**COMPUTER SCIENCE AND ENGINEERING DEAPARTMENT**
**UNIVERSITY DEPARTMENTS, RTU, KOTA**

**Course Outcomes (COs)**

**B.Tech. Computer Science and Engineering**

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| **Electronic Devices & Circuits** | CO1 | **Explain**basic knowledge on the working of various Semiconductor Devices. |
| | CO2 | **Categories** the applicability, strength, and weakness of the various transistors. |
| | CO3 | **Develop**intelligent system by assembling solutions of JFET and MOSFET. |
| | CO4 | **Develop**an interest in the Advantage of Small Signal Amplifiers at Low Frequency |
| **Data Structures & Algorithms** | CO1 | To **Understand** and **Examine** asymptotic analysis of any algorithm. |
| | CO2 | To **Evaluate** and **Analyse** the implementation and application of various ADTs such as Stack, Queue etc. |
| | CO3 | To **Design** tree based data structures such as Binary Tree, BST, AVL Tree etc and **Applications** of it. |
| | CO4 | To **Design** and **Implement** graph and hashing based data structure. |
| **Digital Electronics** | CO 1 | **Recollect** basics of number systems and Digital Electronics |
| | CO 2 | Appraise the understanding to **Clarify** the concept of logic gates |
| | CO 3 | **Applying**Boolean laws to rearrangeand **Modify**them by logic gates to validate in minimized form. |
| | CO 4 | **Illustrate**and **Examine**different sequential systems**.** |
| | CO 5 | **Classify**and **Inspect**different registers and counters |
| **Software Engineering** | CO1 | **Understand** the basic implementation model SDLC and its types**.** |
| | CO2 | **Explain** the process of SRS document of a project**.** |
| | CO3 | **Capable to apply** implementation process of validation and verification methods in software project**.** |
| | CO4 | **Capable to implement** testing techniques on SDLC phases**.** |
| | CO5 | **Analyze and apply** project management techniques on real time project**.** |
| **Object Oriented Programming** | CO 1 | **Relate** the different programming paradigms and their structure. **(K2)** |
| | CO 2 | **Compare** dynamic memory management techniques and apply using pointers, constructors, destructors. **(K2)** |
| | CO 3 | **Describe** the concept of function overloading, operator overloading, virtual functions and polymorphism to solve complex problems. **(K2)** |
| | CO 4 | **Classify** inheritance with the understanding of early and late binding and design solutions.**(K2)** |
| | CO 5 | **Model** solutions for exception handling. **(K3)** |

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| **Advanced Engg.Mathematics** | CO 1 | **Apply** Laplace transformation to solve real life application based problems. |
| | CO 2 | **Develop** Fourier transform for the solution of partial differential equations with special reference to heat equation and wave equation. |
| | CO 3 | **Examine** harmonic analysis and calculate total harmonic distortion. |
| | CO 4 | **Calculate** line integral in complex domain of simple applications through Cauchy's integral formula. |
| | CO 5 | **Develop** Taylor's series and Laurent's series to different functions. |
| **Electronic Devices Lab** | CO 1 | **Access** knowledge of analog and digital multi-meters, regulated dc supplies, analog CRO's. |
| | CO 2 | **Analyze** V-I characteristics of P-N junction Diodes, Zener Diodes. |
| | CO 3 | **Discuss** applications of diodes as clipper and clamper. |
| | CO 4 | **Analyze** characteristics of BJT in CB, CE and CC Configuration. |
| **Data Structures And Algorithms Lab** | CO1 | **Describe** basic concepts of Function, Array and Link-list. |
| | CO2 | Able to **distinguish** how several fundamental algorithms work particularly those concerned with Stack, Queues, Trees and various Sorting algorithms. |
| | CO3 | **Measure** the performance of various algorithms |
| | CO4 | **Design** new algorithms or modify existing ones for new applications and able to **analyze** the space & time complexity. |
| **Digitalelectronicslab** | CO 1 | **Originate**fundamental concepts of basic logic gates, universal logic gates and their realization. |
| | CO 2 | **Demonstrate** SOP & POS, combinational circuits and their realization. |
| | CO 3 | **Implement &Examine**ripple adder/ subtractor, multiplexer, de-multiplexer and their realization. |
| | CO 4 | **Examine**the seven segment displays |
| | CO 5 | **Construct** sequential circuits like flip flops, counters, registers and their realization |
| **Object Oriented Programming Lab** | CO 1 | **Identify** complex problems and develop solutions using objects and classes. **(K1)** |
| | CO 2 | Programs to **demonstrate** the implementation of friend function, constructors and destructors **(K2)** |
| | CO 3 | **Make use of** operator overloading using unary and binary operators. **(K3)** |
| | CO 4 | **Analyze** and implement algorithmic problems including inheritance, and polymorphism. **(K4)** |
| | CO 5 | **Inspect** the concept of Templates and implement exception handling |
| **Discipline & Extra-** | CO 1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |

