**

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

**REFERENCE BOOKS:**

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

## AD406PC: OPERATING SYSTEMS LAB

**B.Tech. II Year II Sem.**

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**Prerequisites:** A course on "Programming for Problem Solving", A course on "Computer Organization and Architecture".

**Co-requisite:** A course on "Operating Systems".

**Course Objectives:**

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

**Course Outcomes:**

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

**List of Experiments:**

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory

6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation

7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## AD407PC: DATABASE MANAGEMENT SYSTEMS LAB

**B.Tech. II Year II Sem.**

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**Co-requisites:** "Database Management Systems".

**Course Objectives:**

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

**Course Outcomes:**

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

**List of Experiments:**

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
   B. Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

## AD409PC: NODE JS/ REACT JS/ DJANGO

**B.Tech. II Year II Sem.**

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**Prerequisites:** Object Oriented Programming through Java, HTML Basics

**Course Objectives:**

- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

**Course Outcomes:** At the end of the course, the student will be able to,

- Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
- Demonstrate Advanced features of JavaScript and learn about JDBC
- Develop Server – side implementation using Java technologies like
- Develop the server – side implementation using Node JS.
- Design a Single Page Application using React.

**Exercises:**

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed in experiment 1 and the database created in experiment 5.
8. Maintaining the transactional history of any user is very important. Explore the various session tracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS, path, event.
10. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js
14. Create a TODO application in react with necessary components and deploy it into github.

**REFERENCE BOOKS:**

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

## *MC410: GENDER SENSITIZATION LAB

**B.Tech. II Year II Sem.**

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**COURSE DESCRIPTION**

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

**Objectives of the Course**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Learning Outcomes**

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**Unit-I: UNDERSTANDING GENDER**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men
- Preparing for Womanhood. Growing up Male. First lessons in Caste.

**Unit – II: GENDER ROLES AND RELATIONS**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

**Unit – III: GENDER AND LABOUR**

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

**Unit – IV: GENDER - BASED VIOLENCE**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

**Unit – V: GENDER AND CULTURE**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".***

☞ **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

## AD501PC: DESIGN AND ANALYSIS OF ALGORITHMS

**B.Tech. III Year I Sem.** **L T P C**
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**Prerequisites:**

- A course on “Computer Programming and Data Structures”.
- A course on “Advanced Data Structures”.

**Course Objectives:**

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

**Course Outcomes:**

- Analyze the performance of algorithms
- Choose appropriate data structures and algorithm design methods for a specified application
- Understand the choice of data structures and the algorithm design methods

**UNIT - I**

**Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.
**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Strassen’s matrix multiplication.

**UNIT - II**

**Disjoint Sets:** Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort
**Backtracking:** General method, applications, n-queen’s problem, sum of subsets problem, graph Coloring, hamitonian cycles.

**UNIT - III**

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

**UNIT - IV**

**Greedy method:** General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.
**Basic Traversal and Search Techniques:** Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

**UNIT - V**

**Branch and Bound:** General method, applications - Traveling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.
**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cook’s theorem.

**TEXT BOOK:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University press, 1998.

**REFERENCE BOOKS:**

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

## AD502PC: INTRODUCTION TO DATA SCIENCE

**B.Tech. III Year I Sem.**

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**Course Objectives:**

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

**Course Outcomes:**

- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

**UNIT - I**

**Introduction**

Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

**Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

**UNIT - II Data Types & Statistical Description**

**Types of Data:** Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

**UNIT - III**

**Vectors:** Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

**Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

**Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

**Lists:** Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

**UNIT - IV**

**Conditionals and Control Flow:** Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

**Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List.

**Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

**UNIT-V**

**Charts and Graphs:** Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot.

**Regression:** Linear Regression Analysis, Multiple Linear regression

**TEXT BOOKS:**

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

**REFERENCE BOOKS:**

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

## AD503PC: COMPUTER NETWORKS

**B.Tech. III Year I Sem.**

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**Prerequisites**

- A course on “Programming for problem solving”
- A course on “Data Structures”

**Course Objectives**

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

**Course Outcomes**

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

**UNIT - I**

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

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

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

**UNIT - II**

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

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

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

**B.Tech. III Year I Sem.**

| L | T | P | C |
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**Prerequisites:** None

**Course Objective:** To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:** The students will understand th e various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

**UNIT – I**

**Introduction to Business and Economics:**

**Business**: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT - II**

**Demand and Supply Analysis:**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function & Law of Supply.

**UNIT - III**

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

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis**: Types of Costs, Short run and Long run Cost Functions.

**Market Structures**: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV**

**Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

**UNIT - V**

**Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

**TEXT BOOKS:**

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

**REFERENCE BOOKS:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

## AD511PE: GRAPH THEORY (Professional Elective – I)

**B.Tech. III Year I Sem.**

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

**Course Objectives:**

- Understanding graphs, trees, connected paths, applications of trees and graphs.

**Course Outcomes:**

- Know some important classes of graph theoretic problems;
- Prove central theorems about trees, matching, connectivity, coloring and planar graphs;
- Describe and apply some basic algorithms for graphs;
- Use graph theory as a modeling tool.

**UNIT - I**

**Introduction**-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

**UNIT - II**

**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra"s shortest path algorithm, Floyd-Warshall shortest path algorithm.

**UNIT - III**

**Trees**- Definitions and characterizations, Number of trees, Cayley"s formula, Kircho↵-matrix-tree theorem, Minimum spanning trees, Kruskal"s algorithm, Prim"s algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury"s algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

**UNIT - IV**

**Independent sets coverings and matchings**– Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall"s Theorem, K¨onig"s Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**UNIT - V**

**Vertex Colorings-** Basic definitions**,** Cliques and chromatic number, Mycielski"s theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**TEXT BOOKS:**

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

**REFERENCE BOOKS:**

1. Lecture Videos: http://nptel.ac.in/courses/111106050/13
2. Introduction to Graph Theory, Douglas B. West, Pearson.

## AD512PE: ADVANCED COMPUTER ARCHITECTURE (Professional Elective – I)

**B.Tech. III Year I Sem.**

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

**Prerequisites:** Computer Organization

**Course Objectives:**

- Impart the concepts and principles of parallel and advanced computer architectures.
- Develop the design techniques of Scalable and multithreaded Architectures.
- Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems

**Course Outcomes:**

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

Shared-Memory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design.

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## AD513PE: WEB PROGRAMMING (Professional Elective – I)

**B.Tech. III Year I Sem.**

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**Course Objectives:**

- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- Understand creating database connectivity using JDBC.
- Learn the concepts of web-based application using sockets.

**Course Outcomes:**

- Design web pages.
- Use technologies of Web Programming.
- Apply object-oriented aspects to Scripting.
- Create databases with connectivity using JDBC.
- Build web-based application using sockets.

**UNIT - I**

**Client side Programming**

**HTML-** Basic Tags- List, Tables, Images, Forms, Frames, CSS

**JAVA Script -**

Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java ScriptObject, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5-CSS3- HTML 5 canvas - Web site creation using tools.

**UNIT – II**

**JAVA**

Introduction to object-oriented programming-Features of Java – Data types, variables and arrays – Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/Output – Files – Utility Classes – String Handling.

**UNIT – III**

**JDBC**

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– InetAddress class – URL class- TCP sockets – UDP sockets, Java Beans –RMI.

**UNIT – IV**

**APPLETS**

Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet. The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

**UNIT – V**

**XML AND WEB SERVICES**

Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services-UDDI-WSDL-Java web services – Web resources.

**TEXT BOOKS:**

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.
3. Michael Morrison XML Unleashed Tech media SAMS.

**REFERENCE BOOKS:**

1. John Pollock, Javascript - A Beginners Guide, 3rd Edition –- Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.

## AD514PE: IMAGE PROCESSING (Professional Elective – I)

**B.Tech. III Year I Sem.**

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

**Prerequisites**

- Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of digital signal processing is desirable.
- A course on “Computational Mathematics”
- A course on “Computer Oriented Statistical Methods”

**Course Objectives**

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

**Course Outcomes**

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

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## AD515PE: COMPUTER GRAPHICS (Professional Elective – I)

**B.Tech. III Year I Sem.**

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

**Prerequisites**

1. Programming for problem solving and Data Structures

**Course Objectives**

- Provide the basics of graphics systems including Points and lines, line drawing algorithms, 2D, 3D objective transformations

**Course Outcomes**

- Explore applications of computer graphics
- Understand 2D, 3D geometric transformations and clipping algorithms
- Understand 3D object representations, curves, surfaces, polygon rendering methods, color models
- Analyze animation sequence and visible surface detection methods

**UNIT - I**

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

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

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

**UNIT - II**

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

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

**UNIT - III**

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

**UNIT - IV**

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

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

**UNIT - V**

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

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

**TEXT BOOKS:**

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education

**REFERENCE BOOKS:**

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
5. Computer Graphics, Steven Harrington, TMH.

