

INFO INSTITUTE OF ENGINEERING, COIMBATORE

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAM OUTCOMES

1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11 Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME EDUCATIONAL OBJECTIVES

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| PEO I | Demonstrate technical competence with analytical and critical thinking to understand and meet the diversified requirements of industry, academia and research. |
| PEO II | Exhibit technical leadership, team skills and entrepreneurship skills to provide business solutions to real world problems. |
| PEO III | Work in multi-disciplinary industries with social and environmental responsibility, work ethics and adaptability to address complex engineering and social problems. |
| PEO IV | Pursue lifelong learning, use cutting edge technologies and involve in applied research to design optimal solutions. |

PROGRAM SPECIFIC OUTCOMES

- Have proficiency in programming skills to design, develop and apply appropriate techniques, to solve complex engineering problems.
- Have knowledge to build, automate and manage business solutions using cutting edge technologies.
- Have excitement towards research in applied computer technologies.

COURSE OUTCOMES

Regulation 2021 Anna University Chennai

| SUBJECT | COs |
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| I Semester | | |
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| HS3152 Professional English - I | CO1 | To use appropriate words in a professional context. |
| | CO2 | To gain understanding of basic grammatic structures and use them in right context |
| | CO3 | To read and infer the denotative and connotative meanings of technical texts |
| | CO4 | To write definitions, descriptions, narrations and essays on various topics |
| MA3151 Matrices and Calculus | CO1 | Use the matrix algebra methods for solving practical problems. |
| | CO2 | Apply differential calculus tools in solving various application problems. |
| | CO3 | Able to use differential calculus ideas on several variable functions. |
| | CO4 | Apply different methods of integration in solving practical problems. |
| | CO5 | Apply multiple integral ideas in solving areas, volumes and other practical problems. |
| PH3151 Engineering Physics | CO1 | Understand the importance of mechanics. |
| | CO2 | Express their knowledge in electromagnetic waves. |
| | CO3 | Demonstrate a strong foundational knowledge in oscillations, optics and lasers |
| | CO4 | Understand the importance of quantum physics |
| | CO5 | Comprehend and apply quantum mechanical principles towards the formation of energy bands. |
| CY3151 | CO1 | To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water |
| | CO2 | To identify and apply basic concepts of nanoscience and nanotechnology in designing the |

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| Engineering Chemistry | | synthesis of nanomaterials for engineering and technology applications. |
| | CO3 | To apply the knowledge of phase rule and composites for material selection requirements. |
| | CO4 | To recommend suitable fuels for engineering processes and applications. |
| | CO5 | To recognize different forms of energy resources and apply them for suitable applications in energy sectors. |
| GE3151 Problem Solving and Python Programming | CO1 | Develop algorithmic solutions to simple computational problems |
| | CO2 | Develop and execute simple Python programs. |
| | CO3 | Write simple Python programs using conditionals and loops for solving problems. |
| | CO4 | Decompose a Python program into functions |
| | CO5 | Represent compound data using Python lists, tuples, dictionaries etc |
| | CO6 | Read and write data from/to files in Python programs. |
| GE3171 Problem Solving and Python Programming Laboratory | CO1 | Develop algorithmic solutions to simple computational problems |
| | CO2 | Develop and execute simple Python programs. |
| | CO3 | Implement programs in Python using conditionals and loops for solving problems. |
| | CO4 | Deploy functions to decompose a Python program. |
| | CO5 | Process compound data using Python data structures. |
| | CO6 | Utilize Python packages in developing software applications. |
| BS3171 Physics Laboratory | CO1 | Understand the functioning of various physics laboratory equipment. |
| | CO2 | Use graphical models to analyze laboratory data |
| | CO3 | Use mathematical models as a medium for quantitative reasoning and describing physical reality |
| | CO4 | Access, process and analyze scientific information. |
| | CO5 | Solve problems individually and collaboratively |
| BS3171 Chemistry Laboratory | CO1 | To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO. |
| | CO2 | To determine the amount of metal ions through volumetric and spectroscopic techniques |