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| **Curricular Activity** | CO 2 | **Learn** role of creativity, innovation and disciplines by participating literary, cultural and technical activities. |
| | CO 3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO 4 | **Learn** public speaking skills being involved in community work and social-culture activities. |
| **Microprocessors And Interfacing** | Co1 | **Describe** 8085 architecture and programming in assembly language. **(K1)** |
| | Co2 | **Discuss** different types of instruction set and addressing modes. **(K2)** |
| | Co3 | **Apply** concepts of interfacing memory and peripheral devices to a microprocessor. **(K3)** |
| | Co4 | **Analyse** different applications of microprocessor. **(K4)** |
| **Discrete Mathematics Structures** | Co1 | Be familiar with fundamental mathematical concepts such as sets and apply them. |
| | Co2 | Students analyze basics knowledge gained by mathematical relation and apply them |
| | Co3 | To be able to understand fundamental of functions such as (domain, co-domain, range, image, inverse image and composition) and types of functions. |
| | Co4 | Use mathematical propositions and proof techniques to check the truthfulness of a real life situation and to apply the notion of mathematical thinking, mathematical proofs and logics such as predicate logic, propositional logic and inference rules. |
| | Co5 | Use graph theory and trees to formulate the problems and solve them. |
| **Linux Shell Programming** | Co1 | Use graph theory and trees to formulate the problems and solve them. |
| | Co2 | Able to understand the vi editor and its basic commands for creating and editing files in Unix/Linux environment and analysis of C environment |
| | Co3 | Understanding of X-window system and its environment. |
| | Co4 | Able to understand the shell with its basic features and working of BASH. |
| | Co5 | Apply the concept of shell programming to solve various problems. |
| **Analysis Of Algorithms** | Co1 | To **review** algorithms and to define the concepts related. **(K2)** |
| | Co2 | To **analyze** certain methods involved such as Greedy, Divide and conquer. **(K4)** |
| | Co3 | To **describe** algorithms involved such as Randomized, Pattern matching, Number Theoretic. **(K1)** |
| | Co4 | To **illustrate** several Problems related to Dynamic Programming, Branch and Bound and Assignment Problems. **(K4)** |
| **Principle Of Communication** | Co1 | Illustrate analog modulation techniques. |
| | Co2 | Analyse pulse modulation and sampling techniques for analog communication. |
| | Co3 | To be able to understand PCM and DELTA Modulation system. |

| | Co4 | Explain digital Modulation techniques. |
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| | Co5 | Define various techniques used in spread-spectrum modulation. |
| **Computer Network** | Co1 | **Describe** the functions of each layer in OSI and TCP/IP model.(K2) |
| | Co2 | **Describe** the functions of data link layer and protocols used in MAC sub layer.(K2) |
| | Co3 | **Building** the skills of IP addressing, Routing Mechanisms and Congestion Control technique.(K3) |
| | Co4 | **Identify** the essential principles of a transport layer protocol and session layer protocol.(K3) |
| | Co5 | **Identify** the essential principles of a transport layer protocol and session layer protocol.(K3) |
| **Microprocessor Lab** | Co1 | **Describe** architecture and instruction set of 8085 microprocessor **(K1).** |
| | Co2 | **Develop** experience with Assembly Language Programming **(K3).** |
| | Co3 | **Demonstrate** the students with interfacing of various peripheral devices with 8085 microprocessor **(K4).** |
| | Co4 | **Design and implement** programs on 8085 microprocessor **(K2).** |
| **Communication Lab** | Co1 | To analyse digital communications with a software to understand how each component works together. |
| | Co2 | To analyse, design and implement AM and FM modulation experiments using discrete electronic components. |
| | Co3 | To understand the basic of MATLAB and PSPICE which are used to simulate the circuit operations. |
| | Co4 | To illustrate the concepts of communication techniques which are useful for sending information from transmitter to receiver |
| | Co5 | To demonstrate and compare different analog modulation schemes. |
| **Linux Shell Programming Lab** | Co1 | Understanding the installation procedure of the Linux operating system, hands on with simple commands and Installation of Linux packages into the operating system. |
| | Co2 | Able to apply the concepts of file handling, and regular expression using shell programming. |
| | Co3 | Capable to apply and implement grep, awk script. |
| | Co4 | Ability to develop and evaluate shell script program that handle processes. |
| | Co5 | Apply the concepts of debugging and execute shell programming. |
| **Advanced Data Structures Lab** | Co1 | Able to prove all the correctness and analyse the running time of the basic algorithms for the classic problems in various domain. **(K4)** |
| | Co2 | Capable to apply the algorithms and design techniques to solve classic problems. **(K3, K5)** |

