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, research literature, and analyse 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 modelling 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.

Course Outcomes

2019 Pattern

F.E Computer Engineering

Course Name: 110005 – **Programming and problem solving**

On the completion of the course, learner will be able to

CO1	Inculcate and apply various skills in problem solving.
CO2	Choose most appropriate programming constructs and features to solve the problems in diversified domains.
CO3	Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python.
CO4	Demonstrate significant experience with the Python program development environment.

Course Name: 110013 – **Project based learning**

On the completion of the course, learner will be able to

CO1	Project based learning will increase their capacity and learning through shared cognition.
CO2	Learners able to draw on lessons from several disciplines and apply them in practical way.
CO3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and learners' attitudes towards learning.

S.E Computer Engineering

201: Course Name: 210241-**Discrete Mathematics**

On the completion of the course, learner will be able to

C201.1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
C201.2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
C201.3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
C201.4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
C201.5	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
C201.6	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
C201.7	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.

202: Course Name: 210242- **Fundamentals of Data Structures**

On the completion of the course, learner will be able to

C202.1	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
C202.2	Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.
C202.3	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
C202.4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
C202.5	Compare and contrast different implementations of data structures (dynamic and static).
C202.6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.

203: Course Name: 210243- **Object Oriented Programming**

On the completion of the course, learner will be able to

C203.1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
C203.2	Design object-oriented solutions for small systems involving multiple objects.
C203.3	Use virtual and pure virtual function and complex programming situations.
C203.4	Apply object-oriented software principles in problem solving.
C203.5	Analyze the strengths of object-oriented programming.
C203.6	Develop the application using object oriented programming language (C++).

204: Course Name: 210244 - **Computer Graphics**

On the completion of the course, learner will be able to

C204.1	Identify the basic terminologies of computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
C204.2	Apply mathematics to develop Computer programs for elementary graphic operations.
C204.3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
C204.4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection
C204.5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
C204.6	Create effective programs using concepts of curves, fractals, animation and gaming

205: Course Name: 210245 - **Digital Electronics & Logic Design**

On the completion of the course, learner will be able to

C205.1	Simplify Boolean Expressions using K Map.
C205.2	Design and implement combinational circuits.
C205.3	Design and implement sequential circuits.
C205.4	Develop simple real-world application using ASM and PLD.
C205.5	Differentiate and Choose appropriate logic families IC packages as per the given design specifications.
C205.6	Explain organization and architecture of computer system.

206: Course Name: 210246 - **Data Structure Laboratory**

On the completion of the course, learner will be able to

C206.1	Use the algorithms on various linear data Structures using sequential organization to solve real life problems
C206.2	Analyze the problems to apply suitable searching and sorting the algorithms to various applications
C206.3	Analyze the problems to use variants of linked list and solve the various real life problems
C206.4	Designing and implements data structures and algorithms for solving different kinds of problems

207: Course Name: 210247- **OOP and Computer Graphics Laboratory**

On the completion of the course, learner will be able to

C207.1	Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.
C207.2	Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
C207.3	Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion and filling with the help of object oriented programming concepts.
C207.4	Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.
C207.5	Apply logic to implement, curves, fractals, animation and gaming programs.

208: Course Name: 210248 **- Digital Electronics Lab**

On the completion of the course, learner will be able to

C208.1	Understand the working of digital electronic circuits
C208.2	Apply knowledge to appropriate IC as per the design specifications.
C208.3	Design and Implement Sequential and Combinational digital circuits as per the specifications.

209: Course Name: 210249 - **Business Communication Skill**

On the completion of the course, learner will be able to

C209.1	Express effectively through verbal/oral communication and improve listening skills
C209.2	Write precise briefs or reports and technical documents.
C209.3	Prepare for group discussion / meetings / interviews and presentations.
C209.4	Explore goal/target setting, self-motivation and practicing creative thinking
C209.5	Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and Leadership quality

210: Course Name: 210250 **- Humanity and Social Science**

On the completion of the course, learner will be able to

C210.1	Aware of the various issues concerning humans and society.
C210.2	Aware about their responsibilities towards society.
C210.3	Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
C210.4	Able to understand the nature of the individual and the relationship between self and the community.
C210.5	Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.

211: Course Name: 210251 **- Audit Course III**

On the completion of the course, learner will be able to

C211.1	Will have ability of basic communication
C211.2	Will have the knowledge of Japanese script.
C211.3	Will get introduced to reading , writing and listening skills
C211.4	Will develop interest to pursue professional Japanese Language course..