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| | CO3 | To analyse and determine the composition of alloys. |
| | CO4 | To learn simple method of synthesis of nanoparticles |
| | CO5 | To quantitatively analyse the impurities in solution by electroanalytical techniques |
| GE3172 English Laboratory | CO1 | To listen to and comprehend general as well as complex academic information |
| | CO2 | To listen to and understand different points of view in a discussion |
| | CO3 | To speak fluently and accurately in formal and informal communicative contexts |
| | CO4 | To describe products and processes and explain their uses and purposes clearly and accurately |
| | CO5 | To express their opinions effectively in both formal and informal discussions |

| II Semester | | |
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| HS3252 Professional English - II | CO1 | To compare and contrast products and ideas in technical texts |
| | CO2 | To identify and report cause and effects in events, industrial processes through technical texts |
| | CO3 | To analyse problems in order to arrive at feasible solutions and communicate them in the written format. |
| | CO4 | To present their ideas and opinions in a planned and logical manner |
| | CO5 | To draft effective resumes in the context of job search. |
| MA3251 Statistics and Numerical Methods | CO1 | Apply the concept of testing of hypothesis for small and large samples in real life problems. |
| | CO2 | Apply the basic concepts of classifications of design of experiments in the field of agriculture. |
| | CO3 | Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems. |
| | CO4 | Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations. |
| | CO5 | Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications. |
| PH3256 Physics for Information Science | CO1 | Gain knowledge on classical and quantum electron theories, and energy band structures |
| | CO2 | Acquire knowledge on basics of semiconductor physics and its applications in various devices |
| | CO3 | Get knowledge on magnetic properties of materials and their applications in data storage. |
| | CO4 | Have the necessary understanding on the functioning of optical materials for optoelectronics |
| | CO5 | Understand the basics of quantum structures and their applications and basics of quantum computing |
| BE3251 | CO1 | Compute the electric circuit parameters for simple problems |
| | CO2 | Explain the working principle and applications of electrical |

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| Basic Electrical and Electronics Engineering | | machines |
| | CO3 | Analyze the characteristics of analog electronic devices |
| | CO4 | Explain the basic concepts of digital electronics |
| | CO5 | Explain the operating principles of measuring instruments |
| GE3251 Engineering Graphics | CO1 | Use BIS conventions and specifications for engineering drawing. |
| | CO2 | Construct the conic curves, involutes and cycloid |
| | CO3 | Solve practical problems involving projection of lines. |
| | CO4 | Draw the orthographic, isometric and perspective projections of simple solids. |
| | CO5 | Draw the development of simple solids. |
| CS3251 Programming in C | CO1 | Demonstrate knowledge on C Programming constructs |
| | CO2 | Develop simple applications in C using basic constructs |
| | CO3 | Design and implement applications using arrays and strings |
| | CO4 | Develop and implement modular applications in C using functions |
| | CO5 | Develop applications in C using structures and pointers. |
| | CO6 | Design applications using sequential and random access file processing. |
| GE3271 Engineering Practices Laboratory | CO1 | Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work. |
| | CO2 | Wire various electrical joints in common household electrical wire work. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work. |
| | CO3 | Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household |

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| | | equipments; Make a tray out of metal sheet using sheet metal work. |
| | CO4 | Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB. |
| CS3271 Programming in C Laboratory | CO1 | Demonstrate knowledge on C programming constructs. |
| | CO2 | Develop programs in C using basic constructs. |
| | CO3 | Develop programs in C using arrays. |
| | CO4 | Develop applications in C using strings, pointers, functions. |
| | CO5 | Develop applications in C using structures. |
| | CO6 | Develop applications in C using file processing. |
| GE3272 Communication Laboratory / Foreign Language | CO1 | Speak effectively in group discussions held in a formal/semi formal contexts. |
| | CO2 | Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions |
| | CO3 | Write emails, letters and effective job applications. |
| | CO4 | Write critical reports to convey data and information with clarity and precision |
| | CO5 | Give appropriate instructions and recommendations for safe execution of tasks |

| III Semester | | |
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| MA3354 Discrete Mathematics | CO1 | Have knowledge of the concepts needed to test the logic of a program. |
| | CO2 | Have an understanding in identifying structures on many levels. |
| | CO3 | Be aware of a class of functions which transform a finite set into another finite set which relates to input and output |