## AD505PC: INTRODUCTION TO DATA SCIENCE USING R LAB

**B.Tech. III Year I Sem.**

| L | T | P | C |
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**Pre-requisites:** Any programming language.

**Course Objectives:**

- Familiarize with R basic programming concepts, various data structures for handling datasets, various graph representations and Exploratory Data Analysis concepts

**Course Outcomes:**

- Setup R programming environment.
- Understand and use R – Data types and R – Data Structures.
- Develop programming logic using R – Packages.
- Analyze data sets using R – programming capabilities

**LIST OF EXPERIMENTS:**

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.

2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)

3. Write R command to
i) Illustrate summation, subtraction, multiplication, and division operations on vectors using vectors.
ii) Enumerate multiplication and division operations between matrices and vectors in R console

4. Write R command to
i) Illustrates the usage of Vector subsetting and Matrix subsetting
ii) Write a program to create an array of 3×3 matrices with 3 rows and 3 columns.

5. Write an R program to draw i) Pie chart ii) 3D Pie Chart, iii) Bar Chart along with chart legend by considering suitable CSV file

6. Create a CSV file having Speed and Distance attributes with 1000 records. Write R program to draw
i) Box plots
ii) Histogram
iii) Line Graph
iv) Multiple line graphs
v) Scatter plot
to demonstrate the relation between the cars speed and the distance.

7. Implement different data structures in R (Vectors, Lists, Data Frames)

8. Write an R program to read a csv file and analyze the data in the file using EDA (Explorative Data Analysis) techniques.

9. Write an R program to illustrate Linear Regression and Multi linear Regression considering suitable CSV file.

**TEXT BOOKS:**

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

**REFERENCE BOOKS:**

1. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press

## AD506PC: COMPUTER NETWORKS LAB

**B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives**

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

**Course Outcomes**

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

**List of Experiments**

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

    How to run Nmap scan

    Operating System Detection using Nmap

    Do the following using NS2 Simulator
    i. NS2 Simulator-Introduction
    ii. Simulate to Find the Number of Packets Dropped
    iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
    iv. Simulate to Find the Number of Packets Dropped due to Congestion
    v. Simulate to Compare Data Rate & Throughput.
    vi. Simulate to Plot Congestion for Different Source/Destination
    vii. Simulate to Determine the Performance with respect to Transmission of Packets

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

## EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

**B.Tech III Year I Sem.**

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### 1. INTRODUCTION:

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

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

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

### 2. OBJECTIVES:

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

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

### 3. SYLLABUS:

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

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

strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**4. MINIMUM REQUIREMENT:**

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

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

**5. SUGGESTED SOFTWARE:**

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

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

**TEXT BOOKS:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

**REFERENCE BOOKS:**

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

## AD507PC: ETL- KAFKA/TALEND

**B.Tech. III Year I Sem.**

| L | T | P | C |
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**Course Objectives:**

- Develop a comprehensive understanding of Extract, Transform, Load (ETL) processes using Apache Kafka and Talend.
- Understand how to scale Kafka clusters seamlessly to handle growing data volumes, ensuring optimal performance for ETL operations.

**Course Outcomes:**

1. Learn to design and deploy fault-tolerant Kafka clusters, ensuring data integrity and availability in real-world scenarios.
2. Gain practical experience in cluster management, topic creation, and basic operations such as producing and consuming messages.

**LIST OF EXPERIMENTS:**

1. Install Apache Kafka on a single node.
2. Demonstrate setting up a single-node, single-broker Kafka cluster and show basic operations such as creating topics and producing/consuming messages.
3. Extend the cluster to multiple brokers on a single node.
4. Write a simple Java program to create a Kafka producer and Produce messages to a topic.
5. Implement sending messages both synchronously and asynchronously in the producer.
6. Develop a Java program to create a Kafka consumer and subscribe to a topic and consume messages.
7. Write a script to create a topic with specific partition and replication factor settings.
8. Simulate fault tolerance by shutting down one broker and observing the cluster behavior.
9. Implement operations such as listing topics, modifying configurations, and deleting topics.
10. Introduce Kafka Connect and demonstrate how to use connectors to integrate with external systems.
11. Implement a simple word count stream processing application using Kafka Stream
12. Implement Kafka integration with the Hadoop ecosystem.

**TEXT BOOK:**

1. Neha Narkhede, Gwen Shapira, Todd Palino, Kafka – The Definitive Guide: Real-time data and stream processing at scale, O′Reilly

## *MC510: INTELLECTUAL PROPERTY RIGHTS

**B.Tech. III Year I Sem.**

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

**Course Objectives:**

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

**Course Outcomes:**

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

**UNIT – I**

**Introduction to Intellectual property**: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

**Law of copyrights:** Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

**Trade Secrets**: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copyright law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

**TEXT BOOK:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

**REFERENCE BOOK:**

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

## AD601PC: AUTOMATA THEORY AND COMPILER DESIGN

**B.Tech. III Year II Sem.**

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**Course Objectives**

- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation

**Course Outcomes**

- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool and design LR parsers

**UNIT - I**

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

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

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

**UNIT - II**

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

**Pumping Lemma for Regular Languages**:

Statement of the pumping lemma, Applications of the Pumping Lemma.

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

**UNIT - III**

**Push Down Automata**: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

**Turing Machines**:

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

**Undecidability:**

Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

**UNIT - IV**

**Introduction:** The structure of a compiler

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex

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

**UNIT - V**

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

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
5. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

## AD602PC: MACHINE LEARNING

**B.Tech. III Year II Sem.**

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**Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability-based learning techniques

**Course Outcomes:**

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

**UNIT - I**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

**UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

**UNIT - III**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

**UNIT - IV**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

**UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

**TEXT BOOKS:**

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

**REFERENCE BOOKS:**

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

## AD603PC: BIG DATA ANALYTICS

**B.Tech. III Year II Sem.**

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**Course Objectives**

- Provide the knowledge of principles and techniques for Big data Analytics and give an exposure of the frontiers of Big data Analytics

**Courses Outcomes**

- Understand the importance of big data analytics and its types
- Perform analytics on big data
- Proficiency in big data storage and processing in Hadoop
- Data analytics through MongoDB
- Data analytics through R

**UNIT - I**

Types of Digital data: Classification of Digital Data,
Introduction to Big Data: Evolution of Big Data, definition of big data, Traditional Business Intelligence vs BigData, Coexistence of Big Data and Data Warehouse.
Big Data Analytics: introduction to Big Data Analytics, What Big Data Analytics Isn't, Sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from Capitalizing Big Data, Top Challenges Facing Big Data, Big Data Analytics Importance, Data Science, Terminologies used in Big Data Environments.

**UNIT - II**

Hadoop: Features of Hadoop, Key advantages of hadoop, versions of hadoop, overview of hadoop ecosystem, Hadoop distributions. Need of hadoop, RDBMS vs Hadoop, Distribution computing challenges, History of hadoop, Hadoop overview,HDFS

**UNIT - III**

Processing data with hadoop, introduction to mapreduce programming, mapper, reducer, combiner, partitioner
NoSQL: Types of NoSQL Databases, advantages of NoSQL, Use of NoSQL in industry, SQL vs NoSQL, newSQL, comparison of Nosql, sql and newsql

**UNIT - IV**

MongoDB, necessity of mongodb, terms used in mongodb and RDBMS, datatypes in mongoDB, mongodb query language

**UNIT - V**

Introduction to R programming, operators, control statements and functions, interfacing with R, vectors, matrices, lists, data frames, factors and tables, accessing input and output, graphs in R, R apply family

**TEXT BOOKS:**

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. R programming for beginners, sandhya arora, latesh malik, university press.

**REFERENCE BOOKS:**

1. chandramouli subramanian, Asha A Geroge, C R Rene Robin, big data analytics, University press.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

## AD621PE: SOFTWARE TESTING METHODOLOGIES (Professional Elective – II)

**B.Tech. III Year II Sem.**

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**Prerequisites**

1. Software Engineering

**Course Objectives**

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

**Course Outcomes:**

- Understand purpose of testing and path testing
- Understand strategies in data flow testing and domain testing
- Develop logic-based test strategies
- Understand graph matrices and its applications
- Implement test cases using any testing automation tool

**UNIT - I**

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

**TEXT BOOKS:**

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

**REFERENCE BOOKS:**

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

## AD622PE: INFORMATION RETRIEVAL SYSTEMS (Professional Elective – II)

**B.Tech. III Year I Sem.**

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**Prerequisites:**
- Data Structures

**Course Objectives:**
- To learn the concepts and algorithms in Information Retrieval Systems
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

**Course Outcomes:**
- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

**UNIT - I**
Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

**UNIT - II**
Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

**UNIT - III**
Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

**UNIT - IV**
User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking,
Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext
Information Visualization: Introduction to Information Visualization, Cognition and Perception,
Information Visualization Technologies

**UNIT - V**
Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems
Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval

**TEXT BOOK:**
1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

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

## AD623PE: PATTERN RECOGNITION (Professional Elective – II)

**B.Tech. III Year II Sem.**

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**Prerequisites:**

- Programming for problem solving
- Computer Oriented Statistical Methods

**Course Objectives:**

- Introducing fundamental concepts, theories, and algorithms for pattern recognition and machine learning.