212: Course Name: 207003 **– Engineering mathematics III**

On the completion of the course, learner will be able to

C212.1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
C212.2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
C212.3	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
C212.4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
C212.5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

213: Course Name: 210252 - **Data Structure & Algorithms**

On the completion of the course, learner will be able to

C213.1	Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications
C213.2	Apply non-linear data structures for solving problems of various domain.
C213.3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
C213.4	Analyze the algorithmic solutions for resource requirements and optimization
C213.5	Use efficient indexing methods and multiway search techniques to store and maintain data
C213.6	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage

214: Course Name-210253- **Software Engineering**

On the completion of the course, learner will be able to

C214.1	Analyze software requirements and formulate design solution for a software
C214.2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
C214.3	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
C214.4	Model and design User interface and component-level.
C214.5	Identify and handle risk management and software configuration management.
C214.6	Utilize knowledge of software testing approaches, approaches to verification and validation.
C214.7	Construct software of high quality-software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

215: Course Name-210254- **Microprocessor**

On the completion of the course, learner will be able to

C215.1	Exhibit skill of assembly language programming for the application.
C215.2	Classify processor architectures.
C215.3	Illustrate advanced features of 80386 Microprocessor.
C215.4	Compare and contrast different processor modes.
C215.5	Use interrupts mechanism in applications.
C215.6	Differentiate between Microprocessors and Microcontrollers.
C215.7	Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.

216: Course Name-210255- **Principles of Programming Languages**

On the completion of the course, learner will be able to

C216.1	Make use of basic principles of programming languages.
C216.2	Develop a program with Data representation and Computations.
C216.3	Develop programs using Object Oriented Programming language: Java.
C216.4	Develop application using inheritance, encapsulation, and polymorphism.
C216.5	Demonstrate Multithreading for robust application development.
C216.6	Develop a simple program using basic concepts of Functional and Logical programming paradigm.

217: Course Name-210256- **Data Structures and algorithms Laboratory**

On the completion of the course, learner will be able to

C217.1	Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.
C217.2	Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.
C217.3	Apply and analyze nonlinear data structures to solve real world complex problems.
C217.4	Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.
C217.5	Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.

218: Course Name-210257- **Microprocessor Lab**

On the completion of the course, learner will be able to

C218.1	Understand and apply various addressing modes and instruction set to implement assembly language programs
C218.2	Apply logic to implement code conversion
C218.3	Analyze and apply logic to demonstrate processor mode of operation

219: Course Name-210258- **Project Based learning II**

On the completion of the course, learner will be able to

C219.1	Identify the real life problem from societal need point of view
C219.2	Choose and compare alternative approaches to select most feasible one
C219.3	Analyze and synthesize the identified problem from technological perspective
C219.4	Design the reliable and scalable solution to meet challenges
C219.5	Evaluate the solution based on the criteria specified
C219.6	Inculcate long life learning attitude towards the societal problems

220: Course Name-210259- **Code of Conduct**

On the completion of the course, learner will be able to

C220.1	Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
C220.2	Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
C220.3	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
C220.4	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

221: Course Name-210260- **Audit Course IV**

On the completion of the course, learner will be able to

C221.1	have ability of basic communication.
C221.2	have the knowledge of Japanese script.
C221.3	get introduced to reading , writing and listening skills
C221.4	develop interest to pursue professional Japanese Language course

T.E COMPUTER ENGINEERING

301: Course Name: 310241 – **Database Management Systems**

On the completion of the course, learner will be able to

C301.1	Analyze and design Database Management System using ER model
C301.2	Implement database queries using database languages
C301.3	Normalize the database design using normal forms
C301.4	Apply Transaction Management concepts in real-time situations
C301.5	Use NoSQL databases for processing unstructured data
C301.6	Differentiate between Complex Data Types and analyze the use of appropriate data types

302: Course Name: 310242 **– Theory of computation**

On the completion of the course, learner will be able to

C302.1	Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
C302.2	Construct regular expression to present regular language and understand pumping lemma for RE
C302.3	Design Context Free Grammars and learn to simplify the grammar
C302.4	Construct Pushdown Automaton model for the Context Free Language
C302.5	Devise Turing Machine for the different requirements outlined by theoretical computer science
C302.6	Analyze different classes of problems, and study concepts of NP completeness

303: Course Name: 310243 – **System Programming and Operating System**

On the completion of the course, learner will be able to

C303.1	Analyze and synthesize basic System Software and its functionality.
C303.2	Identify suitable data structures and Design & Implement various System Software.
C303.3	Compare different loading schemes and analyze the performance of linker and loader.
C303.4	Implement and Analyze the performance of process scheduling algorithms.
C303.5	Identify the mechanism to deal with deadlock and concurrency issues.
C303.6	Demonstrate memory organization and memory management policies.

