PDEA's College Of Engineering Manjari (Bk.) First Year Engineering Department

Programme Outcomes (PO)

1. **PO1: Engineering knowledge** : Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems
2. **PO2: 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. **PO3: 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. **PO4: 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. **PO5: 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. **PO6 : 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. **PO7: 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. **PO8: Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
9. **PO9: Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **PO10: Communication Skills:** 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. **PO11: Project Management and Finance:** Demonstrate knowledge and understanding of 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. **PO12: Life-longLearning :** 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(COs)

First Year Engineering (2019 Course) : SEM-I

107001 – Engineering Mathematics – I

CO 1	Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
CO 2	The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO 3	To deal with derivative of functions of several variables that are essential in various branches of Engineering.
CO 4	To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function
CO 5	The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems

107002: Engineering Physics

CO 1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO 2	Learn basics of lasers and optical fibers and their use in some applications.
CO 3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO 4	Understand theory of semiconductors and their applications in some semiconductor devices.
CO 5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO 6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.

107009: Engineering Chemistry

CO 1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
CO 2	Select appropriate electro-technique and method of material analysis.
CO 3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO 4	Analyze fuel and suggest use of alternative fuels.
CO 5	Identify chemical compounds based on their structure.
CO 6	Explain causes of corrosion and methods for minimizing corrosion.

103004: Basic Electrical Engineering

CO 1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO 2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO 3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.
CO 4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO 5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.
CO 6	Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.

104010: Basic Electronics Engineering

CO 1	Explain the working of P-N junction diode and its circuits.
CO 2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
CO 3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.
CO 4	Use different electronics measuring instruments to measure various electrical parameters.
CO 5	Select sensors for specific applications.
CO 6	Describe basic principles of communication systems.

101011: Engineering Mechanics

CO 1	Determine resultant of various force systems
CO 2	Determine centroid , moment of inertia and solve problems related to friction
CO 3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO 4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO 5	Calculate position, velocity and acceleration of particle using principles of kinematics
CO 6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy

110005 : : Programming and Problem Solving

CO 1	Inculcate and apply various skills in problem solving
CO 2	Choose most appropriate programming constructs and features to solve the problems in diversified domains
CO 3	Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of the language, Python
CO 4	Demonstrate significant experience with the Python program development environment.
CO 5	Apply various features of Object Oriented programming and instance management
CO 6	Design record management in structured document and files management using python

102003 - Systems in Mechanical Engineering

CO 1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO 2	Explain basic laws of thermodynamics, heat transfer and their applications
CO 3	List down the types of road vehicles and their specifications
CO 4	Illustrate various basic parts and transmission system of a road vehicle
CO 5	Discuss several manufacturing processes and identify the suitable process
CO 6	Explain various types of mechanism and its application

111006 -Workshop Practice

CO 1	Familiar with safety norms to prevent any mishap in workshop.
CO 2	Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO 3	Able to understand the construction, working and functions of machine tools and their parts.
CO 4	Able to know simple operations (Turning and Facing) on a centre lathe.

101007: Audit Course 1 Environmental Studies-I

CO 1	Demonstrate an integrative approach to environmental issues with a focus on sustainability.
CO 2	Explain and identify the role of the organism in energy transfers in different ecosystems
CO 3	Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
CO 4	Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings

First Year Engineering (2019 Course) : SEM-II

107008 – Engineering Mathematics – II

CO 1	The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.
CO 2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO 3	To trace the curve for a given equation and measure arc length of various curves.
CO 4	The concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO 5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

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102012: Engineering Graphics

CO 1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries
CO 2	Construct the various engineering curves using the drawing instruments.
CO 3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object
CO 4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO 5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO 6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

110013: Project Based Learning

CO 1	Project based learning will increase their capacity and learning through shared cognition.
CO 2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO 3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

101014: Audit Course 2 Environmental Studies-II

CO 1	Have an understanding of environmental pollution and the science behind those problems and potential solutions.
CO 2	Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO 3	Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO 4	Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues.

PDEA's College Of Engineering Manjari (Bk.)Computer Engineering

Department

Program Education Objectives (PEO)

1. Topreparegloballycompetentgraduateshavingstrongfundamentals,domainknowledge,updated with modern technology to provide the effective solutions for Computerscience and Engineering problems.
2. To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as inteams.

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Programme Specific Outcomes (PSOs)

PSO1 :Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.
PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.

Course Outcomes (COs)

Second Year of Computer Engineering (2019 Course) : SEM I

210241: Discrete Mathematics

CO1	**Formulate** problems precisely, solve the problems, apply formal proof techniques, andexplain the reasoning clearly.
CO2	**Apply** appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
CO3	**Design and analyze** real world engineering problems by applying set theory, propositionallogic and to construct proofs using mathematical induction.
CO4	**Specify, manipulate and apply** equivalence relations; construct and use functions and applythese concepts to solve new problems.
CO5	**Calculate** numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
CO6	**Model and solve** computing problem using tree and graph and solve problems using appropriate algorithms.
CO7	**Analyze** the properties of binary operations, apply abstract algebra in coding theory andevaluate the algebraic structures**.**

210242: Fundamentals of Data Structures

CO1	**Design** the algorithms to solve the programming problems, **identify** appropriate algorithmic strategy for specific application, and **analyze** the time and space complexity.
CO2	**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.
CO3	**Demonstrate** use of sequential data structures- Array and Linked lists to store and process data.
CO4	**Understand** the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
CO5	**Compare** and **contrast** different implementations of data structures (dynamic and static).
CO6	**Understand, Implement and apply** principles of data structures-stack and queue to solve computational problems.

210243: Object Oriented Programming(OOP)

CO1	**Apply** constructs- sequence, selection and iteration; classes and objects, inheritance, useof predefined classes from libraries while developing software.
CO2	**Design** object-oriented solutions for small systems involving multiple objects.
CO3	**Use** virtual and pure virtual function and complex programming situations.
CO4	**Apply** object-oriented software principles in problem solving.
CO5	**Analyze** the strengths of object-oriented programming.

CO6	**Develop** the application using object oriented programming language(C++).

210244: Computer Graphics

CO1	**Identify** the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO2	**Apply** mathematics to develop Computer programs for elementary graphic operations.
CO3	**Illustrate** the concepts of windowing and clipping and **apply** various algorithms to fill and clippolygons.
CO4	**Understand** and **apply** the core concepts of computer graphics, including transformation intwo and three dimensions, viewing and projection.
CO5	**Understand** the concepts of color models, lighting, shading models and hidden surfaceelimination.
CO6	**Create** effective programs using concepts of curves, fractals, animation and gaming

210245: Digital Electronics and Logic Design

CO1	**Simplify** Boolean Expressions using K Map.
CO2	**Design and implement** combinational circuits.
CO3	**Design and implement** sequential circuits.
CO4	**Develop** simple real-world application using ASM and PLD.
CO5	**Differentiate and Choose** appropriate logic families IC packages as per the given design specifications.
CO6	**Explain** organization and architecture of computer system

210246: Data Structures Laboratory

CO1	**Use** algorithms on various linear data structure using sequential organization to solve real lifeproblems.
CO2	**Analyze** problems to **apply** suitable searching and sorting algorithm to various applications.
CO3	**Analyze** problems to **use variants of** linked list and solve various real life problems
CO4	Designing and implement data structures and algorithms for solving different kinds ofproblems.

210247: OOP and Computer Graphics Laboratory

CO1	Understand and **apply** the concepts like inheritance, polymorphism, exception handling andgeneric structures for implementing reusable programming codes.
CO2	**Analyze** the concept of file and **apply** it while storing and retrieving the data from secondarystorages.
CO3	**Analyze** and **apply** computer graphics algorithms for line-circle drawing, scan conversionand filling with the help of object oriented programming concepts.
CO4	**Understand** the concept of windowing and clipping and **apply** various algorithms to fill andclip polygons.
CO5	**Apply** logic to implement, curves, fractals, animation and gaming programs

210248: Digital Electronics Laboratory

CO1	**Understand** the working of digital electronic circuits.
CO2	**Apply** the knowledge to appropriate IC as per the design specifications.
CO3	**Design** and **implement** Sequential and Combinational digital circuits as per the specifications.

210249: Business Communication Skills

CO1	**Express** effectively through verbal/oral communication and improve listening skills
CO2	**Write** precise briefs or reports and technical documents.
CO3	**Prepare** for group discussion / meetings / interviews and presentations.
CO4	**Explore** goal/target setting, self-motivation and practicing creative thinking.
CO5	**Operate** effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities.

210250: Humanity and Social Science

CO1	**Aware** of the various issues concerning humans and society.
CO2	**Aware** about their responsibilities towards society.
CO3	Sensitized about broader issues regarding the social, cultural, economic and humanaspects, involved in social changes.
CO4	**Able** to understand the nature of the individual and the relationship between self and the community.
CO5	**Able** to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.

210251: Audit Course 3

AC3-III Environmental Studies

CO1	**Comprehend** the importance of ecosystem and biodiversity
CO2	**Correlate** the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention
CO3	**Identify** different types of environmental pollution and control measures
CO4	**Correlate** the exploitation and utilization of conventional and non-conventional resources

Second Year of Computer Engineering (2019 Course) : SEM II

207003: Engineering Mathematics III

CO1	Solve Linear differential equations, essential in modelling and design of computer-basedsystems.
CO2	Apply concept of Fourier transform and Z-transform and its applications to continuous anddiscrete systems and image processing.
CO3	Apply Statistical methods like correlation and regression analysis and probability theory fordata analysis and predictions in machine learning.
CO4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
CO5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

210252: Data Structures and Algorithms

CO1	**Identify and articulate** the complexity goals and benefits of a good hashing scheme for real-world applications.
CO2	**Apply** non-linear data structures for solving problems of various domain
CO3	**Design and specify** the operations of a nonlinear-based abstract data type and implement themin a high-level programming language.
CO4	**Analyze** the algorithmic solutions for resource requirements and optimization
CO5	**Use** efficient indexing methods and multiway search techniques to store and maintain data.
CO6	**Use** appropriate modern tools to understand and analyze the functionalities confined to thesecondary storage.

210253: Software Engineering

CO1	**Analyze** software requirements and formulate design solution for a software.
CO2	**Design** applicable solutions in one or more application domains using software engineeringapproaches that integrate ethical, social, legal and economic concerns.
CO3	**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 theircontinuous professional development.
CO4	**Model** and design User interface and component-level.
CO5	**Identify** and handle risk management and software configuration management.
CO6	**Utilize** knowledge of software testing approaches, approaches to verification and validation.
CO7	**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.

210254: Microprocessor

CO1	**E**xhibit skill of assembly language programming for the application
CO2	**Classify** Processor architectures.
CO3	**Illustrate** advanced features of 80386 Microprocessor.
CO4	**Compare** and **contrast** different processor modes.
CO5	**Use** interrupts mechanism in applications
CO6	**Differentiate** between Microprocessors and Microcontrollers.
CO7	**Identify** and **analyze** the tools and techniques used to design, implement, and debug microprocessor-based systems.

210255: Principles of Programming Languages

CO1	**Make** use of basic principles of programming languages.
CO2	**Develop** a program with Data representation and Computations.
CO3	**Develop** programs using Object Oriented Programming language : Java
CO4	**Develop** application using inheritance, encapsulation, and polymorphism
CO5	**Demonstrate** Multithreading for robust application development.
CO6	**Develop** a simple program using basic concepts of Functional and Logical programmingparadigm

210256: Data Structures and Algorithms Laboratory

CO1	**Understand** the ADT/libraries, hash tables and dictionary to design algorithms for aspecific problem.
CO2	Choose most appropriate data structures and **apply** algorithms for graphical solutions ofthe problems.
CO3	**Apply** and **analyze** non linear data structures to solve real world complex problems.
CO4	**Apply** and **analyze** algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.
CO5	**Analyze** the efficiency of most appropriate data structure for creating efficient solutions forengineering design situations.

210257: Microprocessor Laboratory

CO1	**Understand** and **apply** various addressing modes and instruction set to implementassembly language programs
CO2	**Apply** logic to **implement** code conversion
CO3	**Analyze** and **apply** logic to **demonstrate** processor mode of operation

210258: Project Based Learning II

CO1	Identify the real life problem from societal need point of view
CO2	Choose and compare alternative approaches to select most feasible one
CO3	Analyze and synthesize the identified problem from technological perspective
CO4	Design the reliable and scalable solution to meet challenges
CO5	Evaluate the solution based on the criteria specified
CO6	Inculcate long life learning attitude towards the societal problems

210259: Code of Conduct

CO1	**Understand** the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineeringfield.
CO2	**Aware** of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
CO3	**Understand** the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
CO4	**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.

210260: Audit Course 4

AC4-IV : **Stress Relief: Yoga and Meditation**

CO1	**Understand** philosophy and religion as well as daily life issues will be challenged and enhanced.
CO2	**Enhances** the immune system.
CO3	Intellectual and philosophical understanding of the theory of yoga and basic related Hindu scriptures will be developed.
CO4	Powers of concentration, focus, and awareness will be heightened.

Third Year of Computer Engineering (2015 Course) : SEM I

310241: Database Management Systems

CO1	Analyze and design Database Management System using ER model
CO2	Implement database queries using database languages
CO3	Normalize the database design using normal forms
CO4	Apply Transaction Management concepts in real-time situations
CO5	Use NoSQL databases for processing unstructured data
CO6	Differentiate between Complex Data Types and analyze the use of appropriate data types

310242: Theory of Computation

CO1	Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
CO2	Construct regular expression to present regular language and understand pumping lemma for RE
CO3	Design Context Free Grammars and learn to simplify the grammar
CO4	Construct Pushdown Automaton model for the Context Free Language
CO5	Devise Turing Machine for the different requirements outlined by theoretical computer science
CO6	Analyze different classes of problems, and study concepts of NP completeness

310243: Systems Programming and Operating System

CO1	Analyze and synthesize basic System Software and its functionality.
CO2	Identify suitable data structures and Design & Implement various System Software
CO3	Compare different loading schemes and analyze the performance of linker and loader
CO4	Implement and Analyze the performance of process scheduling algorithms
CO5	Identify the mechanism to deal with deadlock and concurrency issues
CO6	Demonstrate memory organization and memory management policies

310244: Computer Networks and Security

CO1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
CO2	Illustrate the working and functions of data link layer
CO3	Analyze the working of different routing protocols and mechanisms
CO4	Implement client-server applications using sockets
CO5	Illustrate role of application layer with its protocols, client-server architectures
CO6	Comprehend the basics of Network Security

Elective I

310245(A): Internet of Things and Embedded Systems

CO1	Understand the fundamentals and need of Embedded Systems for the Internet of Things
CO2	Apply IoT enabling technologies for developing IoT systems
CO3	Apply design methodology for designing and implementing IoT applications
CO4	Analyze IoT protocols for making IoT devices communication
CO5	Design cloud based IoT systems
CO6	Design and Develop secured IoT applications

310246:Database Management Systems Laboratory

CO1	Design E-R Model for given requirements and convert the same into database tables
CO2	Design schema in appropriate normal form considering actual requirements
CO3	Implement SQL queries for given requirements, using different SQL concepts
CO4	Implement PL/SQL Code block for given requirements
CO5	Implement NoSQL queries using MongoDB
CO6	Design and develop application considering actual requirements and using database concepts

310247:Computer Networks and Security Laboratory

CO1	Analyze the requirements of network types, topology and transmission media
CO2	Demonstrate error control, flow control techniques and protocols and analyze them
CO3	Demonstrate the subnet formation with IPallocation mechanism and apply various routing algorithms
CO4	Develop Client-Server architectures and prototypes
CO5	Implement web applications and services using application layer protocols
CO6	Use network security services and mechanisms