**Course Outcomes:**

- Understand the importance of pattern recognition and its representation
- Analyza the variants of NN algorithm
- Understand the necessity of Hidden markov models, decision tree and SVM for classification
- Understand different types of clustering algorithms

**UNIT - I**

Introduction: Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

**UNIT - II**

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm, use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

**UNIT - III**

Hidden Markov Models: Markov Models for Classification, Hidden Morkov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

**UNIT - IV**

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

**UNIT - V**

Clustering: Importance of clustering, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

**TEXT BOOK:**

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub, 1st Ed.

**REFERENCE BOOKS:**

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. PrenticeHall Pub.

**AD624PE: COMPUTER VISION AND ROBOTICS (Professional Elective – II)**

**B.Tech. III Year II Sem.**

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**Pre-Requisites:** Linear Algebra and Probability.

**Course Objectives:**

- To understand the Fundamental Concepts Related To sources, shadows and shading
- To understand the The Geometry of Multiple Views

**Course Outcomes:**

- Implement fundamental image processing techniques required for computer vision
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

**UNIT - I**

**CAMERAS:** Pinhole Cameras

**Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases

**Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models

**Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**UNIT - II**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates

**Edge Detection:** Noise, Estimating Derivatives, Detecting Edges

**Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

**UNIT - III**

**The Geometry of Multiple Views**: Two Views

**Stereopsis**: Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras

**Segmentation by Clustering:** Segmentation, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

**UNIT - IV**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

**Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations

**Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization

**UNIT - V**

**Introduction to Robotics**: Social Implications of Robotics, Brief history of Robotics, Attributes of hierarchical paradigm, Closed world assumption and frame problem, Representative Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and Perception

**Common sensing techniques for Reactive Robots:** Logical sensors, Behavioural Sensor Fusion, Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

**TEXT BOOKS:**

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

**REFERENCE BOOKS:**

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.
2. The Robotics premier, Maja J Matari, MIT Press
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

**AD625PE: DATA WAREHOUSING AND BUSINESS INTELLIGENCE (Professional Elective – II)**

**B.Tech. III Year II Sem.**

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**Course Objectives**:

- This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
- Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

**Course Outcomes:**

- Understand architecture of data warehouse and OLAP operations.
- Understand Fundamental concepts of BI
- Application of BI Key Performance indicators
- Understand Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

**UNIT - I**

Data Warehouse, Data Warehouse Modelling, OLAP operations, Data Qube Computation methods

**UNIT - II**

Business Intelligence Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

**UNIT - III**

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven and Information use.

**UNIT - IV**

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

**UNIT - V**

Business Intelligence and integration implementation-connecting in BI systems- Issues of legality-Privacy and ethics- Social networking and BI.

**TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier, 4th Edition.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

**REFERENCE BOOKS:**

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence. Solutions with SQL Server, 2008 R2 & Office 2010, TMH, 2011.

4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

**FUNDAMENTALS of AI (Open Elective – I)**

**B.Tech. III Year II Sem.**

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**Course Objective:**

- To learn the difference between optimal reasoning Vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

**Course Outcomes:**

- Gain the knowledge of what is AI, risks and benefits of AI, limits of AI and the ethics involved in building an AI application.
- Understand the nature of environments and the structure of agents.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique
- Gain an understanding of the applications of AI

**UNIT – I**

**Foundations of AI:** Introduction to AI, History of AI, Strong and Weak AI, The State of the Art, Risks and Benefits of AI

**Philosophy, Ethics and Safety of AI:** The Limits of AI, Machine thinking capability, The Ethics of AI

**Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

**UNIT – II**

**Solving Problems by Searching:** Problem – Solving Agents

**Uninformed Search Strategies:** Best-First Search, Breadth-First Search, Uniform-Cost Search, Depth-First Search, Iterative Deepening Search and Bidirectional Search

**Informed Search Strategies:** Greedy Best-First Search, A* Search

**UNIT – III**

**Logical Agents:** Knowledge-based agents, Propositional Logic, Propositional Theorem Proving

**First-Order Logic:** Syntax and Semantics of First-Order Logic

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

Knowledge Representation: Ontological Engineering, Categories and Objects, Events

**UNIT – IV**

**Quantifying Uncertainty:** Basic Probability Notation, Inference Using Full-Joint Distributions, Independence, Bayes' Rule and its Use, Naive Bayes Models

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The semantics of Bayesian Networks, Exact Inference in Bayesian Networks

**UNIT – V**

**Learning from Examples:** Forms of Learning, Supervised Learning, Learning Decision Trees, Model Selection, Linear Regression and Classification, Ensemble Learning

**Natural Language Processing:** Language Models, Grammar, Parsing, Complications of Real Natural Language, Natural Language Tasks

**Robotics:** Robots, Robot Hardware, Kind of Problems solved, Application Domains

**Computer Vision:** Simple Image Features, Using Computer Vision

**TEXT BOOKS:**

1. "Artificial Intelligence a Modern Approach", Fourth Edition, Stuart J. Russell & Peter Norvig – Pearson.

**REFERENCE BOOKS:**

1. "Artificial Intelligence", Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.
2. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
3. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
4. Artificial Intelligence, Shivani Goel, Pearson Education.
5. Artificial Intelligence and Expert systems – Patterson, Pearson Education

## AD612OE: MACHINE LEARNING BASICS (Open Elective – I)

**B.Tech. III Year II Sem.**

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**Course Objectives:**

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques
- To study the various probability based learning techniques

**Course Outcomes:**

- Distinguish between, supervised, unsupervised and semi-supervised learning
- Understand algorithms for building classifiers applied on datasets of non-linearly separable classes
- Understand the principles of evolutionary computing algorithms
- Design an ensembler to increase the classification accuracy

**UNIT - I**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants: – Perceptron – Linear Separability – Linear Regression.

**UNIT - II**

Multi-layer Perceptron– Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation

**UNIT - III**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms

**UNIT - IV**

Support Vector Machines

Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

**UNIT - V**

Reinforcement Learning – Overview – Getting Lost Example

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Hidden Markov Models

**TEXT BOOKS:**

1. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

**REFERENCE BOOKS:**

1. Tom M Mitchell, ―Machine Learning, First Edition, McGraw Hill Education, 2013.
2. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
3. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
4. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014

## AD604PC: MACHINE LEARNING LAB

**B.Tech. III Year II Sem.**

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**Course Objective:**

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

**Course Outcomes:**

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

**List of Experiments**

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

**TEXT BOOK:**

1. Machine Learning – Tom M. Mitchell, - MGH.

**REFERENCE BOOK:**

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

## AD605PC: BIG DATA ANALYTICS LAB

**B.Tech. III Year II Sem.**

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**Course Objectives**

- Provide knowledge of Big data Analytics principles and techniques.
- Designed to give an exposure of the frontiers of Big data Analytics

**Course Outcomes**

- Use Excel as an Analytical tool and visualization tool.
- Ability to program using HADOOP and Map reduce
- Ability to perform data analytics using ML in R.
- Use MongoDB to perform data analytics

**List of Experiments**

1. Create a Hadoop cluster
2. Implement a simple map-reduce job that builds an inverted index on the set of input documents (Hadoop)
3. Process big data in HBase
4. Store and retrieve data in Pig
5. Perform data analysis using MongoDB
6. Using Power Pivot (Excel) Perform the following on any dataset
   a. Big Data Analytics
   b. Big Data Charting
7. Use R-Project to carry out statistical analysis of big data
8. Use R-Project for data visualization

**TEXT BOOKS:**

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

**REFERENCE BOOKS:**

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al, McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

## AD606PC: UI DESIGN-FLUTTER

**B.Tech. III Year II Sem.**

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**Course Objectives:**

- To learn installation of SDK of Flutter, Xcode and Android Emulator
- Understanding Stateless and Stateful Widgets and Widget Tree
- Learning of Dart basics
- Application of Animation to app.

**Course Outcomes:**

- Knowledge on installation of various softwares.
- Understanding of various Widgets
- Application of Animation to Apps

**UNIT - I Introducing Flutter and Getting Started**

Introducing Flutter, Defining Widgets and Elements, Understanding Widget Lifecycle Events, The Stateless Widget Lifecycle, The Stateful Widget Lifecycle, Understanding the Widget Tree and the Element Tree, Stateless Widget and Element Trees, Stateful Widget and Element Trees, Installing the Flutter SDK, Installing on mac OS, System Requirements, Get the Flutter SDK, Check for Dependencies, iOS Setup: Install Xcode, Android Setup: Install Android Studio, Set Up the Android Emulator, Installing on Windows, System Requirements, Get the Flutter SDK, Check for Dependencies, Install Android Studio, Set Up the Android Emulator, Installing on Linux, System Requirements, Get the Flutter SDK, Check for Dependencies, Install Android Studio, Set Up the Android Emulator, Configuring the Android Studio Editor.