304: Course Name: 310244 **– Computer Networks and security**

On the completion of the course, learner will be able to

C304.1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
C304.2	Illustrate the working and functions of data link layer
C304.3	Analyze the working of different routing protocols and mechanisms
C304.4	Implement client-server applications using sockets
C304.5	Illustrate role of application layer with its protocols, client-server architectures
C304.6	Comprehend the basics of Network Security

305A: Course Name: 310245A– **Elective-I- Internet of Things and Embedded Systems**

On the completion of the course, learner will be able to

C305A.1	Understand the fundamentals and need of Embedded Systems for the Internet of Things
C305A.2	Apply IoT enabling technologies for developing IoT systems
C305A.3	Apply design methodology for designing and implementing IoT applications
C305A.4	Analyze IoT protocols for making IoT devices communication
C305A.5	Design cloud based IoT systems
C305A.6	Design and Develop secured IoT applications

305B: Course Name: 310245B– **Elective-I-Human Computer Interface**

On the completion of the course, learner will be able to

C305B.1	Design effective Human-Computer-Interfaces for all kinds of users
C305B.2	Apply and analyze the user-interface with respect to golden rules of interface
C305B.3	Analyze and evaluate the effectiveness of a user-interface design
C305B.4	Implement the interactive designs for feasible data search and retrieval
C305B.5	Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality ,multi-media, World wide web related environments
C305B.6	Analyze and identify user models, user support, and stakeholder requirements of HCI systems

305C: Course Name: 310245C– **Elective-I-Distributed Systems**

On the completion of the course, learner will be able to

C305C.1	Analyze Distributed Systems types and architectural styles
C305C.2	Implement communication mechanism in Distributed Systems
C305C.3	Implement the synchronization algorithms in Distributed System applications
C305C.4	Develop the components of Distributed File System
C305C.5	Apply replication techniques and consistency model in Distributed Systems
C305C.6	Build fault tolerant Distributed Systems

305D: Course Name**:** 310245D**–** **Elective-I-Software Project Management**

On the completion of the course, learner will be able to

C305D.1	Comprehend Project Management Concepts
C305D.2	Use various tools of Software Project Management
C305D.3	Schedule various activities in software projects
C305D.4	Track a project and manage changes
C305D.5	Apply Agile Project Management
C305D.6	Analyse staffing process for team building and decision making in Software Projects and Management

306: Course Name: 310246**–** **DBMS Lab**

On the completion of the course, learner will be able to

C306.1	Design E-R Model for given requirements and convert the same into database tables
C306.2	Design schema in appropriate normal form considering actual requirements
C306.3	Implement SQL queries for given requirements, using different SQL concepts
C306.4	Implement PL/SQL Code block for given requirements
C306.5	Implement NoSQL queries using MongoDB
C306.6	Design and develop application considering actual requirements and using database concepts

307: Course Name: 310247– **Computer networks and Security Lab**

On the completion of the course, learner will be able to

C307.1	Analyze the requirements of network types, topology and transmission media
C307.2	Demonstrate error control, flow control techniques and protocols and analyze them
C307.3	Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms
C307.4	Develop Client-Server architectures and prototypes
C307.5	Implement web applications and services using application layer protocols
C307.6	Use network security services and mechanisms

308: Course Name: 310248– **Laboratory Practice I**

On the completion of the course, learner will be able to

- **Systems Programming and Operating System**

C308.1	Implement language translators
C308.2	Use tools like LEX and YACC
C308.3	Implement internals and functionalities of Operating System

- **Internet of Things and Embedded Systems**

C308.4	Design IoT and Embedded Systems based application
C308.5	Develop smart applications using IoT
C308.6	Develop IoT applications based on cloud environment

- **Human Computer Interface**

C308.4	Implement the interactive designs for feasible data search and retrieval
C308.5	Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual Reality and ,multi-media, World wide web related environments
C308.6	Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems

- **Distributed Systems**

C308.4	Demonstrate knowledge of the core concepts and techniques in Distributed Systems
C308.5	Apply the principles of state-of-the-Art Distributed Systems in real time applications
C308.6	Design, build and test application programs on Distributed Systems

- **Software Project Management**

C308.1	Apply Software Project Management tools
C308.2	Implement software project planning and scheduling
C308.3	Analyze staffing in software project

309: Course Name: 310249-**Seminar & Technical Communication**

On the completion of the course, learner will be able to

C309.1	Analyze a latest topic of professional interest
C309.2	Enhance technical writing skills
C309.3	Identify an engineering problem, analyze it and propose a work plan to solve it
C309.4	Communicate with professional technical presentation skills

310: Course Name: 310250-**Audit Course 5**

310250(A): **Cyber Security**

On the completion of the course, learner will be able to

C310A.1	Understand and classify various cybercrimes
C310A.2	Understand how criminals plan for the cybercrimes
C310A.3	Apply tools and methods used in cybercrime
C310A.4	Analyze the examples of few case studies of cybercrimes

310250(B): **Professional Ethics and Etiquettes**

On the completion of the course, learner will be able to

C310B.1	Summarize the principles of proper courtesy as they are practiced in the workplace.
C310B.2	Apply proper courtesy in different professional situations.
C310B.3	Practice and apply appropriate etiquettes in the working environment and day to day life.
C310B.4	Build proper practices personal and business communications of Ethics and Etiquettes.