| | Co3 | Analyse the complexities of various problems in different domains. **(K4)** |
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| | Co4 | Capable to create the efficient algorithms for real life problems. **(K5)** |
| **Discipline & Extra-Curricular Activity** | Co1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |
| | CO2 | **Learn** role of creativity, innovation and disciplines by participating literary, cultural and technical activities. |
| | CO3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO4 | **Learn** public speaking skills being involved in community work and social-culture activities. |
| **Database Management System** | CO1 | Describe data models and schemas in DBMS. |
| | CO2 | Apply logical database design principles, including E-R diagrams and database normalization. |
| | CO3 | Construct simple and moderately advanced database queries using relational Algebra. |
| | CO4 | To understand the concept of Transaction and Concurrency Control. |
| | CO5 | To understand the concept of Failure and Recovery. |
| **Operating System** | CO1 | To identifythe basics of Operating Systems, Services, Functions provided. **(K1)** |
| | CO2 | Analyze the various types of process scheduling. **(K4)** |
| | CO3 | Describe the concepts of Process Management and Memory management **(K2)** |
| | CO4 | To analyse the concept of deadlock. **(K4)** |
| | CO5 | To generalisethe concept of Inter process communication. **(K2)** |
| | CO6 | Discuss File systems and other Input-Output subsystems.**(K2)** |
| | CO7 | Discuss File systems and other Input-Output subsystems.**(K2)** |
| **Theory Of Computation** | CO1 | Understand concepts of formal languages and draw finite automata for regular languages. (K3) |
| | CO2 | Construct context free grammar for various languages. (k3) |
| | CO3 | Demonstrate the push down automaton model for the given language. (K4) |
| | CO4 | Apply Turing machine concept to solve the problems. (K3) |
| | CO5 | Analyze decidability or undecidability for variety of real world problems. (K4) |
| **Computer Architecture AndOrganization** | CO1 | **Describe** classification of Computer Architecture and Micro Operations **(K1)**. |
| | CO2 | **Categorise** memory organization **(K4)** and **explain** the function of each element of a memory hierarchy **(K2)**. |
| | CO3 | To **Use** addressing modes, instruction format and pipelining structure **(K3)**. |
| | CO4 | **Demonstrate** computer Arithmetic **(K3)**. **Identify** and |

| | | compare different methods for computer I/O mechanisms **(K2).** |
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| **Embedded Systems** | CO1 | Define Embedded System and its Components |
| | CO2 | Illustrate bus configuration and memory organization. |
| | CO3 | Convert C program into assembly language using ARM instruction set. |
| | CO4 | Identify correct optimization technique for assembly language program |
| **Information Theory And Coding** | CO1 | Design the channel performance using Information theory |
| | CO2 | Comprehend various error control code properties. |
| | CO3 | Apply linear block codes for error detection and correction. |
| | CO4 | Design BCH & RS codes for Channel performance improvement against burst errors. |
| | CO5 | Apply convolution codes for performance analysis & cyclic codes for error detection and correction. |
| **Human Computer Interaction** | CO1 | Understand the capabilities of both humans and computers from the viewpoint of human information processing. (K2) |
| | CO2 | Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms. (K1) |
| | CO3 | Identify and apply the use HCI design principles, standards and guidelines. (K3) |
| | CO4 | Analyze user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems. (K4) |
| | CO5 | Discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and Word Wide Web-related environments (K2) |
| **Software Testing AndProject Management** | CO1 | Illustrate the Basic testing methods, project planning and planning process |
| | CO2 | Learn W5HH principle and quality improvement approaches |
| | CO3 | Applying different types of cost estimation approaches on real time case studies. |
| | CO4 | Analyse the cost estimation results and illustrate the project management approaches |
| **Database Management Lab** | CO1 | Construct problem definition for real life applications and design a database for the same. (K6) |
| | CO2 | Build conceptual models of a database using ER modeling for real life applications(K3) |
| | CO3 | Analyze concepts of normalization to design an optimal database. (K4) |
| | CO4 | Create queries in SQL to retrieve any type of information from a data base. (K5) |
| | CO5 | Compare the access control in standalone system and |