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| | | functions in computer science. |
| | CO4 | Be aware of the counting principles |
| | CO5 | Be exposed to concepts and properties of algebraic structures such as groups, rings and fields. |
| CS3351 Digital Principles and Computer Organization | CO1 | Design various combinational digital circuits using logic gates |
| | CO2 | Design sequential circuits and analyze the design procedures |
| | CO3 | State the fundamentals of computer systems and analyze the execution of an instruction |
| | CO4 | Analyze different types of control design and identify hazards |
| | CO5 | Identify the characteristics of various memory systems and I/O communication |
| CS3352 Foundations of Data Science | CO1 | Define the data science process |
| | CO2 | Understand different types of data description for data science process |
| | CO3 | Gain knowledge on relationships between data |
| | CO4 | Use the Python Libraries for Data Wrangling |
| | CO5 | Apply visualization Libraries in Python to interpret and explore data |
| CD3291 Data Structures and Algorithms | CO1 | Explain abstract data types |
| | CO2 | Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications |
| | CO3 | Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting |
| | CO4 | Model problems as graph problems and implement efficient graph algorithms to solve them |
| CS3391 Object Oriented Programming | CO1 | Apply the concepts of classes and objects to solve simple problems |
| | CO3 | Make use of exception handling mechanisms and multithreaded model to solve real world problems |
| | CO4 | Build Java applications with I/O packages, string classes, Collections and generics concepts |
| | CO5 | Integrate the concepts of event handling and JavaFX |

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| | | components and controls for developing GUI based applications |
| CS3311 Data Structures And Algorithms Laboratory | CO1 | Implement ADTs as Python classes. |
| | CO2 | Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications |
| | CO3 | Design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting |
| | CO4 | Model problems as graph problems and implement efficient graph algorithms to solve them |
| CS3381 Object Oriented Programming Laboratory | CO1 | Design and develop java programs using object oriented programming concepts |
| | CO2 | Develop simple applications using object oriented concepts such as package, exceptions |
| | CO3 | Implement multithreading, and generics concepts |
| | CO4 | Create GUIs and event driven programming applications for real world problems |
| | CO5 | Implement and deploy web applications using Java |
| CS3361 Data Science Laboratory | CO1 | Make use of the python libraries for data science |
| | CO2 | Make use of the basic Statistical and Probability measures for data science. |
| | CO3 | Perform descriptive analytics on the benchmark data sets. |
| | CO4 | Perform correlation and regression analytics on standard data sets |
| | CO5 | Present and interpret data using visualization packages in Python. |
| GE3361 Professional | CO1 | Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements |
| | CO2 | Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding |

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| Development | CO3 | Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects. |
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| IV Semester | | |
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| CS3452 Theory of Computation | CO1 | Construct automata theory using Finite Automata |
| | CO2 | Write regular expressions for any pattern |
| | CO3 | Design context free grammar and Pushdown Automata |
| | CO4 | Design Turing machine for computational functions |
| | CO5 | Differentiate between decidable and undecidable problems |
| CS3491 Artificial Intelligence and Machine Learning | CO1 | Use appropriate search algorithms for problem solving |
| | CO2 | Apply reasoning under uncertainty |
| | CO3 | Build supervised learning models |
| | CO4 | Build ensembling and unsupervised models |
| | CO5 | Build deep learning neural network models |
| CS3492 Database Management Systems | CO1 | Construct SQL Queries using relational algebra |
| | CO2 | Design database using ER model and normalize the database |
| | CO3 | Construct queries to handle transaction processing and maintain consistency of the database |
| | CO4 | Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database |
| | CO5 | Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement. |
| IT3401 Web Essentials | CO1 | Apply JavaScript, HTML and CSS effectively to create interactive and dynamic websites. |
| | CO2 | Create simple PHP scripts |
| | CO3 | Design and deploy simple web-applications. |
| | CO4 | Create simple database applications. |
| | CO5 | Handle multimedia components |
| 5. CS3451 | CO1 | Analyze various scheduling algorithms and process synchronization. |