**UNIT - II Creating a Hello World App**

Setting Up the Project, Using Hot Reload, Using Themes to Style Your App, Using a Global App Theme, Using a Theme for Part of an App, Understanding Stateless and Stateful Widgets, Using External Packages, Searching for Packages, Using Packages

**UNIT - III Learning Dart Basics**

Use of Dart, Commenting Code, Running the main() Entry Point, Referencing Variables, Declaring Variables, Numbers, Strings, Booleans, Lists, Maps, Runes, Using Operators, Using Flow Statements, if and else, ternary operator, for Loops, while and do-while, while and break, continue, switch and case, Using Functions, Import Packages, Using Classes, Class Inheritance, Class Mixins, Implementing Asynchronous Programming.

**UNIT- IV Creating a Starter Project Template**

Creating and Organizing Folders and Files, Structuring Widgets.

**Understanding the Widget Tree**

Introduction to Widgets, Building the Full Widget Tree, Building a Shallow Widget Tree, Refactoring with a Constant, Refactoring with a Method, Refactoring with a Widget Class.

**UNIT- V Using Common Widgets**

Using Basic Widgets, Safe Area, Container, Text, Rich Text, Column, Row, Column and Row Nesting, Buttons, Floating Action Button, Flat Button, Raised Button, Icon Button, Popup Menu Button, Button Bar, Using Images and Icons, Asset Bundle, Image, Icon, Using Decorators, Using the Form Widget to Validate Text Fields, Checking Orientation.

**Adding Animation to an App**

Using Animated Container, Using Animated Cross Fade, Using Animated Opacity, Using Animation Controlle, Using Staggered Animations,

**TEXT BOOK:**

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development, 1st edition, Wrox publisher.

**REFERENCE BOOKS:**

1. Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart 2, Packt Publishing Limited.
2. Rap Payne, Beginning App Development with Flutter: Create Cross-Platform Mobile Apps, 1st edition, Apress.
3. Frank Zammetti, Practical Flutter: Improve your Mobile Development with Google's Latest Open-Source SDK, 1st edition, Apress.

## *MC609: ENVIRONMENTAL SCIENCE

**B.Tech. III Year II Sem.**

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**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

**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 helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
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 INDIA edition.
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, BS Publications.

## AD70PC: INTRODUCTION TO PREDICTIVE ANALYTICS

**B.Tech. IV Year I Sem.**

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**Course Objectives:**

- The course deals with approaches and techniques related to prediction and forecasting

**Course Outcomes:**

- Understand predictive analytics concepts and techniques.
- Evaluate the value of statistical significance in the context of predictive analytics.
- Understand and implement sampling techniques for managing large datasets.
- Apply various predictive modeling techniques and make informed decisions based on model outcomes.

**UNIT - I**

Introduction: Overview of Predictive Analytics, Setting Up the Problem- Predictive Analytics Processing Steps: CRISP-DM, Defining Data for Predictive Modeling, Defining the Target Variable, Defining Measures of Success for Predictive Models, Doing Predictive Modeling Out of Order.

**UNIT - II**

Data Understanding, Data Visualization in One Dimension, Data Visualization, Two or Higher Dimensions, The Value of Statistical Significance.

**UNIT - III**

Data Preparation: Variable Cleaning-Incorrect Values, Consistency in Data Formats, Outliers, Multidimensional Outliers, Missing Values, Fixing Missing Data, Feature Creation, Feature Creation-Simple Variable Transformations, Fixing Skew, Binning Continuous Variables, Numeric Variable Scaling, Nominal Variable Transformation, Ordinal Variable Transformations, Multidimensional Features, Sampling.

**UNIT - IV**

Predictive Modeling-Decision Trees, Logistic Regression, Neural Networks, K- Nearest Neighbor, Naïve Bayes, Regression Models.

**UNIT - V**

Assessing Predictive Models-Batch Approach to Model Assessment, Assessing Regression Models, Model Ensembles-Motivation for Ensembles, Bagging, Boosting, Improvements to Bagging and Boosting, Model Ensembles and Occam's Razor, Interpreting Model Ensembles.

**TEXT BOOK:**

1. Applied Predictive Analytics, Principles and Techniques for the Professional Data Analyst by Dean Abbott, 2014.

## AD702PC: WEB AND SOCIAL MEDIA ANALYTICS

**B.Tech. IV Year I Sem.**

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**Course Objectives:**

- Exposure to various web and social media analytic techniques.

**Course Outcomes:**

- Knowledge on decision support systems
- Apply natural language processing concepts on text analytics
- Understand sentiment analysis
- Knowledge on search engine optimization and web analytics

**UNIT - I**

**An Overview of Business Intelligence, Analytics, and Decision Support**

Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics

**UNIT - II**

**Text Analytics and Text Mining**

Machine Versus Men on Jeopardy: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools

**UNIT - III**

**Sentiment Analysis**

Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics

**UNIT - IV**

**Web Analytics, Web Mining**

Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools

**UNIT - V**

**Social Analytics and Social Network Analysis**

Social Analytics and Social Network Analysis, Social Media Definitions and Concepts, Social Media Analytics

**Prescriptive Analytics - Optimization and Multi-Criteria Systems:**

Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking

**TEXT BOOK:**

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education

**REFERENCE BOOKS:**

1. Rajiv Sabherwal, Irma Becerra- Fernandez," Business Intelligence– Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, Shaku Atre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

**AD731PE: INTERNET OF THINGS (Professional Elective – III)**

**B.Tech. IV Year I Sem.**

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**Pre-Requisites:** Computer organization, Computer Networks

**Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

**Course Outcomes:**

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.

**UNIT - I**

**Introduction to Internet of Things** –Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates

**Domain Specific IoTs** – Home automation, Environment, Agriculture, Health and Lifestyle

**UNIT - II**

**IoT and M2M** – M2M, Difference between IoT and M2M, SDN and NFV for IoT,

**IoT System Management with NETCOZF, YANG-** Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

**UNIT - III**

**IoT Systems – Logical design using Python-**Introduction to Python – Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

**UNIT - IV**

**IoT Physical Devices and Endpoints** - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

**IoT Physical Servers and Cloud Offerings –** Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application framework –Django, Designing a RESTful web API

**UNIT V**

**Case studies-** Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

**TEXT BOOK:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

**REFERENCE BOOK:**

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

**AD732PE: DATA MINING (Professional Elective – III)**

**B.Tech. IV Year I Sem.** **L T P C**
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**Pre-Requisites:**
1. Database Management System
2. Probability and Statistics

**Course Objectives:**
- Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis.

**Course Outcomes:**
- Understand the need of data mining and pre-processing techniques.
- Perform market basket analysis using association rule mining.
- Utilize classification techniques for analysis and interpretation of data.
- Identify appropriate clustering and outlier detection techniques to handle complex data.
- Understand the mining of data from web, text and time series data.

**UNIT - I**
**Introduction to Data Mining:**
What Data mining? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing**:** Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

**UNIT - II**
**Association Analysis:** Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations.

**UNIT - III**
**Classification:** Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer Feed-Forward Neural Network, Support Vector Machines, k-Nearest-Neighbor Classifiers.

**UNIT - IV**
**Cluster Analysis:** Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density-Based Method-DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods

**UNIT - V**
**Advanced Concepts:** Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining- Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

**TEXT BOOKS:**
1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.

**REFERENCE BOOKS:**
1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India, 2007.

## AD733PE: SCRIPTING LANGUAGES (Professional Elective – III)

**B.Tech. IV Year I Sem.**

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**Prerequisites:**

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

**Course Objectives:**

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

**Course Outcomes:**

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

**UNIT - I**

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

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

**UNIT - II**

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

**UNIT - III**

**Introduction to PERL and Scripting**

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

**UNIT - IV**

**Advanced perl**

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

**UNIT - V**

**TCL**

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

**Tk**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## AD734PE: MOBILE APPLICATION DEVELOPMENT (Professional Elective – III)

**B.Tech. IV Year I Sem.**

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**Prerequisites**

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

**Course Objectives**

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

**Course Outcomes**

- Understand the working of Android OS Practically.
- Develop Android user interfaces
- Develop, deploy and maintain the Android Applications.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes
Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOK:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012

**REFERENCE BOOKS:**

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

**AD735PE: CRYPTOGRAPHY AND NETWORK SECURITY (Professional Elective – III)**

**B.Tech. IV Year I Sem.**

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**Course Objectives:**

- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection

**Course Outcomes:**

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

**UNIT - I**

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

**UNIT - II**

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

**UNIT - III**

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512),

**Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

**UNIT - IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

**UNIT - V**

**E-Mail Security:** Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

**TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

**REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

## AD741PE: QUANTUM COMPUTING (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

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**Course Objectives**

- To introduce the fundamentals of quantum computing
- The problem-solving approach using finite dimensional mathematics

**Course Outcomes**

- Understand basics of quantum computing
- Understand physical implementation of Qubit
- Understand Quantum algorithms and their implementation
- Understand The Impact of Quantum Computing on Cryptography

**UNIT - I**

**History of Quantum Computing:** Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

**UNIT - II**

**Background Mathematics:** Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

**UNIT - III**

**Qubit:** Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

**UNIT - IV**

**Quantum Algorithms:** Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

**UNIT - V**

**Noise and error correction:** Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

**TEXT BOOK:**

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge.