310250(C): Learn New Skills- **Full Stack Developer**

On the completion of the course, learner will be able to

C310C.1	Design and develop web application using frontend and backend technologies..
C310C.2	Design and develop dynamic and scalable web applications
C310C.3	Develop server side scripts
C310C.4	Design and develop projects applying various database techniques

310250(D): **Engineering Economics**

On the completion of the course, learner will be able to

C310D.1	Understand economics, the cost money and management in engineering
C310D.2	Analyze business economics and engineering assets evaluation
C310D.3	Evaluate project cost and its elements for business
C310D.4	Develop financial statements and make business decisions

310250(E): **Foreign Language (Japanese)-Module 3**

On the completion of the course, learner will be able to

C310E.1	Apply language to communicate confidently and clearly in the Japanese language
C310E.2	Understand and use Japanese script to read and write
C310E.3	Apply knowledge for next advance level reading, writing and listening skills
C310E.4	Develop interest to pursue further study, work and leisure

311: Course Name: 310251-**Data science and Big Data analytics**

On the completion of the course, learner will be able to

C311.1	Analyze needs and challenges for Data Science Big Data Analytics
C311.2	Apply statistics for Big Data Analytics
C311.3	Apply the lifecycle of Big Data analytics to real world problems
C311.4	Implement Big Data Analytics using Python programming
C311.5	Implement data visualization using visualization tools in Python programming
C311.6	Design and implement Big Databases using the Hadoop ecosystem

312: Course Name: 310252-**Web Technology**

On the completion of the course, learner will be able to

C313.1	Implement and analyze behavior of web pages using HTML and CSS
C313.2	Apply the client side technologies for web development
C313.3	Analyze the concepts of Servlet and JSP
C313.4	Analyze the Web services and frameworks
C313.5	Apply the server side technologies for web development
C313.6	Create the effective web applications for business functionalities using latest web development platforms

313: Course Name: 310253-**Artificial intelligence**

On the completion of the course, learner will be able to

C314.1	Identify and apply suitable Intelligent agents for various AI applications
C314.2	Build smart system using different informed search / uninformed search or heuristic approaches
C314.3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
C314.4	Apply the suitable algorithms to solve AI problems
C314.5	Implement ideas underlying modern logical inference systems
C314.6	Represent complex problems with expressive yet carefully constrained language of representation

314A: Course Name: 310254A:-**Elective-II-Information Security**

On the completion of the course, learner will be able to

C314A.1	Model the cyber security threats and apply formal procedures to defend the attacks
C314A.2	Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
C314A.3	Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms
C314A.4	Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
C314A.5	Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection

314B: Course Name: 310254B:-**Elective-II-Augmented and Virtual Reality**

On the completion of the course, learner will be able to

C314B.1	Understand the basics of Augmented and Virtual reality systems and list their applications
C314B.2	Describe interface to the Virtual World with the help of input and output devices
C314B.3	Explain representation and rendering system in the context of Virtual Reality
C314B.4	Analyze manipulation, navigation and interaction of elements in the virtual world
C314B.5	Summarize the basic concepts and hardware of Augmented Reality system
C314B.6	Create Mobile Augmented Reality using Augmented Reality techniques and software

314C: Course Name: 310254C:-**Elective-II-Cloud computing**

On the completion of the course, learner will be able to

C314C.1	Understand the different Cloud Computing environment
C314C.2	Use appropriate data storage technique on Cloud, based on Cloud application
C314C.3	Analyze virtualization technology and install virtualization software
C314C.4	Develop and deploy applications on Cloud
C314C.5	Apply security in cloud applications
C314C.6	Use advance techniques in Cloud Computing

314D: Course Name: 310254D-**Elective-II-Software modeling and architectures**

On the completion of the course, learner will be able to

C314D.1	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
C314D.2	Design and analyze an application using UML modeling as fundamental tool
C314D.3	Evaluate software architectures
C314D.4	Use appropriate architectural styles and software design patterns
C314D.5	Apply appropriate modern tool for designing and modeling

315: Course Name:-**310255 Internship**

On the completion of the course, learner will be able to

C315.1	To demonstrate professional competence through industry internship.
C315.2	To apply knowledge gained through internships to complete academic activities in a professional manner.
C315.3	To choose appropriate technology and tools to solve given problem.
C315.4	To demonstrate abilities of a responsible professional and use ethical practices in day to day life.
C315.5	Creating network and social circle, and developing relationships with industry people.
C315.6	To analyze various career opportunities and decide carrier goals.