310248: Laboratory Practice I

- **Systems Programming and Operating System**

CO1	Implement language translators
CO2	Use tools like LEX and YACC
CO3	Implement internals and functionalities of Operating System

- **Internet of Things and Embedded Systems**

CO4	Design IoT and Embedded Systems based application
CO5	Develop smart applications using IoT
CO6	Develop IoT applications based on cloud environment

310249: Seminar and Technical Communication

CO1	Analyze a latest topic of professional interest
CO2	Enhance technical writing skills
CO3	Identify an engineering problem, analyze it and propose a work plan to solve it
CO4	Communicate with professional technical presentation skills

310250: Audit Course 5

310250(A)   Cyber Security

CO1	Understand and classify various cybercrimes
CO2	Understand how criminals plan for the cybercrimes
CO3	Apply tools and methods used in cybercrime
CO4	Analyze the examples of few case studies of cybercrimes

Third Year of Computer Engineering (2019 Course) : SEM II

310251: Data Science and Big Data Analytics

CO1	Analyze needs and challenges for Data Science Big Data Analytics
CO2	Apply statistics for Big Data Analytics
CO3	Apply the lifecycle of Big Data analytics to real world problems
CO4	Implement Big Data Analytics using Python programming
CO5	Implement data visualization using visualization tools in Python programming
CO6	Design and implement Big Databases using the Hadoop ecosystem

310252: Web Technology

CO1	Implement and analyze behavior of web pages using HTML and CSS
CO2	Apply the client side technologies for web development
CO3	Analyze the concepts of Servlet and JSP
CO4	Analyze the Web services and frameworks
CO5	Apply the server side technologies for web development
CO6	Create the effective web applications for business functionalities using latest web development platforms

310253: Artificial Intelligence

CO1	Identify and apply suitable Intelligent agents for various AI applications
CO2	Build smart system using different informed search / uninformed search or heuristic approaches
CO3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO4	Apply the suitable algorithms to solve AI problems
CO5	Implement ideas underlying modern logical inference systems
CO6	Represent complex problems with expressive yet carefully constrained language of representation

Elective II

310254(A): Information Security

CO1	Model the cyber security threats and apply formal procedures to defend the attacks
CO2	Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
CO3	Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms
CO4	Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
CO5	Demonstrate the use of standards and cyber laws to enhance Information Security in the

310255: Internship**

CO1	To demonstrate professional competence through industry internship.
CO2	To apply knowledge gained through internships to complete academic activities in a professional manner.
CO3	To choose appropriate technology and tools to solve given problem.
CO4	To demonstrate abilities of a responsible professional and use ethical practices in day to day life.
CO5	Creating network and social circle, and developing relationships with industry people.
CO6	To analyze various career opportunities and decide carrier goals.

310256:Data Science and Big Data Analytics Laboratory

CO1	Apply principles of Data Science for the analysis of real time problems
CO2	Implement data representation using statistical methods
CO3	Implement and evaluate data analytics algorithms
CO4	Perform text preprocessing
CO5	Implement data visualization techniques
CO6	Use cutting edge tools and technologies to analyze Big Data

310257:Web Technology Laboratory

CO1	Understand the importance of website planning and website design issues
CO2	Apply the client side and server side technologies for web application development
CO3	Analyze the web technology languages, frameworks and services
CO4	Create three tier web based applications

310258:Laboratory Practice II

310254(C) - Cloud Computing

CO4	Use tools and techniques in the area of Cloud Computing
CO5	Use cloud computing services for problem solving
CO6	Design and develop applications on cloud

310259: Audit Course 6

310259(C) - Leadership and Personality Development

CO1	Express effectively through communication and improve listening skills
CO3	Develop effective team leadership abilities.
CO4	Explore self-motivation and practicing creative/new age thinking.
CO5	Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.

Fourth Year of Computer Engineering (2015 Course) : SEM I

410241: High Performance Computing

CO1	To study parallel Computing hardware and programming models
CO2	To be conversant with performance analysis and modeling of parallel program
CO3	To understand the options available to parallelize the programs
CO4	To know the operating system requirements to qualify in handling the parallelization
CO5	To select the specific programming model /Algorithm suitable for particular problem in order to enhance performance and manage project cost
CO6	Cope up with upcoming and legacy system that can adapt future technologies

410242: Artificial Intelligence and Robotics

CO1	Identify and apply suitable Intelligent agents for various AI applications.
CO2	Design smart system using different informed search / uninformed search or heuristic approaches.
CO3	Identify knowledge associated and represent it by ontological engineering to plan a strategy

	to solve given problem.
CO4	Apply the suitable algorithms to solve AI problems.
CO5	Identify and apply various peculiar search strategies for AI.
CO6	Understand the fundamentals of mobile robotics.

410243: Data Analytics

CO1	To develop problem solving abilities using Mathematics
CO2	To apply algorithmic strategies while solving problems
CO3	To develop time and space efficient algorithms
CO4	To study algorithmic examples in distributed, concurrent and parallel environments
CO5	Implement data visualization using visualization tools in Python programming
CO6	Design and implement Big Databases using the Hadoop ecosystem

Elective I 410244(D): Data Mining and Warehousing

CO1	Apply basic, intermediate
CO2	Apply advanced techniques to mine the data
CO3	Analyze the output generated by the process of data mining
CO4	Explore the hidden patterns in the data
CO5	Optimize the mining process by choosing best data mining technique
CO6	Optimize the mining process by algorithms in data mining

Elective II 410245(B): Software Testing and Quality Assurance

CO1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
CO2	Design and develop project test plan, design test cases, test data, and conduct test operations
CO3	Apply recent automation tool for various software testing for testing software
CO4	Apply different approaches of quality management, assurance, and quality standard to software system
CO5	Apply and analyze effectiveness Software Quality Tools
CO6	Maintain software status to track future versioning of software

Elective II 410245(D): Mobile Communication

CO1	To understand the personal communication services
CO2	To learn the design parameters for settings up mobile network
CO3	To know GSM architectures and support services
CO4	To learn current technologies being used on field.
CO5	Get CDMA mobile network layout which confirm to the technology.
CO6	To Learn next generation mobile network and mobile applications.

410246:Laboratory Practice I

CO1	Get solution for complex problems by applying different algorithms.
CO2	To analyze problem by finding its domain and applying domain specific skill.
CO3	To understand the design issues of product /software.
CO4	To adapt the usage of modern tools and recent software.
CO5	To apply the knowledge of computer Engineering for development of projects.
CO6	To keep in touch with current technologies AI .

410247:Laboratory Practice II

CO1	To understand the fundamentals of Data Mining
CO2	To identify the appropriateness and need of mining the data
CO3	To learn the preprocessing, mining and post processing of the data
CO4	To understand various methods, techniques and algorithms in data mining
CO5	To understand the Personal Communication Services and to learn the design parameters for setting up mobile network
CO6	To know GSM architecture and support services and to learn current technologies being used on field

410248:Project Work Stage I

CO1	Solve real life problems by applying knowledge.
CO2	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
CO3	Write precise reports and technical documents in a nutshell.
CO4	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality.
CO5	Participate effectively in multi-disciplinary team work.
CO6	Participate effectively in heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality.

410249: Audit Course 5
AC5-III 3D Printing

CO1	Apply models for 3D printing
CO2	Plan the resources for 3D printing
CO3	Apply principles in 3D printing in real world

Fourth Year of Computer Engineering (2015 Course) : SEM II

410250: Machine Learning

CO1	Distinguish different learning based applications
CO2	Apply different preprocessing methods to prepare training data set for machine learning.
CO3	Design and implement supervised and unsupervised machine learning algorithm.
CO4	Implement different learning models
CO5	Learn Meta classifiers and deep learning concepts
CO6	Understand nature of the problem and apply machine learning algorithm.

410251: Information and Cyber Security

CO1	Gauge the security protections and limitations provided by today's technology
CO2	Identify information security
CO3	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks
CO4	Build appropriate security solutions against cyber-attacks.
CO5	Identify cyber security threats.
CO6	Understand the information and Cyber security in social ethic.

Elective III 410252(D): Soft Computing and Optimization Algorithms

CO1	Describe fundamental concepts in Soft Computing
CO2	Design and develop algorithms applicable to fuzzification and defuzzification
CO3	Apply fuzzification rule, inference rules related to expert system

CO4	Apply different approaches associated with Evolutionary Strategies and Framework
CO5	Design of classifiers using Genetic algorithms and understand optimization in Huge data space
CO6	Provide Solution for Swarm Optimizaton and multi-object stimulations

Elective IV 410253(C): Cloud Computing

CO1	To install cloud computing environments.
CO2	To develop any one type of cloud
CO3	To explore future trends of cloud computing
CO4	Understand cloud computing concepts
CO5	To explore the applications based on cloud computing
CO6	To study various platforms for cloud computing

410254:Laboratory Practice III

CO1	Implement different learning models
CO2	Learn Meta classifiers and deep learning concepts
CO3	Understand nature of the problem and apply machine learning algorithm.
CO4	Build appropriate security solutions against cyber-attacks.
CO5	Identify cyber security threats.
CO6	Understand the information and Cyber security in social ethic.

410255:Laboratory Practice IV

CO1	Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzylogic, fuzzy inference systems and genetic algorithms
CO2	Design and development of certain scientific applications and genetic algorithms in specified applications.
CO3	Commercial application usingcomputational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified applications.
CO4	To install cloud computing environments.
CO5	To develop any one type of cloud
CO6	To explore future trends of cloud computing

410256:Project Work Stage II

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

410257: Audit Course 6 AC6 – I: Business Intelligence

CO1	Apply the concepts of Business Intelligence in real world applications
CO2	Explore and use the data warehousing wherever necessary
CO3	Design and manage practical BI systems

Program Educational Objectives(PEO)

1.PEO1: Possess strong fundamental concepts in mathematics, science, engineering and Technology to address technological challenges.

2.PEO2: Possess knowledge and skills in the field of Computer Science and Information Technology for analyzing, designing and implementing complex engineering problems of any domain with innovative approaches.

3.PEO3: Possess an attitude and aptitude for research, entrepreneurship and higher studies in the field of Computer Science and Information Technology.

4.PEO4: Have commitment ethical practices, societal contributions through communities and life-long learning.

5.PEO5: Possess better communication, presentation, time management and team work skills leading to responsible & competent professional sand will be able to address challenges in the field of IT at global level.

Program Outcomes(PO)

1. PO1:Engineering knowledge: An ability to apply knowledge of mathematics, computing, science,engineering and technology.

2.PO2:Problem Analysis: An ability to define a problem and provide a systematic solution with the help of conducting experiments, analyzing the problem and interpreting the data.

3.PO3:Design / Development of Solutions: An ability to design, implement, and evaluate a software or asoftware/hardware system, component, or process to meet desired needs within realistic constraints.

4.PO4:Conduct Investigations of Complex Problems: An ability to identify, formulates, and provides systematic solutions to complex engineering/Technology problems.

5.PO5:Modern Tool Usage: An ability to use the techniques, skills, and modern engineering technology tools, standard processes necessary for practice as a IT professional.

6.PO6:The Engineer and Society: An ability to apply mathematical foundations, algorithmic principles,and computer science theory in the modeling and design of computer-based systems with necessary constraints and assumptions.

7.PO7:Environment and Sustainability: An ability to analyze and provide solution for the local and global impact of information technology on individuals, organizations and society.

8.PO8:Ethics: An ability to understand professional, ethical, legal, security and social issues and responsibilities.

9.PO9:Individual and Team Work: An ability to function effectively as an individual or as a team member to accomplish a desired goal(s).

10.PO10:Communication Skills: An ability to engage in life-long learning and continuing professional development to cope up with fast changes in the technologies/tools with the help of electives, professional organizations and extra-curricular activities.

11.PO11:Project Management and Finance: An ability to communicate effectively in engineering community at large by means of effective presentations, report writing, paper publications, demonstrations.

12.PO12:Life-long Learning: An ability to understand engineering, management, financial aspects, performance, optimizations and time complexity necessary for professional practice.

Program Specific Outcomes (PSO)

1.PSO1: An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applications in the interdisciplinary domain.

2.PSO2: An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems.

3.PSO3: An understanding of professional, business and business processes, ethical, legal,security and social issues and responsibilities.

4.PSO4: Practice communication and decision-making skills through the use of appropriate technology and be ready for professional responsibilities.

Course Outcomes(CO)

Second Year Information Technology (2019 Course)(SEMESTER-I)

214441: Discrete Mathematics

Course Outcomes:
On completion of the course, students will be able to–
CO1: Formulate and apply formal proof techniques and solve the problems with logical reasoning.
CO2: Analyze and evaluate the combinatorial problems by using probability theory.
CO3: Apply the concepts of graph theory to devise mathematical models.
CO4: Analyze types of relations and functions to provide solution to computational problems.

CO5: Identify techniques of number theory and its application.
CO6: Identify fundamental algebraic structures.

214442:Logic Design & Computer Organization

Course Outcomes:
On completion of the course, students will be able to–
CO1: Perform basic binary arithmetic & simplify logic expressions.
CO2: Grasp the operations of logic ICs and Implement combinational logic functions using ICs.
CO3: Comprehend the operations of basic memory cell types and Implement sequential logic functions using ICs.
CO4: Elucidate the functions & organization of various blocks of CPU.
CO5: Understand CPU instruction characteristics, enhancement features of CPU.
CO6: Describe an assortment of memory types (with their characteristics) used in computer systems and basic principle of interfacing input, output devices.

214443:Data Structure & Algorithms

Course Outcomes:
On completion of the course, students will be able to–
CO1: Perform basic analysis of algorithms with respect to time and space complexity.
CO2: Select appropriate searching and/or sorting techniques in the application development.
CO3: Implement abstract data type (ADT) and data structures for given application.
CO4: Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.
CO5: Apply implement learned algorithm design techniques and data structures to solve problems.
CO6: Design different hashing functions and use files organizations.

214444: Object-Oriented Programming

Course Outcomes:
On completion of the course, students will be able to–
CO1: Differentiate various programming paradigms.
CO2: Identify classes, objects, methods, and handle object creation, initialization, and Destruction to model real-world problems.
CO3: Identify relationship among objects using inheritance and polymorphism principles.
CO4: Handle different types of exceptions and perform generic programming.
CO5: Use of files for persistent data storage for real world application.
CO6: Apply appropriate design patterns to provide object-oriented solutions.

214445: Basics of Computer Network

Course Outcomes:
On completion of the course, students will be able to–
CO1: Understand and explain the concepts of communication theory and compare functions of OSI and TCP/IP model.
CO2: Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols.
CO3: Compare different access techniques, channelization and IEEE standards.
CO4: Apply the skills of subnetting, supernetting and routing mechanisms.
CO5: Differentiate IPv4 and IPv6.

CO6: Illustrate services and protocols used at transport layer.

214446: Logic Design &Computer Organization Lab

Course Outcomes :
On completion of the course, students will be able to—
CO1: Use logic function representation for simplification with K-Maps and design Combinational logic circuits using SSI & MSI chips.
CO2: Design Sequential Logic circuits: MOD counters using synchronous counters.
CO3: Understand the basics of simulator tool & to simulate basic blocks such as ALU & memory.

214447: Data Structure & Algorithms Lab

Course Outcomes:
On completion of the course, students will be able to—
CO1: Analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2: Implement abstract data type (ADT) and data structures for given application.
CO3: Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc.).
CO4: Solve problems using algorithmic design techniques and data structures.
CO5: Analyze of algorithms with respect to time and space complexity.

