**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**(Established by Govt. of A.P., ACT No.30 of 2008)**

**ANANTAPUR – 515 002 (A.P) INDIA**

**B.TECH. - COMPUTER SCIENCE & ENGINEERING**

**Course Structure (R20) – III & IV Year**

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| **Semester–V** |
| **S.No.** | **Course Code** | **Course Name** | **L** | **T** | **P** | **Credits** |
| **1.** | 20A05501T | Computer Networks | 3 | 0 | 0 | 3 |
| **2.** | 20A05502T | Artificial Intelligence | 3 | 0 | 0 | 3 |
| **3.** | 20A05503 | Formal Languages and Automata Theory | 3 | 0 | 0 | 3 |
| **4.** | 20A05504a20A04702b20A05504c | **Professional Elective Course – I**Software Project ManagementDigital Image ProcessingBig Data Technologies | 3 | 0 | 0 | 3 |
| **5.** |  | **Open Elective Course – I** | 3 | 0 | 0 | 3 |
| **6.** | 20A05501P | Computer Networks Lab | 0 | 0 | 3 | 1.5 |
| **7.** | 20A05502P | Artificial Intelligence Lab | 0 | 0 | 3 | 1.5 |
|  8. |  20A05506 | **Skill oriented course – III**Advanced Web Application Development | 1 | 0 | 2 | 2 |
| **9.** | 20A05507 | Evaluation of Community Service Project |  |  |  | 1.5 |
|  **Total** | **21.5** |

**Open Elective-I**

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| **S.No** | **Course** **Code** | **Course Name** | **Offered by the Dept.** |
| 1 | 20A01505 | Building Technology  | CE |
| 2 | 20A02505 | Electric Vehicles | EEE |
| 3 | 20A03505 | 3D Printing Technology  | ME |
| 4 | 20A04505 | Digital Electronics | ECE |
| 5 | 20A27505 | Computer Applications in Food Processing | FT |
| 6 | 20A54501 | Optimization Techniques  | Mathematics |
| 7 | 20A56501 | Materials Characterization Techniques | Physics |
| 8 | 20A51501 | Chemistry of Energy Materials | Chemistry |

**Note:**

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.

2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.

3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

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| **Semester–VI** **Semester-VI** |
| **S.No** | **Course Code** | **Course Name** | **L** | **T** | **P** | **Credits** |
| **1.** | 20A05601T | Compiler Design | 3 | 0 | 0 | 3 |
| **2.** | 20A05602T | Machine Learning  | 3 | 0 | 0 | 3 |
| **3.** | 20A05603T | Internet of Things | 3 | 0 | 0 | 3 |
| **4.** | 20A05604a20A05604b20A05604c | **Professional Elective Course– II**Software TestingAdvanced Computer ArchitectureComputer Vision | 3 | 0 | 0 | 3 |
| **5.** |  | **Open Elective Course – II** | 3 | 0 | 0 | 3 |
| **6.** | 20A05601P | Compiler Design Lab | 0 | 0 | 3 | 1.5 |
| **7.** | 20A05602P | Machine Learning Lab | 0 | 0 | 3 | 1.5 |
| **8.** | 20A05603P | Internet of Things Lab | 0 | 0 | 3 | 1.5 |
| **9.** | 20A52401 | **Skill oriented course - IV**Soft Skills | 1 | 0 | 2 | 2 |
| **10.** | 20A99601 | **Mandatory Non-credit Course**Intellectual Property Rights & Patents | 2 | 0 | 0 | 0 |
| **Total** | **21.5** |
| Industry Internship (Mandatory) for 6 – 8 weeks duration during summer vacationHonors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also) 4 0 0 4 |

**Open Elective-II**

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| **S.No** | **Course Code** | **Course Name** | **Offered by the Dept.** |
| 1 | 20A01704 | Environmental Economics | CE |
| 2 | 20A02605 | Smart Electric Grid | EEE |
| 3 | 20A03605 | Non-Conventional sources of energy | ME |
| 4 | 20A04605 | Signal Processing | ECE |
| 5 | 20A27605 | Food Refrigeration and Cold Chain Management | FT |
| 6 | 20A54701 | Wavelet Transforms & its applications  | Mathematics |
| 7 | 20A56701 | Physics Of Electronic Materials and Devices | Physics |
| 8 | 20A51701 | Chemistry of Polymers and its Applications | Chemistry |

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| **Semester-VII** |
| **S.No.** | **Course Code** | **Course Name** | **L** | T | **P** | **Credits** |
| **1.** | 20A05701a20A05701b20A05701c | **Professional Elective Course– III**Cloud ComputingAgile MethodologiesVehicular Adhoc Networks | 3 | 0 | 0 | 3 |
| **2.** | 20A05702a20A05702b20A05702c | **Professional Elective Course– IV**Fundamentals of AR/VRCryptography & Network SecurityNatural Language Processing | 3 | 0 | 0 | 3 |
| **3.** | 20A05703a20A05703b20A05703c | **Professional Elective Course– V**Full Stack DevelopmentBlock chain Technology and ApplicationsDeep Learning | 3 | 0 | 0 | 3 |
| **4.** | 20A52701a20A52701b20A52701c |  **Humanities Elective – II**Entrepreneurship and IncubationManagement ScienceEnterprise Resource Planning | 3 | 0 | 0 | 3 |
| **5.** |  | **Open Elective Course – III** |  3 | 0 | 0 | 3 |
| **6.** |  | **Open Elective Course – IV** | 3 | 0 | 0 |  3 |
| **7.** | 20A05706 | **Skill oriented course – V**Mobile Application Development | 1 | 0 | 2 |  2 |
| **8.** | 20A05707 | Evaluation of Industry Internship |  |  |  | 3 |
|  **Total** | **23** |

**Open Elective-III**

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| **S.No.** | **Course Code** | **Course Name** | **Offered by the Dept.** |
| 1 | 20A01705 | Cost Effective Housing Techniques | CE |
| 2 | 20A02704 |  IOT Applications in Electrical Engineering | EEE |
| 3 | 20A03704 | Introduction to Hybrid and Electric Vehicles | ME |
| 4 | 20A04704 |  Electronic Sensors | ECE |
| 5 | 20A27704 | Human Nutrition  | FT |
| 6 | 20A54702 | Numerical Methods for Engineers  | Mathematics |
| 7 | 20A56702 | Sensors And Actuators for Engineering ApplicationsApplications | Physics |
| 8 | 20A51702 | Chemistry of Nanomaterials and Applications | Chemistry |

**Open Elective-IV**

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| **S.No.** | **Course Code** | **Course Name** | **Offered by the Dept.** |
| 1 | 20A01706 | Health, Safety & Environmental management | CE |
| 2 | 20A02705 | Renewable Energy Systems | EEE |
| 3 | 20A03705 | Introduction to Composite Materials | ME |
| 4 | 20A04705 | Microcontrollers and Applications | ECE |
| 5 | 20A27705 | Waste and Effluent Management | FT |
| 6 | 20A54703 | Number theory & its Applications | Mathematics |
| 7 | 20A56703 | Smart Materials and Devices | Physics |
| 8 | 20A51703 | Green Chemistry and Catalysis for Sustainable Environment | Chemistry |

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| **Semester-VIII** |
| **S.No.** | **Course Code** | **Course Name** | **Category** | **L** | T | **P** | **Credits** |
| **1.** | 20A05801 | Full Internship & Project work | PR |  |  |  | 12 |
| **Total** | **12** |

**COURSES OFFERED FOR HONOURS DEGREE IN CSE**

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| --- | --- | --- | --- | --- |
| **S.No.** | **Code** | **Course Name** | **Contact Hours per week** |  **Credits** |
| **L** | **T** |
| 1 | 20A05H01 | Privacy preserving and Data Publishing | 4 | 0 |  4 |
| 2 | 20A05H02 | NoSQL Databases | 4 | 0 |  4 |
| 3 | 20A05H03 | Software Defined Data Center | 4 | 0 |  4 |
| 4 | 20A05H04 | Robotics and Intelligent Systems | 4 | 0 |  4 |
| 5 | 20A05H05 | MOOC - 1 |  |  |  2 |
| 6 | 20A05H05 | MOOC - 2 |  |  |  2 |

**Suggested MOOCs:**

1. Multi-Core Computer Architecture – Storage and Interconnects
2. User-centric Computing for Human-Computer Interaction
3. GPU Architectures and Programming
4. Introduction to Quantum Computing
5. Real Time Operating Systems

**LIST OF MINORS OFFERED TO CSE**

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| **S.No.** | **Minor Title** | **Department offering the Minor** |
| 1. | Construction Technology | Civil Engineering |
| 2. | Environmental Geotechnology | Civil Engineering |
| 3. | Energy Systems | EEE |
| 4. | 3D Printing | ME |
| 5. | Industrial Engineering | ME |
| 6. | Food Science | Food Technology |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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| **(20A05501T) COMPUTER NETWORKS****Common to CSE,IT,CSD,CSE(AI),CSE(AI&ML),AI&DS,CSE(IOT)** |
| **Course Objectives:** |
| The course is designed to* Understand the basic concepts of Computer Networks.
* Introduce the layered approach for design of computer networks
* Expose the network protocols used in Internet environment
* Explain the format of headers of IP, TCP and UDP
* Familiarize with the applications of Internet
* Elucidate the design issues for a computer network
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Identify the software and hardware components of a computer network
* Design software for a computer network
* Develop new routing, and congestion control algorithms
* Assess critically the existing routing protocols
* Explain the functionality of each layer of a computer network
* Choose the appropriate transport protocol based on the application requirements
 |
| **UNIT I** | **Computer Networks and the Internet** | Lecture 8Hrs |
| What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1) |
| **UNIT II** | **The Data Link Layer, Access Networks, and LANs** | Lecture 10Hrs |
| Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area NetworksLink Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2) |
| **UNIT III** | **The Network Layer** | Lecture 8Hrs |
| Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1) |
| **UNIT IV** | **The Transport Layer** | Lecture 9Hrs |
| Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1) |
| **UNIT V** | **Principles of Network Applications** | Lecture 8Hrs |
| Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet’s Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2) |
| **Textbooks:** |
| 1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.
 |
| **Reference Books:** |
| 1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.
 |
| **Online Learning Resources:** |
| https://nptel.ac.in/courses/106105183/25http://www.nptelvideos.in/2012/11/computer-networks.htmlhttps://nptel.ac.in/courses/106105183/3 |

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| **(20A05502T) ARTIFICIAL INTELLIGENCE****Common To CSE, IT, CSD, CSE (DS), CSE(IOT)** |
| **Course Objectives:** |
| This course is designed to:* Introduce Artificial Intelligence
* Teach about the machine learning environment
* Present the searching Technique for Problem Solving
* Introduce Natural Language Processing and Robotics
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Apply searching techniques for solving a problem
* Design Intelligent Agents
* Develop Natural Language Interface for Machines
* Design mini robots
* Summarize past, present and future of Artificial Intelligence
 |
| **UNIT I** | **Introduction** | Lecture 9Hrs |
| **Introduction**: What is AI, Foundations of AI, History of AI, The State of Art. **Intelligent Agents**: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents. |
| **UNIT II** | **Solving Problems by searching** | Lecture 9 Hrs |
| Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments. |
| **UNIT III** | **Reinforcement Learning & Natural Language Processing** | Lecture 8Hrs |
| **Reinforcement Learning**: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL**Natural Language Processing**: Language Models, Text Classification, Information Retrieval, Information Extraction. |
| **UNIT IV** | **Natural Language for Communication** | Lecture 8 Hrs |
| **Natural Language for Communication**: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition**Perception**: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.  |
| **UNIT V** | **Robotics** | Lecture 10Hrs |
| **Robotics**: Introduction, Robot Hardware, Robotic Perception, planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains**Philosophical foundations**: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed. |
| **Textbooks:** |
| 1. Stuart J.Russell, Peter Norvig, “Artificial Intelligence A Modern Approach”, 3rd Edition, Pearson Education, 2019.
 |
| **Reference Books:** |
| 1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.
 |
| **Online Learning Resources:** |
| http://peterindia.net/AILinks.htmlhttp://nptel.ac.in/courses/106106139/ https://nptel.ac.in/courses/106/105/106105152/ |

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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| **(20A05503) FORMAL LANGUAGES AND AUTOMATA THEORY** |
| **Course Objectives:** |
| This course is designed to:* Introduce languages, grammar, and computational models
* Explain the Context Free Grammars
* Enable the students to use Turing machines
* Demonstrate decidability and un-decidability for NP-Hard problems
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* List types of Turing Machines
* Design Turing Machine
* Formulate decidability and undesirability problems
 |
| **UNIT I** | **Finite Automata** |  |
| Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automaton, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata. |
| **UNIT II** | **Regular Expressions** |  |
| Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars. |
| **UNIT III** | **Context Free Grammars** |  |
| Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context-Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars. |
| **UNIT IV** | **Pushdown Automata** |  |
| Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalenceof Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata. |
| **UNIT V** | **Turing Machine** |  |
| Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church’s Thesis, Universal Turing Machine, Restricted Turing Machine.**Decidable and Undecidable Problems**: NP, NP-Hard and NP-Complete Problems. |
| **Textbooks:** |
| 1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007. |
| **Reference Books:** |
| * + - 1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
			2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013.
			3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
			4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.
 |
| **Online Learning Resources:** |
| https://nptel.ac.in/courses/106106049/ https://nptel.ac.in/courses/106104028 |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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| **(20A05504a) SOFTWARE PROJECT MANAGEMENT****(Professional Elective Course– I)** |
| **Course Objectives:** |
| This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them. |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Describe the fundamentals of Project Management
* Recognize and use Project Scheduling Techniques
* Familiarize with Project Control Mechanisms
* Understand Team Management
* Recognize the importance of Project Documentation and Evaluation
 |
| **UNIT I** |  | Lecture 9Hrs |
| Conventional Software Management: The waterfall model, conventional software Management performanceEvolution of Software Economics: software Economics. Pragmatic Software Cost EstimationImproving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections. |
| **UNIT II** |  | Lecture 9Hrs |
| The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts |
| **UNIT III** |  | Lecture 9Hrs |
| Work Flows of the process: Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments.Iterative Process Planning: work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning |
| **UNIT IV** |  | Lecture 9Hrs |
| Process Automation: Automation Building Blocks, The Project Environment.Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicatorsTailoring the Process: Process discriminants. Managing people and organizing teams. |
| **UNIT V** |  | Lecture 9Hrs |
| Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process transitions. Case Study: The Command Center Processing and Display System-Replacement (CCPDS-R) |

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| **Textbooks:** |
| Software Project Management, Walker Royce, Pearson Education, 2012 Bob Hughes, Mike Cotterell and Rajib Mall “Software Project Management”, 6th Edition, McGraw Hill Edition, 2017 |
| **Reference Books:** |
| PankajJalote, “Software Project Management in practice”, 5th Edition, Pearson Education, 2017. Murali K. Chemuturi, Thomas M. Cagley Jr.” Mastering Software Project Management: Best Practices, Tools and Techniques”, J. Ross Publishing, 2010  Sanjay Mohapatra, “Software Project Management”, Cengage Learning, 2011 |
| **Online Learning Resources:** |
| http://nptel.ac.in/courses/106101061/29 |

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**B.Tech (CSE)– III-I Sem L T P C**

 **3 0 0 3**

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| **(20A04702b) DIGITAL IMAGE PROCESSING****(Professional Elective Course– I)** |
| **Course Objectives:** |
| This course is designed to enable the students to familiarize themselves with basic concepts of digital image processing and different image transformsand learn various image processing techniques like image enhancement, restoration, segmentation and compression |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Perform image manipulations and different digital image processing techniques
* Illustrate basic operations like – Enhancement, segmentation, compression, Image transforms and restorationtechniques on image.
* Analyze pseudo and fullcolor image processing techniques.
* Apply various morphological operators on images
 |
| **UNIT I** |  | Lecture 8Hrs |
| Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms. |
| **UNIT II** |  | Lecture 9Hrs |
| Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering. |
| **UNIT III** |  | Lecture 9Hrs |
| Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections. |
| **UNIT IV** |  | Lecture 8Hrs |
| Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding. |
| **UNIT V** |  | Lecture 9Hrs |
| Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression. |
| **Textbooks:** |
| 1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.2. Jayaraman, S. Esakkirajan, and T. Veerakumar,” Digital Image Processing”, Tata McGraw-Hill Education, 2011. |
| **Reference Books:** |
| 1. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.2. B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009 |
| **Online Learning Resources:** |
| https://nptel.ac.in/courses/117105079https://nptel.ac.in/courses/117105135 |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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**(20A05504c) BIG DATA TECHNOLOGIES**