316: Course Name: 310256-**Data science and big data analytics laboratory**

On the completion of the course, learner will be able to

C316.1	Apply principles of Data Science for the analysis of real time problems
C316.2	Implement data representation using statistical methods
C316.3	Implement and evaluate data analytics algorithms
C316.4	Perform text preprocessing
C316.5	Implement data visualization techniques
C316.6	Use cutting edge tools and technologies to analyze Big Data

317: Course Name: 310257-Web Technology laboratory

On the completion of the course, learner will be able to

C317.1	Understand the importance of website planning and website design issues
C317.2	Understand the importance of website planning and website design issues
C317.3	Analyze the web technology languages, frameworks and services
C317.4	Create three tier web based applications

318: Course Name: 310258-**Laboratory practice-II**

- **Artificial Intelligence**

On the completion of the course, learner will be able to

C318.1	Design a system using different informed search / uninformed search or heuristic approaches
C318.2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
C318.3	Design and develop an interactive AI application

- **Information Security**

On the completion of the course, learner will be able to

C318.4	Use tools and techniques in the area of Information Security
C318.5	Use the cryptographic techniques for problem solving
C318.6	Design and develop security solution

- **Augmented and Virtual Reality**

On the completion of the course, learner will be able to

C318.4	Use tools and techniques in the area of Augmented and Virtual Reality
C318.5	Use the representing and rendering system for problem solving
C318.6	Design and develop ARVR applications

- **Cloud Computing**

On the completion of the course, learner will be able to

C318.4	Use tools and techniques in the area of Cloud Computing
C318.5	Use cloud computing services for problem solving
C318.6	Design and develop applications on cloud

- **Software Modeling and Architectures**

On the completion of the course, learner will be able to

C318.4	Use tools and techniques in the area Software Modeling and Architectures
C318.5	Use the knowledge of Software Modeling and Architectures for problem solving
C318.6	Design and develop applications using UML as fundamental tool

319: Course Name: 310259 Audit Course 6

310259(A): Digital and Social Media Marketing

On the completion of the course, learner will be able to

C319A.1	Understand the fundamentals and importance of digital marketing
C319A.2	Use the power of social media for business marketing
C319A.3	Analyze the effectiveness of digital marketing and social media over traditional process

310259(B): Sustainable Energy Systems

On the completion of the course, learner will be able to

C319B.1	Comprehend the importance of Sustainable Energy Systems
C319B.2	Correlate the human population growth and its trend to the natural resource degradation and develop the awareness about his/her role towards Sustainable Energy Systems protection
C319B.3	Identify different types of natural resource pollution and control measures
C319B.4	Correlate the exploitation and utilization of conventional and non-conventional resources

310259(C): Leadership and Personality Development

On the completion of the course, learner will be able to

C319C.1	Express effectively through communication and improve listening skills
C319C.2	Develop **e**ffective team leadership abilities.
C319C.3	Explore self-motivation and practicing creative/new age thinking.
C319C.4	Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.

310259(D): Foreign Language (Japanese) Module 4

On the completion of the course, learner will be able to

C319D.1	Have the ability to communicate confidently and clearly in the Japanese language
C319D.2	Understand the nature of Japanese script
C319D.3	Get introduced to reading, writing and listening skills
C319D.4	Develop interest to pursue further study, work and leisure

310259(E): Learn New Skill- 'Software Development Using Agility Approach'

On the completion of the course, learner will be able to

C319E.1	Illustrate the agility and principles
C319E.2	Understand the software development using agile methodology
C319E.3	Apply Dev Ops for the software product development
C319E.4	Develop software products for early delivery through continual feedback and learning

B.E COMPUTER ENGINEERING

C401: 410241: Design and Analysis of Algorithms

On the completion of the course, learner will be able to

C401.1	Formulate the problem
C401.2	Analyze the asymptotic performance of algorithms
C401.3	Decide and apply algorithmic strategies to solve given problem
C401.4	Find optimal solution by applying various methods
C401.5	Analyze and Apply Scheduling and Sorting Algorithms.
C401.6	Solve problems for multi-core or distributed or concurrent environments

C402 **410242: Machine Learning**

On the completion of the course, learner will be able to

C402.1	Identify the needs and challenges of machine learning for real time applications.
C402.2	Apply various data pre-processing techniques to simplify and speed up machine learning algorithms.
C402.3	Select and apply appropriately supervised machine learning algorithms for real time applications.
C402.4	Implement variants of multi-class classifier and measure its performance
C402.5	Compare and contrast different clustering algorithms.
C402.6	Design a neural network for solving engineering problems.

C403 **410243: Blockchain Technology**

On the completion of the course, learner will be able to

C403.1	Interpret the fundamentals and basic concepts in Blockchain
C403.2	Compare the working of different blockchain platforms
C403.3	Use Crypto wallet for cryptocurrency based transactions
C403.4	Analyze the importance of blockchain in finding the solution to the real-world problems.
C403.5	Illustrate the Ethereum public block chain platform
C403.6	Identify relative application where block chain technology can be effectively used and implemented.