| | | client server environment. (K4) |
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| **Java Programming Lab** | CO1 | Understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using Java language. |
| | CO2 | Develop Java programs for real applications using java constructs and libraries. |
| | CO3 | Implement Exception Handling and Multithreading in java. |
| | CO4 | Develop and deploy Applet in java. |
| **Embedded System Lab** | CO1 | Define the general process of embedded system development. |
| | CO2 | Explain embedded systems design tools and hardware programmes |
| | CO3 | To develop and test 8085, 8051, PIC 18 and ARM processor based circuits and their interfaces |
| | CO4 | To analyse microcontroller kit and the development software. |
| **Case Lab** | CO1 | **Recognise** modules of UML for system description and implementation**(K2)** |
| | CO2 | **Construct** use case model and communication model for product development **(K3)** |
| | CO3 | **Use** structural diagrams for system description **(K3)** |
| | CO4 | **Examine** behavioural diagrams for product development **(K3)** |
| | CO5 | **Analyze** a business process model and apply UML models **(K4)** |
| **Discipline & Extra-Curricular Activity** | CO1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |
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| | CO3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO4 | **Learn** public speaking skills being involved in community work and social-culture activities. |
| **Computer Graphics** | CO1 | Understand the basics of computer graphics, different graphics systems and applications of computer graphics.(K1) |
| | CO2 | Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.(K2) |
| | CO3 | Use of geometric transformations on graphics objects and their application in composite form.(K3) |
| | CO4 | Reconstruct scene with different clipping methods and its transformation to graphics display device.(K5) |
| | CO5 | Determine projections and visible surface detection techniques for display of 3D scene on 2D screen.(K4) |
| | CO6 | Render projected objects to naturalize the scene in 2D |

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| | | view and use of illumination models for this.(K3) |
| **Information System Security** | CO1 | Provide an understanding of principal concepts, technologies and basic approaches in information security. |
| | CO2 | Apply different types of encryption techniques and algorithms (AES, DES, RSA). |
| | CO3 | Identify and classify different types of attacks |
| | CO4 | understand the CIA triad of Confidentiality, Integrity and Availability as well as protocols to implement such policies in the form of message exchanges. |
| **Compiler Construction** | CO1 | **Explain** the concept of System Software such as Translators, Assemblers, and different phases of compilers. (K2) |
| | CO2 | **Classify and Analyze** lexical, syntax, semantic rules and grammars for a programming language. (K4) |
| | CO3 | **Analyze** the principles, algorithms, and data structures involved in the design and construction of compilers and parsers by applying theory of computation. (K4) |
| | CO4 | **Assess** code optimization and memory allocation techniques in programming. (K4) |
| **Data Mining And Warehouse** | CO1 | **Discuss** the functionality of the different data mining components. **(K2)** |
| | CO2 | Discover the strengths and **limitations** of various data mining models. (K3) |
| | CO3 | **Examine** different classifiers. **(K3)** |
| | CO4 | **Demonstrate** the use of clustering methodologies. **(K3)** |
| | CO5 | **Describe** a range of techniques for designing data warehousing and data mining systems for real-world applications. **(K2)** |
| **Mobile Computing** | CO1 | **Review** mobile computing devices in the context of wireless network systems **(K2)** |
| | CO2 | **Recognise** challenges faced in data dissemination , bandwidth allocation and management **(K2)** |
| | CO3 | **Discuss** middleware for application development **(K2)** |
| | CO4 | **Discover** the concept of mobile agent and world wide web **(K3)** |
| | CO5 | **Examine** Ad Hoc Networks and routing protocols **(K3)** |
| **Artificial Intelligence** | CO1 | Define different AI branches i.e. problem solving, natural language, learning, knowledge representation, perception, common sense. **(K1)** |
| | CO2 | Explain searching technique, learning method, and language processing. **(K2)** |
| | CO3 | Solving a gaming problem, searching problem and learning problem with uncertain information .**(K3)** |
| | CO4 | Illustrate fuzzy system, expert system and neural network.**(K4)** |
| | CO5 | Design a small intelligent system using learning method for a specific application**. (K5)** |