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| **Common to CSE, IT, CSE(AI), CSE(AI&ML),AI&DS**(Professional Elective Course– I) |
| **Course Objectives:** |
| To learn the big data characteristics, study challenges and Hadoop framework to handle big data. |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Understand the elements of Big data
* Use different technologies to tame Big Data
* Process Given data using Map Reduce
* Develop applications using Hive, NoSQL.
 |
| **UNIT I** |  | Lecture 8Hrs |
| Getting an Overview of Big Data: Introduction to Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics. Exploring the use of Big Data in Business Context Use of Big Data in Social Networking, Use of Big Data Preventing Fraudulent Activities, Use of Big Data in Retail Industry |
| **UNIT II** |  | Lecture 9Hrs |
| Introducing Technologies for Handling Big Data Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-memory Computing Technology for Big Data.Understanding Hadoop Ecosystem Hadoop Ecosystem, Hadoop Distributed File System, Map Reduce, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie. |
| **UNIT III** |  | Lecture 9Hrs |
| Understanding Map Reduce Fundamentals and H Base The Map Reduce Framework, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce, Role of H Base in Big Data Processing. Processing Your Data with Map Reduce Recollecting he Concept of Map Reduce Framework, Developing Simple Map Reduce Application, Points to Consider while Designing Map Reduce. |
| **UNIT IV** |  | Lecture 8Hrs |
| Customizing Map Reduce Execution and Implementing Map Reduce Program Controllong Map Reduce Execution with Input Format, Reading Data with Custom Record Reader, Organizing Output Data with Output Formats, Customizing Data with Record Writer, Customizing the Map Reduce Execution in Terms of YARN, Implementing a Map Reduce Program for Sorting Text Data.Testing and Debugging Map Reduce Application Debugging Hadoop Map Reduce Locally, Performing Unit Testing for Map Reduce Applications. |
| **UNIT V** |  | Lecture 8Hrs |
| Exploring Hive: Introducing Hive, Hive Service, Built-In Functions in Hive, Hive DDl, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive.NoSQL Data Management Introduction to NoSQL, Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distribution Models, Sharding. |
| **Textbooks:** |
| 1. Big Data Black Book, DT Editorial services, Dreamtech Press
 |
| **Reference Books:** |
| 1. Data Science for Business by F. Provost and T. Fawcett, O’Reilly Media.
2. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced
3. Hadoop: The Definitive Guide by Tom White, O’Reilly Media.
4. Big Data and Business Analytics by Jay Liebowitz, Auerbach Publications, CRC Press.
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| **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B.Tech (CSE)– III-I Sem L T P C** **0 0 3 1.5** |
| **(20A05501P) COMPUTER NETWORKS LAB****Common to CSE,IT,CSD,CSE(IOT)** |
| **Course Objectives:*** To understand the different types of networks
* To discuss the software and hardware components of a network
* To enlighten the working of networking commands supported by operating system
* To impart knowledge of Network simulator 2/3
* To familiarize the use of networking functionality supported by JAVA
* To familiarize with computer networking tools**.**

**Course Outcomes (CO):**After completion of the course, students will be able to* Design scripts for Wired network simulation
* Design scripts of static and mobile wireless networks simulation
* Analyze the data traffic using tools
* Design JAVA programs for client-server communication
* Construct a wired and wireless network using the real hardware

**List of Experiments:**1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.
	* Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
	* Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.
2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup
3. Find all the IP addresses on your network. Unicast, Multicast, and Broadcast on your network.
4. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
5. Use Packet tracer software to build network topology and configure using Link State routing protocol.
6. Using JAVA RMI Write a program to implement Basic Calculator
7. Implement a Chatting application using JAVA TCP and UDP sockets.
8. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbour. Implement Hello and Echo commands using JAVA.
9. Using Wireshark perform the following operations:
	* Inspect HTTP Traffic
	* .Inspect HTTP Traffic from a Given IP Address,
	* Inspect HTTP Traffic to a Given IP Address,
	* Reject Packets to Given IP Address,
	* Monitor Apache and MySQL Network Traffic.
10. Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
11. Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
12. Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.

**References:**1. ShivendraS.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, “TCP/IP Essentials A Lab-Based Approach”, Cambridge University Press, 2004.
2. Cisco Networking Academy, “CCNA1 and CCNA2 Companion Guide”, Cisco Networking Academy Program, 3rd edition, 2003.
3. Elloitte Rusty Harold, “Java Network Programming”, 3rd edition, O’REILLY, 2011.

**Online Learning Resources/Virtual Labs:*** <https://www.netacad.com/courses/packet-tracer> - Cisco Packet Tracer.
* Ns Manual, Available at: https://www.isi.edu/nsnam/ns/ns-documentation.html, 2011.
* <https://www.wireshark.org/docs/wsug_html_chunked/> -Wireshark.
* <https://nptel.ac.in/courses/106105183/25>
* <http://www.nptelvideos.in/2012/11/computer-networks.html>
* <https://nptel.ac.in/courses/106105183/3>
* http://vlabs.iitb.ac.in/vlabs-dev/labs\_local/computer-networks/labs/explist.php
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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| **(20A05502P) ARTIFICIAL INTELLIGENCE LAB****Common To CSE,IT,CSD, CSE (DS)**  |
| **Course Objectives:** |
| * To teach the methods of implementing algorithms using artificial intelligence techniques
* To illustrate search algorithms

To demonstrate the building of intelligent agents |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Implement search algorithms
* Solve Artificial intelligence problems
* Design chatbot and virtual assistant
 |
| **List of Experiments:** |
| 1. Write a program to implement DFS and BFS 2. Write a Program to find the solution for traveling salesman Problem 3. Write a program to implement Simulated Annealing Algorithm 4. Write a program to find the solution for the wumpus world problem 5. Write a program to implement 8 puzzle problem 6. Write a program to implement Towers of Hanoi problem 7. Write a program to implement A\* Algorithm 8. Write a program to implement Hill Climbing Algorithm9. Build a Chatbot using AWS Lex, Pandora bots.10. Build a bot that provides all the information related to your college.11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python12. The following is a function that counts the number of times a string occurs in another string: # Count the number of times string s1 is found in string s2 Def count substring(s1,s2): count = 0 for i in range(0,len(s2)-len(s1)+1): if s1 == s2[i:i+len(s1)]: count += 1 return count For instance, countsubstring(’ab’,’cabalaba’) returns 2.Write a recursive version of the above function. To get the rest of a string (i.e. everything but the first character). 13. Higher order functions. Write a higher-order function count that counts the number of elements in a list that satisfy a given test. For instance: count (lambda x: x>2, [1, 2, 3, 4, 5]) should return 3, as there are three elements in the list larger than 2. Solve this task without using any existing higher-order function.14. Brute force solution to the Knapsack problem. Write a function that allows you to generate random problem instances for the knapsack program. This function should generate a list of items containing N items that each have a unique name, a random size in the range 1 ....... 5 and a random value in the range 1..... 10.Next, you should perform performance measurements to see how long the given knapsack solver take to solve different problem sizes. You should perform at least 10 runs with different randomly generated problem instances for the problem sizes 10,12,14,16,18,20 and 22. Use a backpack size of 2:5 x N for each value problem size N. Please note that the method used to generate random numbers can also affect performance, since different distributions of values can make the initial conditions of the problem slightly more or less demanding.How much longer time does it take to run this program when we increase the number of items? Does the backpack size affect the answer?Try running the above tests again with a backpack size of 1 x N and with 4:0 x N. 15. Assume that you are organising a party for N people and have been given a list L of people who, for social reasons, should not sit at the same table. Furthermore, assume that you have C tables (that are infinitely large).Write a function layout (N,C,L) that can give a table placement (i.e. a number from 0 : : :C -1) for each guest such that there will be no social mishaps.For simplicity we assume that you have a unique number 0 ......N-1 for each guest and that the list of restrictions is of the form [(X, Y) ...] denoting guests X, Y that are not allowed to sit together. Answer with a dictionary mapping each guest into a table assignment, if there are no possible layouts of the guests you should answer False. |
| **References:** |
| 1. David Poole, Alan Mackworth, Randy Goebel,”Computational Intelligence: a logical approach”, Oxford University Press, 2004.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998.
4. Artificial Neural Networks, B. Yagna Narayana, PHI
5. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight, TMH.
6. Artificial Intelligence and Expert Systems, Patterson, PHI.
 |
| **Online Learning Resources/Virtual Labs:** |
| https://www.tensorflow.org/https://pytorch.org/https://github.com/pytorchhttps://keras.io/https://github.com/keras-teamhttp://deeplearning.net/software/theano/https://github.com/Theano/Theanohttps://caffe2.ai/https://github.com/caffe2https://deeplearning4j.org/Scikit-learn:https://scikit-learn.org/stable/https://github.com/scikit-learn/scikit-learnhttps://www.deeplearning.ai/https://opencv.org/https://github.com/qqwweee/keras-yolo3https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/https://developer.nvidia.com/cuda-math-libraryhttp://vlabs.iitb.ac.in/vlabs-dev/labs/machine\_learning/labs/index.php |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-I Sem L T P C**

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| **(20A05506) ADVANCED WEB APPLICATION DEVELOPMENT****Skill Oriented Course - III** |
| **Course Objectives:** |
| * Learn how to create dynamic websites using PHP and establish database connectivity.
* Explore SMS API and session management
* Understand the common Web Application Vulnerabilities and provide Security.
* Acquire the knowledge of external libraries to generate various types of documents and files.
* Understand the difference between traditional hosting services and Cloud Hosting services
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Create dynamic websites using PHP and MySQL
* Handle Authentication using Sessions, JWT.
* Secure Web applications from common attacks like Injection, XSS.
* Integrate Libraries to dynamically generate documents, spreadsheets, pdfs, etc.
* Host Websites in traditional web hosting platforms and also Cloud based infrastructure
 |
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| **Module 1:**Introduction: Web Server, Database Server, Private IP Address, Port Address, Server-side Programming, Web Server solution stack.Task: Installation of XAMPP/WAMP. Access a test page using a device (Laptop/Desktop/Mobile) within LAN or hotspot using its private IP address.**Module 2:**PHPMyAdmin: Create, Browse, Drop, Copy, Rename and Alter databases, tables, views, fields and indexes, Import data from CSV and SQL, Export (back-up) data.Task: Design a Student Profile Data Management System for a college. Create a Database and its associated tables.**Module 3:**Php basics: Basic Syntax, primitive types, Variables, Constants, Expressions, Operators, Control structures, functions.Task: Develop a PHP application and run it with a command-line interpreter**Module 4:** Handling HTML Forms: Predefined Variables, Reading data from web form controls like input, textarea, select etc., Handling File Uploads.Task: Develop an Add Student Profile Page which accepts all student details including photo and display them in order.**Module 5:**Predefined Functions and Files: Arrays, Associative Arrays, Multidimensional Arrays, Array functions, String functions, Date and Time functions, File Handling: Open, Close, Create, Read, Write, Append.Task: Implement an effective Logging System using files in PHP.**Module 6:**Classes and Objects: Creating classes and objects, Visibility, Constructor and Destructor, Inheritance, static keyword, interfaces, class Abstraction, namespacesTask: Design and implement Class diagram representation of Student Management System for a college using PHP.**Module 7:**Database Connectivity with MySql: Establish a database Connection using mysqli, Prepare SQL Statement, Bind parameters, Execute the statement, bind the result.Task: Develop Add Student Profile Page to store data into the database and develop a webpage to retrieve the student details based on the Roll Number or any unique ID.**Module 8:**HTTP is a Stateless Protocol: Handling Cookies and Sessions, Implementation of JSON Web Tokens (JWT), SMS API.Task: Design and develop a User Authentication System (Login-Logout functionality) using cookies, sessions, JWT, and SMS API. Also, identify which is suitable for your application**Module 9:**Exception Handling and Security: Handle Database connectivity exceptions, SQL Injection Vulnerability, Cross-site scripting, Session hijacking, and Session fixationTask: Secure all your PHP applications from common vulnerabilities like Injection, XSS, Session hijacking and fixation, and other exceptions**Module 10:**PHP Libraries: Read data from Excel Files, Generate dynamic Excel Files, PDF files, and Word Documents.Task: Design an Administrator Portal through which administrators can be able to upload student data into the database, Download the student data, Generate certificates, etc.**Module 11:**Hosting service provider: Public IP Address, Nameservers, Domain Name, Understand cPanel Modules: File Manager, Databases, Email Accounts, One-Click Installers, DNS, Other Configuration & Monitoring Controls.Task: Host a PHP-MySQL based application on the internet using the Web Hosting Service Provider of your choice (000webhost, Hostinger, Heroku, Godaddy, etc.)**Module 12:**Cloud Hosting: Advantages of Cloud Hosting, Creating Instances or droplets, Managing Roles, Scaling the Application, Securing the instances, Monitoring Tools, etc.Task: Host a PHP-MySQL based application on the internet using the Cloud Hosting Provider of your choice (Amazon Web Services, Google Cloud Platform, DigitalOcean, etc.) |
| **References:** |
| 1. MacIntyre, Peter, and Tatroe, Kevin. Programming PHP: Creating Dynamic Web Pages. United States, O'Reilly Media, 2020.
2. Valade, Janet. PHP and MySQL Web Development All-in-One Desk Reference For Dummies. Germany, Wiley, 2011.
3. Gulabani, Sunil. Amazon Web Services Bootcamp: Develop a Scalable, Reliable, and Highly Available Cloud Environment with AWS. United Kingdom, Packt Publishing, 2018.
 |
| **Online Learning Resources/Virtual Labs:** |
| https://www.apachefriends.org/https://www.wampserver.com/en/https://www.php.net/https://in.godaddy.com/https://www.hostinger.in/https://aws.amazon.com/https://cloud.google.com/ |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05601T) COMPILER DESIGN** |
| **Course Objectives:** |
| * Teach the concepts related to assemblers, loaders, linkers and editors
* Introduce the basic principles of the compiler construction
* Explain the Concept of Context Free Grammars, Parsing and various Parsing Techniques.
* Expose the process of intermediate code generation.
* Instruct the process of Code Generation and various Code optimization techniques
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Differentiate the various phases of a compiler
* Design code generator
* Apply code optimization techniques
* Identify the tokens and verify the code
 |
| **UNIT I** | **Introduction**  | Lecture 8Hrs |
| **Introduction:** The structure of a compiler, the science of building a compiler, programming language basics**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers. |
| **UNIT II** | **Syntax Analysis** | Lecture 9Hrs |
| Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators. |
| **UNIT III** | **Syntax-Directed Translation** | Lecture 9Hrs |
| **Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures. |
| **UNIT IV** | **Code Generation** | Lecture 8Hrs |
| **Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.**Code Generation:** Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation. |
| **UNIT V** | **Machine-Independent Optimization** | Lecture 8Hrs |
| **Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs |
| **Textbooks:** |
| 1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers Principles, Techniques and Tools”, 2nd Edition, Pearson.
 |
| **Reference Books:** |
| 1. Yunlin Su, Song Y. Yan, “Principles of Compilers”, Springer, 2012.
2. Andrew W. Appel, “Modern Compiler Implementation in JAVA”, 2nd edition, Cambridge University Press, 2004.
3. Lex &Yacc – John R. Levine, Tony Mason, Doug Brown, O’reilly
4. Compiler Construction, Louden, Thomson.
 |
| **Online Learning Resources:** |
| * + - 1. https://nptel.ac.in/courses/106108052/
			2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=Compilers
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05602T) MACHINE LEARNING****Common to CSE, IT,CSD,CSE(AI),CSE(AI&ML),CSE(DS),AI&DS,CSE(IOT)** |
| **Course Objectives:** |
| The course is introduced for students to* Understand basic concepts of Machine Learning
* Study different learning algorithms
* Illustrate evaluation of learning algorithms
 |
| **Course Outcomes (CO):** |
| After completion of the course, students will be able to* Identify machine learning techniques suitable for a given problem
* Solve the problems using various machine learning techniques
* Design application using machine learning techniques
 |
|  **UNIT I** **Introduction to Machine Learning &Preparing to Model** Lecture 9Hrs |
| Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning?[Types of Machine Learning](#_bookmark26), Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning[Preparing to Model](#_bookmark63): Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing |
| **UNIT II** **Modelling and Evaluation &Basics of Feature Engineering** Lecture 9Hrs |
| Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a ModelBasics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection |
| **UNIT III** **Bayesian Concept Learning & Supervised Learning: Classification** Lecture 10Hrs |
| Introduction, Why Bayesian Methods are Important? Bayes’ Theorem, [Bayes’ Theorem and Concept Learning](#_bookmark309), Bayesian Belief NetworkSupervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-[*k*-Nearest Neighbour(*k*NN)](#_bookmark357), Decision tree, Random forest model, Support vector machines |
| **UNIT IV** **Supervised Learning: Regression** Lecture 10Hrs |
| Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation. |
| **UNIT V** [**Unsupervised Learning**](#_bookmark458) Lecture 9Hrs |
| Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, *K*-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCANFinding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule learning, Build the aprioriprinciple rules |
| **Textbooks:** |
| 1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.
 |
| **Reference Books:** |
| 1. EthernAlpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
3. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.
 |
| **Online Learning Resources:** |
| * Andrew Ng, “Machine Learning Yearning”
* <https://www.deeplearning.ai/machine-learning-> [yearning/](https://www.deeplearning.ai/machine-learning-yearning/)
* Shai Shalev-Shwartz , Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms” , Cambridge University Press <https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05603T) INTERNET OF THINGS****Common to CSE, IT, CSD, CSE(AI), CSE(DS),AI&DS** |
| **Course Objectives:** |
| * Understand the basics of Internet of Things and protocols.
* Discuss the requirement of IoT technology
* Introduce some of the application areas where IoT can be applied.
* Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Understand general concepts of Internet of Things.
* Apply design concept to IoT solutions
* Analyze various M2M and IoT architectures
* Evaluate design issues in IoT applications
* Create IoT solutions using sensors, actuators and Devices
 |
| **UNIT I Introduction to IoT** Lecture 8Hrs |
| Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates |
| **UNIT II Prototyping IoT Objects using Microprocessor/Microcontroller** | Lecture 9Hrs |
| Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi. |
| **UNIT III IoT Architecture and Protocols** | Lecture 8Hrs |
| Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak. |
| **UNIT IV Device Discovery and Cloud Services for IoT** | Lecture 8Hrs |
| Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT. |
| **UNIT V UAV IoT** | Lecture 10Hrs |
| Introduction toUnmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.  |
| **Textbooks:** |
| 1. Vijay Madisetti and ArshdeepBahga, “ Internet of Things ( A Hands-on-Approach)”, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles,  [K Valavanis](https://www.worldcat.org/search?q=au%3AValavanis%2C+K.&qt=hot_author); [George J Vachtsevanos](https://www.worldcat.org/search?q=au%3AVachtsevanos%2C+George+J.%2C&qt=hot_author), New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.
 |
| **Reference Books:** |
| 1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “ From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal
 |
| **Online Learning Resources:** |
| 1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05604a) SOFTWARE TESTING****(Professional Elective Course-II)** |
| **Course Objectives:** |
| * Introduce the fundamentals of various testing methodologies.
* Describe the principles and procedures for designing test cases.
* Teach debugging methods.
 |
| **Course Outcomes :** |
| After completion of the course, students will be able to* Understand the basic testing procedures.
* Develop reliable software
* Design test cases for testing different programming constructs
* Test the applications by applying different testing methods and automation tools
 |
| **UNIT I Introduction** | Lecture 8Hrs |
| **Introduction:** Purpose of Testing, Dichotomies, Model for Testing, Consequences ofBugs, Taxonomy of Bugs.**Flow graphs and Path testing:** Basics Concepts of Path Testing, Predicates, PathPredicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application ofPath Testing. |
| **UNIT II Flow Testing** | Lecture 9Hrs |
| **Transaction Flow Testing:** Transaction Flows, Transaction Flow Testing Techniques.**Dataflow testing:** Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing. |
| **UNIT III Domain Testing** | Lecture 9Hrs |
| **Domain Testing:** Domains and Paths, Nice & Ugly Domains, Domain testing, Domainsand Interfaces Testing, Domain and Interface Testing, Domains and Testability. |
| **UNIT IV Logic Based Testing** | Lecture 8Hrs |
| **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 V Graph Matrices and Application** | Lecture 8Hrs |
| **State, State Graphs and Transition Testing:** State Graphs, Good & Bad StateGraphs, State Testing, Testability Tips.**Graph Matrices and Application**: Motivational Overview, Matrix of Graph, Relations,Power of a Matrix, Node Reduction Algorithm, Building Tools. |
| **Textbooks:** |
| * + - 1. Boris Beizer, “Software testing techniques”, Dreamtech, second edition, 2002.
 |
| **Reference Books:** |
| 1. Brian Marick, “The craft of software testing”, Pearson Education.2. Yogesh Singh, “Software Testing”, Camebridge3. P.C. Jorgensen, “Software Testing” 3rd edition, Aurbach Publications (Dist.bySPD).4. N.Chauhan, “Software Testing”, Oxford University Press.5. P.Ammann&J.Offutt, “Introduction to Software Testing” , Cambridge Univ.Press.6. Perry, “Effective methods of Software Testing”, John Wiley, 2nd Edition, 1999. |
| **Online Learning Resources:** |
| http://www.nptelvideos.in/2012/11/software-engineering.html https://onlinecourses.nptel.ac.in/noc16\_cs16/previewhttps://nptel.ac.in/courses/117105135 |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05604b) ADVANCED COMPUTER ARCHITECTURE****(Professional Elective Course-II)** |  |
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| **Course Objectives:** |
| * Understand the Concept of Parallel Processing and its applications
* Implement the Hardware for Arithmetic Operations
* Analyse the performance of different scalar Computers
* Develop the Pipelining Concept for a given set of Instructions
* Distinguish the performance of pipelining and non-pipelining environment in a processor
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Illustrate the types of computers, and new trends and developments in computer architecture
* Outline pipelining, instruction set architectures, memory addressing
* Apply ILP using dynamic scheduling, multiple issue, and speculation
* Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
* Apply multithreading by using ILP and supporting thread-level parallelism (TLP)
 |
| **UNIT I** |  | Lecture 8Hrs |
| Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls. |
| **UNIT II** |  | Lecture 9Hrs |
| Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions. |
| **UNIT III** |  | Lecture 9Hrs |
| Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply. |
| **UNIT IV** |  | Lecture 8Hrs |
| The Processor: Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines. |
| **UNIT V** |  | Lecture 8Hrs |
| Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies. |
| **Textbooks:** |
| 1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK. 2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill. |
| **Reference Books:** |
| 1. Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
2. Advanced Computer Architecture – A Design Space Approach – DezsoSima, Terence Fountain, Peter Kacsuk , Pearson.
 |
| **Online Learning Resources:** |
| https://nptel.ac.in/courses/106/105/106105163/ |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05604c) COMPUTER VISION****Common to CSE, IT,CSD, CSE(AI), CSE(AI&ML)AI&DS****(Professional Elective Course– II)**