C404A **410244(A): Pervasive Computing**

On the completion of the course, learner will be able to

C404A.1	Demonstrate fundamental concepts in pervasive computing.
C404A.2	Explain pervasive devices and decide appropriate one as per the need of real time applications.
C404A.3	Classify and analyze context aware systems for their efficiency in different ICT systems.
C404A.4	Illustrate intelligent systems and generic intelligent interactive applications.
C404A.5	Design HCI systems in pervasive computing environment.
C404A.6	Explore the security challenges and know the role of ethics in the context of pervasive computing

C404B **410244(B): Multimedia Techniques**

On the completion of the course, learner will be able to

C404B.1	Describe the media and supporting devices commonly associated with multimedia information and systems.
C404B.2	Demonstrate the use of content-based information analysis in a multimedia information system.
C404B.3	Critique multimedia presentations in terms of their appropriate use of audio, video,graphics, color ,and other information presentation concepts.
C404B.4	Implement a multimedia application using an authoring system.
C404B.5	Understanding of technologies for tracking, navigation and gestural control.
C404B.6	Implement Multimedia Internet of Things Architectures.

C404C **410244(C): Cyber Security and Digital Forensics**

On the completion of the course, learner will be able to

C404C.1	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
C404C.2	Build appropriate security solutions against cyber-attacks.
C404C.3	Underline the need of digital forensic and role of digital evidences
C404C.4	. Explain rules and types of evidence collection
C404C.5	Analyze, validate and process crime scenes
C404C.6	Identify the methods to generate legal evidence and supporting investigation reports

C404D **410244(D): Object Oriented Modeling and Design**

On the completion of the course, learner will be able to

C404D.1	Describe the concepts of object-oriented and basic class modelling.
C404D.2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
C404D.3	Choose and apply a befitting design pattern for the given problem
C404D.4	To Analyze applications, architectural Styles & software control strategies
C404D.5	To develop Class design Models & choose Legacy Systems.
C404D.6	To Understand Design Patterns

C404E **410244(E): Digital signal Processing**

On the completion of the course, learner will be able to

C404E.1	Understand the mathematical models and representations of DT Signals and Systems
C404E.2	Apply different transforms like Fourier and Z-Transform from applications point of view.
C404E.3	Understand the design and implementation of DT systems as DT filters with filter structures and different transforms.
C404E.4	Demonstrate the knowledge of signals and systems for design and analysis of systems
C404E.5	Apply knowledge and use the signal transforms for digital processing applications
C404E.6	To understand Filtering and Different Filter Structures

C405A **410245(A): Information Retrieval**

On the completion of the course, learner will be able to

C405A.1	CO1:Implement the concept of Information Retrieval
C405A.2	CO2:Generate quality information out of retrieved information
C405A.3	CO3:Apply techniques such as classification, clustering, and filtering over multimedia to analyze the information
C405A.4	CO4:Evaluate and analyze retrieved information
C405A.5	CO5:Understand the data in various Application and Extensions of information retrieval
C405A.6	CO6: Understand Parallel information retrieving and web structure

C405B **410245(B): GPU Programming and Architecture**

On the completion of the course, learner will be able to

C405B.1	CO1: Describe GPU architecture
C405B.2	CO2: Write programs using CUDA, identify issues and debug them.
C405B.3	CO3: Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
C405B.4	CO4: Write simple programs using OpenCL
C405B.5	CO5: Identify efficient parallel programming patterns to solve problems
C405B.6	CO6: Explore the modern GPUs architecture and it's Applications.

C405C **410245(C): Mobile Computing**

On the completion of the course, learner will be able to

C405C.1	CO1: Develop a strong grounding in the fundamentals of mobile Networks
C405C.2	CO2: Apply knowledge in MAC, Network, and Transport Layer protocols ofWireless Network
C405C.3	CO3: Illustrate Global System for Mobile Communications
C405C.4	CO4: Use the 3G/4G technology based network with bandwidth capacity planning,VLR and HLR identification algorithms
C405C.5	CO5: Classify network and transport layer of mobile communication
C405C.6	CO6: Design & development of various wireless network protocols using simulationtools

C405D **410245(D): Software Testing and Quality assurance**

On the completion of the course, learner will be able to

C405D.1	CO1: Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
C405D.2	CO2: Design and Develop project test plan, design test cases, test data, and conduct test operations.
C405D.3	CO3: Apply recent automation tool for various software testing for testing software.
C405D.4	CO4: Apply different approaches of quality management, assurance, and quality standard to software system.
C405D.5	CO5: Apply and analyze effectiveness Software Quality Tools.
C405D.6	CO6: Apply tools necessary for efficient testing framework.

C405E **410245(E): Compilers**

On the completion of the course, learner will be able to

C405E.1	CO1: Design and implement a lexical analyzer using LEX tools
C405E.2	CO2: Design and implement a syntax analyzer using YACC tools
C405E.3	CO3:Understand syntax-directed translation and run-time environment
C405E.4	CO4 : Generate intermediate codes for high-level statements.
C405E.5	CO5 :Construct algorithms to produce computer code.
C405E.6	CO6: Analyze and transform programs to improve their time and memory efficiency

C406 **410246: Laboratory Practice III**

On the completion of the course, learner will be able to

C406.1	CO1: Apply preprocessing techniques on datasets.
C406.2	CO2: Implement and evaluate linear regression and random forest regression models.
C406.3	CO3: Apply and evaluate classification and clustering techniques.
C406.4	CO4: Analyze performance of an algorithm.
C406.5	CO5: Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound.
C406.6	CO6: Interpret the basic concepts in Blockchain technology and its applications