214448: Object Oriented Programming Lab

Course Outcomes:
On completion of the course, students will be able to—
CO1: Differentiate various programming paradigms.
CO2: Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems.
CO3: Identify relationship among objects using inheritance and polymorphism.
CO4: Handle different types of exceptions and perform generic programming.
CO5: Use file handling for real world application.
CO6: Apply appropriate design patterns to provide object-oriented solutions.

214449: Soft Skill Lab

Course Outcomes:
On completion of the course, students will be able to—
CO1:Introspect about individual's goals, aspirations by evaluating one's SWOC and think creatively.
CO2: Develop effective communication skills including Listening, Reading, Writing and Speaking.
CO3:Constructively participate in group discussion, meetings and prepare and deliver Presentations.
CO4: Write precise briefs or reports and technical documents.
CO5:Practice professional etiquette, present oneself confidently and successfully handle personal interviews .
CO6:Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

214450 (D) : Mandatory Audit Course 3:

Cyber Security and Law

Course Outcomes:
On completion of the course, learner will be able to --
CO1: Understand the basic concepts of cyber security and its abilities
CO2: Analyse and evaluate the cyber security needs of an organization.
CO3: Understand the importance of cyber laws and its practices.
CO4: Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation

Course Outcomes(CO)

Second Year Information Technology (2019 Course)(SEMESTER-II)

207003: Engineering Mathematics III

Course Outcomes:
On completion of this course student will be able to –
CO1: Solve Linear differential equations, essential in modelling and design of computer-based systems.
CO2: Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
CO3: Apply Statistical methods like correlation& regression analysis and probability theory for data analysis and predictions in machine learning.
CO4: Solve Algebraic &Transcendental equations and System of linear equations using numerical techniques.
CO5: Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

214451: Processor Architecture

Course Outcomes :
On completion of this course student will be able to –
CO1: Apprehend architecture and memory organization of PIC 18 microcontroller.
CO2: Implement embedded C programming for PIC 18.
CO3: Use concepts of timers and interrupts of PIC 18.
CO4: Demonstrate real life applications using PIC 18.
CO5: Analyze architectural details of ARM processor.

214452: Database Management System

Course Outcomes:
On completion of this course student will be able to --
CO1: Apply fundamental elements of database management systems.
CO2: Design ER-models to represent simple database application scenarios.
CO3: Formulate SQL queries on data for relational databases.
CO4: Improve the database design by normalization & to incorporate query processing.
CO5: Apply ACID properties for transaction management and concurrency control.
CO6: Analyze various database architectures and technologies.

214453: Computer Graphics

Course Outcomes:
On completion of the course, students will be able to–
CO1: Apply mathematical and logical aspects for developing elementary graphics operations like scan conversion of points, lines, circle, and apply it for problem solving.
CO2: Employ techniques of geometrical transforms to produce, position and manipulate Objects in 2 dimensional and 3-dimensional space respectively.
CO3: Describe mapping from a world coordinates to device coordinates, clipping, and projections in order to produce 3D images on 2D output device.
CO4: Apply concepts of rendering, shading, animation, curves and fractals using computer graphics tools in design, development and testing of 2D, 3D modeling applications.
CO5: Perceive the concepts of virtual reality.

214454: Software Engineering

Course Outcomes:
On completion of the course, students will be able to --
CO1: Classify various software application domains.
CO2: Analyze software requirements by using various modeling techniques.
CO3: Translate the requirement models into design models.
CO4: Apply planning and estimation to any project.
CO5: Use quality attributes and testing principles in software development life cycle.
CO6: Discuss recent trends in Software engineering by using CASE and agile tools.

214455: Programming Skill Development Lab

Course Outcomes:
On completion of this course student will be able to --
CO1: Apply concepts related to embedded C programming.
CO2: Develop and Execute embedded C program to perform array addition, block transfer, sorting operations
CO3: Perform interfacing of real-world input and output devices to PIC18FXXX microcontroller.
CO4: Use source prototype platform like Raspberry-Pi/Beagle board/Arduino.

214456: Database Management System Lab

Course Outcomes :
On completion of this course student will be able to --
CO1: Install and configure database systems.
CO2: Analyze database models & entity relationship models.
CO3 : Design and implement a database schema for a given problem-domain
CO4: Implement relational database systems.
CO5: Populate and query a database using SQL DDL / DML / DCL commands.
CO6 :Design a backend database of any one organization: CASE STUDY

214457: Computer Graphics Lab

Course Outcomes :
On completion of this course student will be able to --
CO1: Apply line& circle drawing algorithms to draw the objects.
CO2: Apply polygon filling methods for the object.
CO3: Apply polygon clipping algorithms for the object.
CO4: Apply the 2D transformations on the object.

CO5: Implement the curve generation algorithms.
CO6: Demonstrate the animation of any object using animation principles.

214458: Project Based Learning

Course Outcomes
On completion of the course, student will be able to --
CO1: Design solution to real life problems and analyze its concerns through shared cognition.
CO2: Apply learning by doing approach in PBL to promote lifelong learning.
CO3: Tackle technical challenges for solving real world problems with team efforts.
CO4: Collaborate and engage in multi-disciplinary learning environments.

214459 (D): Mandatory Audit course 4 :
Intellectual Property Rights

Course Outcomes
On completion of the course, learner will be able to --
CO1: Exhibit the concepts of Intellectual Property Rights
CO2: Differentiate among different IPR
CO3: Formulate and characterize innovative ideas and inventions into IPR
CO4: Demonstrate knowledge of advances in patent law and IP regulations

Course Outcomes(CO)

Third Year Information Technology (2019 Course)(SEMESTER-I)

314441: Theory of Computation

Course Outcomes:
On completion of the course, students will be able to—
CO1: Construct finite automata and its variants to solve computing problems.
CO2: Write regular expressions for the regular languages and finite automata.
CO3: Identify types of grammar, design and simplify Context Free Grammar.
CO4: Construct Pushdown Automata machine for the Context Free Language.
CO5: Design and analyze Turing machines for formal languages.
CO6: Understand decidable and undecidable problems, analyze complexity classes.

314442: Operating Systems

Course Outcomes:
On completion of the course, students will be able to—
CO1: Understanding the role of Modern Operating Systems.
CO2: Apply the concepts of process and thread scheduling.
CO3: Apply the concept of process synchronization, mutual exclusion and the deadlock.
CO4: Understand and apply the concepts of various memory management techniques.
CO5: Make use of concept of I/O management and File system.
CO6: Understand Important of System software.

314443: Machine Learning

Course Outcomes:
On completion of the course, students will be able to—
CO1: Apply basic concepts of machine learning and different types of machine learning algorithms.
CO2: Differentiate various regression techniques and evaluate their performance.
CO3: Compare different types of classification models and their relevant application.
CO4: Illustrate the tree-based and probabilistic machine learning algorithms.
CO5: Identify different unsupervised learning algorithms for the related real world problems.
CO6: Apply fundamental concepts of ANN.

314444: Human Computer Interaction

Course Outcomes:
On completion of the course, students will be able to—
CO1: Explain importance of HCI study and principles of user-centered design (UCD) approach.
CO2: Develop understanding of human factors in HCI design.
CO3: Develop understanding of models, paradigms, and context of interactions.
CO4: Design effective user-interfaces following a structured and organized UCD process.
CO5: Evaluate usability of a user-interface design.
CO6: Apply cognitive models for predicting human-computer-interactions.

314445(A) : Elective -I : Design and Analysis of Algorithm

Course Outcomes:
On completion of the course, students will be able to—
CO1: Calculate computational complexity using asymptotic notations for various algorithms.
CO2: Apply Divide & Conquer as well as Greedy approach to design algorithms.
CO3: Understand and analyze optimization problems using dynamic programming.
CO4: Illustrate different problems using Backtracking.
CO5: Compare different methods of Branch and Bound strategy.
CO6: Classify P, NP, NP-complete, NP-Hard problems

314446 : Operating Systems Lab

Course Outcomes:
On completion of the course, students will be able to—
CO1: Apply the basics of Linux commands.
CO2: Build shell scripts for various applications.
CO3: Implement basic building blocks like processes, threads under the Linux.
CO4: Develop various system programs for the functioning of OS concepts in user space like concurrency
control, CPU Scheduling, Memory Management and Disk Scheduling in Linux.
CO5: Develop system programs for Inter Process Communication in Linux.

314447: Human Computer Interaction Laboratory

Course Outcomes:
On completion of the course, students will be able to—
CO1: Differentiate between good design and bad design.
CO2: Analyze creative design in the surrounding.
CO3: Assess design based on feedback and constraint.
CO4: Design paper-based prototypes and use wire frame.
CO5: Implement user-interface design using web technology.

CO6: Evaluate user-interface design using HCI evaluation techniques.

314448 : Laboratory Practice-I (Machine Learning)

Course Outcomes:
On completion of the course, students will be able to–
CO1: Implement different supervised and unsupervised learning algorithms.
CO2: Evaluate performance of machine learning algorithms for real-world applications.

314448 (A) : Laboratory Practice-I (Design of Analysis Algorithm)

Course Outcomes:
On completion of the course, students will be able to–
CO1: Implement the various algorithmic design strategies and use it to solve real time problems/applications
CO2: Apply Divide & Conquer as well as Greedy approach to design algorithms.
CO3: Understand and analyze optimization problems using dynamic programming.

314449 : Seminar

Course Outcomes:
On completion of the course, students will be able to–
CO1: Understand, interpret and summarize technical literature.
CO2: Demonstrate the techniques used in the paper.**(SEMESTER-II)**
CO3: Distinguish the various techniques required to accomplish the task.
CO4: Identify intended future work based on the technical review.
CO5: Prepare and present the content through various presentation tools and techniques in effective manner.
CO6: Keep audience engaged through improved interpersonal skills.

Mandatory Audit Course 5
314450 (B) : Startup Ecosystems

Course Outcomes:
completion of the course, students will be able to–
CO1: Identify Startup opportunities
CO2: Explain legal and other requirements for new ventures
CO3: Analyze financial Issues of startups

Course Outcomes(CO)

Third Year Information Technology (2019 Course)(SEMESTER-II)(SEMESTER-II)

314451: Computer Network and Security

Course Outcomes:
On completion of the course, students will be able to–
CO1: Know Responsibilities, services offered and protocol used at application layer of network
CO2: Understand wireless network and different wireless standards.
CO3: Recognize the Adhoc Network's MAC layer, routing protocol and Sensor networkarchitecture.

CO4: Define the principal concepts of network security and Understand network security threats,security services, and countermeasures
CO5: Apply basic cryptographic techniques in application development.
CO6: G ain a good comprehension of the landscape of cyber security
Vulnerabilities & describe typical threats to modern digital systems.

314452: Data Science and Big Data Analytics

Course Outcomes:
On completion of the course, students will be able to–
CO1: Understand Big Data primitives.
CO2: Learn and apply different mathematical models for Big Data.
CO3: Demonstrate Big Data learning skills by developing industry or research applications.
CO4: Analyze and apply each learning model comes from a different algorithmic approach and it will
perform differently under different datasets.
CO5: Understand, apply and analyze needs, challenges and techniques for big data visualization.
CO6: Learn different programming platforms for big data analytics.

314453: Web Application Development

Course Outcomes: -
On completion of the course, students will be able to–
CO1: Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap.
CO2: Demonstrate the use of web scripting languages.
CO3: Develop web application with Front End & Back End Technologies.
CO4: Develop mobile website using JQuery Mobile.
CO5: Deploy web application on cloud using AWS.

314454 (D): Elective –II (Software Modeling and Design)

Course Outcomes:
On completion of the course, students will be able to–
CO1: Understand basics of object oriented methodologies and Unified Modeling Language (UML).
CO2: Understand and apply analysis process, use case modeling, domain/class modeling
CO3: Design and apply interaction and behavior modeling on a given system.
CO4: Comprehend OO design process and business, access and view layer class design.
CO5: Recognize the software design principles and patterns to be applied on system.
CO6: Get started on study of architectural design principles and guidelines in the various type of application
development.

314455: Internship

Course Outcomes:
On completion of the internship, learner will be able to –
CO1: To develop professional competence through industry internship.
CO2: To apply academic knowledge in a personal and professional environment
CO3: To build the professional network and expose students to future employees.
CO4: To Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
CO6: To make own career goals and personal aspirations.

314456: Computer Network Security Lab

Course Outcomes:
On completion of the course, students will be able to–
CO1: Design and configure small size network and associated networking commands.
CO2: Understand various client/server environments to use application layer protocols.
CO3: Use basic cryptographic techniques in software and system design.
CO4: Apply methods for authentication, access control, intrusion detection.

314457: DS & BDA Lab

Course Outcomes:
On completion of the course, students will be able to–
CO1: Apply Big data primitives and fundamentals for application development.
CO2: Explore different Big data processing techniques with use cases.
CO3: Apply the Analytical concept of Big data using Python.
CO4: Visualize the Big Data using Tableau.
CO5: Design algorithms and techniques for Big data analytics.
CO6: Design and develop Big data analytic application for emerging trends.

314458: Laboratory Practice-II (Web Application Development)

Course Outcomes:
On completion of the course, students will be able to–
CO1: Develop Static and Dynamic responsive website using technologies HTML, CSS, Bootstrapand AJAX.
CO2: Create Version Control Environment.
CO3: Develop an application using front end and backend technologies.
CO4: Develop mobile website using JQuery Mobile.
CO5: Deploy web application on cloud using AWS.

314458 :Laboratory Practice-II (Software Modeling Design)

Course Outcomes:
On completion of the course, students will be able to–
CO1: Develop use case model with the help of UML notations.
CO2: Develop and implement analysis model and design model.
CO3: Develop and implement Interaction and behavior Model.

Mandatory Audit Course 6
314459 (B): Leadership and Personality Development

Course Outcomes:
On completion of the course, students will be able to–
CO1: Practice responsible decision-making and personal accountability.
CO2: Demonstrate an understanding of group dynamics and effective teamwork.
CO3: Develop a range of leadership skills and abilities such as effectively leading change, resolving conflict, and motivating others.
CO4: Develop multi-dimensional personality.

414453: Information and Cyber Security

Course Outcomes:
By the end of the course, students should be able to
1. Use basic cryptographic techniques in application development.
2. Apply methods for authentication, access control, intrusion detection and prevention.
3. To apply the scientific method to digital forensics and perform forensic investigations.
4. To develop computer forensics awareness.
5. Ability to use computer forensics tools.

414454: Machine Learning and Applications

Course Outcomes:
By the end of the course, students should be able to
1. Model the learning primitives.
2. Build the learning model.
3. Tackle real world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

414455: Software Design and Modeling

Course Outcomes:
By the end of the course, students should be able to
1. Understand object oriented methodologies, basics of Unified Modeling Language (UML).
2. Understand analysis process, use case modeling, domain/class modeling
3. Understand interaction and behavior modeling.
4. Understand design process and business, access and view layer class design
5. Get started on study of GRASP principles and GoF design patterns.
6. Get started on study of architectural design principles and guidelines in the various type of application development.

414456E: Elective-I
Business Analytics and Intelligence

Course Outcomes:
By the end of the course, students should be able to
1. Comprehend the Information Systems and development approaches of Intelligent Systems.
2. Evaluate and rethink business processes using information systems.
3. Propose the Framework for business intelligence.
4. Get acquainted with the Theories, techniques, and considerations for capturing organizational intelligence.
5. Align business intelligence with business strategy.

6. Apply the techniques for implementing business intelligence systems.

414457C: Elective-II
Software Testing and Quality Assurance

Course Outcomes:
By the end of the course, students should be able to
1. Test the software by applying testing techniques to deliver a product free from bugs.
2. Investigate the scenario and to select the proper testing technique.
3. Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
4. Understand how to detect, classify, prevent and remove defects.
5. Choose appropriate quality assurance models and develop quality.
6. Ability to conduct formal inspections, record and evaluate results of inspections.