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| **Course Objectives:** |
| The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture. |
| **Course Outcomes:** |
| After completing the course, you will be able to:* Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
* Describe known principles of human visual system,
* Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,
* Suggest a design of a computer vision system for a specific problem
 |
| **UNIT I** | **LINEAR FILTERS** | Lecture 8Hrs |
| Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids. |
| **UNIT II** | **EDGE DETECTION** | Lecture 9Hrs |
| Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners. |
| **UNIT III** | **TEXTURE** | Lecture 9Hrs |
| Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids –The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids, Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes |
| **UNIT IV** | **SEGMENTATION BY CLUSTERING** | Lecture 8Hrs |
| What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves |
| **UNIT V RECOGNIZATIONBYRELATIONSBETWEENTEMPLATES** | Lecture 8Hrs |
| Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM. |
| **Textbooks:**David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.**Reference Books:**1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e,bySonka.
3. Computer Vision and Applications: Concise Edition (WithCD) by Jack Academy Press, 2000.

**Online Learning Resources:** <https://nptel.ac.in/courses/106105216> <https://nptel.ac.in/courses/108103174> |

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**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05601P) COMPILER DESIGN LAB** |
| **Course Objectives:** |
| * To introduce LEX and YACC tools
* To learn to develop algorithms to generate code for a target machine
* To implement LL and LR parsers
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Design, develop, and implement a compiler for any language
* Use LEX and YACC tools for developing a scanner and a parser
* Design and implement LL and LR parsers
* Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
 |
| **List of Experiments:** |
| Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines. Implementation of Lexical Analyzer using Lex Tool 3. Generate YACC specification for a few syntactic categories. 1. Program to recognize a valid arithmetic expression that uses operator +, – , \* and /.
2. Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
3. Implementation of Calculator using LEX and YACC
4. Convert the BNF rules into YACC form and write code to generate abstract syntax tree

4. Write program to find ε – closure of all states of any given NFA with ε transition. 5. Write program to convert NFA with ε transition to NFA without ε transition. 6. Write program to convert NFA to DFA 7. Write program to minimize any given DFA. 8. Develop an operator precedence parser for a given language. 9. Write program to find Simulate First and Follow of any given grammar. 10. Construct a recursive descent parser for an expression. 11. Construct a Shift Reduce Parser for a given language. 12. Write a program to perform loop unrolling. 13. Write a program to perform constant propagation. 14. Implement Intermediate code generation for simple expressions.  |
| **References:** |
| * + - 1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.
			2. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.
			3. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
			4. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
			5. Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.
 |
| **Online Learning Resources/Virtual Labs:** |
| http://cse.iitkgp.ac.in/~bivasm/notes/LexAndYaccTutorial.pdf |

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**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05602P) MACHINE LEARNING LAB****Common to CSE, CSD,CSE(AI),CSE(AI&ML),CSE(DS),AI&DS** |
| **Course Objectives:** |
| * Make use of Data sets in implementing the machine learning algorithms
* Implement the machine learning concepts and algorithms in any suitable language of choice.
 |
| **Course Outcomes (CO):** |
| After completion of the course, students will be able to* Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
* Appreciate the importance of visualization in the data analytics solution.
* Derive insights using Machine learning algorithms
 |
| **List of Experiments:** |
| **Note:** 1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.
4. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
5. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
6. Write a program to demonstrate the working of the decision tree based ID3 algorithm.

Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 1. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
2. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
3. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
4. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
5. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
6. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
7. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

**Projects**1. Predicting the Sale price of a house using Linear regression
2. Spam classification using Naïve Bayes algorithm
3. Predict car sale prices using Artificial Neural Networks
4. Predict Stock market trends using LSTM
5. Detecting faces from images
 |
| **References:** |
| 1. Python Machine Learning Workbook for beginners, AI Publishing, 2020.
 |
| **Online Learning Resources/Virtual Labs:** |
| 1. [Machine Learning A-Z (Python & R in Data Science Course) | Udemy](https://www.udemy.com/course/machinelearning/?matchtype=p&msclkid=98d1e794a45f13b60192850107a857d7&utm_campaign=BG-LongTail_la.EN_cc.INDIA&utm_content=deal4584&utm_medium=udemyads&utm_source=bing&utm_term=_._ag_1214960761643591_._ad__._kw_%2BMachine+%2BLearning+%2Btutorial_._de_c_._dm__._pl__._ti_kwd-75935360750084%3Aloc-90_._li_148619_._pd__._)
2. [Machine Learning | Coursera](https://www.coursera.org/learn/machine-learning?utm_source=bg&utm_medium=sem&utm_campaign=94-BrandedSearch-IN&utm_content=94-BrandedSearch-IN&campaignid=415374026&adgroupid=1211662289904340&device=c&keyword=programs%20machine%20learning&matchtype=e&network=o&devicemodel=&adpostion=&creativeid=&hide_mobile_promo&msclkid=96f80c9fa62914c42a766e0a020f97aa&utm_term=programs%20machine%20learning)
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**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A05603P) INTERNET OF THINGS LAB** |
| **Course Objectives:** |
| * To introduce components such as WiFi, Bluetooth, Temperature, Moisture sensors
* To know the Micro controller such as Arduino
* To know the System on Chip (SOC) / Single Board Computer such as Raspberry Pi
* To understand HTTP IoT protocols and perform Experiments for data transmission
* To understand UAV/Drones and Internet of Drones Experiments
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Know the various IoT sensors and understand the functionality
* Design and analyze IoT experiments and transfer the data to IoT Clouds
* Design the IoT systems for real time applications
* Understand Drones and Perform Internet of Drones Experiments
 |
| **List of Experiments:** |
| **Experiments using ESP32****1. Serial Monitor, LED, Servo Motor - Controlling*** **Experiment1:**Controlling actuators through Serial Monitor. Creating different led patterns and controlling them using push button switches. Controlling servo motor with the help of joystick.

2. **Distance Measurement of an object*** **Experiment 2:**Calculatethe distance to an object with the help of an ultrasonic sensor and display it on an LCD.

3, **LDR Sensor, Alarm and temperature, humidity measurement** **Experiment 3:*** Controlling relay state based on ambient light levels using LDR sensor.
* Basic Burglar alarm security system with the help of PIR sensor and buzzer.
* Displaying humidity and temperature values on LCD

**4. Experiments using Raspberry Pi**  **Experiment 4:** * Controlling relay state based on input from IR sensors
* Interfacing stepper motor with R-Pi
* Advanced burglar alarm security system with the help of PIR sensor, buzzer and keypad. (Alarm gets disabled if correct keypad password is entered)
* 5. Automated LED light control based on input from PIR (to detect if people are present) and LDR(ambient light level)

**5. IOT Framework**  **Experiment 5:**Upload humidity & temperature data to ThingSpeak, periodically logging ambient light level to ThingSpeak**Experiment 6:** Controlling LEDs, relay & buzzer using Blynk app**6. HTTP Based** **Experiment 7:** * Introduction to HTTP. Hosting a basic server from the ESP32 to control various digital based

actuators (led, buzzer, relay) from a simple web page.**Experiment 8:** * Displaying various sensor readings on a simple web page hosted on the ESP32.

**7. MQTT Based****Experiment 9:**Controlling LEDs/Motors from an Android/Web app, Controlling AC Appliances from an android/web app with the help of relay.**Experiment 10:**Displaying humidity and temperature data on a web-based application **8. UAV/Drone:****Experiment 11:** * Demonstration of UAV elements, Flight Controller
* Mission Planner flight planning design

**Experiment 12:** * Python program to read GPS coordinates from Flight Controller
 |
| **Reference**: |
| 1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – Business Model Generation – Wiley, 2011
3. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
 |
| **Online Learning Resources/Virtual Labs:** |
| https://www.arduino.cc/https://www.raspberrypi.org/ |

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**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A52401) SOFT SKILLS** |
| **Course Objectives:** |
| * To encourage all round development of the students by focusing on soft skills
* To make the students aware of critical thinking and problem-solving skills
* To develop leadership skills and organizational skills through group activities
* To function effectively with heterogeneous teams
 |
| **Course Outcomes (CO):** |
| By the end of the program students should be able to * Memorize various elements of effective communicative skills
* Interpret people at the emotional level through emotional intelligence
* apply critical thinking skills in problem solving
* analyse the needs of an organization for team building
* Judge the situation and take necessary decisions as a leader
* Develop social and work-life skills as well as personal and emotional well-being
 |
| **UNIT – I** | **Soft Skills & Communication Skills** | **10 Hrs** |
| Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication**Activities:** **Intrapersonal Skills-** Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources) **Interpersonal Skills-** Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.**Verbal Communication**- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.**Non-verbal communication** – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation  |
| **UNIT – II** | Critical Thinking | **10 Hrs** |
| Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking**Activities:**Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis  |
| **UNIT – III** | Problem Solving & Decision Making | **10 Hrs** |
| Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles**Activities:**Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion |
| **UNIT – IV** | **Emotional Intelligence & Stress Management** | **10 Hrs** |
| Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips**Activities:**Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates |
| **UNIT – V** | **Leadership Skills** | **10 Hrs** |
| Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management **Activities:**Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.**NOTE-:** 1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill. 2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc. |
| **Textbooks:** |
| 1. Personality Development and Soft Skills (English, Paperback, Mitra BarunK.)Publisher: ‎ Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, [Dr Shikha Kapoor](https://www.ikbooks.com/author-details/dr-shikhakapoor/1099)Publisher ‏ : ‎ I K International Publishing House; 0 edition (February 28, 2018)
 |
| **Reference Books:** |
| 1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India
 |
| **Online Learning Resources:** |
| 1. <https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q>
2. <https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ>
3. <https://youtu.be/-Y-R9hDl7lU>
4. <https://youtu.be/gkLsn4ddmTs>
5. <https://youtu.be/2bf9K2rRWwo>
6. <https://youtu.be/FchfE3c2jzc>
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**B.Tech (CSE)– III-II Sem L T P C**

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| **(20A99601) INTELLECTUAL PROPERTY RIGHTS AND PATENTS****(Mandatory Non-Credit Course)** |
| **Course Objectives:*** This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws, Cyber Laws, Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations
 |
| **Course Outcomes:*** Understand IPR law & Cyber law
* Discuss registration process, maintenance and litigations associated with trademarks
* Illustrate the copy right law

Enumerate the trade secret law. |
| UNIT IIntroduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.**UNIT II**Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.**UNIT III**Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.**UNIT IV**Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.**UNIT V**Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.**Textbooks:**1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal &Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections

**References:**1. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub.
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**B.Tech (CSE)– IV-I Sem L T P C**