C407 **410247: Laboratory Practice IV**

On the completion of the course, learner will be able to

C407.1	CO1: Apply android application development for solving real life problems
C407.2	CO2: Design and develop system using various multimedia components.
C407.3	CO3: Identify various vulnerabilities and demonstrate using various tools.
C407.4	CO4: Apply information retrieval tools for natural language processing
C407.5	CO5: Develop an application using open source GPU programming languages
C407.6	CO6: Apply software testing tools to perform automated testing

C408 **410248: Project Stage I**

On the completion of the course, learner will be able to

C408.1	Solve real life problems by applying knowledge.
C408.2	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
C408.3	Write precise reports and technical documents in a nutshell.
C408.4	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work
C408.5	Inter-personal relationships, conflict management and leadership quality.
C408.6	Solve real life problems by applying knowledge.

C409 **AC7 – I: MOOC-learn New Skill**

On the completion of the course, learner will be able to

C409.1 **AC7 – I**	CO1: To acquire additional knowledge and skill.

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C410 **410249: High Performance Computing**

On the completion of the course, learner will be able to

C410.1	CO1: Understand various Parallel Paradigm
C410.2	CO2: Design and Develop an efficient parallel algorithm to solve given problem
C410.3	CO3: Illustrate data communication operations on various parallel architecture
C410.4	CO4: Analyze and measure performance of modern parallel computing systems
C410.5	CO5: Apply CUDA architecture for parallel programming
C410.6	CO6: Analyze the performance of HPC applications

C411 **410251: Deep Learning**

On the completion of the course, learner will be able to

C411.1	**CO1:** Understand the basics of Deep Learning and apply the tools to implement deeplearningapplications
C411.2	**CO2:** Evaluate the performance of deep learning models (e.g., with respect to the bias-variance trade-off, overfitting and underfitting, estimation of test error).
C411.3	**CO3:** To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN)forimplementing Deep Learning models
C411.4	**CO4:** To implement and apply deep generative models.
C411.5	**CO5:** Construct and apply on-policy reinforcement learning algorithms
C411.6	**CO6**:To Understand Reinforcement Learning Process

C412(A) **410252(A): Natural Language Processing**

On the completion of the course, learner will be able to

C412A.1	CO1: Describe the fundamental concepts of NLP, challenges and issues in NLP
C412A.2	CO2: Analyze Natural languages morphologically, syntactical and semantically OR Describe the concepts of morphology, syntax, semantics of natural language
C412A.3	CO3: Illustrate various language modelling techniques
C412A.4	CO4: Integrate the NLP techniques for the information retrieval task
C412A5	CO5: Demonstrate the use of NLP tools and techniques for text-based processing of natural languages
C412A.6	CO6: Develop real world NLP applications

C412(B) **410252(B): Image Processing**

On the completion of the course, learner will be able to

C412B.1	CO1: Apply Relevant Mathematics Required for Digital Image Processing.
C412B.2	CO2: Apply Special and Frequency Domain Method for Image Enhancement.
C412B.3	CO3: Apply algorithmic approaches for Image segmentation.
C412B.4	CO4: Summarize the Concept of Image Compression and Object Recognition.
C412B5	CO5: Explore the Image Restoration Techniques.
C412B.6	CO6: Explore the Medical and Satellite Image Processing Applications

C412(C) **410252(C): Software Defined Networks**

On the completion of the course, learner will be able to

C412C.1	CO1: Interpret the need of Software Defined networking solutions.
C412C.2	CO2: Analyze different methodologies for sustainable Software Defined Networking solutions.
C412C.3	CO3: Select best practices for design, deploy and troubleshoot of next generation networks.
C412C.4	CO4: Develop programmability of network elements.
C412C.5	CO5: Demonstrate virtualization and SDN Controllers using Open Flow protocol
C412C.6	CO6: Design and develop various applications of SDN

C413(A) **410253(A): Pattern Recognition**

On the completion of the course, learner will be able to

C413A.1	CO1: Analyze various type of pattern recognition techniques
C413A.2	CO2: Identify and apply various pattern recognition and classification approaches to solvethe problems
C413A.3	CO3: Evaluate statistical and structural pattern recognition
C413A.4	CO4: Percept recent advances in pattern recognition confined to various applications
C413A.5	CO5:Implement Bellman's optimality principle and dynamic programming
C413A.6	CO6:Analyze Patterns using Genetic Algorithms & Pattern recognition applications.

C413(B) **410253(B): Soft Computing**

On the completion of the course, learner will be able to

C413B.1	**CO1:** Understand requirement of soft computing and be aware of various soft computingtechniques.
C413B.2	**CO2:** Understand Artificial Neural Network and its characteristics and implement ANNalgorithms.
C413B.3	**CO3:** Understand and Implement Evolutionary Computing Techniques.
C413B.4	**CO4:** Understand the Fuzzy logic and Implement fuzzy algorithms for solving real life problems.
C413B.5	**CO5:** Apply knowledge of Genetic algorithms for problem solving.
C413B.6	**CO6:** Develop hybrid systems for problem solving.