**REFERENCE BOOKS:**

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II.
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms.

## AD742PE: EXPERT SYSTEMS (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

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**Course Objectives:**

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

**Course Outcomes:**

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert systems
- Understand various problems with an expert systems

**UNIT-I**

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game trees, Min-max algorithms, game playing – Alpha-beta pruning.

**UNIT-II**

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

**UNIT-III**

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

**UNIT-IV**

**Expert System Tools:** Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

**UNIT-V**

**Building an Expert System:** Expert system development, Selection of the tool, Acquiring Knowledge, Building process.

**Problems with Expert Systems:** Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

**TEXT BOOKS:**

1. Elain Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill, New Delhi,
2. Waterman D.A., “A Guide to Expert Systems”, Addison Wesley Longman,

**REFERENCE BOOKS:**

1. Stuart Russel and other Peter Norvig, “Artificial Intelligence – A Modern Approach”, Prentice-Hall.
2. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley.
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley, Weiss S. M. and Kulikowski C.A., “A Practical Guide to Designing Expert Systems”, Rowman & Allanheld, New Jersey.

## AD743PE: CLOUD COMPUTING (Professional Elective – III)

**B.Tech. IV Year I Sem.**

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**Pre-requisites:**

1. A course on “Computer Networks”.
2. A course on “Operating System”.

**Course Objectives:**

- This course provides an insight into cloud computing
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing

**Course Outcomes:**

- Understand different computing paradigms and potential of the paradigms and specifically cloud computing
- Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
- Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.

**UNIT - I**

Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

**UNIT - II**

**Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing:** SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

**UNIT - III**

**Virtualization, Programming Models for Cloud Computing:** MapReduce, Cloud Haskell, Software Development in Cloud

**UNIT - IV**

**Networking for Cloud Computing:** Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

**UNIT - V**

Security in Cloud Computing, and Advanced Concepts in Cloud Computing

**TEXT BOOK:**

1. Chandrasekaran, K. Essentials of cloud computing. CRC Press, 2014.

**REFERENCE BOOKS:**

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.

## AD744PE: GAME THEORY (Professional Elective – IV)

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Course Objectives**

The course will explain in depth the standard equilibrium concepts (such as Nash equilibrium, Subgame-Perfect Nash Equilibrium, and others) in Game Theory.

**Course Outcomes**

- Understand the basic concepts of game theory and solutions
- Understand different types of equilibrium interpretations
- Understand and analyze knowledge and solution concepts
- Analyze extensive games with perfect information

**UNIT - I**

Introduction- Game Theory, Games and Solutions, Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation

Nash Equilibrium- Strategic Games, Nash Equilibrium, Examples, Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

**UNIT - II**

Mixed, Correlated, and Evolutionary Equilibrium -Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium

Rationalizability and Iterated Elimination of Dominated Actions- Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions

**UNIT - III**

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? Knowledge and Solution Concepts, The Electronic Mail Game

**UNIT - IV**

Extensive Games with Perfect Information -Extensive Games with Perfect Information, Subgame Perfect Equilibrium, Two Extensions of the Definition of a Game, The Interpretation of a Strategy, Two Notable Finite Horizon Games, Iterated Elimination of Weakly Dominated Strategies

Bargaining Games -Bargaining and Game Theory, A Bargaining Game of Alternating Offers, Subgame Perfect Equilibrium, Variations and Extensions

**UNIT - V**

Repeated Games - The Basic Idea Infinitely Repeated Games vs. Finitely Repeated Games, Infinitely Repeated Games: Definitions, Strategies as Machines, Trigger Strategies: Nash Folk Theorems, Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion, Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion, Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion, The Structure of Subgame Perfect Equilibria Under the Discounting Criterion, Finitely Repeated Game

**TEXT BOOKS:**

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press.

**REFERENCE BOOKS:**

1. Game Theory, Roger Myerson, Harvard University Press.
2. Game Theory, D. Fudenberg and J. Tirole, MIT Press.
3. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.
4. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
5. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

**AD745PE: KNOWLEDGE REPRESENTATION AND REASONING**
**(Professional Elective – IV)**

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Course Objectives:**

- To investigate the key concepts of Knowledge Representation (KR) techniques and different notations.
- To integrate the KR view as a knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques and process, knowledge acquisition and sharing of ontology.

**Course Outcomes:**

- Analyze and design knowledge-based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge-engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge.

**UNIT - I**

**The Key Concepts:** Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity

**UNIT - II**

**Ontology:** Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

**UNIT - III**

**Knowledge Representations:** Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

**UNIT - IV**

**Processes:** Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

**UNIT - V**

**Knowledge Soup:** Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Nonmonotonic Logic, Theories, Models and the world, Semiotics Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

**TEXT BOOKS:**

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

**AD721OE: INTRODUCTION TO NATURAL LANGUAGE PROCESSING**
**(Open Elective – II)**

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Prerequisites:**

- Data structures and compiler design

**Course Objectives:**

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

**Course Outcomes:**

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

**UNIT - I**

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

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

**UNIT - II**

**Syntax I:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

**UNIT – III**

**Syntax II:** Models for Ambiguity Resolution in Parsing, Multilingual Issues

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

**UNIT - IV**

**Semantic Parsing II:** Predicate-Argument Structure, Meaning Representation Systems

**UNIT - V**

**Language Modeling:** Introduction, N-Gram Models, Language Model Evaluation, Bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, Bayesian topic based, Multilingual and Cross Lingual Language Modeling

**TEXT BOOKS:**

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication

**REFERENCE BOOK:**

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

## AD722OE: AI APPLICATIONS (Open Elective – II)

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Prerequisites:** Fundamentals of AI

**Course Objectives:**

- To give deep knowledge of AI and how AI can be applied in various fields to make life easy.

**Course Outcomes:**

- Correlate AI and solutions to modern problems.
- Use of AI in business applications
- Application of AI in manufacturing automation
- Use of AI in streaming of data and Network applications

**UNIT - I**

Alibaba: Using Artificial Intelligence To Power The Retail And Business-To-Business Services Of The Future
Amazon: Using Deep Learning To Drive Business Performance

**UNIT - II**

McDonald's: Using Robots And Artificial Intelligence To Automate Processes
Walmart: Using Artificial Intelligence To Keep Shelves Stacked And Customers Happy

**UNIT - III**

LinkedIn: Using Artificial Intelligence To Solve The Skills Crisis
Netflix: Using Artificial Intelligence To Give Us A Better TV Experience

**UNIT - IV**

Salesforce: How Artificial Intelligence Helps Businesses Understand Their Customers
Uber: Using Artificial Intelligence To Do Everything

**UNIT - V**

Siemens: Using Artificial Intelligence And Analytics To Build The Internet Of Trains
Tesla: Using Artificial Intelligence To Build Intelligent Cars

**TEXT BOOK:**

1. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

## AD703PC: PROFESSIONAL PRACTICE, LAW & ETHICS

**B.Tech. IV Year I Sem.**

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**Course Objectives:**

- Understand the types of roles they are expected to play in the society as practitioners of the engineering profession.
- To develop some ideas of the legal and practical aspects of their profession.

**Course Outcome:**

- Practice ethics and rule of the land in their profession
- Follow the principles and elements of legal contracts
- Able to resolve disputes pertaining to arbitration, reconciliation
- Aware of intellectual property loss

**UNIT - I**

**Professional Practice and Ethics:** Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders

**UNIT - II**

**Law of Contract:** Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

**UNIT - III**

**Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:** Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration;

**UNIT - IV**

**Arbitration agreements** – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

**UNIT - V**

**Law relating to Intellectual property:** Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970

**TEXT BOOKS:**

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ravinder Kaur, Legal Aspects of Business, 4e, Cengage Learning, 2016.

**REFERENCE BOOKS:**

1. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
2. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House.
3. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers.

## AD711PE: INTERNET of THINGS LAB (Professional Elective – III)

**B.Tech. IV Year I Sem.**

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**Course Objectives**

- To introduce the raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of distance sensor on IoT devices

**Course Outcomes**

1. Ability to introduce the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor
2. Get the skill to program using python scripting language which is used in many IoT devices

**List of Experiments**

1. Using Raspberry pi
   a. Calculate the distance using a distance sensor.
   b. Interface an LED and switch with Raspberry pi.
   c. Interface an LDR with Raspberrry Pi.