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| **(20A05701a) CLOUD COMPUTING****Common to CSE,IT, CSD, CSE(AI), CSE(AI&ML), CSE(DS), AI&DS****Professional Elective Course - III** |
| **Course Objectives:** |
| * To explain the evolving computer model called cloud computing.
* To introduce the various levels of services that can be achieved by cloud.
* To describe the security aspects in cloud.
 |
| **Course Outcomes (CO):** |
| After completion of the course, students will be able to* Ability to create cloud computing environment
* Ability to design applications for Cloud environment
* Design &amp; develop backup strategies for cloud data based on features.
* Use and Examine different cloud computing services.
* Apply different cloud programming model as per need.
 |
| **UNIT I** | **Basics of Cloud computing** | Lecture 8Hrs |
| **Introduction to cloud computing:** Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications**Cloud concepts and Technologies:** Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.**Cloud Services and Platforms:** Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software. |
| **UNIT II** | **Hadoop and Python** | Lecture 9Hrs |
| **Hadoop MapReduce:** Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.**Cloud Application Design**: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.**Python Basics:** Introduction, Installing Python, Python data Types &amp; Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes. |
| **UNIT III** | **Python for Cloud computing** | Lecture 8Hrs |
| **Python for Cloud:** Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.**Cloud Application Development in Python**: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App. |
| **UNIT IV** | **Big data, multimedia and Tuning** | Lecture 8Hrs |
| **Big Data Analytics:** Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.**Multimedia Cloud:** Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.**Cloud Application Benchmarking and Tuning:** Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study. |
| **UNIT V** | **Applications and Issues in Cloud** | Lecture 9 Hrs |
| **Cloud Security:** Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.**Cloud for Industry, Healthcare &Education:** Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.**Migrating into a Cloud:** Introduction, Broad Approaches to migrating into the cloud, the seven–step model of migration into a cloud.**Organizational readiness and Change Management in The Cloud Age:** Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.**Legal Issues in Cloud Computing**: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics. |
| **Textbooks:** |
| 1. Cloud computing A hands-on Approach‖ By ArshdeepBahga, Vijay Madisetti, Universities Press, 20162. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016 |
| **Reference Books:** |
| 1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O ‘Reilly, SPD, rp2011.
6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.
 |
| **Online Learning Resources:** |
| [Cloud computing - Course (nptel.ac.in)](https://onlinecourses.nptel.ac.in/noc21_cs14/preview) |

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**B.Tech (CSE)– IV-I Sem L T P C**

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| **(20A05701b) AGILE METHODOLOGIES****(Professional Elective Course– III)** |
| **Course Objectives:** |
| * To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
* To provide good understanding of software design and a set of software technologies and APIs.
* To carry out detailed examination and demonstration of Agile development and testing techniques.
* To discuss Agile software development
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Realize the importance of interacting with business stakeholders in determining the requirements for a software system
* Perform iterative software development processes: how to plan them, how to execute them.
* Point out the impact of social aspects on software development success.
* Develop techniques and tools for improving team collaboration and software quality.
* Perform Software process improvement as an ongoing task for development teams.
* Show how agile approaches can be scaled up to the enterprise level.
 |
| **UNIT I AGILE METHODOLOGY** | Lecture 9 Hrs |
| Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values  |
| **UNIT II AGILE PROCESSES** | Lecture 8Hrs |
| Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.  |
| **UNIT III AGILITY AND KNOWLEDGE MANAGEMENT** | Lecture 8 Hrs |
| Agile Information Systems – Agile Decision Making - Earl‗S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).  |
| **UNIT IV AGILITY AND REQUIREMENTS ENGINEERING** | Lecture 9 Hrs |
| Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.  |
| **UNIT V AGILITY AND QUALITY ASSURANCE** | Lecture 9 Hrs |
| Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.  |
| **Textbooks:** |
| 1. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.
 |
| **Reference Books:** |
| 1. Craig Larman, ―Agile and Iterative Development: A Manager‗s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.
 |
| **Online Learning Resources:** |
| https://www.nptelvideos.com/video.php?id=904 |

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| **(20A05701c) VEHICULAR ADHOC NETWORKS****(Professional Elective Course– III)** |
| **Course Objectives:** |
| * Introduce to the students with the emerging technologies, standards and applications in vehicular communication systems
* Study the design considerations and challenges of vehicle-to-infrastructure and vehicle-to-vehicle communications
* Theories such as vehicular mobility modeling, and vehicular technologies and standards from the physical to network layers will be introduced
* Examples of emerging applications of vehicular communication in Intelligent Transportation Systems will also be studied and discussed.
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Understand and describe the basic theories and principles, technologies, standards, and system architecture of vehicular ad-hoc networks (VANET) or inter-vehicle communication networks.
* Analyze, design, and evaluate vehicular communication platforms for various kinds of safety and infotainment applications.
 |
| **UNIT I Introduction** | Lecture 8 Hrs |
| Basic Principles and Challenges, Past and ongoing VANET activities, Cooperative Vehicular Safety applications – Enabling technologies, cooperative system architecture, safety applications. |
| **UNIT II Vehicular Mobility Modelling** | Lecture 9Hrs |
| Random models, flow and traffic models, behavioural models, trace and survey-based models, joint transport and communication simulations |
| **UNIT III Vehicular Communications** | Lecture 9Hrs |
| Physical Layer Consideration- Signal propagation, Doppler spread and its impact on OFDM systems, MAC Layer- Proposed MAC approaches and standards, IEEE 802.11p |
| **UNIT IV VANET Routing Protocols** | Lecture 9Hrs |
| Opportunistic packet forwarding, topology based routing, geographic routing |
| **UNIT V Applications, Standards and Regulations** | Lecture Hrs |
| VANET limitations, example applications, communication paradigms, message coding and composition, data aggregation, Regulations and Standards, DSRC protocol stack, Cellular V2X. |
| **Textbooks:** |
| 1. H.Hartenstein and K.P. Laberteaux, VANET: Vehicular Applications and Inter-Networking Technologies, Wiley 2010.
 |
| **Reference Books:** |
| 1. P. H.-J. Chong, I. W.-H. Ho, Vehicular Networks: Applications, Performance Analysis and Challenges, Nova Science Publishers, 2019.
2. C. Sommer, F. Dressler, Vehicular Networking, Cambridge University Press, 2015.
3. M. Emmelmann, B. Bochow and C. C. Kellum, Vehicular Networking: Automotive Applications and Beyond, Wiley, 2010.
4. M. Watfa, Advances in Vehicular Ad-Hoc Networks: Development and Challenges, Information Science Reference, 2010.
5. H. Moustafa, Y. Zhang, Vehicular Networks: Techniques, Standards, and Applications, CRC Press, 2009.
 |
| **Online Learning Resources:https://nptel.ac.in/courses/106105160** |

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| **(20A05702a) FUNDAMENTALS OF AR/VR****(Professional Elective Course– IV)** |
| **Course Objectives:** |
| * To Teach about human interaction with computers
* To Demonstrate Virtual reality
* To introduce to the design of visualization tools
* To explain how to apply VR/MR/AR for various applications.
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Demonstrate human interaction with computers
* Animate using Virtual reality and 3D Art optimization
* Design audio and video interaction paradigms
* Design Data visualization tools
* Apply VR/AR in various fields in industry
 |
| **UNIT I** |  | Lecture 8Hrs |
| **How Humans interact with Computers:** Common term definition, introduction, modalities through the ages (pre- 20th century, through world war-II, post-world war-II, the rise of personal computing, computer miniaturization), why did we just go over all of this? Types of common HCI modalities, new modalities, the current state of modalities for spatial computing devices, current controllers for immersive computing systems, a note on hand tracking and hand pose recognition.**Designing for our Senses, Not our Devices:** Envisioning a future, sensory technology explained, who are we building this future for?, sensory design, five sensory principles, Adob’s AR story. |
| **UNIT II** |  | Lecture 9Hrs |
| **Virtual Reality for Art:** A more natural way of making 3D art, VR for animation.**3D art optimization:** Introduction, draw calls, using VR tools for creating 3D art, acquiring 3D models vs making them from scratch. **How the computer vision that makes augmented reality possible works:** Who are we?, a brief history of AR, how and why to select an AR platform, mapping, platforms, other development considerations, the AR cloud. |
| **UNIT III** |  | Lecture 9Hrs |
| **Virtual reality and augmented reality:** cross platform theory: Why cross platform? The role of game engines, understanding 3D graphics, portability lessons from video game design, simplifying the controller input.**Virtual reality toolkit:**open source framework for the community: What is VRTK and why people use it? the history of VRTK, welcome to the steam VR unity toolkit, VRTK v4, the future of VRTK, success of VRTK. **Three virtual reality and augmented reality development practices:** Developing for virtual reality and augmented reality, handling locomotion, effective use of audio, common interaction paradigms. |
| **UNIT IV** |  | Lecture 8Hrs |
| **Data and machine learning visualization design and development in spatial computing:** Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data visualization vs 3D data visualization in spatial computing, interactivity in data visualziations and in spatial computing, animation, failures in data visulaization, good data visualization design optimize 3D spaces, data representations, infographics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.  |
| **UNIT V** |  | Lecture 8Hrs |
| **Character AI and Behaviors:** Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Delibarative AI, machine learning.**The virtual and augmented reality health technology ecosystem:** VR/AR health technology application design, standard UX isn’t intuitive, tutorial: insight Parkinson’s experiment, companies, case studies from leading academic institutions. |
| **Textbooks:** |
| 1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, “Creating Augmented & Virtual Realities”, 1st edition, O’REILLY, 2019.
 |
| **Reference Books:** |
| * Steve Aukstakalnis, “Practical Augmented Reality”, Pearson Education, 2017.
 |
| **Online Learning Resources:** |
| https://nptel.ac.in/courses/106106138https://nptel.ac.in/courses/121106013 |

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| **(20A05702b) CRYPTOGRAPHY & NETWORK SECURITY****(Professional Elective Course – IV)** |
| **Course Objectives:** |
| This course aims at training students to master the:* The concepts of classical encryption techniques and concepts of finite fields and number theory
* Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
* Design issues and working principles of various authentication protocols, PKI standards
* Various secure communication standards including Kerberos, IPsec, TLS and email
* Concepts of cryptographic utilities and authentication mechanisms to design secure applications
 |
| **Course Outcomes**: |
| * After completion of the course, students will be able to
* Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
* Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
* Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
* Apply different digital signature algorithms to achieve authentication and create secure applications
* Apply network security basics, analyse different attacks on networks and evaluate the performance of firewalls and security protocols like TLS, IPSec, and PGP
* Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications
 |
| **UNIT I** |  | Lecture 9Hrs |
| Computer and Network Security Concepts : Computer Security Concepts, The OSI Security Architecture, Security Attacks ,Security Services , Security Mechanisms ,A Model for Network Security, Classical Encryption Techniques : Symmetric Cipher Model ,Substitution Techniques ,Transposition Techniques ,Steganography, Block Ciphers : Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard :AES Structure, AES Transformation Functions |
| **UNIT II** |  | Lecture 9Hrs |
| Number Theory:The Euclidean Algorithm, Modular Arithmetic, Fermat’s and Euler’s Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p), Finite Fields of the Form GF(2n).Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography. |
| **UNIT III** |  | Lecture 9Hrs |
| Cryptographic Hash Functions: Application of Cryptographic Hash Functions,Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC.Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure |
| **UNIT IV** |  | Lecture 9Hrs |
| User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.IPSecurity: IP Security Overview,IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange. |
| **UNIT V** |  | Lecture 8Hrs |
| Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell(SSH)Firewalls: Firewall Characteristics and Access Policy, Types of Firewalls, Firewall Location and Configurations. |
| **Textbooks:** |
| 1. Cryptography and Network Security- William Stallings, Pearson Education, 7thEdition.
2. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.
 |
| **Reference Books:** |
| 1. Cryptography and Network Security- Behrouz A Forouzan, DebdeepMukhopadhyaya, Mc-GrawHill, 3rd Edition,2015.
2. Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.
 |
| **Online Learning Resources:** |
| 1. <https://nptel.ac.in/courses/106/105/106105031/>lecture by Dr. DebdeepMukhopadhyayIITKharagpur [VideoLecture]
2. <https://nptel.ac.in/courses/106/105/106105162/>lecture by Dr.SouravMukhopadhyay IIT Kharagpur [VideoLecture]
3. <https://www.mitel.com/articles/web-communication-cryptography-and-network-security>web articles by Mitel PowerConnections
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**(20A05702c) NATURAL LANGUAGE PROCESSING**

**(Professional Elective Course– IV)**

**Course Objectives:**

* Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
* Discuss approaches to syntax and semantics in NLP.
* Examine current methods for statistical approaches to machine translation.
* Teach machine learning techniques used in NLP.

**Course Outcomes:**

After completion of the course, students will be able to

* Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
* Apply the various Parsing techniques, Bayes Rule, Shannon game, Entropy and Cross Entropy.
* Understand the fundamentals of CFG and parsers and mechanisms in ATN’s.
* Apply Semantic Interpretation and Language Modelling.
* Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

**UNIT I Introduction to Natural language** Lecture 8Hrs

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems,Different Levels of Language Analysis, Representations and Understanding, Organization ofNatural language Understanding Systems, Linguistic Background: An outline of English Syntax.

**UNIT II Grammars and Parsing** Lecture 9Hrs

Grammars and Parsing- Top-Down and Bottom-Up Parsers, Transition Network Grammars,Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannon game, Entropy and Cross Entropy.

**UNIT III Grammars for Natural Language** Lecture 8Hrs

Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

**UNIT IV** Lecture 8Hrs

**Semantic Interpretation**

Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.

**Language Modelling**

Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, LanguageModel Adaption, Types of Language Models, Language-Specific Modelling Problems,Multilingual and Cross lingual Language Modelling.

**UNIT V**  Lecture9 Hrs

**Machine Translation**

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

**Multilingual Information Retrieval**

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

**Multilingual Automatic Summarization**

Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

**Textbooks:**

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, AksharBharathi, Vineetchaitanya, Prentice–Hall of India.

**Reference Books:**

1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

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| **Online Learning Resources:** |
| https://nptel.ac.in/courses/106/105/106105158/http://www.nptelvideos.in/2012/11/natural-language-processing.html |

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| **(20A05703a) FULL STACK DEVELOPMENT****(Professional Elective Course– V)** |
| **Course Objectives:** |
| Learn the core concepts of both the frontend and backend programming course, to get familiar with the latest web development technologies. |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Develop a fully functioning website and deploy on a web server.
* Gain Knowledge about the front end and back end tools
* Find and use of code packages based on their documentation to produce working results ina project.
* Create web pages that function using external data.
 |
| **UNIT I Web Development Basics** | Lecture 8Hrs |
| Web development Basics - HTML & Web servers Shell - UNIX CLIVersion control – Git&Github HTML, CSS |
| **UNIT II Frontend Development** | Lecture 9Hrs |
| JavascriptbasicsOOPSAspectsofJavaScriptMemoryusageandFunctionsinJSAJAXfordataexchangewithserverjQueryFrameworkjQueryevents,UIcomponents etc. JSON data format. |
| **UNIT III REACT JS** | Lecture 9Hrs |
| Introduction to React Router and Single Page Applications React Forms, FlowArchitecture and Introduction to Redux More Redux and Client-Server Communication |
| **UNIT IV Java Web Development** | Lecture 8Hrs |
| JAVA PROGRAMMING BASICS, Model View Controller (MVC) PatternMVCArchitectureusingSpringRESTfulAPIusingSpringFrameworkBuildingan application using Maven |
| **UNIT V Databases & Deployment** | Lecture 8Hrs |
| Relational schemas and normalization Structured Query Language(SQL)DatapersistenceusingSpringJDBCAgiledevelopmentprinciplesanddeployingapplication in Cloud |
| **Textbooks:** |
| 1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to CreatingDynamic Websites by Robin Nixon
3. AZAT MARDAN, FullStackJavaScript:LearnBackbone.js,Node.jsandMongoDB.2015
 |
| **Reference Books:** |
| 1. Full-Stack JavaScript Development by Eric Bush.
2. Tomasz Dyl , KamilPrzeorski , MaciejCzarnecki, Mastering Full Stack React Web Development 2017
 |
| **Online Learning Resources:** |
| https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/ |

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| **(20A05703b) BLOCKCHAIN TECHNOLOGY AND APPLICATIONS****(Professional Elective Course– V)** |
| **Course Objectives:** |
| * Understand how block chain systems (mainly Bitcoin and Ethereum) work and to securely interact with them,
* Design, build, and deploy smart contracts and distributed applications,
* Integrate ideas from block chain technology into their own projects.
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
* Identify the risks involved in building Block chain applications.
* Review of legal implications using smart contracts.
* Choose the present landscape of Block chain implementations and Understand Crypto currency markets.
* Examine how to profit from trading crypto currencies.
 |
| **UNIT I Introduction** | Lecture 8Hrs |
| Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market. |
| **UNIT II Block chain Concepts** | Lecture 9Hrs |
| Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with block chain solutions, life cycle of block chain transaction. |
| **UNIT III Architecting Block chain solutions** | Lecture 9Hrs |
| Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications. |
| **UNIT IV Ethereum Block chain Implementation** | Lecture 8Hrs |
| Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppelin Contracts |
| **UNIT V Hyper ledger Block chain Implementation** | Lecture 8Hrs |
| Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential. |
| **Textbooks:** |
| 1. Ambadas, Arshad SarfarzAriff, Sham “Blockchain for Enterprise Application Developers”, Wiley* + - 1. Andreas M. Antonpoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly
 |
| **Reference Books:** |
| Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill. Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly |
| **Online Learning Resources:** |
| 1. https://github.com/blockchainedindia/resources
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0 401.htm
4. https://nptel.ac.in/courses/106105184
5. https://onlinecourses.nptel.ac.in/noc22\_cs44/preview
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| **(20A05703c) DEEP LEARNING****(Professional Elective Course– V)** |
| **Course Objectives:** |
| * + Demonstrate the major technology trends driving Deep Learning
	+ Build, train, and apply fully connected deep neural networks
	+ Implement efficient (vectorized) neural networks
	+ Analyse the key parameters and hyper parameters in a neural network's architecture
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* + Demonstrate the mathematical foundation of neural network
	+ Describe the machine learning basics
	+ Differentiate architecture of deep neural network
	+ Build a convolutional neural network
	+ Build and train RNN and LSTMs
 |
| **UNIT I** |  | Lecture 8Hrs |
| Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes’ Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares. |
| **UNIT II** |  | Lecture 9Hrs |
| Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms. |
| **UNIT III** |  | Lecture 8Hrs |
| Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. |
| **UNIT IV** |  | Lecture 9Hrs |
| Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks. |
| **UNIT V** |  | Lecture 8Hrs |
| Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models. |
| **Textbooks:** |
| * 1. Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
	2. Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition,2017.
 |
| **Reference Books:** |
| 1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O’Reilly, Shroff Publishers,2019.
 |
| **Online Learning Resources:** |
| 1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf
4. https://www.cse.iitm.ac.in/~miteshk/CS7015.html
5. https://www.deeplearningbook.org
6. https://nptel.ac.in/courses/106105215
 |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE)– IV-I Sem L T P C**

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**(20A52701a) ENTREPRENEURSHIP & INCUBATION**

**(HUMANITIES ELECTIVE II)**

**Course Objectives:**

* To make the student understand about Entrepreneurship
* To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
* To facilitate the student in knowing various sources of finance in starting up of a business
* To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
* To encourage the student in creating and designing business plans

**Course Outcomes:**

* Understand the concept of Entrepreneurship and challenges in the world of competition.
* Apply the Knowledge in generating ideas for New Ventures.
* Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
* Evaluate the role of central government and state government in promoting Entrepreneurship.
* Create and design business plan structure through incubations.