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| Introduction to Operating Systems | CO2 | Explain deadlock prevention and avoidance algorithms. |
| | CO3 | Compare and contrast various memory management schemes. |
| | CO4 | Explain the functionality of file systems, I/O systems, and Virtualization |
| | CO5 | Compare iOS and Android Operating Systems. |
| 6. GE3451 Environmental Sciences and Sustainability | CO1 | To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation. |
| | CO2 | To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society. |
| | CO3 | To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations. |
| | CO4 | To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development. |
| | CO5 | To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization. |
| CS3461 Operating Systems Laboratory | CO1 | Define and implement UNIX Commands. |
| | CO2 | Compare the performance of various CPU Scheduling Algorithms. |
| | CO3 | Compare and contrast various Memory Allocation Methods. |
| | CO4 | Define File Organization and File Allocation Strategies. |
| | CO5 | Implement various Disk Scheduling Algorithms. |
| CS3481 Database Management Systems Laboratory | CO1 | Create databases with different types of key constraints. |
| | CO2 | Construct simple and complex SQL queries using DML and DCL commands. |
| | CO3 | Use advanced features such as stored procedures and triggers and incorporate in GUI based application development. |
| | CO4 | Create an XML database and validate with meta-data (XML schema). |
| | CO5 | Create and manipulate data using NOSQL database. |

| V Semester | | |
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| CS3591 Computer Networks | CO1 | Explain the basic layers and its functions in computer networks. |
| | CO2 | Understand the basics of how data flows from one node to another. |
| | CO3 | Analyze routing algorithms. |
| | CO4 | Describe protocols for various functions in the network. |
| | CO5 | Analyze the working of various application layer protocols. |
| IT3501 Full Stack Web Development | CO1 | Understand the various stacks available for web application development |
| | CO2 | Use Node.js for application development |
| | CO3 | Develop applications with MongoDB |
| | CO4 | Use the features of Angular and Express |
| | CO5 | Develop React applications |
| CS3551 Distributed Computing | CO1 | Explain the foundations of distributed systems |
| | CO2 | Solve synchronization and state consistency problems |
| | CO3 | Use resource sharing techniques in distributed systems |
| | CO4 | Apply working model of consensus and reliability of distributed systems |
| | CO5 | Explain the fundamentals of cloud computing |
| CS3691 Embedded Systems and Iot | CO1 | Explain the architecture of embedded processors. |
| | CO2 | Write embedded C programs. |
| | CO3 | Design simple embedded applications. |
| | CO4 | Compare the communication models in IOT |
| | CO5 | Design IoT applications using Arduino/Raspberry Pi /open platform |

| VI Semester | | |
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| CCS356 | CO1 | Compare various Software Development Lifecycle Models |

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| Object Oriented Software Engineering | CO2 | Evaluate project management approaches as well as cost and schedule estimation strategies. |
| | CO3 | Perform formal analysis on specifications. |
| | CO4 | Use UML diagrams for analysis and design. |
| | CO5 | Architect and design using architectural styles and design patterns, and test the system |
| IT3681 Mobile Applications Development Laboratory | CO1 | Design and build simple mobile applications supporting multiple platforms. |
| | CO2 | Apply various programming techniques and patterns to build mobile applications. |
| | CO3 | Build real-time mobile applications for society/environment |
| | CO4 | Build gaming and multimedia based mobile applications |
| | CO5 | Build AI based mobile applications for society/environment following ethical practices |