414458: Computer Laboratory VII

Course Outcomes:
By the end of the course, students should be able to
1. The students will be able to implement and port controlled and secured access to software systems and networks.
2. The students will be able to build learning software in various domains.

414459: Computer Laboratory VIII

Course Outcomes:
By the end of the course, students should be able to
1. Draw, discuss different UML 2.0 diagrams, their concepts, notation, advanced notation, forward and reverse engineering aspects.
2. Identify different software artifacts used to develop analysis and design model from requirements.
3. Develop use case model.
4. Develop, implement analysis model and design model.
5. Develop, implement Interaction and behavior Model.
6. Implement an appropriate design pattern to solve a design problem.

414460: Project Phase-I

Course Outcomes:
By the end of the course, students should be able to
1. To show preparedness to study independently in chosen domain of Information Technology and programming languages and apply their acquired knowledge to variety of real time problem scenarios.
2. To function effectively as a team to accomplish a desired goal.
3. An understanding of professional, ethical, legal, security and social issues and responsibilities related to Information Technology Project.

414461D: Audit Course-V
Statistical Learning Model using R

Course Outcomes:
By the end of the course, students should be able to,
1) Students will be familiar with concepts related to "data science", "analytics", "machine learning", etc. These are important topics, and will enable students to embark on highly rewarding careers.
2) Students will capable of learning "big data" concepts on their own

Course Outcomes(CO)

Fourth Year of Information Technology (2015 Course)(SEMESTER-II)

414462: Distributed Computing System

Course Outcomes :
By the end of the course, students should be able to
1. Understand the principles and desired properties of distributed systems based on different application areas.
2. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
3. Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
4. Identify the challenges in developing distributed applications

414463: Ubiquitous Computing

Course Outcomes:
By the end of the course, students should be able to
1. Demonstrate the knowledge of design of Ubicomp and its applications.
2. Explain smart devices and services used Ubicomp.
3. Describe the significance of actuators and controllers in real time application design.
4. Use the concept of HCI to understand the design of automation applications.
5. Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.
6. Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.

414464D: Elective III
Internet and Web Programming

Course Outcomes :
By the end of the course, students should be able to
1. Demonstrate static website using basic tools.
2. Develop client side programming skills.
3. Develop server side programming skills.
4. Understand web services and handle content management tools.
5. Develop mobile website using mobile web development tools.
6. Understand aspects of web security and cyber ethics.

414464D: Internet and Web Programming Laboratory

Course Outcomes:
By the end of the course, students should be able to
1. Use fundamental skills to develop and maintain website and web application.
2. Apply scripting skills for Server side and Client-side Programming.
3. Develop web services to transfer data and add interactive components to website.
4. Combine multiple web technologies to create advanced web components.

414465A: Elective IV
Rural Technologies and Community Development

Course Outcomes :
By the end of the course, students should be able to
1. Understand rural development model.
2. Learn different measures in rural development and its impact on overall economy.
3. Understand and learn importance of technologies in rural and community development.
4. Understand challenges and opportunities in rural development.

414466: COMPUTER LABORATORY-IX

Course Outcomes :
Upon successful completion of this course student will be able to
1. Demonstrate knowledge of the core concepts and techniques in distributed systems.
2. Learn how to apply principles of state-of-the-Art Distributed systems in practical application.
3. Design, build and test application programs on distributed systems.

414467: COMPUTER LABORATORY-X

Course Outcomes :
Upon successful completion of this course student will be able to
1. Set up the Android environment and explain the Evolution of cellular networks.
2. Develop the User Interfaces using pre-built Android UI components.
3. Create applications for performing CURD SQLite database operations using Android.
4. Create the smart android applications using the data captured through sensors.
5. Implement the authentication protocols between two mobile devices for providing. Security.
6. Analyze the data collected through android sensors using any machine learning algorithm.

414468: Project Work

Course Outcomes:
By the end of the course, Students will be able to
1. Learn teamwork.
2. Be well aware about Implementation phase.

3. Get exposure of various types of testing methods and tools.
4. Understand the importance of documentation.

414469D: Audit Course-VI
AI and Robotics

Course Outcomes:
By the end of the course, students should be able to
1. The goal of this course is to familiarize the students with the basic concepts of robotics, artificial intelligence and intelligent machines.
2. It will help students to understand and apply principles, methodology and techniques of intelligent systems to robotics.

Mechanical Engineering Department

Programme Education Objectives (PEO)

1. Stand out in professional career and/or higher education by acquiring knowledge in mathematical, computing and Mechanical Engineering principles.

2. Be able to develop the communication skills, professional personality and ethical values that will mould them into a good human beings, responsible citizens and competent professionals.

3. Demonstrate good scientific and engineering breadth in the design and development of novel and cost-effective products to cater to the needs of the society.

4. Prolife rate mechanical engineers with utmost practical skill with sound theoretical knowledge.

Programme Outcomes (PO)

Engineering Graduates will be able to:
1. Design a system according to the requirements and identify, formulate, analyze and solve complex mechanical engineering problems.

2. Develop and apply knowledge to various applications.

3. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Acknowledge the need for lifelong learning and being a part of it.

5. Understand knowledge of professional and ethical responsibilities.

6. Provide solutions to varied engineering problems using software tools.

7. Apply basic knowledge of science, mathematics and engineering fundamentals in the field of Mechanical Engineering
8. Function competently as an individual and as a part of multi-disciplinary teams.

9. UnderstandimpactofMechanicalengineeringsolutionsonsocietyandenvironmentin

   continuous and sustainable manner.

10. To model mathematically analytical and synthetic curves, surfaces.

11. To study role and components of different Automation strategies.

Programme Specific Outcomes (PSOs)

1. Extend and implement new thoughts on product design and development with the aids of modern, AutoCAD, proE, catia, CAD/CAM, CFD tools, for better manufacturing practices.

2. Ability to search, articulate the industrial problems and solve with the use ofMechanical Engineering tools for futuristic outcomes and development of society.

3. Apply technical knowledge in the fields of Thermal, Design, and Manufacturing sciences to solve Engineering Problems.

Course Outcomes (COs)

Second Year of Computer Engineering (2019 Course) : SEM I

202041- Solid Mechanics

CO1	DEFINE various types of stresses and strain developed on determinate and indeterminate members.
CO2	DRAW Shear force and bending moment diagram for various types of transverse loading and support.
CO3	COMPUTE the slope & deflection, bending stresses and shear stresses on a beam.
CO4	CALCULATE torsional shear stress in shaft and buckling on the column.
CO5	APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
CO6	UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.

202042 - Solid Modeling and Drafting

CO1	UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management
CO2	UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry
CO3	CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
CO4	APPLY geometric transformations to simple 2D geometries
CO5	USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
CO6	USE PMI & MBD approach for communication

202043 - Engineering Thermodynamics

CO1	DESCRIBE the basics of thermodynamics with heat and work interactions.
CO2	APPLY laws of thermodynamics to steady flow and non-flow processes.
CO3	APPLY entropy, available and non - available energy for an Open and Closed System,

CO4	DETERMINE the properties of steam and their effect on performance of vapour power cycle.
CO5	ANALYSE the fuel combustion process and products of combustion.
CO6	SELECT various instrumentations required for safe and efficient operation of steam generator

202044 - Engineering Materials and Metallurgy

CO1	COMPARE crystal structures and ASSESS different lattice parameters.
CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
CO3	DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.
CO4	IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
CO5	ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
CO6	SELECT appropriate materials for various applications

203156 - Electrical and Electronics Engineering

CO1	APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
CO2	DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
CO3	UNDERSTAND the operation of DC motor, its speed control methods and braking
CO4	DISTINGUISH between types of three phase induction motor and its characteristic features
CO5	EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems
CO6	CHOOSE energy storage devices and electrical drives for EVs

202045 - Geometric Dimensioning and Tolerancing Lab

CO1	SELECT appropriate IS and ASME standards for drawing.
CO2	READ & ANALYSE variety of industrial drawings
CO3	APPLY geometric and dimensional tolerance, surface finish symbols in drawing
CO4	EVALUATE dimensional tolerance based on type of fit, etc.
CO5	SELECT an appropriate manufacturing process using DFM, DFA, etc.

207002 - Engineering Mathematics - III

CO1	SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems.
CO2	APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.

CO3	APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
CO4	PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
CO5	SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations

202047 - Kinematics of Machinery

CO1	APPLY kinematic analysis to simple mechanisms
CO2	ANALYZE velocity and acceleration in mechanisms by vector and graphical method
CO3	SYNTHESIZE a four bar mechanism with analytical and graphical methods
CO4	APPLY fundamentals of gear theory as a prerequisite for gear design
CO5	CONSTRUCT cam profile for given follower motion

202048 - Applied Thermodynamics

CO1	DETERMINE COP of refrigeration system and ANALYZE psychrometric processes.
CO2	DISCUSS basics of engine terminology,air standard, fuel air and actual cycles.
CO3	IDENTIFY factors affecting the combustion performance of SI and CI engines.
CO4	DETERMINE performance parameters of IC Engines and emission control.
CO5	EXPLAIN working of various IC Engine systems and use of alternative fuels.
CO6	CALCULATE performance of single and multistage reciprocating compressors and DISCUSS rotary positive displacement compressors.

202049 - Fluid Mechanics

CO1	DETERMINE various properties of fluid
CO2	APPLY the laws of fluid statics and concepts of buoyancy
CO3	IDENTIFY types of fluid flow and terms associated in fluid kinematics
CO4	APPLY principles of fluid dynamics to laminar flow
CO5	ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
CO6	CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws

202050 - Manufacturing Processes

CO1	SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
CO2	UNDERSTAND mechanism of metal forming techniques and CALCULATE load required

	for flat rolling
CO3	DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
CO4	CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics
CO5	DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
CO6	UNDERSTAND the principle of manufacturing of fibre-reinforce composites and metal matrix composites

202051 - Machine Shop

CO1	PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique
CO2	MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
CO3	PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
CO4	DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
CO5	PREPARE industry visit report
CO6	UNDERSTAND procedure of plastic processing

202052 - Project Based Learning - II

CO1	IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
CO2	ANALYZE the results and arrive at valid conclusions.
CO3	PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge.
CO4	CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures.
CO5	USE of technology in proposed work and demonstrate learning in oral and written form.
CO6	DEVELOP ability to work as an individual and as a team member

T.E. Mechanical- 2019 pattern SEM I

302041: Numerical and Statistical Methods

CO1	SOLVE system of equations using direct and iterative numerical methods.
CO2	ESTIMATE solutions for differential equations using numerical techniques.
CO3	DEVELOP solution for engineering applications with numerical integration.
CO4	DESIGN and CREATE a model using a curve fitting and regression analysis.
CO5	APPLY statistical Technique for quantitative data analysis.
CO6	DEMONSTRATE the data, using the concepts of probability and linear algebra.

302042: Heat and Mass Transfer

CO1	ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system.
CO2	DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction.
CO3	EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results.
CO4	INTERPRET heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
CO5	ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
CO6	DESIGN & ANALYSIS of heat transfer equipments and investigation of its performance

302043: Design of Machine Elements

CO1	DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading.
CO2	DESIGN shafts, keys and couplings under static loading conditions.
CO3	ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
CO4	EVALUATE dimensions of machine components under fluctuating loads.
CO5	EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints.
CO6	APPLY the design and development procedure for different types of springs.

302044: Mechatronics

CO1	DEFINE key elements of mechatronics, principle of sensor and its characteristics.
CO2	UTILIZE concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O.
CO3	DETERMINE the transfer function by using block diagram reduction technique.
CO4	EVALUATE Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
CO5	APPLY the concept of different controller modes to an industrial application.
CO6	DEVELOP the ladder programming for industrial application.

302045-A: Advanced Forming & Joining processes

CO1	ANALYSE the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations
CO2	ASSESS the parameters for special forming operation and SELECT appropriate special forming operation for particular applications
CO3	ANALYSE the effect of HAZ on microstructure and mechanical properties of materials

CO4	CLASSIFY various solid state welding process and SELECT suitable welding processes for particular applications
CO5	CLASSIFY various advanced welding process and SELECT suitable welding processes for particular applications.
CO6	INTERPRET the principles of sustainable manufacturing and its role in manufacturing industry.

302045-B:Machining Science &Technology

CO1	DEFINE metal cutting principles and mechanics of metal cutting and tool life.
CO2	DESCRIBE features of gear and thread manufacturing processes.
CO3	SELECT appropriate grinding wheel and demonstrate the various surface finishing processes.
CO4	SELECT appropriate jigs/fixtures and to draw the process plan for a given component.
CO5	SELECT & EVALUATE various parameters of process planning.
CO6	GENERATE CNC program for Turning / Milling processes and generate tool path using CAM software

302046: Digital Manufacturing aboratory

CO1	DEVELOP a component using conventional machines, CNC machines and Additive Manufacturing Techniques.
CO2	ANALYZE cutting tool parameters for machining given job.
CO3	DEMONSTRATE simulation of manufacturing process using Digital Manufacturing Tools.
CO4	SELECT and DESIGN jigs and Fixtures for a given component.
CO5	DEMONESTRATE different parameters for CNC retrofitting and reconditioning

302047: Skill Development

CO1	APPLY& DEMONSTRATE procedure of assembly & disassembly of various machines.
CO2	DESIGN & DEVELOP a working/model of machine parts or any new product.
CO3	EVALUATE fault with diagnosis on the machines, machine tools and home appliances.
CO4	IDENTIFY & DEMONSTRATE the various activities performed in an industry such as maintenance, design of components, material selection

T.E. Mechanical 2019 pattern sem II

302049: Artificial Intelligence & Machine Learning

CO1	DEMONSTRATE fundamentals of artificial intelligence and machine learning.
CO2	APPLY feature extraction and selection techniques. .

CO3	APPLY machine learning algorithms for classification and regression problems.
CO4	DEVISE AND DEVELOP a machine learning model using various steps.
CO5	EXPLAIN concepts of reinforced and deep learning.
CO6	SIMULATE machine learning model in mechanical engineering problems

302050: Computer Aided Engineering

CO1	DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
CO2	APPLY the various meshing techniques for better evaluation of approximate results.
CO3	APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
CO4	ANALYZE and APPLY various numerical methods for different types of analysis.
CO5	EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.
CO6	GENERATE the results in the form of contour plot by the USE of CAE tools.

302051: Design of Transmission Systems

CO1	APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.
CO2	EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards.
CO3	SELECT&DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.
CO4	DEFINE and DESIGN various types of Clutches, Brakes, used in automobile.
CO5	APPLY various concept to DESIGN Machine Tool Gear box, for different applications
CO6	ELABORATE various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

302052-A: Composite Materials

CO1	DEFINE & COMPARE composites with traditional materials.
CO2	IDENTIFY & ESTIMATE different parameters of the Polymer Matrix Composite
CO3	CATEGORISE and APPLY Metal Matrix Process from possessions landscape.
CO4	DETERMINE volume/weight fraction and strength of Composites.
CO5	SELECT appropriate testing and inspection method for composite materials.
CO6	SELECT composites materials for various applications.

302052-B: Surface Engineering

CO1	DEFINE the basic's principle & mechanism of surface degradation.
CO2	ANALYSE & SELECT correct corrosion prevention techniques for a different service condition.
CO3	DEMONSTRATE the role of surface engineering of materials to modify/improve the surface properties.
CO4	SELECT the suitable surface heat treatments to improve the surface properties.
CO5	APPLY the surface modification technique to modify surface properties.
CO6	ANALYSE & EVALUTE various surface coating defects using various testing/characterization method.