**UNIT I**

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

**UNIT II**

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

**UNIT III**

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

**UNIT IV**

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

**UNIT V**

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

**Textbooks:**

1. D F Kuratko and T V Rao, “Entrepreneurship**”** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, “ Fundamentals of Entrepreneurship”, PHI, 2013

**References:**

1. Vasant Desai, “Small Scale Industries and Entrepreneurship”, Himalaya Publishing 2012.
2. Rajeev Roy “Entrepreneurship”, 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana‖ “Entrepreneurship Development: Text & Cases”, Excel Books, 2011.
4. Stuart Read, Effectual “Entrepreneurship”, Routledge, 2013.

**E-Resources**

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7\_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

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**(20A52701b) MANAGEMENT SCIENCE**

**(HUMANITIES ELECTIVE-II)**

**Course Objectives:**

* To provide fundamental knowledge on Management, Administration, Organization & its concepts.
* To make the students understand the role of management in Production
* To impart the concept of HRM in order to have an idea on Recruitment, Selection,Training& Development, job evaluation and Merit rating concepts
* To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
* To make the students aware of the contemporary issues in management

**Course Outcomes:**

* Understand the concepts & principles of management and designs of organization in a practical world
* Apply the knowledge of Work-study principles & Quality Control techniques in industry
* Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
* Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
* Create Modern technology in management science.

**UNITI** I**NTRODUCTION TO MANAGEMENT**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor’s Scientific Theory-Henry Fayol’s principles - Eltan Mayo’s Human relations - Systems Theory - **Organisational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

**UNIT II OPERATIONS MANAGEMENT**

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Deming‘s contribution to Quality. **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

**UNIT III HUMAN RESOURCES MANAGEMENT (HRM)**

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job & Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

**UNIT IV STRATEGIC & PROJECT MANAGEMENT**

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

**UNIT V CONTEMPORARY ISSUES IN MANAGEMENT**

The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking - Balanced Score Card - Knowledge Management.

**Textbooks:**

1. A.R Aryasri, “Management Science”, TMH, 2013

2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

**References:**

1. Koontz &Weihrich, “Essentials of Management”, 6th edition, TMH, 2005.

2. Thomas N.Duening& John M.Ivancevich, “Management Principles and Guidelines”, Biztantra.

3. Kanishka Bedi, “Production and Operations Management”, Oxford University Press, 2004.

4. Samuel C.Certo, “Modern Management”, 9th edition, PHI, 2005

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**(20A52701c) ENTERPRISE RESOURCE PLANNING**

**(HUMANITIES ELECTIVE-II)**

**Course Objectives:**

* To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
* To enable the students in knowing the Advantages of ERP
* To train the students to develop the basic understanding of how ERP enriches the
* Business organizations in achieving a multidimensional growth.
* Impart knowledge about the historical background of BPR
* To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

**Course Outcomes:**

* Understand the basic use of ERP Package and its role in integrating business functions.
* Explain the challenges of ERP system in the organization
* Apply the knowledge in implementing ERP system for business
* Evaluate the role of IT in taking decisions with MIS
* Create reengineered business processes with process redesign

**UNIT I**

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

**UNIT II**

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

**UNIT III**

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

**UNIT IV**

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

**UNIT V**

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

**Textbooks:**

1. Pankaj Sharma. “Enterprise Resource Planning”. Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, “Enterprise Resource Planning”, IV Edition, Mc.Graw Hill, 2019

**References:**

 1. Marianne Bradford “Modern ERP”, 3rd edition.

2. “ERP making it happen Thomas f. Wallace and Michael

 3. Directing the ERP Implementation Michael w pelphrey

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**(20A05706) MOBILE APPLICATIN DEVELOPMENT**

**(Skill Oriented course - IV)**

|  |
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| **Course Objectives:** |
| * Learn the configuration of Android Studio, SDK Manager, and AVD Emulators
* Understand Android UI Components and make use of Material Design for Android
* Learn the usage of Libraries, APIs and handle messages
* Explore various Hybrid App Development Platforms
* Acquire the knowledge of app releases and publishing and app to the play store
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Demonstrate the configuration of Android Software Development tools
* Design and develop Mobile Applications using Android and Kotlin
* Develop a complex android application by using apis, Libraries, and message handling techniques
* Construct the mobile application using a hybrid framework or SDK
* Release and publish an application on Google Play Store
 |
| **Activities:** |
| **Module 1:**Android OS Architecture: Application Layer, Framework Layer, Libraries and Runtime, Hardware Abstraction Layer, and KernelTask: Select any two Mobile Apps used in your mobile phone and note the various functionalities and their corresponding layers**Module 2:**Android Studio: Install Android Studio, SDK Manager, Configure Plugins, Android Virtual Device(AVD) EmulatorsTask: Install Android Studio and Configure Latest Android SDKs and Android Virtual Devices**Module 3:**Building your First Application: Understanding Activities and Intents, Activity Lifecycle and Managing State, Activities and Implicit IntentsTask: Build and Run Hello World Application on the virtual Device and also test the app on your mobile phone**Module 4:**Android UI components: Text Controls, Buttons, Widgets, Layouts, ContainersTask: Explore all the UI Controls and design a Student Registration Activity**Module 5:**Material Design for Android: Material theme and widgets, Elevation shadows, Cards, Animations, DrawablesTask: Design the Student Registration Activity using Material Design for Android Components**Module 6:**Navigation: Back-button navigation, Hierarchical navigation patterns, Ancestral navigation (Up button), Descendant navigation, Lateral navigation with tabs and swipesTask: Design a complete Student Management Application using Android and provide effective navigation between various Activities**Module 7:**Connect to the Internet: Security best practices for network operations, Including permissions in the manifest, Performing network operations on a worker thread, Making an HTTP connection, Parsing the results, Managing the network stateTask: Develop an Android Application that stores Student Details into the hosting server and retrieve student details from the server**Module 8:**Messages and Storage: Creating a Snackbar object, Showing the message to the user, instantiate a Toast object, Show the toast, Add Notification to your App, Customize Notifications, App-specific storage, Preferences, Room persistence libraryTask: Secure the Student Management Application with proper hints, messages, notifications, and logging**Module 9:**GeoLocation: Set up the project and get an API Key, Add Markers on the map, map Styles, Enable location trackingTask: Add your college location on maps and also provide a location tracking feature in your app**Module 10:**Authentication: Add Firebase to the project, Email Authentication, Phone Authentication, Gmail AuthenticationTask: Design and implement an effective student Login System with OTP feature and email authentication using firebase**Module 11:**Hybrid App Development: Hybrid App vs Native App, React-Native, Flutter, Ionic, XamarinTask: Design Student Management App using any one of the Hybrid Frameworks or SDKs.**Module 12:**Publish App to Play Store: Add a launcher icon and Application ID, Specify API Level targets and version number, Disable logging and debugging, Generate signed APK for release, Create a Google Developer Account, Run pre-launch reports, Review criteria for publishing, Submit your app for publishing.Task: Prepare and Publish Your Android Apps in Google Play Store |
| **References:** |
| 1. Smyth, Neil. Android Studio 4.2 Development Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 4.2, Kotlin, and Android Jetpack, Payload Media, Incorporated, 2021.2. Cheng, Fu. Build Mobile Apps with Ionic 4 and Firebase: Hybrid Mobile App Development. Germany, Apress, 2018.3. Derks, Roy, and Boduch, Adam. React and React Native: A Complete Hands-on Guide to Modern Web and Mobile Development with React.js, 3rd Edition. United Kingdom, Packt Publishing, 2020. |
| **Online Learning Resources/Virtual Labs:** |
| https://developer.android.com/https://material.io/https://kotlinlang.org/https://google-developer-training.github.io/android-developer-fundamentals-course-concepts/https://developers.google.com/ |

**OPEN ELECTIVES**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech III-I Sem L T P C**

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| **(20A01505) BUILDING TECHNOLOGY****(Open Elective-I)** |
| **Course Objectives:** |
| * To know different types of buildings, principles and planning of the buildings.
* To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
* To know the different modes of vertical transportation in buildings.
* To know the utilization of prefabricated structural elements in buildings.
* To know the importance of acoustics in planning and designing of buildings.
 |
| **Course Outcomes (CO):** |
| * Understand the principles in planning and design the buildings
* To get different types of buildings, principles and planning of the buildings
* To know the different methods of termite proofing in buildings.
* Know the different methods of vertical transportation in buildings.
* Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.
* Know the importance of acoustics in planning and designing of buildings.
 |
| **UNIT I** |  |  |
| Overview of the course, basic definitions, buildings-types-components-economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building. |
| **UNIT II** |  |  |
| Termite proofing: Inspection-control measures and precautions-lighting protectionof buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building. |
| **UNIT III** |  |  |
| Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators. |
| **UNIT IV** |  |  |
| Prefabrication systems in residential buildings-walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings. |
| **UNIT V** |  |  |
| Acoustics –effect of noise –properties of noise and its measurements, principles of acoustics of building. Sound insulation-importance and measures. |
| **Textbooks:** |
| 1. Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015
2. Building construction by Punmia.B.C, Jain.A.K and Jain.A.K Laxmi Publications 11th edition 2016
 |
| **Reference Books:** |
| 1. National Building Code of India, Bureau of Indian Standards
2. Building construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P.Arora and S.P.BrndraDhanpat Rai and Sons Publications, New Delh 2014 edition
 |
| <https://nptel.ac.in/courses/105102206>https://nptel.ac.in/courses/105103206 |

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| **(20A02505) ELECTRIC VEHICLES****(Open Elective-I)** |
| **Course Objectives:** |
| * To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
* To get exposed to EV system configuration and parameters
* To know about electro mobility and environmental issues of EVs
* To understand about basic EV propulsion and dynamics
* To understand about fuel cell technologies for EV and HVEs
* To know about basic battery charging and control strategies used in electric vehicles
 |
| **Course Outcomes:** |
| * Understand and differentiate between conventional and latest trends in Electric Vehicles
* Analyze various EV resources, EV dynamics and Battery charging
* Apply basic concepts of EV to design complete EV system
* Design EV system with various fundamental concepts
 |
| **UNIT I INTRODUCTION TO EV SYSTEMS AND PARAMETERS** |
| Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters. |
| **UNIT II EV AND ENERGY SOURCES** |
| Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems |
| **UNIT III EV PROPULSION AND DYNAMICS** |  |
| Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration. |
| **UNIT IV FUEL CELLS** |  |
| Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples |
| **UNIT V BATTERY CHARGING AND CONTROL** |  |
| **Battery charging:** Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.**Control:** Introduction, modelling of electromechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle |
| **Textbooks:**1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
 |
| **Reference Books:** |
| 1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.
 |
| **Online Learning Resources:** |
| 1. <https://onlinecourses.nptel.ac.in/noc22_ee53/preview> |

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 **3 0 0 3**

**(20A03505a) 3D PRINTING TECHNOLOGY**

**(Open Elective-I)**

**Course Objectives:**

* Familiarize techniques for processing of CAD models for rapid prototyping.
* Explain fundamentals of rapid prototyping techniques.
* Demonstrate appropriate tooling for rapid prototyping process.
* Focus Rapid prototyping techniques for reverse engineering.
* Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

**Course Outcomes:**

* Use techniques for processing of CAD models for rapid prototyping.
* Understand and apply fundamentals of rapid prototyping techniques.
* Use appropriate tooling for rapid prototyping process.
* Use rapid prototyping techniques for reverse engineering.
* Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

**UNIT I Introduction to 3D Printing**

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

**UNIT II Solid and Liquid Based RP Systems**

Working Principle, Materials, Advantages, Limitations and Applicationsof Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

**UNIT III Powder Based & Other RP Systems**

**Powder Based RP Systems:** Working Principle,Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

**Other RP Systems:** Working Principle,Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

**UNIT IV Rapid Tooling & Reverse Engineering**

**Rapid Tooling:** Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

**Reverse Engineering (RE):** Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

**UNIT V Errors in 3D Printing and Applications:**

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.

**Software:** Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

**Applications:** Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

**Textbooks:**

1. Chee Kai Chua and Kah Fai Leong, “3D Printing and Additive Manufacturing Principles and Applications” 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing”, Springer, 2/e, 2010.

**Reference Books:**

1. Frank W.Liou, “Rapid Prototyping & Engineering Applications”, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, **“**Rapid Prototyping: Principles and Applications in Manufacturing”, John Wiley&Sons, 2006.

**Online Learning Resources:**

* NPTEL Course on Rapid Manufacturing.
* https://nptel.ac.in/courses/112/104/112104265/
* https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
* https://slideplayer.com/slide/6927137/
* https://www.mdpi.com/2073-4360/12/6/1334
* https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
* https://lecturenotes.in/subject/197
* https://www.cet.edu.in/noticefiles/258\_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
* https://www.vssut.ac.in/lecture\_notes/lecture1517967201.pdf
* <https://www.youtube.com/watch?v=NkC8TNts4B4>

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**(20A04505) DIGITAL ELECTRONICS**

**(Open Elective Course- I)**

**Course Objectives:**

* To provide the fundamental concepts associated with the digital logic and circuit design.
* To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.
* To familiarize with the different number systems, logic gates, and combinational and sequential circuits, memory elements utilized in the different digital circuits and systems.
* To introduce different digital logic families

**Course Outcomes:**

* Become familiar with the Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from to others
* Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems
* Understand the working mechanism and design guidelines of different combinational, sequential circuits, memory elements and their role in the digital system design.
* Understand different logic families and use the best combination of ICs during the design of a digital system

**UNIT 1**

DIGITAL FUNDAMENTALS: Number Systems - Decimal, binary, octal, Hexadecimal,1's and 2's complements,Codes - Binary, BCD, Excess 3, Gray, Alphanumeric codes, Booleantheorems. Logic gates: Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization.

**UNIT II**

COMBINATIONAL CIRCUITS: Half and Full Adders, Half and FullSubtractors, Binary Parallel Adder Carry look ahead Adder, BCD 'Adder, Multiplexer,Demultiplexer, MagniudeComparator, Decoder, Encoder, Priority Encoder.

**UNIT III**

SYNCHRONOUS SEQUENTIAL CIRCUITS: Flip flops - SR, JK, T, D, Master/Slave FF- operation and excitation tables, Triggering of FF, conversion of FF. Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

**UNIT IV**

MEMORY DEVICES: Basic memory structure - ROM, PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM.Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA).

**UNIT V**

Digital Logic Families: Logic levels,propagation delay, power dissipation, fan-out and fan-in, noise margin, RTL, TTL, ECL, CMOS.

**Textbooks:**

1. Modern Digital Electronics(Edition III) : R. P. Jarn; TMH
2. Digital Fundamentals: Thomas I. Floyd
3. Digital circuits and design: S. Salivahanan, and S. Anvzzhagan

**References:**

1. Digital Integrated Electronics: Taub & Schilling; MGH
2. Digital Design: Morris Mano; PHI.Course

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**20A27505) COMPUTER APPLICATIONS IN FOOD TECHNOLOGY**

**(Open Elective-1)**

**Course Objectives:**

* To know different software and applications in food technology.
* To understand the Chemical kinetics in food processing, Microbial distraction in thermal processing of food.
* To acquire knowledge on computer aided manufacturing and control of food machinery, inventory control, process control.

**Course Outcomes:**

* Students will gain knowledge on software in food technology, data analysis, Chemical kinetics, microbial distortion in thermal process
* Use of linear regression in analyzing sensory data, application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants.

**UNIT I**

Introduction to various software and their applications in food technology. Application of MS Excel to solve the problems of Food Technology, SPSS and JMP for data analysis, Pro-Engineering for design, Lab VIEW and SCADA for process control .