VII Semester

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| CS3711 SUMMER INTERNSHIP | CO1 | Industry Practices, Processes, Techniques, technology, automation and other core aspects of software industry |
| | CO2 | Analyze, Design solutions to complex business problems |
| | CO3 | Build and deploy solutions for target platform |
| | CO4 | Preparation of Technical reports and presentation. |

VIII Semester

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| CS3811 Project Work/Internship | CO1 | Gain Domain knowledge and technical skill set required for solving industry /research problems |
| | CO2 | Provide solution architecture, module level designs, algorithms |
| | CO3 | Implement, test and deploy the solution for the target platform |
| | CO4 | Prepare detailed technical report, demonstrate and present the work |

ELECTIVE COURSES

| SUBJECT | COs |
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| ELECTIVE I | | |
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| CCS346 Exploratory Data Analysis | CO1 | Understand the fundamentals of exploratory data analysis. |
| | CO2 | Implement the data visualization using Matplotlib. |
| | CO3 | Perform univariate data exploration and analysis. |
| | CO4 | Apply bivariate data exploration and analysis. |
| | CO5 | Use Data exploration and visualization techniques for multivariate and time series data. |
| CCS360 Recommender Systems | CO1 | Understand the basic concepts of recommender systems. |
| | CO2 | Implement machine-learning and data-mining algorithms in recommender systems data sets. |
| | CO3 | Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics. |
| | CO4 | Design and implement a simple recommender system. |
| | CO5 | Learn about advanced topics of recommender systems. |
| | CO6 | Learn about advanced topics of recommender systems applications |
| CCS355 Neural Networks and Deep Learning | CO1 | Apply Convolution Neural Network for image processing. |
| | CO2 | Understand the basics of associative memory and unsupervised learning networks. |
| | CO3 | Apply CNN and its variants for suitable applications. |
| | CO4 | Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks. |
| | CO5 | Apply autoencoders and generative models for suitable applications |
| CCS369 Text and Speech Analysis | CO1 | Explain existing and emerging deep learning architectures for text and speech processing |
| | CO2 | Apply deep learning techniques for NLP tasks, language modelling and machine translation |

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| | CO3 | Explain coreference and coherence for text processing |
| | CO4 | Build question-answering systems, chatbots and dialogue systems |
| | CO5 | Apply deep learning models for building speech recognition and text-to-speech systems |
| CCW331 Business Analytics | CO1 | Explain the real world business problems and model with analytical solutions. |
| | CO2 | Identify the business processes for extracting Business Intelligence |
| | CO3 | Apply predictive analytics for business fore-casting |
| | CO4 | Apply analytics for supply chain and logistics management |
| | CO5 | Use analytics for marketing and sales. |
| CCS349 Image and Video Analytics | CO1 | Understand the basics of image processing techniques for computer vision and video analysis. |
| | CO2 | Explain the techniques used for image pre-processing. |
| | CO3 | Develop various object detection techniques. |
| | CO4 | Understand the various face recognition mechanisms. |
| | CO5 | Elaborate on deep learning-based video analytics. |
| CCS338 Computer Vision | CO1 | To understand basic knowledge, theories and methods in image processing and computer vision. |
| | CO2 | To implement basic and some advanced image processing techniques in OpenCV. |
| | CO3 | To apply 2D a feature-based based image alignment, segmentation and motion estimations. |
| | CO4 | To apply 3D image reconstruction techniques |
| | CO5 | To design and develop innovative image processing and computer vision applications. |
| CCS334 Big Data Analytics | CO1 | Describe big data and use cases from selected business domains. |
| | CO2 | Explain NoSQL big data management. |
| | CO3 | Install, configure, and run Hadoop and HDFS |
| | CO4 | Perform map-reduce analytics using Hadoop. |
| | CO5 | Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics. |