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| **Bio-informatics** | CO1 | Give students an introduction to the basic practical techniques of bioinformatics. |
| | CO2 | Application of bioinformatics and biological databases to problem solving in real research problems. |
| | CO3 | Know about Multiple sequence alignments and phylogenetic analysis. |
| | CO4 | Analysis of codon usage bias, computational prediction and analysis of regulatory sites. |
| **Fuzzy Logic And Applications** | CO1 | Understand need of fuzzy sets, arithmetic operations on fuzzy sets, possibility theory, fuzzy logic, and its applications. |
| | CO2 | Know about fuzzy inference rule and decision making. |
| | CO3 | Apply different operation on fuzzy set, fuzzy relation. |
| | CO4 | Evaluate Fuzzy logic using evidence theory, necessity and Belief measures |
| **Computer Graphics & Multimedia** | CO1 | Recollect knowledge of different geometrical shapes and coordinate properties (K1) |
| | CO2 | Illustrate different clipping algorithms to clip an object in a window.(K2) |
| | CO3 | Apply transformations on various objects like line, circle and polygon.(K3) |
| | CO4 | Practice different shape drawing algorithm(K3) |
| **Web Programming Lab** | CO1 | **Identify, describe, analyse** and then **apply** the various scripting languages which require to develop web applications. |
| | CO2 | **Investigate** and **Develop** Experiments for showing the application of dynamic page functionality in web pages using Servlets, JSP etc. |
| | CO3 | **Design** E-Commerce application. |
| | CO4 | **Recognise** Active Server Pages, PHP etc which can be used in developing web applications. |
| **Compiler Construction Lab** | CO1 | Understand the structure of compilers. |
| | CO2 | Create program for solving parser problems. |
| | CO3 | Understand the use of regular expression and transition diagrams. |
| | CO4 | Understand the basic data structures used in compiler construction such as abstract syntax trees, symbol tables, three-address code, and stack machines. |
| **Advance Java Lab** | CO1 | Recall the concepts of basic java language. **(K1)** |
| | CO2 | Design simple GUI applications using JSP, Applet, Swing. **(K3)** |
| | CO3 | Implement database through Java programs, using Java Data Base Connectivity (JDBC). **(K3)** |
| | CO4 | Use of certain technologies by implementing them in the Java programming language to solve the given problem **(K4)** |
| | CO5 | Apply event handling, multithreading on given problem.**(K3)** |

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| **Discipline & Extra-Curricular Activity** | CO1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |
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| | CO3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO4 | **Learn** public speaking skills being involved in community work and social-culture activities. |
| **Cloud Computing** | CO1 | **Describe** concept of cloud computing and its characteristics, challenges and risk involved in it.(K2) |
| | CO2 | **Discuss** cloud service, deployment models and map reduce programming concept.(K2) |
| | CO3 | **Illustrate** concept of virtualization, cloud enabling technology and green computing.(K3) |
| | CO4 | **Integration** of security polices in multi tenancy cloud environment with cloud applications.(K4) |
| | CO5 | **Analyze** cloud systems like Google cloud platform, Amazon web services using different cost metrics and pricing models.(K4) |
| **Real Time System** | CO1 | To **identify** the basics of Real Time Systems. **(K2)** |
| | CO2 | **Generalize** the Periodic and Aperiodic task scheduling.**(K2)** |
| | CO3 | To **recognize** certain concepts of Resource Access Control.**(K1)** |
| | CO4 | To **memorize** the parameters, constraints and dependencies of several task models. **(K1)** |
| | CO5 | To **analyze** several types of scheduling. **(K4)** |
| **Soft Computing** | CO1 | Know different method and application of Soft Computing.(**K1**) |
| | CO2 | Explain the concepts of fuzzy logic, Rough set, Artificial neural network, Evaluation method and Hybrid method.(**K2**) |
| | CO3 | Solving specific problem using different soft computing method.(**K3**) |
| | CO4 | Illustrate different soft computing method.(**K4**) |
| | CO5 | Design a small intelligent system for a specific application.(**K5**) |
| **Digital Image Processing** | CO1 | Review the fundamental concepts of a digital image processing systems.(K2) |
| | CO2 | Analyze images in the spatial domain using various transforms.(K4) |
| | CO3 | Evaluate the techniques for image enhancement and image restoration.(K5) |
| | CO4 | Categorize various compression techniques and transformation functions.(K5) |
| **Distributed System** | CO1 | To understand the basic concept, principles and techniques behind the design of distributed systems (K2) |