2. Using Arduino
   a. Calculate the distance using a distance sensor.
   b. Interface an LED and switch with Aurdino.
   c. Interface an LDR with Aurdino
   d. Calculate temperature using a temperature sensor.

3. Using Node MCU
   a. Calculate the distance using a distance sensor.
   b. Interface an LED and switch with Raspberry pi.
   c. Interface an LDR with Node MCU
   d. Calculate temperature using a temperature sensor.

4. Installing OS on Raspberry Pi
   a) Installation using PiImager
   b) Installation using image file
   - Downloading an Image
   - Writing the image to an SD card
     - using Linux
     - using Windows
   - Booting up Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html

5. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
   update your repositories list:
   install the package for Python 3:
   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

6. Create a DJANGO project and an app.
7. Create a DJANGO view for weather station REST API
8. Create DJANGO template

9. Configure MYSQL with DJANGO framework

**TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

**REFERENCE BOOKS:**

1. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

## AD712PE: DATA MINING LAB (Professional Elective – III)

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Prerequisites**

- A course on "Database Management System

**Course Objectives:**

- The course is intended to obtain hands-on experience using data mining software.
- Intended to provide practical exposure of the concepts in data mining algorithms

**Course Outcomes:**

1. Apply preprocessing statistical methods for any given raw data.
2. Gain practical experience of constructing a data warehouse.
3. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
4. Apply OLAP operations on data cube construction

**LIST OF EXPERIMENTS**: Experiments using Weka/ Pentaho/Python

1. Data Processing Techniques:
   (i) Data cleaning (ii) Data transformation – Normalization (iii) Data integration
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
3. Data Warehouse schemas – star, snowflake, fact constellation
4. Data cube construction – OLAP operations
5. Data Extraction, Transformations & Loading operations
6. Implementation of Attribute oriented induction algorithm
7. Implementation of apriori algorithm
8. Implementation of FP – Growth algorithm
9. Implementation of Decision Tree Induction
10. Calculating Information gain measures
11. Classification of data using Bayesian approach
12. Classification of data using K – nearest neighbour approach
13. Implementation of K – means algorithm
14. Implementation of BIRCH algorithm
15. Implementation of PAM algorithm
16. Implementation of DBSCAN algorithm

**TEXT BOOKS:**

1. Data Mining – Concepts and Techniques - JIAWEI HAN &MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining &OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007

**REFERENCE BOOK:**

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining, Pearson Education.

## AD713PE: SCRIPTING LANGUAGES LAB (Professional Elective – III)

**B.Tech. IV Year I Sem.**

| L | T | P | C |
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**Prerequisites:** Any High level programming language (C, C++)

**Course Objectives**

- To Understand the concepts of scripting languages for developing web based projects
- To understand the applications the of Ruby, TCL, Perl scripting languages

**Course Outcomes**

1. Ability to understand the differences between Scripting languages and programming languages
2. Gain some fluency programming in Ruby, Perl, TCL

**LIST OF EXPERIMENTS**

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the users first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for sorting a list using a comparison function
14. Write a TCL script to (i) create a list (ii) append elements to the list (iii) Traverse the list (iv) Concatenate the list
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.
    b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions
    a) Shift
    b) Unshift
    c) Push
19. a) Write a Perl script to substitute a word, with another word in a string.
    b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## AD714PE: MOBILE APPLICATION DEVELOPMENT LAB (Professional Elective – III)

**B.Tech. IV Year I Sem.**

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|---|---|---|---|
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**Course Objectives:**

- To learn how to develop Applications in an android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

**Course Outcomes:**

1. Understand the working of Android OS Practically.
2. Develop user interfaces.
3. Develop, deploy and maintain the Android Applications.

**LIST OF EXPERIMENTS:**

1. Create an Android application that shows Hello + name of the user and run it on an emulator.

(b) Create an application that takes the name from a text box and shows hello message along with the name entered in the text box, when the user clicks the OK button.

2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Datepicker), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on the right fragment instead of the second screen with the back button. Use Fragment transactions and Rotation event listeners.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store usernames and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with a Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

**TEXT BOOKS:**

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

**REFERENCE BOOK:**

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

**AD715PE: CRYPTOGRAPHY AND NETWORK SECURITY LAB (Professional Elective – III)**

**B.Tech. IV Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**Course Objectives:**

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.

**Course Outcomes:**

- Understand basic cryptographic algorithms, message and web authentication and security issues.
- Identify information system requirements for both of them such as client and server.
- Understand the current legal issues towards information security.

**List of Experiments:**

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and display the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
   a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement the RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA

**TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition

**REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

**AD851PE: SOCIAL NETWORK ANALYSIS (Professional Elective – V)**

**B.Tech. IV Year II Sem.**

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

**Prerequisites**

- Web Technologies
- Computer Networks
- Data Warehousing and Data Mining

**Course Objectives**

- Understand the concepts of social media
- Learn the mechanisms for social network analysis
- Analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.

**Course Outcomes**

- Ability to construct social network maps easily
- Gain skills in tracking the content flow through the social media
- Understand NodeXL use to perform social network analysis

**UNIT - I**

**Introduction:** Social Media and Social Networks
**Social Media:** New Technologies of Collaboration
**Social Network Analysis:** Measuring, Mapping, and Modelling collections of Connections.

**UNIT - II**

NodeXL, Layout, Visual Design, and Labelling, Calculating and Visualising Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

**UNIT - III**

**CASE STUDIES:**
**Email:** The lifeblood of Modern Communication**.**
**Thread Networks:** Mapping Message Boards and Email Lists
**Twitter:** Conversation, Entertainment and Information

**UNIT - IV**

**CASE STUDIES:**
Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

**UNIT - V**

**CASE STUDIES:**
**You Tube:** Contrasting Patterns of Content Interaction, and Prominence**.**
**Wiki Networks:** Connections of Creativity and Collaboration

**TEXT BOOK**:

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.

**REFERENCE BOOKS:**

1. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.
2. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, MGH, 2011.

**AD852PE: FEDERATED MACHINE LEARNING (Professional Elective – V)**

**B.Tech. IV Year II Sem.**

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**Prerequisites**

- The prerequisite knowledge for this course includes machine learning, basic computer systems and basic programming skills.

**Course Objectives**

- Understand the key concepts and issues behind Federated Learning
- Get familiar with key theoretical results of Federated Learning

**Course Outcomes**

- Understand the basics on privacy-preserving ML
- Analyze the key concepts of Distributed ML and FL
- Understand the key concepts and applications of Horizontal FL and Vertical FL
- Motivates the intensive mechanism design for FL
- Analyze the concepts of federated reinforcement learning

**UNIT - I**

Introduction: Motivation, Federated Learning as a Solution, The Definition of Federated Learning, Categories of Federated Learning, Current Development in Federated Learning, Research Issues in Federated Learning, Open-Source Projects, Standardization Efforts, The Federated AI Ecosystem
Background: Privacy-Preserving Machine Learning, PPML and Secure ML, Threat and Security Models, Privacy Threat Models, Adversary and Security Models, Privacy Preservation Techniques, Secure Multi-Party Computation, Homomorphic Encryption, Differential Privacy

**UNIT - II**

Distributed Machine Learning: Introduction to DML, The Definition of DML, DML Platforms, Scalability-Motivated DML, Large-Scale Machine Learning, Scalability-Oriented DML Schemes, Privacy-Motivated DML, Privacy-Preserving Decision Trees, Privacy-Preserving Techniques, Privacy-Preserving DML Schemes, Privacy-Preserving Gradient Descent, Vanilla Federated Learning, Privacy-Preserving Methods

**UNIT - III**

Horizontal Federated Learning: The Definition of HFL, Architecture of HFL, The Client- Server Architecture, The Peer-to-Peer Architecture, Global Model Evaluation, The Federated Averaging Algorithm, Federated Optimization, The FedAvg Algorithm, The Secured FedAvg Algorithm, Improvement of the FedAvg Algorithm, Communication Efficiency, Client Selection Vertical Federated Learning: The Definition of VFL, Architecture of VFL, Algorithms of VFL, Secure Federated Linear Regression, Secure Federated Tree-Boosting

**UNIT - IV**

Federated Transfer Learning: Heterogeneous Federated Learning, Federated Transfer Learning, The FTL Framework, Additively Homomorphic Encryption, The FTL Training Process, The FTL Prediction Process, Security Analysis, Secret Sharing-Based FTL Incentive Mechanism Design for Federated Learning: Paying for Contributions, Profit- Sharing Games, Reverse Auctions, A Fairness-Aware Profit Sharing Framework, Modeling Contribution, Modeling Cost, Modeling Regret, Modeling Temporal Regret, The Policy Orchestrator, Computing Payoff Weightage

**UNIT - V**

Federated Learning for Vision, Language, and Recommendation: Federated Learning for Computer Vision, Federated CV, Federated Learning for NLP, Federated NLP, Federated Learning for Recommendation Systems, Recommendation Model, Federated Recommendation System

Federated Reinforcement Learning:
Introduction to Reinforcement Learning, Policy, Reward, Value Function, Model of the Environment, RL Background Example, Reinforcement Learning Algorithms, Distributed Reinforcement Learning, Asynchronous Distributed Reinforcement Learning, Synchronous Distributed Reinforcement Learning, Federated Reinforcement Learning, Background and Categorization

**TEXT BOOK:**

1. Federated Learning, Qiang Yang, Yang Liu, Yong Cheng, Yan Kang, Tianjian Chen, and Han Yu Synthesis Lectures on Artificial Intelligence and Machine Learning 2019.