**UNIT II**

Chemical kinetics in food processing: Determining rate constant of zero order reaction First order rate constant and half-life of reactions. Determining energy of activation of vitamin degradation during food storage Rates of Enzymes catalyzed reaction. Microbial distraction in thermal processing of food. Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food. Sampling to ensure that a lot is not contaminated with more than a given percentage Statistical quality control. Probability of occurrence in normal distribution. Using binomial distribution to determine probability of occurrence. Probability of defective items in a sample obtained from large lot

**UNIT III**

Sensory evaluation of food Statistical descriptors of a population estimated from sensory data obtained from a sample Analysis of variance**.** One factor, completely randomized design For two factor design without replication**.** Use of linear regression in analyzing sensory data. Mechanical transport of liquid food**.** Measuring viscosity of liquid food using a capillary tube viscometer . Solving simultaneous equations in designing multiple effect evaporator while using matrix algebra available in excel.

**UNIT I**V

Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product.

**UNIT V**

Basic Introduction to computer aided manufacturing. Application of computers, instrumentation and control of food machinery, inventory control, process control etc.

**Recommended books:**

1. Computer Applications in Food Technology: Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office.

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**B.Tech III-I Sem L T P C**

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|  | **(20A54501) OPTIMIZATION TECHNIQUES****(Open Elective- I)** |  |  |  |  |
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| **Course Objectives:** |
| This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.  |
| **Course Outcomes:** Student will be able to |
| * formulate a linear programming problem and solve it by various methods.
* give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
* identify strategies in a game for optimal profit.
* implement project planning.
 |
| **UNIT I** |  |  |
| Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method. |
| **UNIT II** |  |  |
| Transportation problems- assignment problems-Game theory. |
| **UNIT III** |  |  |
| CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.  |
| **UNIT IV** |  |  |
| Sequencing Problems-Replacement problems-Capital equipment- Discounting costs- Group replacement. |
| **UNIT V** |  |  |
| Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.  |
| **Textbooks:** |
| 1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers
 |
| **Reference Books:** |
| 1. Problems on Operations Research, Er. Prem kumargupta, Dr.D.S. Hira, Chand publishers
2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav
 |
| **Online Learning Resources:** |
| <https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf><https://slideplayer.com/slide/7790901/><https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf> |

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**(20A56501) MATERIALS CHARACTERIZATION TECHNIQUES**

**(Open Elective- I)**

**Course Objectives**:

* To provide an exposure to different characterization techniques.
* To enlighten the basic principles and analysis of different spectroscopic techniques.
* To explain the basic principle of Scanning electron microscope along with its limitations and applications.
* To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
* To educate the uses of advanced electric and magnetic instruments for characterization.

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

* To explain the structural analysis by X-ray diffraction.
* To understand the morphology of different materials using SEM and TEM.
* To recognize basic principles of various spectroscopic techniques.
* To study the electric and magnetic properties of the materials.
* To make out which technique can be used to analyse a material

**UNIT I**

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg’s law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H)  Methods, Small angle X-ray scattering (SAXS) (in brief).

**UNIT II**

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

**UNIT III**

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

**UNIT IV**

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

**UNIT V**

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

**Textbooks:**

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang

Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008

2. Handbook of Materials Characterization -by Sharma S. K. - Springer

**References:**

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M.

McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall, 2001

3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-[Yang Leng](https://www.wiley.com/en-us/search?pq=%7Crelevance%7Cauthor%3AYang+Leng)- John Wiley & Sons4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley (Bp)

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**B.Tech III-I Sem L T P C**

 **3 0 0 3**

**(20A51501) CHEMISTRY OF ENERGY MATERIALS**

**(Open Elective- I)**

**Course Objectives:**

* To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
* To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
* To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
* Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
* To understand and apply the basics of calculations related to material and energy flow in the processes.

 **Course Outcomes**:

* Ability to perform simultaneous material and energy balances.
* Student learn about various electrochemical and energy systems
* Knowledge of solid, liquid and gaseous fuels
* To know the energy demand of world, nation and available resources to fulfill the demand
* To know about the conventional energy resources and their effective utilization
* To acquire the knowledge of modern energy conversion technologies
* To be able to understand and perform the various characterization techniques of fuels
* To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

**UNIT I: Electrochemical Systems:** Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batterie**s.**

**UNIT II: Fuel Cells:** Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,.

**UNIT III: Hydrogen Storage:** Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

**UNIT IV:Solar Energy:** Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

**UNIT V:** Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

**References:**

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

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**B.Tech IV-I Sem L T P C**

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| **(20A01704) ENVIRONMENTAL ECONOMICS****(Open Elective Course - II)**  |
| **Course Objectives:** |
| * To impart knowledge on sustainable development and economics of energy
* To teach regarding environmental degradation and economic analysis of degradation
* To inculcate the knowledge of economics of pollution and their management
* To demonstrate the understanding of cost benefit analysis of environmental resources
* To make the students to understand principles of economics of biodiversity
 |
| **Course Outcomes :** |
| After the completion of the course, the students will be able to know* The information on sustainable development and economics of energy
* The information regarding environmental degradation and economic analysis of degradation
* The identification of economics of pollution and their management
* The cost benefit analysis of environmental resources
* The principles of economics of biodiversity
 |
|  **UNIT I** |  |  |
| Sustainable Development: Introduction to sustainable development - Economy-Environment inter-linkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy – Nonrenewable energy, scarcity, optimal resources, backstop technology, property research, externalities, and the conversion of uncertainty. |
| **UNIT II** |  |  |
|  Environmental Degradation: Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.  |
| **UNIT - III** |  |  |
| Economics of Pollution: Economics of Pollution - Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.  |
| **UNIT IV** |  |  |
|  Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.  |
| **UNIT V** |  |  |
| Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate Change – stern Report  |
| **Textbooks:** |
| * + - 1. An Introduction to Environmental Economics by N. Hanley, J. Shogren and B. White Oxford University Press.(2001)
			2. Blueprint for a Green Economy by D.W. Pearce, A. Markandya and E.B. Barbier Earthscan, London.(1989)
 |
| **Reference Books:** |
| * + - 1. Environmental Economics: An Elementary Introduction by R.K. Turner, D.W. Pearce and I. Bateman Harvester Wheatsheaft, London. (1994),
			2. Economics of Natural Resources and the Environment by D.W. Pearce and R.K. Turner Harvester Wheat sheaf, London. (1990),
			3. Environmental and Resource Economics: An Introduction by Michael S. Common and Michael Stuart 2ndEdition, Harlow: Longman.(1996),
			4. Natural Resource and Environmental Economics by Roger Perman, Michael Common, Yue Ma and James Mc Gilvray 3rdEdition, Pearson Education.(2003),
 |
| **Online Learning Resources:**<https://nptel.ac.in/courses/109107171> |
|  |

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**B.Tech III-II Sem L T P C**

 **3 0 0 3**

**(20A02605) SMART ELECTRIC GRID**

**(Open Elective Course-II)**

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| **Course Objectives:** |
| * Understand recent trends in grids, smart grid architecture and technologies
* Analyze smart substations
* Apply the concepts to design smart transmission systems
* Apply the concepts to design smart distribution systems
 |
| **Course Outcomes:** |
| * Understand trends in Smart grids, needs and roles of Smart substations
* Design and Analyze Smart Transmission systems
* Design and Analyze Smart Distribution systems
* Analyze SCADA and DSCADA systems in practical working environment
 |
| **UNIT I** | **INTRODUCTION TO SMART GRID** |  |
| Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid |
| **UNIT II** | **SMART GRID TECHNOLOGIES** |  |
| Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds |
| **UNIT III** | **SMART SUBSTATIONS** |  |
| Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation |
| **UNIT IV** | **SMART TRANSMISSION SYSTEMS** |  |
| Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid |
| **UNIT V** | **SMART DISTRIBUTION SYSTEMS** |  |
| DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation |
| **Textbooks:** |
| 1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.
 |
| **Reference Books:** |
| 1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.
 |
| **Online Learning Resources:** |
| 1. <https://onlinecourses.nptel.ac.in/noc22_ee82/preview> |

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**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A03605c) NON – CONVENTIONAL SOURCES OF ENERGY**

**(Open Elective-II)**

**Course Objectives:**

* To explain concept of various forms of renewable energy
* To outline division aspects and utilization of renewable energy sources for both domestics and industrial applications
* To analyse the environmental and cost economics of using renewable energy sources compared to fossil fuels*.*

**Course Outcomes:**

* Explain the basic concepts of solar radiation and solar collectors
* Develop Bio - Energy
* Explain the geothermal Energy
* Apply the principles of electrical technology to develop MHD power generator
* Utilize different wind parameters for design of rotor
* Make use of power curve for energy estimation

**UNIT I**

**Principles of Solar Radiation**:

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT II**

**Solar Energy Collection & Storage**

**Solar Energy Collection**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**Solar Energy Storage and Applications**:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT III**

**Wind Energy &Biomass**

**Wind Energy**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**Biomass**: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

**UNIT IV**

**Geothermal Energy & Ocean Energy**

**Geothermal Energy**: Resources, types of wells, methods of harnessing the energy, potential in India.

**Ocean Energy**: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. **Tidal and wave energy:** Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT V**

**Direct Energy Conversion**

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

**Textbooks:**

* + - 1. Tiwari and Ghosal, Renewable energy resources, Narosa Publishing House-2004.
			2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publications-1988.

**Reference Books:**

1. Twidell& Weir, Renewable Energy Sources, Routledge; 3/e, 2015.
2. Sukhatme S.P., Nayak.J.P, ‘Solar Energy – Principle of Thermal Storage and collection”, Tata McGraw Hill, 2008.
3. Sathyajith Mathew, Wind Energy Fundamentals, Resource Analysis and Economics, Springer Publications, 2006.
4. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press, 2010.
5. Wind Power, Revised Edition: Renewable Energy for Home, Farm, and Business, Paul Gipe, Chelsea Green Publishing, 2004.
6. S.S. Rao, B.B. Parulekar, Energy Technology (Non Conventional, Renewable and Conventional), Khanna publications, 1994.

**Online Learning Resources:**

* https://nptel.ac.in/courses/103103206
* https://nptel.ac.in/courses/108108078
* https://onlinecourses.nptel.ac.in/noc21\_ph33/preview
* https://nptel.ac.in/courses/121106014
* https://mrcet.com/downloads/digital\_notes/EEE/31082020/IV-I%20SOLAR%20&%20WIND%20ELECTRICAL%20SYSTEMS%20DIGITAL%20NOTES%201.pdf
* <https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A04605) SIGNAL PROCESSING**

**(Open Elective Course –II)**

**Course objectives:**

* Understand, represent and classify continuous time and discrete time signals and systems, together with the representation of LTI systems.
* Ability to represent continuous time signals (both periodic and non-periodic) in the time domain, sdomain and the frequency domain
* Understand the properties of analog filters, and have the ability to design Butterworth filters
* Understand and apply sampling theorem and convert a signal from continuous time to discrete time or from discrete time to continuous time (without loss of information)
* Able to represent the discrete time signal in the frequency domain
* Able to design FIR and IIR filters to meet given specifications

**Course Outcomes**:

* Understand and explain continuous time and discrete time signals and systems, in time and frequency domain
* Apply the concepts of signals and systems to obtain the desired parameter/ representation
* Analyse the given system and classify the system/arrive at a suitable conclusion
* Design analog/digital filters to meet given specifications
* Design and implement the analog filter using components/ suitable simulation tools
* Design and implement the digital filter using suitable simulation tools, and record the input and output of the filter for the given audio signal

**UNIT I**

Signal Definition, Signal Classification, System definition, System classification, for both continuous time and discrete time. Definition of LTI systems

**UNIT II**

Introduction to Fourier Transform, Fourier Series, Relating the Laplace Transform to Fourier Transform, Frequency response of continuous time systems

**UNIT III**

Frequency response of ideal analog filters, Salient features of Butterworth filters Design and implementation of Analog Butterworth filters to meet given specifications

**UNIT IV**

Sampling Theorem- Statement and proof, converting the analog signal to a digital signal. Practical sampling. The Discrete Fourier Transform, Properties of DFT. Comparing the frequency response of analog and digital systems.

**UNIT V**

Definition of FIR and IIR filters. Frequency response of ideal digital filters

Transforming the Analog Butterworth filter to the Digital IIR Filter using suitable mapping techniques, to meet given specifications. Design of FIR Filters using the Window technique, and the frequency sampling technique to meet given specifications Comparing the designed filter with the desired filter frequency response

**Textbooks:**

1. ‘Signals and Systems’, by Simon Haykin and Barry Van Veen, Wiley.

**References:**

1. 'Theory and Application of Digital Signal Processing', Rabiner and Gold
2. ‘Signals and Systems’, Schaum’s Outline series
3. ‘Digital Signal Processing’, Schaum’s Outline series

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**B.Tech III-II Sem L T P C**

 **3 0 0 3**

**(20A27605) FOOD REFRIGERATION AND COLD CHAIN MANAGEMENT**

**OPEN ELECTIVE II**

**Course Objectives:**

* To know the equipment available to store perishable items for a long time
* To understand to increase the storage life of food items

**Course Outcomes**

By the end of the course, the students will

* Understand various principles and theories involved in refrigeration systems
* Understand the different equipment useful to store the food items for a long period.
* Understand how to increase the storage life of food items

**UNIT I**

Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

**UNIT II**

Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry vs wet compression, throttling vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

**UNIT III**

Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquid sub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

**UNIT IV**

Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

**UNIT V**

Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convicted heat, internal heat sources, heat of respiration, peak load; etc.

**Textbooks:**

1. Arora, C. P. “Refrigeration and Air Conditioning”. Tata MC Graw Hill Publishing Co.Ltd., New Delhi. 1993.

**References:**

1. Adithan, M. and Laroiya, S. C. “Practical Refrigeration and Air Conditioning”. Wiley Estern Ltd., New Delhi 1991

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**B.Tech III-II Sem L T P C**

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| **(20A54701) WAVELET TRANSFORMS AND ITS APPLICATIONS****(Open Elective-II)** |
| **Course Objectives:** |
| This course provides the students to understand Wavelet transforms and its applications. |
| **Course Outcomes:**  |
| * Understand wavelets and wavelet expansion systems.
* Illustrate the multi resolution analysis ad scaling functions.
* Form fine scale to coarse scale analysis.
* Find the lattices and lifting.
* Perform numerical complexity of discrete wavelet transforms.
* Find the frames and tight frames using fourier series.
 |
| **UNIT I** | Wavelets |  |
| Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform the Discrete-Time and Continuous Wavelet Transforms. |
| **UNIT II** | A Multiresolution Formulation of Wavelet Systems |  |
| Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.  |
| **UNIT III** | Filter Banks and the Discrete Wavelet Transform |  |
| Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View. |
| **UNIT IV** | Time-Frequency and Complexity |  |
| Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform. |
| **UNIT V** | Bases and Matrix Examples |  |
| Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example. |
| **Textbooks:** |
| 1. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”,Prentice Hall, (1997).
2. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999).
 |
| **Reference Books:** |
| 1. Raghuveer Rao, “Wavelet Transforms”, Pearson Education, Asia.
 |
| Online Learning Resources: |
| <https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915> |

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**B.Tech III-II Sem L T P C**

 **3 0 0 3**

**(20A56701) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES**

**(Open Elective-II)**

**Course Objectives:**

* To impart the fundamental knowledge on various materials, their properties and applications.
* To provide insight into various semiconducting materials, and their properties.
* To enlighten the characteristic behavior of various semiconductor devices.
* To provide the basics of dielectric and piezoelectric materials and their properties.
* To explain different categories of magnetic materials, mechanism and their advanced applications.

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

* To understand the fundamentals of various materials.
* To exploit the physics of semiconducting materials
* To familiarize with the working principles of semiconductor-based devices.
* To understand the behaviour of dielectric and piezoelectric materials.
* To identify the magnetic materials and their advanced applications.

**UNIT I Fundamentals of Materials Science**

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

**UNIT II Semiconductors**

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

**UNIT III Physics of Semiconductor devices**

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

**UNIT IV Dielectric Materials and their applications:**

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

**UNIT V Magnetic Materials and their applications**

Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

**Textbooks**

1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, Dhanpat Rai and Co.

#### Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011
4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland, Chapman& Hall Pub.

**NPTEL courses links**

<https://nptel.ac.in/courses/113/106/113106062/>

<https://onlinecourses.nptel.ac.in/noc20_mm02/preview>, <https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech III-II Sem L T P C**

 **3 0 0 3**

**(20A51701) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS**

**Course Objectives:**

* To understand the basic principles of polymers
* To synthesize the different polymeric materials and their characterization by various instrumental methods.
* To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
* To enumerate the applications of polymers in engineering

**Course Outcome**

* At the end of the course, the student will be able to:
* Understand the state of art synthesis of Polymeric materials
* Understand the hydro gels preparation, properties and applications in drug delivery system.
* Characterize polymers materials using IR, NMR, XRD.
* Analyze surface phenomenon fo micelles and characterise using photoelectron spectroscopy, ESCA and Auger spectroscopy

**UNIT I :** Polymers-Basics and Characterization

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

**Unit II** : Synthetic Polymers Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization.

Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications.

Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD.