302053: Measurement Laboratory

CO1	EVALUATE causes of errors in Vernier calipers, micrometers by performing experiments in standard metrological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement.
CO2	ANALYZE strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations.
CO3	EXAMINE surface Textures, surface finish using equipment's like Talysurf and analyze surface finish requirements of metrological equipment's like gauges, jaws of vernier calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement.
CO4	MEASURE the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurement lead time.
CO5	PERFORM Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machine etc. to increase repeatability and reproducibility.
CO6	COMPILE the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report

302054: Fluid Power & Control Laboratory

CO1	DEFINE working principle of components used in hydraulic and pneumatic systems.
CO2	IDENTIFY & EXPLAIN various applications of hydraulic and pneumatic systems.
CO3	SELECT an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues.
CO4	SIMULATE & ANALYSE various hydraulic and pneumatic systems for industrial/mobile applications.
CO5	DESIGN a hydraulic and pneumatic system for the industrial applications.
CO6	DESIGN & DEMONESTRATE various IoT, PLC based controlling system using hydraulics and pneumatics.

302055: Internship/Mini project

CO1	DEMONSTRATE professional competence through industry internship.
CO2	APPLY knowledge gained through internships to complete academic activities in a professional manner.
CO3	CHOOSE appropriate technology and tools to solve given problem.
CO4	DEMONSTRATE abilities of a responsible professional and use ethical practices in day to day life.
CO5	DEVELOP network and social circle, and DEVELOPING relationships with industry people.
CO6	ANALYZE various career opportunities and DECIDE career goals.

Mini project

CO1	EXPLAIN plan and execute a Mini Project with team.
CO2	IMPLEMENT hardware/software/analytical/numerical techniques, etc.
CO3	DEVELOP a technical report based on the Mini project.
CO4	DELIVER technical seminar based on the Mini Project work carried out.

B.E.Mechanical – 2015 Pattern sem –I

Course Code : 402041 Course Name : Hydraulics and Pneumatics

CO1	Understand working principle of components used in hydraulic & pneumatic systems
CO2	Identify various applications of hydraulic & pneumatic systems
CO3	Selection of appropriate components required for hydraulic and pneumatic systems
CO4	Analyse hydraulic and pneumatic systems for industrial/mobile applications
CO5	Design a system according to the requirements
CO6	Develop and apply knowledge to various applications

Course Code : 402042 Course Name : CAD CAM and Automation

CO1	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
CO2	Use analytical and synthetic curves and surfaces in part modeling.
CO3	Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
CO4	Generate CNC program for Turning / Milling and generate tool path using CAM software.
CO5	Demonstrate understanding of various rapid manufacturing techniques and develop Competency in designing and developing products using rapid manufacturing technology.

CO6	Understand the robot systems and their applications in manufacturing industries.

Course Code : 402043 Course Name : Dynamics of Machinery

CO1	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
CO2	Estimate natural frequency for single DOF undamped & damped free vibratory systems.
CO3	Determine response to forced vibrations due to harmonic excitation, base excitation and Excitation due to unbalance forces.
CO4	Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
CO5	Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
CO6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems.

Course Code : 402044 A Course Name : Elective – I
Finite Element Analysis

CO1	Understand the different techniques used to solve mechanical engineering problems.
CO2	Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
CO3	Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
CO4	Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
CO5	Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
CO6	Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.

Course Code : 402044 B Course Name : Elective – I
Computational Fluid Dynamics

CO1	Analyze and model fluid flow and heat transfer problems.
CO2	Generate high quality grids and interpret the correctness of numerical results with physics.

CO3	Conceptualize the programming skills.
CO4	Use a CFD tool effectively for practical problems and research.

Course Code : 402044 C Course Name : Elective – I
Heating, Ventilation, Air Conditioning and Refrigeration Engineering

CO1	Determine the performance parameters of trans-critical & ejector refrigeration systems
CO2	Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
CO3	Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
CO4	Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
CO5	Estimate heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope.
CO6	Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems

Course Code : 402045 A Course Name : Elective – II
Automobile Engineering

CO1	To compare and select the proper automotive system for the vehicle.
CO2	To analyse the performance of the vehicle.
CO3	To diagnose the faults of automobile vehicles.
CO4	To apply the knowledge of EVs, HEVs and solar vehicles

Course Code : 402045 B Course Name : Elective – II
Operation Research

CO1	Apply LPP and Decision Theory to solve the problems ·
CO2	Apply the concept of transportation models to optimize available resources
CO3	Decide optimal strategies in conflicting situations ·
CO4	Implement the project management techniques.
CO5	Minimize the process time
CO6	Optimize multi stage decision making problems

Course Code : 402045 C Course Name : Elective – II
Energy Audit and Management

CO1	Compare energy scenario of India and World.
CO2	Carry out Energy Audit of the Residence / Institute/ Organization ·
CO3	Evaluate the project using financial techniques ·
CO4	Identify and evaluate energy conservation opportunities in Thermal Utilities.
CO5	Identify and evaluate energy conservation opportunities in Electrical Utilities
CO6	Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research.

Course Code : 402046 Course Name : Project – I

CO1	Find out the gap between existing mechanical systems and develop new creative new mechanical system..
CO2	Learn about the literature review ·
CO3	Get the experience to handle various tools, tackles and machines

B.E. Mechanical SEM 2 (2015 PATTREN)
Course Code : 402047 Course Name : Energy Engineering

CO1	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
CO2	Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same.
CO3	Recognize the layout, component details of hydroelectric power plant and nuclear power plant ·
CO4	Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
CO5	Emphasize the fundaments of non-conventional power plants
CO6	Describe the different power plant electrical instruments and basic principles of economics of power generation

Course Code: 402048 Course Name : Mechanical System Design

CO1	Understand the difference between component level design and system level design.
CO2	Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
CO3	Learn optimum design principles and apply it to mechanical components
CO4	Handle system level projects from concept to product

Course Code : 402049 A Course Name : Elective – III
Tribology

CO1	The course will enable the students to know the importance of Tribology in Industry ·
CO2	The course will enable the students to know the basic concepts of Friction, Wear, Lubrications and their measurements..
CO3	This course will help students to know the performance of different types of bearings and analytical analysis thereof.
CO4	This course will help students to apply the principles of surface engineering for different applications of tribology

Course Code : 402049 B Course Name : Elective – III
Industrial Engineering

CO1	Apply the Industrial Engineering concept.
CO2	Understand, analyze and implement different concepts involved in method study.
CO3	Design and Develop different aspects of work system and facilities.
CO4	Understand and Apply Industrial safety standards, financial management practices ·
CO5	Undertake project work based on modeling & simulation area

Course Code : 402049 C Course Name : Elective – III
Robotics

CO1	Identify different type of robot configuration with relevant terminology.
CO2	Select suitable sensors, actuators and drives for robotic systems. Understand kinematics in robotic systems.
CO3	Design robot with desired motion with suitable trajectory planning.
CO4	Select appropriate robot programming for given application.
CO5	Understand need of IoT, machine learning, simulation in robotics.

Course Code : 402050 A Course Name : Elective – IV
Advanced Manufacturing Processes

CO1	Classify and analyze special forming processes ·
CO2	Analyze and identify applicability of advanced joining processes
CO3	Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
CO4	Select appropriate micro and nano fabrication techniques for engineering applications

CO5	Understand and apply various additive manufacturing technology for product development ·
CO6	Understand material characterization techniques to analyze effects of chemical composition,composition variation, crystal structure, etc

Course Code : 402050 B Course Name : Elective – IV
Solar and Wind Energy

CO1	Design of solar food drier for domestic purpose referring existing system
CO2	Design of parabolic dish solar cooker for domestic purpose referring existing system
CO3	Design of solar photovoltaic system for domestic purpose referring existing system
CO4	Design miniature wind mill for domestic purpose referring existing system

Course Code : 402050 C Course Name : Elective – IV
Product Design and Development

CO1	Understand essential factors for product design ·
CO2	Design product as per customer needs and satisfaction
CO3	Understand Processes and concepts during product development ·
CO4	Understand methods and processes of Forward and Reverse engineering ·
CO5	Carry various design processes as DFA, DFMEA, design for safety ·
CO6	Understand the product life cycle and product data management

Electronics & Telecommunication Engineering Department

Program Education Objectives (PEOs)

PEO 1-Preparation: transition to a successful professional career

To prepare the students to excel undergraduate programmes, in applied research, or in PG programmes to succeed in industry/technical profession anywhere in the world through rigorous learning- teaching.

PEO 2-Core Competence: development of the fundamental prerequisites

To provide students with a solid foundation in mathematical, scientific and electronics and communication engineering fundamentals required to solve engineering problems – thus generating core competence. This serves them lifelong in their professional domain as well as higher education.

PEO 3- Design Competence: aiding the students in the R & D competency

To inculcate a strong flavour of research activities among the students and impart them with good scientific and engineering depth and breadth of knowledge including proficiency in hardware languages, use of latest software tools, ability to apply engineering experience in designing and conducting experiments and analyze the significance of experimental data so as to comprehend, analyze, design and create novel products and provide solutions to the real life problems facing the society and humanity at large.

PEO 4- Professionalism: developing lifelong and world class employability

To inculcate in students the finest professional attributes, ethics, a positive attitude, effective communication and presentation skills, ownership, responsibility and accountability – aptitude to work in multi-cultural/national and multi-disciplinary ambience, develop in one adaptability to different situations, ability to work in teams, take independent decisions and ability to integrate engineering issues to broader social contexts.

PEO 5- Career Development: equipping the students to succeed in a variety of career options

To prepare the students for successful and productive career choices in both public and private sectors in the field of electronics & communication engineering or other allied engineering or other fields. Also equipping the students by imparting professional development courses and industrial trainings, preparing students to crack various national level competitive examinations like GATE, IES, etc and providing encouragement to pursue higher studies or to become successful entrepreneurs in life.

PEO 6- Learning Environment: inculcate a lifelong learning culture

To provide students with an academic environment that ignites in one the spirit of excellence, develop the urge of discovery, creativity, inventiveness, leadership and a passion to be the best by

providing state-of-the-art facility and an overall ambience that fosters brilliance.

Programme Outcomes:

PO 1 - **Engineering Knowledge:** Apply knowledge of mathematics, science , and Electronics and Communication Engieering for solving engineering problems and modelling.

PO 2 - **Problem analysis:** Design and conduct experiments as well as to analyze and interpret experimental or collected data, simulate and fabricate electronic circuits and systems and make own projects utilizing latest software tools and techniques. They also possess the ability to identify, formulate, research literature and analyze complex engineering problems to reach logical conclusions.

PO 3 - **Design / development of solutions:** Design a system, component or process to meet the desired specifications, performance and capabilities; compatible with health, safety, legal, societal and environmental considerations.

PO 4 - **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments in analyzing and interpreting data, and synthesizes the data to come to valid conclusion.

PO 5 - **Modern tool usage:** Apply appropriate techniques, resources and modern attitudes, IT tools (linking hardware and software) including prediction and modeling to complex engineering activities and research.

PO 6 - **Engineer and Society:** Understand the special duty they owe to protect the public's health, safety and welfare by virtue of their professional status as engineers in society.

PO 7 - **Environment and sustainability:** Understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.

PO 8 - **Ethics:** Understand ethics of life and professions and abide by them.

PO 9 - Individual and Team-work: Articulate teamwork principles, work with a multi-disciplinary team, and appreciate the role of a leader, leadership principles, and attitudes conducive to effective professional practice of Electronics and Communication Engineering.

PO 10 - Communication: Communicate and present effectively both orally and in writing, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO 11 - Project management and finance: Demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.

PO 12 - Life-long learning: Engage in life-long learning, demonstrate knowledge and understanding of contemporary and emerging issues relevant to their domain - demonstrate knowledge and understanding of business practices and principles of management and understand their limitations, develop awareness of legal consequences of engineering solution.

Program Specific Outcomes (PSOs)

PSO 1- An ability to design and implement complex systems in areas like signal processing embedded systems, VLSI and Communication Systems.

PSO 2 -An ability to make use of acquired technical knowledge for qualifying in competitive examinations at various levels.

PSO 3 - Graduates will be able to apply fundamentals of electronics in various domains of analog and digital systems.

Course Outcomes (COs)

Second Year of Electronics/ E & Tc Engineering (2019 Course) Semester I

207005: Engineering Mathematics -III

CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO3: Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

204181: Electronic Circuits

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
CO4: Explain internal schematic of Op-Amp and define its performance parameters.
CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

204182: Digital Circuits

CO1: Identify and prevent various hazards and timing problems in a digital design.
CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.
CO3: Analyze, design and implement combinational logic circuits.
CO4: Analyze, design and implement sequential circuits.
CO5: Differentiate between Mealy and Moore machines.
CO6: Analyze digital system design using PLD

204183: Electrical Circuits

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.
CO2: Formulate and analyze driven and source free RL and RC circuits.
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
CO5: Explain construction, working and applications of special purpose motors & understand

motors used in electrical vehicles.
CO6: Analyze and select a suitable motor for different applications. Course Contents

204184: Data Structures

CO1: Solve mathematical problems using C programming language.
CO2: Implement sorting and searching algorithms and calculate their complexity.
CO3: Develop applications of stack and queue using array.
CO4: Demonstrate applicability of Linked List.
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

204185: Electronic Circuits Lab
204186: Digital Circuits Lab
204187: Electrical Circuits Lab
204188: Data Structures Lab
204189: Electronic Skill Development Lab

204190: Mandatory Audit Course – 3
• Introduction to Japanese Language and Culture

Second Year of Electronics/ E & Tc Engineering (2019 Course) Semester II

204191: Signals & Systems

CO1: Identify, classify basic signals and perform operations on signals.
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

204192: Control Systems

CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO2: Determine the (absolute) stability of a closed-loop controlsystem.
CO3: Perform time domain analysis of control systems required for stability analysis.

CO4: Perform frequency domain analysis of control systems required for stability analysis.
CO5: Apply root-locus, Frequency Plots technique to analyze controlsystems.
CO6: Express and solve system equations in state variable form.
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

204193: Principles of Communication Systems

CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO3: Explain generation and detection of FM systems and compare with AM systems.
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).
CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

204194: Object Oriented Programming
CO1: Describe the principles of object oriented programming.
CO2: Apply the concepts of data encapsulation, inheritance in C++.
CO3: Understand Operator overloading and friend functions in C++.
CO4: Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
CO5: Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
CO6: Describe and use of File handling in C++

204195: Signals & Control System Lab
204196: Principles of Communication Systems Lab
204197: Object Oriented Programming Lab
204198: Data Analytics Lab

204199: Employbility Skills Development

CO1: Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO2: Develop effective communication skills (listening, reading, writing, and speaking), self-management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO3: Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO4: Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO5: Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional

environment.

204200: Project Based Learning

CO1: Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO2: Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO3: Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO4: Analyze the results and arrive at valid conclusion.
CO5: Use of technology in proposed work and demonstrate learning in oral and written form.
CO6: Develop ability to work as an individual and as a team member.

204201: Mandatory Audit Course – 4
• Enhancing Soft Skills and Personality

Third Year E&TC Engineering (2019 Course)

Semester I

304181 Digital Communication

CO1: Apply the statistical theory for describing various signals in a communication system.
CO2: Understand and explain various digital modulation techniques used in digital
       communication systems and analyze their performance in presence of AWGN noise.
CO3: Describe and analyze the digital communication system with spread spectrum modulation.
CO4: Analyze a communication system using information theoretic approach.
CO5: Use error control coding techniques to improve performance of a digital communication
       system

304182 Electromagnetic Field Theory
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the
       given source.
 CO2: Apply boundary conditions to the boundaries between various media to interpret behavior
       of the fields on either sides.
 CO3: State, Identify and Apply Maxwell's equations (integral and differential forms) in both the
        forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time
        average power density using Poynting Theorem, Retarded magnetic vector potential.
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations)
        equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO5: Interpret and Apply the transmission line equation to transmission line problems with load
       impedance to determine input and output voltage/current at any point on the Transmission
       line, Find input/load impedance, input/load admittance, reflection coefficient, SWR,
      Vmax/Vmin, length of transmission line using Smith Chart
 CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics.