**AD853PE: AUGMENTED REALITY & VIRTUAL REALITY (Professional Elective –V)**

**B.Tech. IV Year II Sem.**

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**Course Objectives:**

- Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts**.**
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

**Course Outcomes:**

- Describe how AR systems work and list the applications of AR.
- Understand the software architectures of AR.
- Understand the Visual perception and rendering in VR
- Understand the interaction, auditory perception and rendering in VR

**UNIT - I**

**Introduction to Augmented Reality:** Augmented Reality - Defining augmented reality, history of augmented reality, Examples, Related fields

**Displays:** Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays

**Tracking:** Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

**UNIT - II**

**Computer Vision for Augmented Reality:** Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.

**Interaction**: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaces on Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

**Software Architectures**: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs

**UNIT - III**

**Introduction to Virtual Reality:** Defining Virtual Reality, History of VR, Human Physiology and Perception

**The Geometry of Virtual Worlds:** Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations

**Light and Optics:** Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

**UNIT - IV**

**The Physiology of Human Vision:** From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

**Visual Perception:** Visual Perception - Perception of Depth, Perception of Motion, Perception of Color

**Visual Rendering:** Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

**UNIT - V**

**Motion in Real and Virtual Worlds:** Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection

**Interaction:** Motor Programs and Remapping, Locomotion, Social Interaction

**Audio:** The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

**TEXT BOOKS:**

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India;First edition (12 October 2016),ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016

**REFERENCE BOOKS:**

1. Allan Fowler-AR Game Developmentll, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

**AD854PE: WEB SECURITY (Professional Elective –V)**

**B.Tech. IV Year II Sem.**

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**Course Objectives:**

1. Give an Overview of information security
2. Give an overview of Access control of relational databases

**Course Outcomes:** Students should be able to

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand how common mistakes can be bypassed and exploit the application
4. Identify common application vulnerabilities

**UNIT - I**

The Web Security, The Web Security Problem, Risk Analysis and Best Practices
Cryptography and the Web: Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography, Digital Identification

**UNIT - II**

The Web's War on Your Privacy, Privacy-Protecting Techniques, Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

**UNIT - III**

Database Security: Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

**UNIT - IV**

Security Re-engineering for Databases: Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and

**UNIT - V**

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location Based Access Control, Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

**TEXT BOOKS:**

1. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly.
2. Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

**AD855PE: AD-HOC & SENSOR NETWORKS (Professional Elective – V)**

**B.Tech. IV Year II Sem.**

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**Prerequisites**
- Computer Networks
- Distributed Systems
- Mobile Computing

**Course Objectives**
- To understand the challenges of routing in ad-hoc and sensor networks
- To understand various broadcast, mutlicast and geocasting protocols in ad hoc and sensor networks
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN

**Course Outcomes**
- Understand the concepts of sensor networks and applications
- Understand and compare the MAC and routing protocols for adhoc networks
- Understand the transport protocols of sensor networks

**UNIT - I**
**Introduction to Ad Hoc Networks**
Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.
**Routing in MANETs**
Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms-Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; *Position- based* routing algorithms-Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

**UNIT - II**
**Data Transmission**
Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

**UNIT - III**
**Geocasting**
Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.
TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

**UNIT - IV**
**Basics of Wireless Sensors and Lower Layer Issues**-Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

**UNIT - V**
**Upper Layer Issues of WSN**
Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

**TEXT BOOKS**
1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications, March 2006, ISBN – 981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman)

**REFERENCE BOOKS:**
1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols and Applications, Wiley.

## AD861PE: SPEECH AND VIDEO PROCESSING (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Course Objectives**

- To make students understand speech and video processing techniques

**Course Outcomes:**

- Describe the mechanisms of human speech production systems and methods for speech feature extraction.
- Understand basic algorithms of speech analysis and speech recognition.
- Explain basic techniques in digital video processing, including imaging characteristics and sensors.
- Apply motion estimation and object tracking algorithms on video.

**UNIT - I**

**Speech processing concepts**

The speech production mechanism, Discrete time speech signals, Pole-Zero modeling of speech, relevant properties of the fast Fourier transform for speech recognition, convolution, linear and non linear filter banks, spectral estimation of speech using DFT.
Linear Prediction analysis of speech.

**UNIT - II**

**Speech recognition**

Feature extraction for speech, static and dynamic feature for speech recognition, MFCC, LPCC, Distance measures, vector quantization models, Gaussian Mixture model, HMM.

**UNIT - III**

**Multi-Dimensional Signals and Systems**

Multi-Dimensional Signals, Multi-Dimensional Transforms, Multi-Dimensional Systems, Multi-Dimensional Sampling Theory, Sampling Structure Conversion
**Digital Images and Video:** Human Visual System and Color, Digital Video

**UNIT - IV**

**Motion Estimation**

Image Formation, Motion Models, 2D Apparent-Motion Estimation, Differential Methods, Matching Methods, Nonlinear Optimization Methods, Transform-Domain Methods, 3D Motion and Structure Estimation

**UNIT - V**

**Video Segmentation and Tracking**

Image Segmentation, Change Detection, Motion Segmentation, Motion Tracking, Image and Video Matting, Performance Evaluation

**TEXT BOOKS:**

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processing series
2. Digital Video processing, A Murat Tekalp, 2nd edition, Prentice Hall.

**REFERENCE BOOKS:**

1. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
2. Video Processing and Communications, Yao Wang, J. Osternann and Qin Zhang, Pearson Education.
3. “Speech and Audio Signal Processing”, B.Gold and N. Morgan, Wiley.
4. “Digital image sequence processing, Compression, and analysis”, Todd R. Reed, CRC Press.
5. “Handbook of Image and Video processing”, Al Bovik, Academic press, second Edition.

## AD862PE: ROBOTIC PROCESS AUTOMATION (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Course Objectives:**

- Introduce robotic process automation, techniques of automation using UIPath RPA tool.

**Course Outcomes:**

- Understand the concepts of Robotic Process Automation.
- Apply the flow chart mechanism in various calculations.
- Applying UIPath tool for debugging process.
- Design system managing techniques.
- Create application for process automation using UIPath tool.

**UNIT - I**

**Robotic Process Automation:** Introduction**,** Scope and techniques of automation, Robotic process automation, Components of RPA, RPA platforms, About UiPath
**UIPath Stack** Uipath Studio, Uipath Robot, Types of Robots, UiPath Orchestrator
**UIPath Studio** Projects, User interface
**The User Interface:** Task recorder, Advanced UI interactions: Input methods, Output methods

**UNIT - II**

**Sequence, Flowchart, and Control Flow:** Sequencing the workflow, Activities, Control Flow, various types of loops and decision making
**Data Manipulation:** Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, File operation with step-by-step example, CSV/Excel to data table and vice versa

**UNIT - III**

**Taking Control of the Controls:** Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Handling events, revisit recorder, When to use OCR, Types of OCR available, How to use OCR
**Plugins and Extensions:** Terminal Plugin, SAP Automation, Citrix automation and Credential management

**UNIT - IV**

**Handling User Events and Assistant Bots:** Assistant bots, Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event
**Exception Handling, Debugging, and Logging:** Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting

**UNIT - V**

**Managing and Maintaining the Code:** Project organization, nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files
**Deploying and Maintaining the Bot:** Publishing using publish utility, using Orchestration Server to control bots, deploy bots, License Management, Publishing and Managing updates

**TEXT BOOKS:**

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition

**REFERENCE BOOKS:**

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

## AD863PE: RANDOMIZED ALGORITHMS (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Course Objective:**

- To introduce the power of randomization in the design of algorithms.

**Course Outcomes:**

- Appreciate the fundamentals of randomized algorithm design.
- Understand the fundamentals of Markov chains and the Monte Carlo method.
- Apply high probability analysis to selected randomized algorithms.
- Understand the Fingerprint and Pattern Matching techniques

**UNIT - I**

Introduction, A Min – Cut algorithm, Las Vegas and Monte Carlo, Binary Planar Partitions, A Probabilistic Recurrence

Game-Theoretic Techniques: Game Tree Evaluation, The Minimax Principle

**UNIT - II**

Moments and Deviations: Occupancy Problems, The Markov and Chebyshev Inequalities, Randomized Selection, Two Point sampling, The Coupon Collector's problem.