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| | CO2 | Study software components of distributed computing systems. Know about the communication and interconnection architecture of multiple computer systems. (K1) |
| | CO3 | Appreciation of the differences in the handling of issues like mutual exclusion, deadlock detection, fault handling, etc. in a centralized system and a distributed system. (K1) |
| | CO4 | Discuss the security issues and student should able to built fault tolerant distributed system. **(K2)** |
| | CO5 | To understand the issues, challenges, and solutions related to the design and implementations of distributed applications in practice. (K2) |
| **Robotics** | CO1 | How to Evaluate and analyse robots for specific activities and scenarios |
| | CO2 | Apply various terminologies and understand various sensors related to ROBOTs |
| | CO3 | Create Robot cells and understand them |
| | CO4 | Understand micro and nano robotics system |
| **Cyber Security** | CO1 | Gain a fundamental knowledge of what Cyber Security is and Apply knowledge of computer science to provide security. |
| | CO2 | Classify different type of attack and how to identify and prevent. |
| | CO3 | Identify issues to protect digital assets in compliance with cyber laws. |
| | CO4 | Determine the vulnerability to detects and classifies system weaknesses in networks, application and predicts the effectiveness of countermeasures. |
| | CO5 | Determine the vulnerability to detects and classifies system weaknesses in networks, application and predicts the effectiveness of countermeasures. |
| **Internet Of Things** | CO1 | **Discuss** IOT and its logical and physical design. **(K2)** |
| | CO2 | **Review** enabling technologies of IOT, hardware, software components, and architecture of IOT. **(K2)** |
| | CO3 | **Discover** challenges of IOT and its dissimilarity with M2M. **(K3)** |
| | CO4 | **Explain** various IOT protocols. **(K2)** |
| | CO5 | **Examine** case studies related to domain specific IOTs. **(K3)** |
| **Digital Image Processing Lab** | CO1 | **Manipulate** Color image segmentation algorithms. **(K3)** |
| | CO2 | **Compare** image coding and compression techniques. **(K4)** |
| | CO3 | **Examine** image enhancement techniques. **(K3)** |
| | CO4 | **Understand** Computer vision for skin tumor image evaluation and New Border Images. **(K2)** |
| **Android Lab** | CO1 | Explain Android Platform, Architecture and features |
| | CO2 | Design User Interface and develop activity for Android App. |
| | CO3 | Implement various basic concepts of Android during |

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| | | application development |
| | CO4 | Select and Use best GUI components which are user friendly |
| | CO5 | Defend the use of appropriate strategies in developed application |
| **Project-1** | CO1 | Able to demonstrate sound technical knowledge for their project work. |
| | CO2 | Problem identification, formulation and its solution. |
| | CO3 | Acquire collaborative skills through teamwork. |
| | CO4 | Acquire skills for effective communication and to present the idea clearly and coherently to particular audience in both written and oral format. |
| | CO5 | Cost estimation and resource requirement for overall effective utilization. |
| **Seminar** | CO1 | **Acquire** awareness on latest technology and current trends in the field of Computer science. |
| | CO2 | **Use** of various tools, data etc. for literature survey in the defined area. |
| | CO3 | **Improve** communication skills, presentation skills, and other soft skills for delivering seminar in selected topic. |
| | CO4 | **Prepare** technical report in selected topic. |
| **Discipline & Extra-Curricular Activity** | CO1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |
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| | CO3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO4 | **Learn** public speaking skills being involved in community work and social-culture activities. |
| **Machine Learning** | CO1 | Become aware of variety of machine learning algorithms and explain how these algorithms are different from traditional algorithms. |
| | CO2 | Develop machine learning solutions to classification, regression, and clustering problems; and be able to interpret the results of the algorithms. |
| | CO3 | To compare different methods for performance evaluation of machine learning and select appropriate model according to problem. |
| | CO4 | Ability to apply semi supervised machine learning techniques and associated computing techniques. |
| | CO5 | Be capable of performing experiments in Machine Learning using real-world data. |
| **Big Data Using Hadoop** | CO1 | **Describe** about the sources of Big Data and Analyzing Tools. |
| | CO2 | **Interpret** mapping statistical methods to analyze huge data. |
| | CO3 | **Apply** the other frameworks in Distributed File |