**UNIT III :** Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEAK.

Learning Outcomes:

**UNIT IV:** Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

**UNIT V :** Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

 **References :**

1. A Text book of Polymer science, Billmayer
2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
3. Advanced Organic Chemistry, B.Miller, Prentice Hall
4. Polymer Chemistry – G.S.Mishra
5. Polymer Chemistry – Gowarikar
6. Physical Chemistry –Galston
7. Drug Delivery- Ashim K. Misra

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

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| **(20A01705) COST EFFECTIVE HOUSING TECHNIQUES****(Open Elective Course - III)** |
| **Course Objectives:** |
| * To understand the requirements of structural safety for future construction.
* To know about the housing scenario, housing financial systems land use and physical
* planning for housing and housing the urban poor
* To know the traditional practices of rural housing
* To know the different innovative cost effective construction techniques
* To know the alternative building materials for low cost housing.
 |
| **Course Outcomes :** |
| * To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
* To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
* Apply the traditional practices of rural housing
* Understand the different innovative cost effective construction techniques
* Suggest the alternative building materials for low cost housing
 |
| **UNIT I** |  |  |
| 1. **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
2. **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
3. **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
4. **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor
 |
| **UNIT II** |  |  |
| **Development and adoption of low cost housing technology**Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building |
| **UNIT III** |  |  |
| **Alternative building materials for low cost housing**Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - alternative building maintenance**Low cost Infrastructure services:**Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy |
| **UNIT IV** |  |  |
| **Rural Housing:** Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs |
| **UNIT V** |  |  |
| **Housing in Disaster prone areas:**Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement’s of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety |
| **Textbooks:** |
| 1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books
 |
| **Reference Books:** |
| 1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon  Publishers
 |
| **Online Learning Resources:** |
| <https://nptel.ac.in/courses/124107001> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

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| **(20A02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING****(Open Elective Course – III)** |
|  |  |  |  |
| **Course Objectives:** |
| * Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
* Analyze motion less and motion detectors in IoT applications
* Understand about Analyze applications of IoT in smart grid
* Apply the concept of Internet of Energy for various applications
 |
| **Course Outcomes:** |
| * Understand the concept of IoT in Electrical Engineering
* Analyze various types of motionless sensors and various types of motion detectors
* Apply various applications of IoT in smart grid
* Design future working environment with Energy internet
 |
| **UNIT I** | **SENSORS** |  |
| Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric  |
| **UNIT II** | **OCCUPANCY AND MOTION DETECTORS** |  |
| Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors |
| **UNIT III** | **MEMS** |  |
| Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors |
| **UNIT IV** | **IoT FOR SMART GRID** |  |
| Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home |
| **UNIT V INTERNET of ENERGY (IoE)**Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid  |
| **Textbooks:** |
| 1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019
 |
| **Reference Books:** |
| 1. Raj Kumar Buyya and Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019
 |
| **Online Learning Resources:** |
| 1.<https://onlinecourses.nptel.ac.in/noc22_cs96/preview>2. <https://nptel.ac.in/courses/108108123>3. <https://nptel.ac.in/courses/108108179>  |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A03704) INTRODUCTION TO HYBRID AND ELECTRICAL VEHICLES**

**(Open Elective-III)**

**Course Objectives:**

* Provide good foundation on hybrid and electrical vehicles.
* To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
* Familiarize energy storage systems for electrical and hybrid transportation.
* To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

**Course Outcomes:**

* Explain the working of hybrid and electric vehicles
* Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources
* Develop the electric propulsion UNIT and its control for application of electric vehicles
* Choose proper energy storage systems for vehicle applications
* Design and develop basic schemes of electric vehicles and hybrid electric vehicles

**UNIT I Electric Vehicle Propulsion and Energy Sources**

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. Battery modelling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Li-polymer battery.

**UNIT II Electric Vehicle Power Plant and Drives**

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

**UNIT III Hybrid and Electric Drive Trains**

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

**UNIT IV Electric and Hybrid Vehicles - Case Studies**

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study –Toyota Prius, Honda Insight, Chevrolet Volt. 42 V systems for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy-duty vehicles, fuel cell heavy duty vehicles.

**UNIT V Electric and Hybrid Vehicle Design**

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

**Textbooks:**

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, [M. Saber Fallah](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22M.+Saber+Fallah%22&source=gbs_metadata_r&cad=4), [AvestaGoodarzi](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Avesta+Goodarzi%22&source=gbs_metadata_r&cad=4), Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

**Reference Books:**

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. John G. Hayes, [G. Abas Goodarzi](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=G.+Abas+Goodarzi&search-alias=stripbooks), Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018.

**Online Learning Resources:**

* https://archive.nptel.ac.in/courses/108/103/108103009/
* https://www.youtube.com/watch?v=wypbLRe9xUg
* https://www.youtube.com/watch?v=q6BYr5-fq5U
* https://www.youtube.com/watch?v=3E1SXG7VkQk
* https://www.iare.ac.in/sites/default/files/IARE\_HEV\_LN\_0.pdf
* <https://nptel.ac.in/courses/108102121>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A04704) ELECTRONIC SENSORS**

**(Open Elective Course –III)**

**Course Objectives:**

* Learn the characterization of sensors.
* Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
* Understand the concepts of Electro analytic and smart sensors
* Able to use sensors in different applications

**Course Outcomes**:

* Learn about sensor Principle, Classification and Characterization.
* Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
* Understand the basic concepts of Smart Sensors
* Design a system with sensors

**UNIT I**

**Sensors / Transducers**: Principles, Classification, Parameters, Characteristics, Environmental

Parameters (EP), Characterization

**Electromechanical Sensors:** Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

**UNIT II**

**Thermal Sensors**: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

**UNIT III**

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors,

Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

**UNIT IV**

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen

Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

**UNIT V**

**Smart Sensors:** Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters,

Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

**Textbooks:**

1. “Sensors and Transducers - D. Patranabis” –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

**References:**

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A27704) HUMAN NUTRITION**

**(OPEN ELECTIVE-III)**

**Course Objectives:**

* To get knowledge on Concepts and content of nutrition source and metabolic functions.
* To know about Balanced diets for various groups; Diets and disorders, recommended dietary allowances
* To learn about Epidemiology of under nutrition and over nutrition.
* To understand Nutrition and immunity.

**Course Outcomes:**

* To study the Salient features of Concepts and content of nutrition, Malnutrition, Nutrition education
* Assessment of nutritional status, disorders Food fad and faddism.

**UNIT I**

Concepts and content of nutrition: Nutrition agencies; Nutrition of community; Nutritional policies and their implementation; Metabolic function of nutrients. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings;

**UNIT II**

Water and energy balance: Water intake and losses; Basal metabolism- BMR; Body surface area and factors affecting BMR Formulation of diets: Classification of balanced diet; Balanced diets for various groups; Diets and disorders. Recommended dietary allowances (RDA); For various age group; According physiological status; Athletic and sports man; Geriatric persons

**UNIT III**

Malnutrition: Type of Malnutrition; Multi-factorial causes; Epidemiology of under nutrition and over nutrition; Nutrition and immunity.

**UNIT IV**

Nutrition education Assessment of nutritional status: Diet surveys; Anthropometry; Clinical examination; Biochemical assessment; Additional medical information

**UNIT V**

Blood constituents; Hormone types; Miscellaneous disorders Food fad and faddism. Potentially toxic substances in human food.

**Textbooks:**

1. Swaminathan M, Advanced Text Book on Food & Nutrition (Volume I and II) , The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006
2. Stewart Truswell, ABC of Nutrition (4th edition) , BMJ Publishing Group 2003, ISBN 0727916645.
3. Martin Eastwood, Principles of Human Nutrition , Blackwell Publishing, Boca Rotan

**Reference:**

1. Mike Lean and E. Combet ,Barasi’s Human Nutrition – A Health Perspective , Second Edition CRC Press, London
2. Introduction to Human Nutrition, Micheal J. G., Susan A.L. Aedin C. and Hester H.V, Wiley-Blackwell Publication, UK 2009 , ISBN 9781405168076
3. Bogert L.J., Goerge M.B, Doris H.C., Nutrition and Physical Fitness, W.B. Saunders Company, Toronto, Canada

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

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|  | **(20A54702) NUMERICAL METHODS FOR ENGINEERS** **(OPEN ELECTIVE-III)** |
|  |
| **Course Objectives:** |
| This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations. |
| **Course Outcomes:**  |
| * Apply numerical methods to solve algebraic and transcendental equations.
* Understand fitting of several kinds of curves.
* Derive interpolating polynomials using interpolation formulae.
* Solve differential and integral equations numerically.
 |
| **UNIT I** | **Solution of Algebraic & Transcendental Equations** |  |
| Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method. |
| **UNIT II** | **Curve Fitting** |  |
| Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.  |
| **UNIT III** | **Interpolation** |  |
| Finite differences-Newton’s forward and backward interpolation formulae – Lagrange’s formulae Gauss forward and backward formula, Stirling’s formula, Bessel’s formula |
| **UNIT IV** | **Numerical Integration**  |  |
| Numerical Integration: Trapezoidal rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule |
| **UNIT V Solution of Initial value problems to Ordinary differential equations** |
| Numerical solution of Ordinary Differential equations: Solution by Taylor’s series-Picard’s Method of successive Approximations-Modified Euler’s Method-Runge-Kutta Methods.  |
| **Textbooks:** |
| 1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India
 |
| **Reference Books:** |
| 1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.
 |
| **Online Learning Resources**: |
| <https://slideplayer.com/slide/8588078/> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A56702) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS**

**(OPEN ELECTIVE-III)**

**Course Objectives**:

* To provide exposure to various kinds of sensors and actuators and their engineering applications.
* To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
* To enlighten the operating principles of various sensors and actuators
* To educate the fabrication of sensors
* To identify the required sensor and actuator for interdisciplinary application

**Course Outcomes:**

* To recognize the need of sensors and actuators
* To understand working principles of various sensors and actuators
* To identify different type of sensors and actuators used in real life applications
* To exploit basics in common methods for converting a physical parameter into an electrical quantity
* To make use of sensors and actuators for different applications

**UNIT I Introduction to Sensors and Actuators**

**Sensors**: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

**Actuators:** Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators.

**UNIT II Temperature and Mechanical Sensors**

**Temperature Sensors**: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

**Mechanical Sensors**: Types of Mechanical sensors and their basic principle of working: Force sensors: strain gauges, tactile sensors, Pressure sensors: semiconductor, piezoresistive, capacitive, VRP.

**UNIT III Optical and Acoustic Sensors**

**Optical Sensors**: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

**Acoustic Sensors**: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

**UNIT IV Magnetic, Electromagnetic Sensors and Actuators**

 Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

**UNIT V Chemical and Radiation Sensors**

**Chemical Sensors**: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

**Radiation Sensors**: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

**Textbooks:**

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015

2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

**Reference Books:**

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003

2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999

3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.

4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

5. Principles of Industrial Instrumentation By D. Patranabhis

**NPTEL courses links**

<https://onlinecourses.nptel.ac.in/noc21_ee32/preview>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A51702) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS**

**(OPEN ELECTIVE-III)**

**Course Objectives:**

* To understand synthetic principles of Nanomaterials by various methods
* To characterize the synthetic nanomaterials by various instrumental methods
* To enumerate the applications of nanomaterials in engineering

**Course Outcomes:**

* Understand the state of art synthesis of nano materials
* Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
* Analyze nanoscale structure in metals, polymers and ceramics
* Analyze structure-property relationship in coarser scale structures
* Understand structures of carbon nano tubes

**UNIT I**

Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Synthetic Methods**:** Bottom-Up approach**:** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

**UNIT II**

Top-Down approach: Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling.

**UNIT III**

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

**UNIT IV**

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals.

**UNIT V**

Engineering Applications of Nanomaterials

**Textbooks:**

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

**References:**

1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.
3. Nanomaterials Chemistry, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

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| **(20A01706) HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICES****(Open Elective Course-IV)** |
| **Course Objectives:** |
| * To understand safety, health and environmental management.
* To be familiar with hazard classification and assessment, hazard evaluation and hazard . control, environmental issues and management
* To get exposed to accidents modeling, accident investigation and reporting, concepts of. HAZOP and PHA
* To be familiar with safety measures in design and process operations.
* To get exposed to risk assessment and management, principles and methods
 |
| **Course Outcomes :** |
| * To understand safety, health and environmental management.
* To be familiar with hazard classification and assessment, hazard evaluation and hazard.
* To get exposed to accidents modelling, accident investigation and reporting control, environmental issues and management
* To get concepts of HAZOP and PHA.
* To be familiar with safety measures in design and process operations.
 |
| **UNIT I** |  |  |
| Introduction to safety, health and environmental management - Basic terms and their definitions - Importance of safety - Safety assurance and assessment - Safety in design and operation - Organizing for safety.  |
| **UNIT II** |  |  |
| Hazard classification and assessment - Hazard evaluation and hazard control. Environmental issues and Management - Atmospheric pollution - Flaring and fugitive release - Water pollution - Environmental monitoring - Environmental management.  |
| **UNIT III** |  |  |
| Accidents modelling - Release modelling - Fire and explosion modelling - Toxic release and dispersion Modelling  |
| **UNIT IV** |  |  |
| Accident investigation and reporting - concepts of HAZOP and PHA. Safety measures in design and process operations - Inserting, explosion, fire prevention, sprinkler systems.  |
| **UNIT V** |  |  |
| Risk assessment and management - Risk picture - Definition and characteristics - Risk acceptance criteria - Quantified risk assessment - Hazard assessment - Fatality risk assessment - Risk management principles and methods. |
| **Textbooks:** |
| * + - 1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
			2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.
 |
| **Reference Books:** |
| 1. Introduction to Safety and Reliability of Structures, by Jorg Schneider
2. Structural Engineering Documents Vol. 5, International Association for Bridge and Structural Engineering (IABSE), 138pp., 1997.
3. Safety and Health for Engineers, by Roger L. Brauer, John Wiley and Sons Inc. pp. 645-663, 2006.
4. Health, Safety and Environmental Management in Offshore and Petroleum Engineering, Srinivasan Chandrasekaran, John Wiley and Sons, 2016.
 |
| **Online Learning Resources:** |
| <https://nptel.ac.in/courses/114106017> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

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| **(20A02705) RENEWABLE ENERGY SYSTEMS****(Open Elective Course – IV)** |
| **Course Objectives:** |
| * Understand various sources of Energy and the need of Renewable Energy Systems.
* Understand the concepts of Solar Radiation, Wind energy and its applications.
* Analyze solar thermal and solar PV systems
* Understand the concept of geothermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.
 |
| **Course Outcomes:** |
| * Understand various alternate sources of energy for different suitable application requirements
* Understand the concepts of solar energy generation strategies and wind energy system
* Analyze Solar and Wind energy systems
* Understand the basics of Geothermal Energy Systems, various diversified energy scenarios of ocean, biomass and fuel cells
 |
| **UNIT I** | **SOLAR ENERGY** |  |
| Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage. |
| **UNIT II** | **PV ENERGY SYSTEMS** |  |
| Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems. |
| **UNIT III** | **WIND ENERGY** |  |
| Principle of wind energy conversion; Basic components of wind energy conversion systems; windmill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations. |
| **UNIT IV** | **GEOTHERMAL ENERGY**  |  |
| Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India. |
| **UNIT V** | **MISCELLANEOUS ENERGY TECHNOLOGIES** |  |
| **Ocean Energ**y: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations. **Bio mass Energy**: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration**Fuel cell**: Principle of working of various types of fuel cells and their working, performance and limitations. |
| **Textbooks:** |
| 1. Stephen Peake, “Renewable Energy Power for a Sustainable Future”, Oxford International Edition, 2018.
2. G. D. Rai, “Non-Conventional Energy Sources”, 4th Edition, Khanna Publishers, 2000.
 |
| **Reference Books:** |
| 1. S. P. Sukhatme, “Solar Energy”,3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , “ Non-Conventional Energy Resources”, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,“Non-Conventional Energy Resources”,3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, “Renewable Energy Resource: Basic Principles and Applications”, Narosa Publishing House, 2004.
 |
| **Online Learning Resources:** |
| 1. <https://nptel.ac.in/courses/103103206>2. <https://nptel.ac.in/courses/108108078> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

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**(20A03705) INTRODUCTION TO COMPOSITE MATERIALS**

**(Open Elective-IV)**

**Course Objectives:**

* Introduce composite materials and their applications.
* Build proper background for stress analysis in the design of composite structures.
* Familiarize various properties of composite materials.
* Focus on biodegradable composites.

**Course Outcomes:**

* Identify the practical applications of composites. (L3)
* Identify the polymer matrix composites. (L3)
* Classify of bio- degradable composites. (L2)
* Outline the various types of ceramic matrix materials. (L2)

**UNIT I Introduction to composites**

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

**UNIT II Polymer matrix composites**

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

**UNIT III Metal matrix composites**

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

**UNIT IV Ceramic matrix composites**

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

**UNIT V Advances & Applications of composites**

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbonfibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

**Textbooks:**

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

**Reference Books:**

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

**Online Learning Resources:**

* https://nptel.ac.in/courses/112104229
* https://nptel.ac.in/courses/112104168
* https://nptel.ac.in/courses/101104010
* https://nptel.ac.in/courses/105108124
* <https://nptel.ac.in/courses/112104221>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A04705) MICROCONTROLLERS & APPLICATIONS**

**(Open Elective Course –IV)**

**Course Objectives:**

* Describe the Architecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
* Write 8051 Assembly level programs using 8051 instruction set.
* Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
* Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

**Course Outcomes:**

* Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
* Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
* Develop the 8051 Assembly level programs using 8051 Instruction set
* Design the Interrupt system, operation of Timers/Counters and Serial port of 8051

**UNIT 1** 8051 Microcontroller:

Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

**UNIT II**

Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions.