ELECTIVE II

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| CCS332 App Development | CO1 | Develop Native applications with GUI Components. |
| | CO2 | Develop hybrid applications with basic event handling. |
| | CO3 | Implement cross-platform applications with location and data storage capabilities. |
| | CO4 | Implement cross platform applications with basic GUI and event handling. |
| | CO5 | Develop web applications with cloud database access. |
| CCS336 Cloud Services Management | CO1 | Exhibit cloud-design skills to build and automate business solutions using cloud technologies. |
| | CO2 | Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services |
| | CO3 | Solve the real world problems using Cloud services and technologies |
| CCS370 UI and UX Design | CO1 | Build UI for user Applications |
| | CO2 | Evaluate UX design of any product or application |
| | CO3 | Demonstrate UX Skills in product development |
| | CO4 | Implement Sketching principles |
| | CO5 | Create Wireframe and Prototype |
| CCS366 Software Testing and Automation | CO1 | Understand the basic concepts of software testing and the need for software testing |
| | CO2 | Design Test planning and different activities involved in test planning |
| | CO3 | Design effective test cases that can uncover critical defects in the application |
| | CO4 | Carry out advanced types of testing |
| | CO5 | Automate the software testing using Selenium and TestNG |
| CCS374 Web Application Security | CO1 | Understanding the basic concepts of web application security and the need for it |
| | CO2 | Be acquainted with the process for secure development and deployment of web applications |
| | CO3 | Acquire the skill to design and develop Secure Web Applications that use Secure APIs |
| | CO4 | Be able to get the importance of carrying out vulnerability assessment and penetration testing |
| | CO5 | Acquire the skill to think like a hacker and to use hackers |

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| | | tool sets |
| CCS342 DevOps | CO1 | Understand different actions performed through Version control tools like Git. |
| | CO2 | Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle. |
| | CO3 | Ability to Perform Automated Continuous Deployment |
| | CO4 | Ability to do configuration management using Ansible |
| | CO5 | Understand to leverage Cloud-based DevOps tools using Azure DevOps |
| CCS358 Principles of Programming Languages | CO1 | Describe syntax and semantics of programming languages |
| | CO2 | Explain data, data types, and basic statements of programming languages |
| | CO3 | Design and implement subprogram constructs |
| | CO4 | Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog |
| | CO5 | Understand and adopt new programming languages |

| ELECTIVE III | | |
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| CCS335 Cloud Computing | CO1 | Understand the design challenges in the cloud. |
| | CO2 | Apply the concept of virtualization and its types. |
| | CO3 | Experiment with virtualization of hardware resources and Docker. |
| | CO4 | Develop and deploy services on the cloud and set up a cloud environment. |
| | CO5 | Explain security challenges in the cloud environment. |
| CCS372 Virtualization | CO1 | Analyse the virtualization concepts and Hypervisor |
| | CO2 | Apply the Virtualization for real-world applications |
| | CO3 | Install & Configure the different VM platforms |
| | CO4 | Experiment with the VM with various software |
| CCS341 Data Warehousing | CO1 | Design data warehouse architecture for various Problems |
| | CO2 | Apply the OLAP Technology |
| | CO3 | Analyse the partitioning strategy |