| | | Systems. |
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| | CO4 | **Create** cluster in Hadoop distributed file system. |
| | CO5 | **Apply** Map Reduction in HDFS. |
| **Computer Vision** | CO1 | **Identify** basic concepts, terminology, theories, models and methods in the field of computer vision. |
| | CO2 | **Describe** basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition. |
| | CO3 | **Implement** basic image processing and computer vision techniques. |
| | CO4 | **Appreciate** typical pattern recognition techniques for object recognition. |
| **Advance Operating System** | CO1 | To **identify** the basics of Operating Systems along with Scheduling and Synchronization. **(K2)** |
| | CO2 | To **analyze** the Distributed Operating system and it's concepts at a glance. **(K4)** |
| | CO3 | To **classify** failures and required preventive Recovery methods. **(K4)** |
| | CO4 | To **memorize** the Distributed Scheduling and mutual exclusion algorithms as well as issues related. **(K1)** |
| | CO5 | To **examine** the Real time OS and concepts related. **(K1)** |
| **Wireless Sensor Networks** | CO1 | **Describe** design objectives and challenges of wireless sensor networks |
| | CO2 | **Discuss** technological background and future research on WSN |
| | CO3 | **Explain** MAC protocols and deployment mechanisms |
| | CO4 | **Describe** network clustering and QoS Management |
| | CO5 | **Review** different routing protocols |
| **Machine Learning Lab** | CO1 | **Capable** of implementing Data Frame, Statistical Learning, Feature extraction and Feature Selection. |
| | CO2 | **Examine** real world problem and solve them using various supervised machine learning models. |
| | CO3 | **Examine** real world problems and solve them using various unsupervised machine learning models. |
| | CO4 | I**mplementing** Apriori algorithm and f-p growth algorithm to develop application involving Market basket analysis. |
| | CO5 | **Capable** to implement Recommendation System. |
| **Big Data Using Hadoop Lab** | CO1 | Able to **Apply** analytics on Structured, Unstructured Data. |
| | CO2 | **Implement** several Data Intensive tasks using the Map Reduce Paradigm. |
| | CO3 | **Demonstrate** an ability to use frameworks like Hadoop to efficiently store retrieve and process Big Data for analytics. |
| | CO4 | To enable students to have skills that will help them to **solve** complex real-world problems in for decision |

| | | support. |
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| **Seminar** | CO1 | **Acquire** awareness on latest technology and current trends in the field of Computer science. |
| | CO2 | **Use** of various tools, data etc. for literature survey in the defined area. |
| | CO3 | **Improve** communication skills, presentation skills, and other soft skills for delivering seminar in selected topic. |
| | CO4 | **Prepare** technical report in selected topic. |
| **Project** | CO1 | Able to demonstrate sound technical knowledge for their project work. |
| | CO2 | Problem identification, formulation and its solution. |
| | CO3 | Acquire collaborative skills through teamwork. |
| | CO4 | Acquire skills for effective communication and to present the idea clearly and coherently to particular audience in both written and oral format. |
| | CO5 | Cost estimation and resource requirement for overall effective utilization. |
| **Discipline & Extra-Curricular Activity** | CO1 | **Develop** and understand diverse philosophies and cultures across societies through NCC and sports activities. |
| | CO2 | **Learn** role of creativity, innovation and disciplines by participating literary, cultural and technical activities. |
| | CO3 | **Acquire** skills for effective citizenship and life-long learning through professional development activities |
| | CO4 | **Learn** public speaking skills being involved in community work and social-culture activities. |