Markov Chains and Random Walks: A 2-SAT example, Markov Chains, Random Walks on Graphs, Graph Connectivity

**UNIT - III**

Algebraic Techniques: Fingerprinting and Freivald's Technique, Verifying Polynomial Identities, Perfect Matching in Graphs, Verifying Equality of Strings, A Comparison of Fingerprinting Techniques, Pattern Matching

**UNIT - IV**

Data Structures: The Fundamental of Data-structures, Random Treaps, Skip Lists, Hash Tables

Graph Algorithms: All Pairs Shortest Path, The Min- Cut Problem, Minimum Spanning Trees

**UNIT - V**

Geometric Algorithms: Randomized Incremental Construction, Convex Hulls in the Plane, Duality, Half-Space Intersections, Dalaunay Triangulations, Trapezoidal Decompositions, Parallel and Distributed Algorithms: The PRAM Model, Sorting on a PRAM, Maximal Independent Sets, Perfect Matchings

**TEXT BOOKS:**

1. Randomized Algorithms: Rajeev Motwani, Prabhakar Raghavan, cambridge University Press
2. Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis by Eli Upfal and Michael Mitzenmacher.

## AD864PE: COGNITIVE COMPUTING (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Prerequisites:** Probability theory

**Course Objectives:**

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

**Course Outcomes:**

- Understand cognitive computing
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing.

**UNIT - I**

**Introduction to Cognitive Science:** Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

**UNIT - II**

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

**UNIT - III**

Cognitive Modeling: modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

**UNIT - IV**

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, OpenCog, CopyCat, Memory Networks.

**UNIT - V**

DeepQA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

**TEXT BOOK:**

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.

**REFERENCE BOOKS:**

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Hollan.

## AD865PE: SEMANTIC WEB (Professional Elective – VI)

**B.Tech. IV Year II Sem.**

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**Course Objectives:**

- Introduce Semantic Web Vision and learn Web intelligence
- Understanding about XML, RDF, RDFS, OWL
- Querying Ontology and Ontology Reasoning
- To learn Semantic Web Applications, Services and Technology
- To learn Knowledge Representation for the Semantic Web

**Course Outcomes:**

- Understand the characteristics of the semantic web technology
- Understand the concepts of Web Science, semantics of knowledge resource and ontolog
- Describe logic semantics and inference with OWL.
- Use ontology engineering approaches in semantic applications
- Learn about web graph processing for various applications such as search engine, community detection

**UNIT - I**

**Introduction:** Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

**UNIT - II**

**Web Services:** Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

**UNIT - III**

**Resource Description Framework:** Features, Capturing Knowledge with RDF.
**XML Technologies:** XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, XQuery, XLink, XPointer, XInclude, XMLBase, XHTML, XForms, SVG.

**UNIT - IV**

**Taxonomies and Ontologies:** Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

**UNIT - V**

**Semantic Web Application:** Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base.
**Semantic Search Technology:** Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle

**TEXT BOOKS:**

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst , Kevin T. Smith, Wiley Publishing, Inc.
2. Peter Mika, Social Networks and the Semantic Web, Springer

**REFERENCE BOOKS:**

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience
2. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst , Kevin T. Smith, Wiley Publishing, Inc.
3. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
4. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
5. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
6. Programming the Semantic Web, T. Segaran, C. Evans,J. Taylor, O'Reilly, SPD.

## AD831OE: CHATBOTS (Open Elective – III)

**B.Tech. IV Year II Sem.**

| L | T | P | C |
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**Course Objectives:**

- Knowledge on concepts of chatbots and understanding the developer environment bot framework.

**Course Outcomes:**

- Understand basic concepts of chatbots
- Analyze different entities in building bots
- Understand the concepts of advanced bot building
- Discuss different types of chatbot use cases

**UNIT - I**

**Introduction to Chatbots:** Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms

**UNIT - II**

**Setting Up the Developer Environment Botframework**

Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database.

**UNIT - III**

Basics of Bot Building- Intents, Entities

**UNIT - IV**

**Advanced Bot Building**

Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier

**UNIT - V**

**Business and Monetization**

Analytics, Chatbot Use Cases- Modes of Communication- Business-to-Business (B2B), ChapBusiness-to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to-Employee (B2E), Employee-to-Employee (E2E), Chatbots by Industry Vertical

**TEXT BOOK:**

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress

**REFERENCE BOOKS:**

1. Drexen Braxley, Chat GPT #1 Bible - 10 Books in 1: A Comprehensive Guide to AI: Elevate Your Daily Life, Increase Work Output, Secure Financial Gains, Foster Career Growth, and Cultivate Modern Talents Paperback
2. D. Nardo Publications, ChatGPT Made Simple How Anyone Can Harness AI To Streamline Their Work, Study & Everyday Tasks To Boost Productivity & Maintain Competitive Edge By Mastering Prompt Engineering
3. Robert E. Miller,Prompt Engineering Bible Join and Master the AI RevolutionsProfit Online with GPT-4 & Plugins for Effortless Money Making!
4. Lucas Foster, Chat GPT Bible Developer and Coder Special Edition: Enhancing Coding Productivity with AI-Assisted Conversations.

## AD832OE: EVOLUTIONARY COMPUTING (Open Elective – III)

**B.Tech. IV Year II Sem.**

| L | T | P | C |
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**Prerequisites:** Knowledge on algorithms

**Course Objectives:**

- Introduce the concepts of evolutionary computing and various evolution algorithms

**Course Outcomes:**

- Appraise the significance of evolutionary computing
- Apply genetic operators and genetic programming for classification problems
- Hybridization of genetic algorithms with other techniques
- Understand multi objective, interactive evolutionary algorithms

**UNIT - I**

**Optimization, Modelling, and Simulation Problems**

Search Problems, Optimization Versus Constraint Satisfaction, The Famous NP Problems

**Evolutionary Computing:** The Origins: The Main Evolutionary Computing Metaphor, Brief History, The Inspiration from Biology, Evolutionary Computing

**Evolutionary Algorithm:** Definition, Components of Evolutionary Algorithms, An Evolutionary Cycle by Hand, Example Applications, The Operation of an Evolutionary Algorithm, Natural Versus Artificial Evolution, Evolutionary Computing, Global Optimization, and Other Search Algorithms

**UNIT - II**

**Representation, Mutation, and Recombination**

Representation and the Roles of Variation Operators, Binary Representation, Integer Representation, Real-Valued or Floating-Point Representation, Permutation Representation, Tree Representation

**Fitness, Selection, and Population Management:** Population Management Models, Parent Selection, Survivor Selection, Selection Pressure, Multimodal Problems, Selection, and the Need for Diversity

**Popular Evolutionary Algorithm Variants:** Genetic Algorithms, Evolution Strategies, Evolutionary Programming, Genetic Programming, Learning Classifier Systems, Differential Evolution, Particle Swarm Optimization, Estimation of Distribution Algorithms

**UNIT - III**

**Parameters and Parameter Tuning:** Evolutionary Algorithm Parameters, EAs and EA Instances, Designing Evolutionary Algorithms, The Tuning Problem, Algorithm Quality: Performance and Robustness, Tuning Methods.

**Parameter Control:** Introduction, Examples of Changing Parameters, Classification of Control Techniques, Examples of Varying EA Parameters

**UNIT - IV**

**Working with Evolutionary Algorithms:** Working of EA, Performance Measures, Test Problems for Experimental Comparisons, Example Applications

**Hybridization with Other Techniques: Memetic Algorithms:** Motivation for Hybridizing EAs, A Brief Introduction to Local Search, Structure of a Memetic Algorithm, Adaptive Memetic Algorithms, Design Issues for Memetic Algorithms, Example Application: Multistage Memetic Timetabling

**UNIT - V**

**Multiobjective Evolutionary Algorithms**

Multiobjective Optimization Problems, Dominance and Pareto Optimality, EA Approaches to Multiobjective Optimization, Example Application: Distributed Coevolution of Job Shop Schedules
**Constraint Handling:** Two Main Types of Constraint Handling, Approaches to Handling Constraints, Example Application: Graph Three-Colouring
**Interactive Evolutionary Algorithms:** Characteristics of Interactive Evolution, Algorithmic Approaches to the Challenges of IEAs, Interactive Evolution as Design vs. Optimization, Example Application: Automatic Elicitation of User Preferences

**TEXT BOOK:**

1. A. E. Eiben, J. E. Smith, Introduction to Evolutionary Computing, Second Edition, Springer.

**REFERENCE BOOKS:**

1. David E. Goldberg, "Genetic Algorithms in search, Optimization & Machine Learning".
2. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.