C413(C) **410253(C): Business Intelligence**

On the completion of the course, learner will be able to

C413C.1	CO1: Differentiate the concepts of Decision Support System & Business Intelligence
C413C.2	CO2:Use Data Warehouse & Business Architecture to design a BI system.
C413C.3	CO3:Build graphical reports
C413C.4	CO4:Apply different data preprocessing techniques on dataset
C413C.5	CO5:mplement machine learning algorithms as per business needs
C413C.6	CO6:Identify role of BI in marketing, logistics, and finance and telecommunication sector

C413(D) **410253(D): Quantum Computing**

On the completion of the course, learner will be able to

C413D.1	CO1: To understand the concepts of Quantum Computing
C413D.2	CO2: To understand and get exposure to mathematical foundation and quantum mechanics
C413D.3	CO3: To understand and implement buiding blocks of Quantum circuits
C413D.4	CO4: To understand quantum information, its processing and Simulation tools
C413D.5	CO5: To understand basic signal processing algorithms FT, DFT and FFT
C413D.6	CO6 : To study and solve examples of Quantum Fourier Transforms and their applications

C414 **410254 : Laboratory Practice V**

On the completion of the course, learner will be able to

C414.1	CO1: Analyze and measure performance of sequential and parallel algorithms.
C414.2	CO2: Design and Implement solutions for multicore/Distributed/parallel environment.
C414.3	CO3: Identify and apply the suitable algorithms to solve AI/ML problems.
C414.4	CO4: Apply the technique of Deep Neural network for implementing Linear regression andclassification.
C414.5	CO5: Apply the technique of Convolution (CNN) for implementing Deep Learning models.
C414.6	CO6: Design and develop Recurrent Neural Network (RNN) for prediction.

C415 **410255 : Laboratory Practice VI**

On the completion of the course, learner will be able to

C415.1	CO1: Apply basic principles of elective subjects to problem solving and modeling.
C415.2	CO2: Use tools and techniques in the area of software development to build mini projects
C415.3	CO3: Design and develop applications on subjects of their choice.
C415.4	CO4: Generate and manage deployment, administration & security

C416 **410256** : **Project Stage II**

On the completion of the course, learner will be able to

C416.1	CO1: Show evidence of independent investigation
C416.2	CO2: Critically analyze the results and their interpretation.
C416.3	CO3: Report and present the original results in an orderly way and placing the open questions in the right perspective.
C416.4	CO4: Link techniques and results from literature as well as actual research and future research lines with the research.
C416.5	CO5: Appreciate practical implications and constraints of the specialist subject

C417 **410257** : **Audit Course 8**
AC8 – I: Usability Engineering

On the completion of the course, learner will be able to

C416.1	CO1: Describe the human centered design process and usability engineering process and the irroles in system design and development.
C416.2	CO2: Discuss usability design guidelines, their foundations, assumptions, advantages,and weaknesses.
C416.3	CO3: Design a user interface based on analysis of human needs and prepare a prototype system
C416.4	.CO4: Assess user interfaces using different usability engineering techniques.
C416.5	CO5: Present the design decisions

C417 **410257** : **Audit Course 8**

AC8 – II: Conversational Interfaces

On the completion of the course, learner will be able to

C417.1	CO1: Develop an effective interface for conversation
C417.2	CO2: Explore advanced concepts in user interface

C417 **410257** : **Audit Course 8**

AC8–III: Social Media And Analytics

On the completion of the course, learner will be able to

C417.1	CO1: Develop a far deeper understanding of the changing digital land scape
C417.2	. CO2: Identify some of the latest digital marketing trends and skill sets needed for today's marketer.
C417.3	CO3: Successful planning, prediction, and management of digital marketing campaigns.
C417.4	CO4: Assessuserinterfacesusingdifferentusabilityengineeringtechniques.
C417.5	CO5: Implement smart management of different digital assets for marketing needs.
C417.6	CO6: Assess digital marketing as a long term career opportunity.

C417 **410257** : **Audit Course 8**

AC8 – IV: MOOC-learn New Skill

On the completion of the course, learner will be able to

C417.1	CO1: To acquire additional knowledge and skill.

C417 **410257** : **Audit Course 8**

AC8 – V: Emotional Intelligence

On the completion of the course, learner will be able to

C417.1	CO1: Expand your knowledge of emotional patterns in yourself and others
C417.2	CO2: Discover how you can manage your emotions, and positively influence yourself and others
C417.3	CO3: Build more effective relationships with people at work and at home
C417.4	CO4: Positively influence and motivate colleagues, team members, managers
C417.5	CO5: Increase the leadership effectiveness by creating an atmosphere that engages others