304183: Database Management
CO1: Ability to implement the underlying concepts of a database system.
CO2: Design and implement a database schema for a given problem-domain using data model.
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and
        update problems.
 CO4: Implement transactions, concurrency control, and be able to do Database recovery.
 CO5: Able to understand various Parallel Database Architectures and its applications.
 CO6: Able to understand various Distributed Databases and its applications.

304184: Microcontroller
CO1: Understand the fundamentals of microcontroller and programming.
CO2: Interface various electronic components with microcontrollers.
CO3: Analyze the features of PIC 18F XXXX.
CO4: Describe the programming details in peripheral support.
CO5: Develop interfacing models according to applications.
CO6: Evaluate the serial communication details and interfaces..

304185 (B): Electronic Measurements(Elective -I)
CO1: Understand the metrics for the measurement system

CO2: Select and use the instruments for measurement & analysis of basic electronic parameters
CO3: Identify and use the different signal generators for specific applications
CO4: Understand the principles of different Oscilloscopes for specific applications
CO5: Identify the use of other display devices, recorders and timer/counter in measurement systems
CO6: Use the advanced measurement systems for electronics parameter measurement
.

304186: Digital Communication Lab

304187: Database Management Lab

304188: Microcontroller Lab

304189 (B): Electronic Measurements Lab (Elective-I)

304190: Skill Development

CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO4: Student would be able to communicate effectively at different technical and administrative levels.
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.

304191 (A): Mandatory Audit Course – 5

Developing Soft skills and Personality

Third Year E&TC Engineering (2019 Course)

Semester II

304192: Cellular Networks
CO1: Understand fundamentals of wireless communications.
CO2: Discuss and study OFDM and MIMO concepts.
CO3: Elaborate fundamentals mobile communication
CO4: Describes aspects of wireless system planning.
CO5: Understand of modern and futuristic wireless networks architecture. CO6: Summarize different issues in performance analysis.

304193: Project Management
CO1: Apply the fundamental knowledge of project management for effectively handling the projects.
CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.
CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.
CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.
CO6: Develop new products assessing their commercial viability and develop skillsetsfor becoming successful entrepreneurs while being fully aware of the legal issuesrelated to Product development and Entrepreneurship

304194: Power Devices & Circuits
CO1: To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.
CO2: To design triggering / driver circuitsfor various power devices.
CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.
CO4: To understand significance and design of various protections circuitsfor power devices.
CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.
CO6: To understand case studies of power electronics in applicationslike electric vehicles, solar systems etc.

304195 (E): Network Security (Elective-II)
CO1: Analyze attacks on computers and computer security.
CO2: Demonstrate knowledge of cryptography techniques.
CO3: Illustrate various Symmetric and Asymmetric keys for Ciphers
CO4: Evaluate different Message Authentication Algorithms and Hash Functions
CO5: Get acquainted with various aspects of E-Mail Security
CO6: Assimilate various aspects of Web Security

304196: Cellular Networks Lab

304197: Power Devices & Circuits Lab

304198 (E): Network Security Lab (Elective – II)

304199: Internship
CO1: To develop professional competence through internship.
 CO2: To apply academic knowledge in a personal and professional environment.
 CO3: To build the professional network and expose students to future employees.
CO4: Apply professional and societal ethics in their day to day life.
CO5: To become a responsible professional having social, economic and administrative considerations.
 CO6: To make own career goals and personal aspirations.

304200: Mini Project
CO1: Understand, plan and execute a Mini Project with team.
CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO3: Prepare a technical report based on the Mini project.
CO 4: Deliver technical seminar based on the Mini Project work carried out

304191 (B): Mandatory Audit Course – 6
English language for competitive exams

Final Year E&TC Engineering (2015 Course) Semester I

404181 VLSI Design & Technology

CO 1. Write effective HDL coding for digital design.
CO 2. Apply knowledge of real time issues in digital design.
CO 3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO 4. Design CMOS circuits for specified applications.
CO 5. Analyze various issues and constraints in design of an ASIC
CO 6. Apply knowledge of testability in design and build self test circuit.

404202 ADVANCED POWER ELECTRONICS

CO 1. Understand operation and implementation of dual converters, Multilevel inverters, cycloconverters and power factor improvement techniques for controlled rectifiers.
CO 2. Select and Design a suitable power converter to meet the demand of DC drive system.
CO 3. Select and Design a suitable power converter to meet the demand of 3 phase inductor motor drive.
CO 4. Understand working of BLDC, Stepper, Servo drive system.
CO 5. Understand implementation of Solar and Wind Power System.

404203 ELECTRONIC SYSTEM DESIGN

CO 1. Understand various stages of hardware, software and PCB design.
CO 2. Analyze reliability of product design.
CO 3. Design and test various electronic products/modules.
CO 4. Suggest special design considerations and understand need of documentation.

404204 ELECTIVE I Internet of Things

CO 1. Discover key IoT concepts including identification, sensors, localization, wireless protocols, data storage and security.
CO 2. Explore IoT technologies, architectures, standards, and regulation.
CO 3. Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices.
CO 4. Examine technological developments that will likely shape the industrial landscape in the future.
CO 5. Develop and implement IoT solutions and applications.

404205 ELECTIVE II BIOMEDICAL ELECTRONICS

CO 1. Understand operation of the cardiac, respiratory and neural physiological systems.
CO 2. Understand the principle, operation, design of biomedical instruments and specific applications of biomedical engineering.
CO 3. Understand working principle of Clinical Lab Instruments.
CO 4. Understand working principle and applications of Radiology Instrumentation.

404206 LAB PRACTICE –I (APE + ESD)
404207 LAB PRACTICE –II (VLSI DESIGN + IOT)

404208 PROJECT PHASE-I

AUDIT COURSE 5 CRITICAL THINKING

Students can expect to be smarter, stronger and more confident thinkers.
Students can embark on a life-long journey of "self-directed learning".

Final Year E&TC Engineering (2015 Course) Semester II

404209 COMPUTER NETWORKS AND SECURITY

CO1. Design, implement, and analyze simple computer networks.
CO2. Identify, formulate, and solve network engineering problems.
CO3. Use techniques, skills, and modern networking tools necessary for engineering practice.
CO4. Have a basic knowledge of cryptography and network security

404210 PROCESS INSTRUMENTATION

CO1. Handle any kind of process by framing it in block diagram, mathematical model and
      different process variables.
CO2. Handle different types of controller like electronic, pneumatic and hydraulic.
CO3. Implement different control schemes to various processes.
CO4. Design relay logic for various processes.
CO5. Understand batch process with an example
CO 6. Design process control scheme

404211 ELECTIVE III

AUDIO VIDEO ENGINEERING
CO1. Describe and differentiate working principles of Digital TV, HDTV etc.
CO2. Understand the concept of basic television signal processing
CO3. Identify globally accepted color TV standards.
CO4. Demonstrate the need of audio and video compression techniques in real life.

404212 ELECTIVE IV WIRELESS SENSOR NETWORK

CO1. Explain various concepts and terminologies used in WSN.
CO2. Describe importance and use of radio communication and link management in WSN.
CO3. Explain various wireless standards and protocols associated with WSN.
CO4. Recognise importance of localization and routing techniques used in WSN.
CO5. Understand techniques of data aggregation and importance of security in WSN.
CO6. Examine the issues involved in design and deployment of WSN.

404213 LAB PRACTICE – III

404214 LAB PRACTICE – IV

404215 PROJECT PHASE-II

AUDIT COURSE 6
Technologies, Disruptions and Entrepreneurial Opportunities

PDEA'sCollegeOfEngineeringManjari(Bk.) Instrumentation & Control EngineeringDepartment

ProgramEducationObjectives(PEO)

1. Topreparegloballycompetentgraduateshavingstrongfundamentals,domainknowledge,updatedwithmoderntechnologytoprovidetheeffectivesolutionsforComputerscienceandEngineering problems.
2. Topreparethegraduatestoworkasacommittedprofessionalwithstrongprofessionalethics andvalues,senseofresponsibilities,understandingof legal,safety, health,societal,culturalandenvironmental issues.
3. Topreparecommittedandmotivatedgraduateswithresearchattitude,lifelonglearning,investigativeapproach,andmultidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to workeffectivelyasindividualaswellasinteams.

ProgrammeOutcomes(PO)

1. **PO1: Engineering knowledge** : Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems
2. **PO2: 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. **PO3: 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. **PO4: 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. **PO5: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. **PO6 :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 engineeringpractice.
7. **PO7: 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. **PO8: Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
9. **PO9: Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **PO10: Communication Skills:** Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehendandwriteeffectivereportsanddesigndocumentation,make effective presentations, and give and receive clear instructions.
11. **PO11: Project Management and Finance:** Demonstrate knowledge and understanding of 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. **PO12:Life-longLearning:** 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.

ProgrammeSpecificOutcomes(PSOs)

1. **Apply concepts of automatic control, including measurement, feedback and feed forward regulation for the operation of continuous and discrete systems**

2. **Design and implement systems utilizing analog and/or digital control devices**

3. **Apply the concepts of chemistry, physics, and electricity/electronics to measurement and control systems**

4. **Apply the concepts of digital and microprocessor systems and functionality of system components/devices for the automation of processes**

5. **Apply the concepts of measurements and sensor selection and**

6. **Communicate the technical details of control systems using current techniques and graphical standards**

Course Outcomes(COs)

Second Year of Instrumentation & control (2019Course) : SEM I

207008 :Engineering Mathematics III

CO1	Solve higher order linear differential equation using appropriate techniques to modeland analyze electrical circuits
CO2	Apply Integral transforms such as Laplace transform, Fourier transform and Z-Transformto solve problems related to signal processing and control systems
CO3	Apply Statistical methods like correlation, regression and Probability theory as applicable to analyze and interpret experimental data related to energy management,power systems, testing and quality control
CO4	Perform Vector differentiation and integration, analyze the vector fields and apply towave theory and electro-magnetic fields
CO5	Analyze Complex functions, conformal mappings, and perform contour integration inthe study of electrostatics, signal and image processing.
CO6	
CO7	

206261 :Sensors and Transducers

CO1	Understand the working principle, construction, operation, characteristics and features of sensors and transducers.
CO2	Examine the performance specifications of various sensors and transducers
CO3	Select sensors and transducers for measurement applications
CO4	Design sensor/transducer circuits for measurement of physical parameters

206262 :Linear Integrated Circuits

CO1	Analyze the op-amp characteristics and understand their significance
CO2	Evaluate the performance of linear and non-linear circuits using Op- Amp
CO3	Test the performance of Voltage controlled oscillator, Phase lock loop, Sample and Hold Circuit.

CO4	Design and implement active filter circuits and voltage regulator using special purpose ICs.
CO5	Design and test multivibrator circuits using timer

206263:Electrical Measurements &Instrumentation

CO1	Apply fundamental knowledge of Instrument for electrical measurements
CO2	Distinguish analog and digital instruments
CO3	Design the voltmeter and ammeter for different ranges
CO4	Compute the values of inductance, resistance and capacitance using bridges
CO5	Implement ADC and DAC using special purpose IC
CO6	Determine voltage, frequency and phase shift of unknown signals using CRO

206264 :Control System Components

CO1	Implement logic gates using relays
CO2	Develop electrical circuits for motor control operations
CO3	Construct pneumatic and hydraulic circuits for control applications using appropriate pneumatic and hydraulic components
CO4	Design of SCR triggering circuit using UJT
CO5	Understand the need of electronic safety circuits

206265 :ComputationalTechniques

CO1	Practice with MATLAB environment
CO2	Develop MATLAB program for mathematical problem
CO3	Import and Export data using MATLAB
CO4	Develop simulink model of system
CO5	Design GUI model for specific applications

206266 :Communication Skills

CO1	Effectively communicate through verbal/oral communication and improve the listening skills
CO2	Write precise briefs or reports and technical documents.
CO3	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations
CO4	Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
CO5	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

206267 :Audit Course- III**StressRelief:YogaandMeditation**

CO1	**Understand**philosophyandreligionaswellasdailylifeissueswillbechallengedandenhanced
CO2	**Enhances**theimmunesystem.
CO3	IntellectualandphilosophicalunderstandingofthetheoryofyogaandbasicrelatedHinduscriptureswill

	bedeveloped.
CO4	Powersofconcentration,focus,andawarenesswillbeheightened.

Second Year of Instrumentation & control Engineering (2019Course) : SEM II
206268: Control Systems

CO1	Classify the control systems
CO2	Develop mathematical models of LTI (Linear Time Invariant) systems
CO3	Represent the system in canonical forms (signal flow graph)
CO4	Analyze the LTI system in time domain and frequency domain
CO5	Test the stability of LTI system using conventional methods

206269: Digital Electronics

CO1	Represent numerical values in various number systems and their conversion / Simplify logical expressions using Boolean Laws, K-map method and design them using logic gates
CO2	Understand different logic families
CO3	Design combinational digital circuits using logic gates
CO4	Understand operation basics of flip-flops, registers, decoders, encoders, multiplexers and de-multiplexers
CO5	Design synchronous, asynchronous sequential and non- sequential counters
CO6	Design digital clock and frequency counter circuits.

206270: Process Loop Elements

CO1	Define the control objectives, input variables (manipulated and disturbance) and output variables and draw the process control loops.
CO2	Demonstrate the working of process loop components
CO3	Understand the need of standard signals and Use DPT for level and flow Measurement
CO4	Determine the response of discontinuous and continuous (P, I, D, PI, PD and PID) control actions for standard input signals and estimate the PID controller parameters by using process reaction curve, Ziegler-Nichols and frequency response method for agiven process
CO5	Analyze characteristics of control valve, select and determine control valve size for gas, vapor and liquid services vapor and liquid services
CO6	Demonstrate the working of control valve accessories and design a spring and diaphragm actuator.

206271: Signals and Systems

CO1	Identify and represent the type of signals and systems and Perform elementary operations on signals
CO2	Classify systems based on their properties
CO3	Understand fundamental properties of LTI systems and be able to determine response of the system for given input
CO4	Determine Fourier series and Fourier transform of Continuous time signals and understand how to interpret and plot Fourier transform magnitude and phase functions
CO5	Analyse and design of an LTI systems using Fourier transform and Laplace transform
CO6	Understand the concept of probability and statistical properties of signals

206272: Data Structures

CO1	Understand and comprehend the basics of python programming
CO2	Test various operations of Array, Matrix and Lists
CO3	Implement various operations on Sets, Maps and Link Structures
CO4	Demonstrate various operations on Stacks Ques.
CO5	Choose appropriate data structure for application

206273: Project Based Learning

CO1	Identify projects relevant to Instrumentation and Control systems
CO2	Use different electronic components and sensors/transducers to provide practical solution to real life problems
CO3	Design/model/simulate/and fabricate a prototype
CO4	Designing and implementation of mini project which includes measurement of parameter signal processing, controlling, debugging related to objectives defined in the problem statement
CO5	Prepare the project report

Third Year of Instrumentation & control Engineering (2019Course) : SEM I
306261 :EmbeddedSystems

CO1	Design and implement an embedded system based on an eight bit microcontroller
CO2	Develop software and hardware for embedded systems using microcontroller
CO3	Develop 8051 Assembly level and C programs using 8051 instruction set.
CO4	Identify the functionality of development boards to implement embedded applications.
CO5	Demonstrate basic architecture, characteristics, quality attributes and operating systems of embedded systems used in industry.