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| | CO4 | Critically analyze the differentiation of various schema for given problem |
| | CO5 | Frame roles of process manager & system manager |
| CCS367 Storage Technologies | CO1 | Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment |
| | CO2 | Illustrate the usage of advanced intelligent storage systems and RAID |
| | CO3 | Interpret various storage networking architectures - SAN, including storage subsystems and virtualization |
| | CO4 | Examine the different role in providing disaster recovery and remote replication technologies |
| | CO5 | Infer the security needs and security measures to be employed in information storage management |
| CCS365 Software Defined Networks | CO1 | Describe the motivation behind SDN |
| | CO2 | Identify the functions of the data plane and control plane |
| | CO3 | Design and develop network applications using SDN |
| | CO4 | Orchestrate network services using NFV |
| | CO5 | Explain various use cases of SDN and NFV |
| CCS368 Stream Processing | CO1 | Understand the applicability and utility of different streaming algorithms. |
| | CO2 | Describe and apply current research trends in data-stream processing. |
| | CO3 | Analyze the suitability of stream mining algorithms for data stream systems. |
| | CO4 | Program and build stream processing systems, services and applications. |
| | CO5 | Solve problems in real-world applications that process data streams. |
| CCS362 Security and Privacy in Cloud | CO1 | Understand the cloud concepts and fundamentals. |
| | CO2 | Explain the security challenges in the cloud. |
| | CO3 | Define cloud policy and Identity and Access Management. |
| | CO4 | Understand various risks and audit and monitoring mechanisms in the cloud. |

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| | CO5 | Define the various architectural and design considerations for security in the cloud. |
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| ELECTIVE IV | | |
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| CCS344 Ethical Hacking | CO1 | To express knowledge on basics of computer based vulnerabilities |
| | CO2 | To gain understanding on different foot printing, reconnaissance and scanning methods. |
| | CO3 | To demonstrate the enumeration and vulnerability analysis methods |
| | CO4 | To gain knowledge on hacking options available in Web and wireless applications. |
| | CO5 | To acquire knowledge on the options for network protection. |
| | CO6 | To use tools to perform ethical hacking to expose the vulnerabilities. |
| CCS343 Digital and Mobile Forensics | CO1 | Have knowledge on digital forensics. CO2: Know about digital crime and investigations. |
| | CO2 | Know about digital crime and investigations. |
| | CO3 | Be forensic ready |
| | CO4 | Investigate, identify and extract digital evidence from iOS devices. |
| | CO5 | Investigate, identify and extract digital evidence from Android devices. |
| CCS363 Social Network Security | CO1 | Develop semantic web related simple applications |
| | CO2 | Address Privacy and Security issues in Social Networking |
| | CO3 | Explain the data extraction and mining of social networks |
| | CO4 | Discuss the prediction of human behavior in social communities |
| | CO5 | Describe the applications of social networks |
| CCS351 Modern Cryptography | CO1 | Interpret the basic principles of cryptography and general cryptanalysis. |
| | CO2 | Determine the concepts of symmetric encryption and authentication. |
| | CO3 | Identify the use of public key encryption, digital signatures, and key establishment. |

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| | CO4 | Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions. |
| | CO5 | Express the use of Message Authentication Codes. |
| CB3591 Engineering Secure Software Systems | CO1 | Identify various vulnerabilities related to memory attacks. |
| | CO2 | Apply security principles in software development. |
| | CO3 | Evaluate the extent of risks. |
| | CO4 | Involve selection of testing techniques related to software security in the testing phase of software development. |
| | CO5 | Use tools for securing software. |
| CCS339 Cryptocurrency and Blockchain Technologies | CO1 | Understand emerging abstract models for Blockchain Technology |
| | CO2 | Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain. |
| | CO3 | It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable. |
| | CO4 | Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application. |
| CCS354 Network Security | CO1 | Classify the encryption techniques |
| | CO2 | Illustrate the key management technique and authentication. |
| | CO3 | Evaluate the security techniques applied to network and transport layer |
| | CO4 | Discuss the application layer security standards. |
| | CO5 | Apply security practices for real time applications. |
| CCS362 Security and Privacy in Cloud | CO1 | Understand the cloud concepts and fundamentals. |
| | CO2 | Explain the security challenges in the cloud. |
| | CO3 | Define cloud policy and Identity and Access Management. |
| | CO4 | Understand various risks and audit and monitoring mechanisms in the cloud. |
| | CO5 | Define the various architectural and design considerations for security in the cloud. |