**UNIT III**

8051 Stack, Stack and Subroutine instructions. Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.

**UNIT IV**

8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch.

**UNIT V**

8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.

**Textbooks:**

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; “The 8051 Microcontroller and Embedded Systems – using assembly and C”, PHI, 2006 / Pearson, 2006.
2. Kenneth J. Ayala, “The 8051 Microcontroller”, 3rd Edition, Thomson/Cengage Learning.

**References:**

1. Manish K Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.

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**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A27705) WASTE AND EFFLUENT MANAGEMENT**

**(OPEN ELECTIVE-IV)**

**Course Objectives:**

* To understand the wastewater treatment process.
* To gain knowledge on waste disposal in various ways.
* To know about advances in wastewater treatment.

**Course Outcomes:**

* Acquires knowledge on technologies used for chemical and biological methods of waste water and effluent treatment

**UNIT I**

Wastewater Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents. Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

**UNIT II**

Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.

**UNIT III**

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry.

Chemical Unit Processes: Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage

**UNIT IV**

Biological Treatment: Overview of biological Treatment – Microbial metabolism – Bacterial growth and energetics – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

**UNIT V**

Advanced Wastewater Treatment: Technologies used in advanced treatment – Classification of technologies. Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration- Absorption – Ion Exchange – Advanced oxidation process.

**Textbooks:**

1. Herzka A & Booth RG; “Food Industry Wastes: Disposal and Recovery”; Applied Science Pub Ltd. 1981,
2. Fair GM, Geyer JC & Okun DA; “Water & Wastewater Engineering”; John Wiley & Sons, Inc. 1986,

**References:**

1. GE; “Symposium: Processing Agricultural & Municipal Wastes”; AVI. 1973,
2. Inglett Green JH & Kramer A; “Food Processing Waste Management”; AVI. 1979,
3. Rittmann BE & McCarty PL; “Environmental Biotechnology: Principles and Applications”; Mc-Grow-Hill International editions2001,.
4. Bhattacharyya B C & Banerjee R; “Environmental Biotechnology”; Oxford University Press.
5. Bartlett RE; “ Wastewater Treatment; Applied Science” Pub Ltd.
6. G. Tchobanoglous, FI Biston, “Waste water Engineering Treatment and Reuse”: Mc Graw Hill, 2002.
7. “Industrial Waste Water Management Treatment and Disposal by Waste Water” 3rd Edition Mc Graw Hill 2008

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**B.Tech IV-I Sem L T P C**

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| **(20A54703) NUMBER THEORY AND ITS APPLICATIONS****(OPEN ELECTIVE-IV)** |
| **Course Objectives:** |
| This course enables the students to learn the concepts of number theory and its applications to information security. |
| **Course Outcomes:** |
| * Understand number theory and its properties.
* Understand principles on congruences
* Develop the knowledge to apply various applications
* Develop various encryption methods and its applications.
 |
| **UNIT I Integers, Greatest common divisors and prime Factorization** |
| The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations |
| **UNIT II Congruences** |
| Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences |
| **UNIT III Applications of Congruences** |
| Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes. |
| **UNIT IV Finite fields & Primality, factoring** |
| Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases. |
| **UNIT V Cryptology** |
| Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers- Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science. |
| **Textbooks:** |
| 1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.
 |
| **Reference Books:** |
| 1. An Introduction To The Theory Of Numbers, [Herbert S. Zuckerman](https://www.amazon.in/Herbert-S-Zuckerman/e/B00288HHJ4/ref%3Ddp_byline_cont_book_1), [Hugh L. Montgomery](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=Hugh+L.+Montgomery&search-alias=stripbooks), [Ivan Niven](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_3?ie=UTF8&field-author=Ivan+Niven&search-alias=stripbooks), wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press
 |
| Online Learning Resources: |
| <https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications> |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

 **3 0 0 3**

**(20A56703) SMART MATERIALS AND DEVICES**

**(OPEN ELECTIVE-IV)**

**Course Objectives**:

* To provide exposure to smart materials and their engineering applications.
* To impart knowledge on the basics and phenomenon behind the working of smart materials
* To enlighten the properties exhibited by smart materials
* To educate various techniques used to synthesize and characterize smart materials
* To identify the required smart material for distinct applications/devices

**Course Outcomes:**

* to recognize the need of smart materials
* to understand the working principles of smart materials
* to know different techniques used to synthesize and characterize smart materials
* to exploit the properties of smart materials
* to make use of smart materials for different applications

**UNIT I**

**Introduction**: Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

**UNIT II: Properties of Smart Materials**: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

**UNIT III: Synthesis of smart materials**: Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Co-precipitaiton. Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Sol-gel, spray pyrolysis.

**UNIT IV: Characterization techniques**: X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

**UNIT V: Materials and Devices:** Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.

Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

**Textbooks:**

1. Encyclopaedia of Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

**References:**

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.
2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.
3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, 2ndEdn., John Wiley & Sons, 2003.
4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, 2002.
5. Optical Metamaterials: Fundamentals and Applications -W. Cai and V. Shalaev, springer,2010.
6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

**NPTEL courses links**

<https://nptel.ac.in/courses/112/104/112104173/>

<https://nptel.ac.in/courses/112/104/112104251/>

https://nptel.ac.in/content/storage2/courses/112104173/Mod\_1\_smart\_mat\_lec

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem L T P C**

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**(20A51703) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-IV)**

**Course Objectives:**

* Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
* Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

**Course Outcomes:**

* Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

**UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY**

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

**UNIT II: CATALYSIS AND GREEN CHEMISTRY**

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

**UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS**

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water-based coatings, Ionic liquids as catalyst and solvent

**UNIT IV: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES**

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Renewable Feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency: Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis. Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions).

**UNIT V: GREEN PROCESSES FOR GREEN NANOSCIENCE**

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

**Textbooks:**

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford

University Press, USA

**References:**

# Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.

# Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

**HONOURS**

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| **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B.Tech (CSE) L T P C** **3 1 0 4****(20A05H01) PRIVACY PRESERVING AND DATA PUBLISHING** |
| **Pre-requisite**  | **Probability, Design and Analysis of Algorithms** |
|  |
| **Course Objectives:** |
| Introduce attack models, provide methods and tools for publishing useful information while preserving data privacy. |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Apply anonymization methods for sensitive data protection.
* Apply state-of art techniques for data privacy protection.
* Design privacy preserving algorithms for real-world applications.
* Identify security and privacy issues in OLAP systems.
* Apply information metrics for Maximizing the preservation of information in the anonymizationprocess.

 |
| **UNIT I** |  | 12 Hrs |
| Data Collection and Data Publishing, Introduction to Privacy-Preserving Data Publishing, Attack Models and Privacy Models: Record Linkage Model, Attribute Linkage Model, Probabilistic Model, Modeling Adversary’s Background Knowledge |
| **UNIT II** |  | 12 Hrs |
| Anonymization Operations, Generalization and Suppression, Anatomization and Permutation, Random Perturbation, Information Metrics, General Purpose Metrics, Special Purpose Metrics, Trade-Off Metrics, Anonymization Algorithms: Algorithms for the Record Linkage Model, Algorithms for the Attribute Linkage Model, Algorithms for the Table Linkage Model, Algorithms for the Probabilistic Attack Model, Attacks on Anonymous Data, |
| **UNIT III** |  | 12 Hrs |
| Anonymization for Classification Analysis: Introduction, Anonymization Problems for Red Cross BTS, High-Dimensional Top-Down Specialization (HDTDS), Workload-Aware Mondrian, Bottom-Up Generalization, Genetic Algorithm, Evaluation Methodology, Anonymization for Cluster Analysis: Introduction, Anonymization Framework for Cluster Analysis, Dimensionality Reduction-Based Transformation |
| **UNIT IV** |  | 12 Hrs |
| Multiple Views Publishing: Introduction, Checking Violations of *k*-Anonymity on Multiple Views, Checking Violations with Marginals, Anonymizing Sequential Releases with New Attributes: Introduction, Monotonicity of Privacy, Anonymization Algorithm for Sequential Releases, Anonymizing Incrementally Updated Data Records: Introduction, Continuous Data Publishing, Dynamic Data Republishing |
| **UNIT V** |  | 12 Hrs |
| Collaborative Anonymization for Vertically Partitioned Data: Introduction, Privacy-Preserving Data Mashup, Cryptographic Approach, Collaborative Anonymization for Horizontally Partitioned Data: Introduction, Privacy Model, Overview of the Solution, Anonymizing Transaction Data: Introduction, Cohesion Approach, Band Matrix Method, *km*-Anonymization, Transactional *k*-Anonymity, Anonymizing Query Logs |
| **Textbooks:** |
| 1. Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu and Philip S. Yu, Introduction to Privacy-Preserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010.2. Charu C. Aggarwal, Privacy-Preserving Data Mining: Models and Algorithms, 1st Edition, Springer, 2008. |
| **Reference Books:** |
| 1. Chen, B. C., Kifer, D., LeFevre, K., &Machanavajjhala, A. (2009). Privacy-preserving data publishing. Foundations and Trends® in Databases, 2(1–2), 1-167. |
| **Online Learning Resources:** |
| https://archive.nptel.ac.in/courses/106/106/106106235/ https://archive.nptel.ac.in/courses/106/106/106106146/  |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE) L T P C**

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|  | **(20A05H02) NoSQL DATABASES** |  |  |  |  |
|  |  |  |  |  |
| **Pre-requisite**  | **DBMS** |  |  |
|  |
| **Course Objectives:** |
| * Discuss the history unstructured data
* To know non-relational databases and their importance in Data science.
* Understand the differences between Relational and NoSQL databases
* To explore the several types of NoSQL databases and understand the role in Big Data.
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Explain and compare different types of NoSQL database.
* Compare and contrast RDBMS with different NoSQL databases.
* Define, compare and use the four types of NoSQL databases (Document-oriented, KeyValue pairs, Column-oriented and Graph
* Demonstrate the architecture, define objects, load data, query data and performance tune Column-oriented, Key-Value pair, Document and Graph databases.
* Evaluate NoSQL database development tools and programming languages
 |
| **UNIT I Overview and history of NoSQL Databases** | Lecture 12Hrs |
| Definition of the four types of NoSQL databases. The value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The emergence of NoSQL, Key Points. |
| **UNIT II RDBMS Vs NoSQL** | Lecture 12Hrs |
| Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregated-Oriented Databases, Replication and Sharding, MapReduce on databases, Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication. |
| **UNIT III Document Databases** | Lecture 12Hrs |
| No-SQL Key-Value Databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analysis or Real Time Analytics. |
| **UNIT IV Column Oriented Databases** | Lecture 12Hrs |
| Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.  |
| **UNIT V Key Value Databases** | Lecture 12Hrs |
| NoSQL Key-Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets, Firebase- Cloud hosted NoSQL Database, Graph NoSQL databases using Neo4j, NoSQL database development tools and programming languages, Graph Databases features, consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.  |
| **Textbooks:** |
| 1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition 2019.
 |
| **Reference Books:** |
| 1. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1st Ed.). Raleigh, NC: The Pragmatic Programmers, LLC. ISBN-13: 978-1934356920 ISBN-10: 19343569211. Guy Harrison, Next Generation Database: NoSQL and big data, Apress.
 |
| **Online Learning Resources:** |
| 1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-databa
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech (CSE) L T P C**

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| **(20A05H03) SOFTWARE DEFINED DATA CENTER** |
| **Course Objectives:** |
| * Introduce conventional Data Centers followed by Modern Data Centers
* To discuss various software elements of modern data centers
* Explain Virtualization concepts for Data Centers
* Discuss Compute, Storage and Network virtualization
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Understanding of difference between Conventional Data Center Vs Modern Data Centers
* Differentiate Cloud computing and Software Defined Data Centers
* Differentiate Virtualization with conventional techniques
* Explore the techniques of Software Defined Compute, Storage and Networking components
* Able Manage Software Defined Data Centers and Develop the techniques for future Data Centers.
 |
|  **UNIT I Introduction** | Lecture 12Hrs |
| Data Center evolution, A history of Modern Data Center, Focus on cost reduction, Focus on Customer service in the business, Flattening of the IT organization, IT as an operational Expense, Monolithic Storage Array rise and fall, Move From Disk to Flash, Emergence of Convergence, The Role of Cloud computing. |
| **UNIT II Emerging Data Center Trends** | Lecture 12Hrs |
| Emergence of SDCC, Commoditization of Hardware, Software Defined – Compute, Storage, Networking and Security, Software Defined Storage (SDS), Hyperconvergence, Hyper Converged Infrastructure(HCI) and SDS relationship, Flash in Hyperconvergence, Modern IT business Requirements. |
| **UNIT IIIData Center Agility** | Lecture 12Hrs |
| Principles and Strategies, Transform Data Center, Align Data Center and Business Needs, Server virtualization, VDI, Eliminate and Implement Monolithic to Hyperconvergence, Full Stack Management. |
| **UNIT VHyper converged Infrastructure** | Lecture 12Hrs |
| Software Defined Storage, SDS comparison to Traditional Storage, SDS requirements, SDS in Hyperconverged, Hyperconvergence Design Model, Virtual Storage appliances, Appliance vs. Software/Reference Architecture,  |
| **UNIT V** | **Future Data Centers** | Lecture 12Hrs |
| Data growth, Storage capacity, flash storage deployment, Deployment Experiences SDS and HCI, IT transformations- Automation, Orchestration, DevOps, Open Standards and Interoperability, Performance Benchmarking Standards, Future Trends, Containers Instead of virtual machines, Open Source tools, Beyond Today’s Flash, Pooling of Resources. |
| **Textbooks:** |
| 1. Building a Modern Data Center, Principles and Strategies of Design, Scott D.Lowe, James Green, David Davis. Actual Tech Media, 2016.
 |
| **Reference Books:** |
| 1. Data Center Handbook: Plan, Design, Build, and Operations of a Smart Data Center, Second Edition, HwaiyuGeng P.E.,2021 John Wiley & Sons.
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**B.Tech (CSE) L T P C**

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| **(20A05H04) ROBOTICS AND INTELLIGENT SYSTEMS** |  |  |
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| **Course Objectives:** |
| * Understand the basic concepts of robotics.
* Discuss the requirement of robotic technology
* Introduce robotics kinematics, dynamic analysis and programming.
* Understand the concepts of intelligent system and apply them to robotics
 |
| **Course Outcomes:** |
| After completion of the course, students will be able to* Understand general concepts of Robotics and intelligent systems.
* Understand robotics control systems
* Analyze and understand the various programming languages of robotics
* Understand Industrial robots and its applications
* Create IoT solutions using sensors, actuators and Devices
 |
| **UNIT I** |  | Lecture 8Hrs |
| **Introduction to Robotics :**Background, Historical development, Robot Arm Kinematics and Dynamics, Manipulator Trajectory planning and Motion Control, Robot Sensing |
| **UNIT II** |  | Lecture 9Hrs |
| **Robot Arm Kinematics and Dynamics:** Introduction to Kinematics, Direct and Inverse Kinematics Problem and solution, Dynamics introduction, Lagrange-Euler Formulation, Newton Euler Formation, Generalized D’Alembert Equations of motion. Trajectory planning,  |
| **UNIT III** |  | Lecture 9Hrs |
| **Sensing and Vision:** Introduction to Sensing, Proximity Sensing, Touch Sensors, Force and Torque Sensing, Image acquisition, Illumination techniques, Imaging Geometry, Recognition and Interpretation. |
| **UNIT IV** |  | Lecture 8Hrs |
| **Robot Programming Languages:** Introduction to Robot Programming Languages, Characteristics of Robot Level Languages, three levels of robot programming, requirements of a robot programming language, Task Level Languages, problems peculiar to robot languages, Introduction to Robot Operating System (ROS) |
| **UNIT V** |  | Lecture 8Hrs |
| **Robot Intelligence:** Introduction, State Space Search, Problem Reduction, Use of Predicate Logic, Means-Ends Analysis, Problem solving, Robot Learning, Robot Task Planning, Basic Problems in Task Planning, Expert systems and knowledge engineering. |
| **Textbooks:** |
| 1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics : Control, Sensing, Vision and Intelligence1. Aaron Martinez, Enrique Fernandez, Learning ROS for Robotics Programming: A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework, PACKT publishing, Open Source.
 |
| **Reference Books:** |
| John J. Craig, Introduction to Robotics: Mechanics and Control, Addison Wesley publication, Third Edition.**Online Learning Resources** |
| https://nptel.ac.in/courses/107106090https://nptel.ac.in/courses/112108298 |