306262:Industrial Automation-I

CO1	Understand the fundamentals of Industrial Automation, PLC & SCADA
CO2	Develop Ladder Program using basic & advanced PLC instructions for Sequential & Continuous processes.

CO3	Interface Analog & Digital I/O devices, Hydraulic & Pneumatic systems and VFD with PLC.
CO4	Apply Analog PLC functions to given process control applications
CO5	Develop SCADA system for given applications.

306263: Modern Control Theory

CO1	Analyze dynamics of a linear system by State Space Representation.
CO2	Determine the stability of a linear system using pole-placement technique
CO3	Design state observers.
CO4	Determine the stability of systems.
CO5	Realize the structure of a discrete time system and model its action mathematically.

306263: Operating Systems

CO1	Operating systems and their principle
CO2	Understanding of modern operating system
CO3	Analyze multi-processing and their applications
CO4	Apply memory management concepts
CO5	Analyze safety of operating system.

306265 B: Elective-I B: Data Science

CO1	Use data science processes.
CO2	Demonstrate statistics for data analysis
CO3	Describe data science packages
CO4	Describe data cleaning methods.
CO5	Model multi dimensional data and visualize it using appropriate tool

306266: Seminar

CO1	be able to be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.
CO2	be able to improve skills to read, understand, and interpret material on technology.
CO3	improve communication and writing skills.

Third Year of Instrumentation & control Engineering (2019Course) : SEM II

306268: Internet of Things

CO1	Present a survey on building blocks of IOT.
CO2	Compare the connectivity technologies and protocols in IOT.
CO3	Use IOT platform for application development
CO4	Discuss Security issues in IOT
CO5	Develop Architectural Approach for IOT application

306269: Industrial Automation- II

CO1	Understand the fundamentals of DCS Organization in Industrial Automation.
CO2	Analyze the software and hardware DCS configuration.
CO3	Analyze the different security design approaches, engineering and operator interface issues

	for designing Distributed control system.
CO4	Analyze the latest networking technologies RS232, RS485, OPC, HART and Field bus protocol.
CO5	Design and development of DCS programming for simple process applications

306270: Digital Signal Processing

CO1	Understand benefits and limitations of processing signals digitally
CO2	Recognize types of discrete-time signals and properties of discrete-time systems.
CO3	Compute the response of discrete-time systems to various input signals.
CO4	Evaluate and analyze the frequency domain characteristics of Discrete-Time Systems
CO5	Design and implement different frequency selective FIR and IIR filters

306271 A: Elective II A: Building Automation

CO1	Articulate the purpose and operation of HVAC system components, the operation of HVAC systems.
CO2	Apply knowledge of thermal comfort conditions and its impact on human comfort, productivity, And health.
CO3	Investigate HVAC air systems and water system operations and control philosophies
CO4	Evaluate importance of fire safety systems
CO5	Demonstrate the security & access control system.

306272: Mini Project

CO1	Planning and implementation of hardware/ software project .
CO2	Prepare the budget for hardware requirement .
CO3	Demonstrate the project .
CO4	Work as a team member.

306273: Internship

CO1	Develop professional competence through industry internship
CO2	Apply academic knowledge in a personal and professional environment
CO3	Build the professional network and expose students to future employees
CO4	Apply professional and societal ethics in their day-to-day life
CO5	Develop professional approach for social, economic, and administrative considerations.

Fourth Year of Instrumentation & control Engineering (2015Course) : SEM I

406261: Process Dynamics and Control

CO1	To understand the basic principles & importance of process control, classification of process variables and to provide the knowledge of process modeling & dynamics.
CO2	process variables and to provide the knowledge of process modeling & dynamics. 2. To equip students with knowledge of dynamic behaviour of first order and second order processes. Analyzing closed-loop control systems for stability and steadystate performance
CO3	To understand the principle and design of feedback, multi-loop controllers, model based controllers and their applications
CO4	To equip students with knowledge of multivariable control, interaction, the pairing, decoupling and design of controllers for interacting multivariable systems.

406262: Project Engineering and Management

CO1	Apply the basic concepts of industrial organisation and management for instrumentation projects.
CO2	To understand life cycle phases and activities involve in instrumentation projects
CO3	To know the use of various standards in instrumentation projects.
CO4	To know front end engineering design and its documentation.
CO5	To learn the detail engineering design and its documentation

406263: Computer Techniques and Applications

CO1	To provide better understanding of functions of different operating systems.
CO2	To provide knowledge of software testing and communication protocols
CO3	To understand the software development life cycle.
CO4	To differentiate real time operating system and operating system
CO5	To explain the operating system functions in detail
CO6	To use the proper communication channel and software for transforming and storing the da

406264- Elective- I: A) Industrial Internet of Things

CO1	Study of Building blocks of IOT and it's various components
CO2	Study of protocols in IOT
CO3	Analyze the security issues in IOT
CO4	Select proper IOT technology for application.
CO5	Design simple IOT based application
CO6	Compare the connectivity technologies and protocols in IO

406265- Elective- II: B) Instrumentation and Control for Power Plants

CO1	To expose the students to the detail process of thermal power plant
CO2	To impart knowledge on various measurements and instrumentation involved in thermal power generation
CO3	To provide the knowledge on specific measurement techniques and control systems practiced in boiler and turbine units
CO4	To impart basic knowledge in nuclear power plant and associated instrumentation.
CO5	To provide the knowledge on hydroelectric power plant and associated instrumentation

406266- Project Stage- I

CO1	To learn how to apply academic knowledge to industrial challenges.
CO2	To learn how to develop project management skills
CO3	To learn to work in team.
CO4	To apply multidisciplinary knowledge.

406267 Audit Course Green Energy

CO1	To understand development of sustainable energy recourses.
CO2	To comprehend utilization of non-conventional technologies
CO3	To undertake prospective assignments in relevant fields.

Fourth Year of Instrumentation & Control Engineering (2015Course) : SEM II

406268: Process Instrumentation

CO1	To demonstrate design procedure for control of Heat Exchanger, Boiler, Distillation column control, Dryer, Evaporator, Continuous and batch reactor.
CO2	To provide students with knowledge about principle and design of controller for pumps and compressors
CO3	Use of appropriate software tools (e.g. MATLAB, SCILAB etc. Control Toolbox & Simulink) for design of well-tuned control loops.
CO4	Analysis and design of controller for safety and process monitoring and understand the need for scaling of instruments.
CO5	Ability to gain knowledge and analysis of unit processes and unit operations.
CO6	Ability to understand and analysis how process dynamics and control are related to materials and systems of unit operations

406269: Industrial Automation

CO1	To make the students understand the fundamentals of automation and various automation systems used in industry such as PLC, DCS, and SCADA.
CO2	Students should understand the working of these systems and should be able to determine hardware and software requirements of PLC, DCS and SCADA..
CO3	Students should further understand how to design any application based on these systems.
CO4	Students will understand architecture of PLC, I/O Module, Communication module and Memory Addressing and designing ladder logic for application
CO5	Students will learn the architecture and programming of DCS. Students will understand the need of SIS, risk reduction methods, evaluation of SIL(Safety Integrity Levels)
CO6	

406270- Elective- III: A) Building Automation

CO1	Articulate the purpose and operation of HVAC system components, the operation of HVAC systems.
CO2	Understanding thermal comfort conditions with respect to temperature and humidity and human clothing and activities and its impact on human comfort, productivity, and health
CO3	Understanding of the needs and requirements for ventilation and its impact on design and energy and its impact on human comfort, productivity, and health
CO4	Understand the way in which a large fire alarm system would be connected and zoned.
CO5	Understand the fundamental elements that make up an Access Control System
CO6	

406271- Elective- IV: C) Instrumentation in Agriculture and Food Industries

CO1	Scope of Instrumentation in agriculture field.
CO2	To know difference between continuous and batch process
CO3	To Know greenhouse automation schemes
CO4	Understand sensors used in agriculture field.
CO5	Understand Instrumentation at weather monitoring stations
CO6	Demonstrate soil properties and sensors used to measure

406272- Project Stage- II

CO1	To learn latest communication protocols, latest trends in the industry
CO2	Integration of different technologies into a product / process
CO3	To make them industry ready

406274: Audit Course 6 : Business Intelligence

CO1	Apply the concepts of Business Intelligence in real world applications
CO2	Explore and use the data warehousing wherever necessary
CO3	Design and manage practical BI systems

Programme Educational Objectives (PEOs):
1. PEO1: Graduates of the MBA program will successfully integrate core, cross-functional and inter-disciplinary
aspects of management theories, models and frameworks with the real world practices and the sector specific
nuances to provide solutions to real world business, policy and social issues in a dynamic and complex world.
2. PEO2: Graduates of the MBA program will possess excellent communication skills, excel in cross-functional, multidisciplinary,
multi-cultural teams, and have an appreciation for local, domestic and global contexts so as to manage
continuity, change, risk, ambiguity and complexity.
3. PEO3: Graduates of the MBA program will be appreciative of the significance of Indian ethos and values in
managerial decision making and exhibit value centered leadership.
4. PEO4: Graduates of the MBA program will be ready to engage in successful career pursuits covering a broad
spectrum of areas in corporate, non-profit organizations, public policy, entrepreneurial ventures and engage in lifelong
learning.
5. PEO5: Graduates of the MBA program will be recognized in their chosen fields for their managerial competence,
creativity & innovation, integrity & sensitivity to local and global issues of social relevance and earn the trust &
respect of others as inspiring, effective and ethical leaders, managers, entrepreneurs, entrepreneurs and change Agents.

Programme Outcomes (POs): At the end of the MBA programme the learner will possess the
1. Generic and Domain Knowledge - Ability to articulate, illustrate, analyze, synthesize and apply the knowledge of
principles and frameworks of management and allied domains to the solutions of real-world complex business
issues
2. Problem Solving & Innovation - Ability to Identify, formulate and provide innovative solution frameworks to real
world complex business and social problems by systematically applying modern quantitative and qualitative

  Problem solving tools and techniques.
Programme Outcomes (POs): At the end of the MBA programme the learner will possess the
1. Generic and Domain Knowledge - Ability to articulate, illustrate, analyze, synthesize and apply the knowledge of
principles and frameworks of management and allied domains to the solutions of real-world complex business
issues
2. Problem Solving & Innovation - Ability to Identify, formulate and provide innovative solution frameworks to real
world complex business and social problems by systematically applying modern quantitative and qualitative

Problem solving tools and techniques.
3. Critical Thinking - Ability to conduct investigation of multidimensional business problems using research based
knowledge and research methods to arrive at data driven decisions
4. Effective Communication - Ability to effectively communicate in cross-cultural settings, in technology mediated
environments, especially in the business context and with society at large
5. Leadership and Team Work - Ability to collaborate in an organizational context and across organizational
boundaries and lead themselves and others in the achievement of organizational goals and optimize outcomes for
all stakeholders.
6. Global Orientation and Cross-Cultural Appreciation: Ability to approach any relevant business issues from a global
perspective and exhibit an appreciation of Cross Cultural aspects of business and management.
7. Entrepreneurship - Ability to identify entrepreneurial opportunities and leverage managerial & leadership skills
for founding, leading & managing startups as well as professionalizing and growing family businesses.
8. Environment and Sustainability - Ability to demonstrate knowledge of and need for sustainable development and
assess the impact of managerial decisions and business priorities on the societal, economic and environmental
aspects.
9. Social Responsiveness and Ethics - Ability to exhibit a broad appreciation of the ethical and value underpinnings
of managerial choices in a political, cross-cultural, globalized, digitized, socio-economic environment and
distinguish between ethical and unethical behaviors & act with integrity.
10. LifeLong Learning – Ability to operate independently in new environment, acquire new knowledge and skills and

  Assimilate them into the internalized knowledge and skills.
Programme Specific Outcomes (PSOs): It is expected that Institutes define the PSOs for each specialization /
major-minor combination. PSOs shall also vary based upon the customized combination of Generic Core, Generic

  Elective, Subject Core, Subject Elective, Foundation, Enrichment & Alternative Study Credit
  Courses that they offer.

Course Outcomes (COs)

First Year of MBA (2019 Pattern): SEM I
101: – Managerial Accounting (MA)

CO1	DESCRIBE the basic concepts related to Accounting, Financial Statements, Accounting, Marginal Costing, Budgetary Control and Standard Costing.
CO2	EXPLAIN in detail, all the theoretical concepts taught through the syllabus
CO3	PERFORM all the necessary calculations through the relevant numerical problems
CO4	ANALYSE the situation and decide the key financial as well as non-financial

	elements involved in the situation
CO5	EVALUATE the financial impact of the decision

102: Organizational Behavior (OB)

CO1	DESCRIBE the major theories, concepts, terms, models, frameworks and research findings in the field of organizational behavior.
CO2	EXPLAIN the implications of organizational behavior from the perspectives of employees, managers, leaders and the organization.
CO3	MAKE USE OF the Theories, Models, Principles and Frameworks of organizational behavior in specific organizational settings.
CO4	DECONSTRUCT the role of individual, groups, managers and leaders in influencing how people behave and in influencing organizational culture at large
CO5	FORMULATE approaches to reorient individual, team, managerial and leadership behavior in order to achieve organizational goals
CO6	ELABORATE UPON the challenges in shaping organizational behavior, Organizational culture and organizational change.

103: Economic Analysis for Business Decisions (EABD)

CO1	DEFINE the key terms in micro-economics.
CO2	EXPLAIN the key terms in micro-economics, from a managerial perspective.
CO3	IDENTIFY the various issues in an economics context and DEMONSTRATE their significance from the perspective of business decision making
CO4	EXAMINE the inter-relationships between various facets of micro-economics from the perspective of a consumer, firm, industry, market, competition and business cycles
CO5	DEVELOP critical thinking based on principles of micro-economics for informed business decision making.
CO6	ANTICIPATE how other firms in an industry and consumers will respond to economic decisions made by a business, and how to incorporate these responses into their own decisions

104: Business Research Methods (BRM)

CO1	DEFINE various concepts & terms associated with scientific business Research.
CO2	EXPLAIN the terms and concepts used in all aspects of scientific business Research.
CO3	MAKE USE OF scientific principles of research to SOLVE contemporary Business research problems.
CO4	EXAMINE the various facets of a research problem and ILLUSTRATE the relevant aspects of the research process from a data driven decision perspective

CO5	JUDGE the suitability of alternative research designs, sampling designs, data collection instruments and data analysis options in the context of a given real-life business research problem from a data driven decision perspective
CO6	FORMULATE alternative research designs, sampling designs, data collection instruments, testable hypotheses, data analysis strategies and research Reports to address real-life business research problems.

105: Basics of Marketing (BOM)

CO1	RECALL and REPRODUCE the various concepts, principles, frameworks and terms related to the function and role of marketing
CO2	DEMONSTRATE the relevance of marketing management concepts and frameworks to a new or existing business across wide variety of sectors and ILLUSTRATE the role that marketing plays in the 'tool kit' of every organizational leader and Manager
CO3	APPLY marketing principles and theories to the demands of marketing Function and practice in contemporary real world scenarios.
CO4	EXAMINE and LIST marketing issues pertaining to segmentation, targeting and positioning, marketing environmental forces, consumer buying behavior, marketing mix and Product Life Cycle in the context of real world Marketing offering (commodities, goods, services, e-products/ e-services).
CO5	EXPLAIN the interrelationships between segmentation, targeting and positioning, marketing environment, consumer buying behavior, marketing Mix and Product Life Cycle with real world examples.
CO6	DISCUSS alternative approaches to segmentation, targeting and positioning, the marketing environment, consumer buying behavior, marketing mix and Product Life Cycle in the context of real world marketing offering (commodities, goods, services, e-products/ e-services.).

106: Digital Business (DB)

CO1	DESCRIBE the conceptual framework of e commerce, mobile commerce and social commerce
CO2	SUMMARIZE the impact of information, mobile, social, digital, IOT and Related technologies on society, markets & commerce.
CO3	ILLUSTRATE value creation & competitive advantage in a digital Business environment.
CO4	EXAMINE the changing role of intermediaries, changing nature of supply Chain and payment systems in the online and offline world.
CO5	ELABORATE upon the various types of digital business models and OUTLINE their benefits and limitations
CO6	DISCUSS the various applications of Digital Business in the present day World.

107: Management Fundamentals (MF)

CO1	ENUMERATE various managerial competencies and approaches to management
CO2	EXPLAIN the role and need of Planning, Organizing, Decision Making and Controlling
CO3	MAKE USE OF the principles of goal setting and planning for simple as well as Complex tasks and small projects.

CO4	COMPARE and CONTRAST various organizational structures of variety of business and not-for-profit entities in a real world context.
CO5	BUILD a list of the decision making criteria used by practicing managers, leaders and entrepreneurs in routine and non-routine decision making situations and EVALUATE and EXPLAIN the same
CO6	FORMULATE and DISCUSS a basic controlling model in a real life business, startup and not-for-profit organizational context

109: Entrepreneurship Development (ED)

CO1	DEFINE the key terms, LIST the Attributes and Characteristics of Entrepreneurs features and ENUMERATE the Factors influencing Entrepreneurship Growth.
CO2	DISCUSS various theories of entrepreneurship and the entrepreneurship development ecosystem in Indian context
CO3	APPLY the theories of entrepreneurship and entrepreneurship development framework to analyze and identify entrepreneurial opportunities.
CO4	DISCRIMINATE between potential options available for entrepreneur for embarking on establishing a Start Up
CO5	EVALUATE the start up ecosystem and the entrepreneurial opportunities in Light of requirements of a business plan.
CO6	CREATE a business plan that captures entrepreneurs and variety of entrepreneur motivations, entrepreneur culture and sectoral opportunities and financing options

112: Demand Analysis and Forecasting (DAF)

CO1	DESCRIBE the key terms associated with demand analysis, demand estimation and demand forecasting
CO2	SUMMARIZE the use of demand forecasting in various functions of management
CO3	IDENTIFY the pros and cons of various forecasting methods
CO4	DECONSTRUCT a forecast into its various components
CO5	BUILD a forecast for common products and services using time-series data

GENERIC ELECTIVES INSTITUTE LEVEL

113: Verbal Communication Lab (VCL)

CO1	RECOGNIZE the various elements of communication, channels of Communication and barriers to effective communication...
CO2	EXPRESS themselves effectively in routine and special real world business Interactions.
CO3	DEMONSTRATE appropriate use of body language.
CO4	TAKE PART IN professional meetings, group discussions, telephonic calls, Elementary interviews and public speaking activities.
CO5	APPRAISE the pros and cons of sample recorded verbal communications in a business context
CO6	CREATE and DELIVER effective business presentations, using appropriate technology tools, for common business situations

115: Selling & Negotiations Skills Lab (SNSL)

CO1	DESCRIBE the various selling situations and selling types
CO2	OUTLINE the pre-sales work to be carried out by a professional salesperson
CO3	IDENTIFY the key individuals involved in a real world sales process for a real World product/ service / e-product / e-service.
CO4	FORMULATE a sales script for a real world sales call for a product/ service / e product/ e-service
CO5	DECONSTRUCT the pros and cons of sample real world sales calls for a product/service / e-product / e-service
CO6	DEVELOP a sales proposal for a real world product/ service / e-product / e service and for a real world selling situation

117 - Business Systems and Procedures (BSP)

CO1	TABULATE the key elements of a typical business system and related work flow procedures
CO2	EXPLAIN a business system and related procedures.
CO3	PREDICT the fail points / bottle necks in a typical business process.
CO4	BREAK DOWN a business system into simpler components and explain the interrelationships
CO5	DEVELOP a process based thinking approach
CO6	CREATE standard operating procedures and flow charts / other visual representations for typical business systems and processes

First Year of MBA (2019 Course): SEM II

201: Marketing Management

CO1	DESCRIBE the key terms associated with the 4 Ps of marketing
CO2	COMPARE and CONTRAST various approaches to pricing for a real world Marketing offering (commodities, goods, services, e-products/ e-services.)
CO3	DEMONSTRATE an understanding of various channel options for a real world marketing offering (commodities, goods, services, e-products/ eservices.)
CO4	EXAMINE the product line of a real world marketing offering (commodities, Goods, services, e-products/ e-services.)
CO5	EXPLAIN the role of various communication mix elements for a real world marketing offering (commodities, goods, services, e-products/ e-services.)
CO6	DESIGN a marketing plan for a real world marketing offering (commodities, Goods, services, e-products/ e-services.)

202: Financial Management

| CO1 | Identify and articulate the complexity goals and benefits of a good hashing |

	scheme for real-world applications.
CO2	Apply non-linear data structures for solving problems of various domain
CO3	Design and specify the operations of a nonlinear-based abstract data type and implement themin a high-level programming language.
CO4	Analyze the algorithmic solutions for resource requirements and optimization
CO5	Use efficient indexing methods and multiway search techniques to store and maintain data.
CO6	Use appropriate modern tools to understand and analyze the functionalities confined to thesecondary storage.

203: Human Resource Management

CO1	DESCRIBE the role of Human Resource Function in an Organization
CO2	ENUMERATE the emerging trends and practices in HRM
CO3	ILLUSTRATE the different methods of HR Acquisition and retention
CO4	DEMONSTRATE the use of different appraisal and training methods in an Organization
CO5	OUTLINE the compensation strategies of an organization
CO6	INTERPRET the sample job descriptions and job specifications for contemporary entry level roles in real world organizations

204: Operations & Supply Chain Management

CO1	DEFINE basic terms and concepts related to Production, Operations, Services, Supply Chain and Quality Management
CO2	Explain the process characteristics and their linkages with process-product matrix in a real world context
CO3	DESCRIBE the various dimensions of production planning and control and their inter-linkages with forecasting
CO4	CALCULATE inventory levels and order quantities and MAKE USE OF various Inventory classification methods.
CO5	OUTLINE a typical Supply Chain Model for a product / service and ILLUSTRATE the linkages with Customer Issues, Logistic and Business Issues in a real world context
CO6	ELABORATE upon different operational issues in manufacturing and services organizations where the decision-making element is emphasized

205 FIN: Financial Markets and Banking Operations (SC)

CO1	RECALL the structure and components of Indian financial system through banking operations & Financial Markets
CO2	UNDERSTAND the concepts of financial markets, their working and Importance.
CO3	ILLUSTRATE the working and contribution of Banks and NBFCs to the Indian Economy.
CO4	ANALYZE the linkages in the Financial Markets.
CO5	EXPLAIN the various banking and accounting transactions
CO6	DEVELOP necessary competencies expected of a finance professional

206 FIN: Personal Financial Planning (SC)

CO1	UNDERSTAND the need and aspects of personal financial planning
CO2	Describe the investment options available to an individual
CO3	IDENTIFY types of risk and means of managing it

CO4	DETERMINE the ways of personal tax planning
CO5	EXPLAIN retirement and estate planning for an individual and design a financial plan
CO6	CREATE a financial plan for a variety of individuals.

217 FIN: Securities Analysis & Portfolio Management (SE)

CO1	REMEMBER various concepts taught in the syllabus
CO2	EXPLAIN various theories of Investment Analysis and Portfolio Management
CO3	CALCULATE risk and return on investment using various concepts covered in the syllabus
CO4	ANALYZE and DISCOVER intrinsic value of a security.
CO5	DESIGN/ CREATE optimal portfolio

219 FIN: Direct Taxation (SE)

CO1	UNDERSTAND various basic concepts/ terminologies related Direct Taxation
CO2	EXPLAIN how tax planning can be done
CO3	ILLUSTRATE how online filling of various forms and returns can be done
CO4	CALCULATE Gross Total Income and Income Tax Liability of an individual assessee.
CO5	ANALYZE and DISCOVER intrinsic value of a security
CO6	DESIGN/ DEVELOP / CREATE tax saving plan

205OSCM: Services And Operation Management (SC)

CO1	DESCRIBE the nature and CHARACTERISTICS of services and the services economy
CO2	DESRCIBE the service design elements of variety of services
CO3	USE service blueprinting for mapping variety of real life service processes
CO4	ANALYSE alternative locations and sites for variety of service facilities
CO5	JUDGE and EXPLAIN the service orientation at variety of service facilities / organizations
CO6	CREATE flow process layouts for variety of services.

206 OSCM: Supply Chain Management

CO1	DESCRIBE the key concepts of Supply Chain Management and the – driving forces in contemporary Supply Chain Management
CO2	EXPLAIN the structure of modern day supply chains.
CO3	IDENTIFY the various flows in real world supply chains.
CO4	COMPARE and CONTRAST push and pull strategies in Supply Chain Management
CO5	EXPLAIN the key Operational Aspects in Supply Chain Management
CO6	DISCUSS the relationship between Customer Value and Supply Chain Management

GENERIC ELECTIVES INSTITUTE LEVEL

217 OSCM: - Planning & Control of Operations

CO1	DESCRIBE the building blocks of Planning & Control of Operations
CO2	EXPLAIN the need for aggregate planning and the steps in aggregate planning

CO3	MAKE USE OF the various forecasting approaches in the context of operations planning process
CO4	ILLUSTRATE how capacity planning is done in organizations and its relationship with MRP
CO5	EXPLAIN the importance of scheduling in operations management
CO6	CREATE a Bill of Materials

219 OSCM: Inventory Management

CO1	DEFINE the key terms associated with Inventory Management.
CO2	CLASSIFY various types of inventory, and inventory costs.
CO3	CALCULATE Economic Order Quantity and stock levels under various conditions.
CO4	COMPARE and CONTRAST various methods of inventory control
CO5	ASSESS various factors influencing Make or Buy decisions
CO6	SOLVE problems based on ABC classification of inventory

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209: Start Up and New Venture Management

CO1	DESCRIBE the strategic decisions involved in establishing a startup
CO2	EXPLAIN the decision making matrix of entrepreneur in establishing a startup
CO3	IDENTIFY the issues in developing a team to establish and grow a startup
CO4	FORMULATE a go to market strategy for a startup
CO5	DESIGN a workable funding model for a proposed startup.
CO6	DEVELOP a convincing business plan description to communicate value of the new venture to customers, investors and other stakeholders

210: Qualitative Research Methods

CO1	ENUMERATE the key terms associated with Qualitative research approach
CO2	COMPARE and CONTRAST Qualitative research approach with the Quantitative approach
CO3	CONSTRUCT appropriate research and sampling designs for Qualitative research work in real world business and non-business contexts
CO4	ILLUSTRATE the use of appropriate qualitative research methods in real world business and non-business contexts.
CO5	EVALUATE the quality of Qualitative Research work
CO6	COMBINE Qualitative and Quantitative research approaches in a real world Research project.

211: Business, Government & Society

CO1	DESCRIBE the economic roles of government in the Indian context
CO2	EXPLAIN the macroeconomic crises around the world
CO3	ILLUSTRATE the inter linkages between economic growth , poverty and inequality
CO4	EXAMINE the rationale, success and failures of Public Private Partnerships in the Indian context
CO5	ASSESS the forces for and against Globalization and the socio-economic impact of Globalization

CO6	DISCUSS the interplay between technology, business and society

Second Year of MBA (2019 Course): SEM III

301: Strategic Management (Compulsory Generic Core (GC) Courses)

CO1	DESCRIBE the basic terms and concepts in Strategic Management.
CO2	EXPLAIN the various facets of Strategic Management in a real world context
CO3	DESCRIBE the trade-offs within and across strategy formulation, implementation, appraisal
CO4	INTEGRATE the aspects of various functional areas of management to develop a strategic perspective
CO5	EXPLAIN the nature of the problems and challenges confronted by the top management team and the approaches required to function effectively as Strategists.
CO6	DEVELOP the capability to view the firm in its totality in the context of its environment

302: Decision Science

CO1	DESCRIBE the concepts and models associated with Decision Science
CO2	UNDERSTAND the different decision-making tools required to achieve optimization in business processes
CO3	APPLY appropriate decision-making approach and tools to be used in business environment.
CO4	ANALYSE real life situation with constraints and examine the problems using different decision-making tools
CO5	EVALUATE the various facets of a business problem and develop problem solving ability
CO6	DISCUSS & propose the various applications of decision tools in the present business scenario

Generic Elective – University Level

308: Project Management

CO1	DEFINE the key terms and concepts in project management.
CO2	EXPLAIN the Importance of project management methodologies and tools at the distinct stages in the Project's life cycle
CO3	ILLUSTRATE the importance of PM in most industries and businesses
CO4	EXAMINE the importance of Leadership specifically in hetero genous and virtual teams as well as governance and approaches to conflict resolutions
CO5	DESIGN dashboard, status report and index for Key Performance Indicators of project for the Management

309: Knowledge Management

CO1	DEFINE the key terms and concepts in Knowledge Management
CO2	DESCRIBE the Knowledge Management cycle
CO3	DISCUSS the types of Knowledge and its implications
CO4	OUTLINE the importance of capturing knowledge elements and its structures application as a competitive advantage to business
CO5	EXPLAIN the human and business aspects of knowledge management

311: Management of Non-profit organizations

CO1	DESCRIBE the basic concepts and frameworks in the field of Non-Profit

	Sector & Non-Profit Organization
CO2	EXPLAIN the characteristics of Non-Profit organizations, summarizing the factors affecting development of Non-Profit organization
CO3	MAKE use of theoretical concepts, frameworks while registration process of Non-Profit Organization
CO4	EXAMINE the role of any public policies which helps NPO in decision making
CO5	EVALUATE the performance of Non- Profit organizations, the critical financial considerations of the Non - Profit organization

Subject Core - SC - FIN

304FIN: Advanced Financial Management

CO1	DESCRIBE the basic concepts in financing, investing and profit distribution in a firm
CO2	EXPLAIN theoretical concepts related to raising and use of funds and value of firm
CO3	CALCULATE values for making capital structure, investment, liquidity and dividend decisions in the financial management of a firm
CO4	ANALYZE the options for making the right financial decisions of a firm
CO5	ASSESS the role of financial planning, risk analysis in investments, liquidity and credit management policy of the firm on shareholder value
CO6	DESIGN an appropriate financial strategy using any one or multiple concepts/ techniques learned in this course

305 FIN: International Finance

CO1	Enumerate the key terms associated with International Finance
CO2	Summarize the various the concepts related to regulators, financial markets, Financial Instruments, tax structures at international level
CO3	Illustrate the role of international monitory systems & intermediaries in Global financial market
CO4	Inspect the various parameters of global financial market and interpret best possible international investment opportunities.
CO5	Determine the various strategies to start investment or business at the international level by considering various factors of international finance.
CO6	Formulate the investment plan or business plan by adapting international finance environment

304: Services Operations Management – II

CO1	DEFINE the key concepts in Services Operations Management
CO2	DIFFERENRTIATE between various service strategies, service quality dimensions, and customer relationships based on life time value
CO3	IDENTIFY the sources of value in a service supply relationship & three factors that drive profitability for a professional service firm
CO4	CATEGORIZE a service firm according to its stage of competitiveness.
CO5	MODIFY the Service strategies of an organization for achieving the strategic service vision
CO6	SOLVE the relevant numerical in the scope of the subject.

305 OSCM: Logistics Management

CO1	DEFINE basic terms and concepts related to Logistics management.
CO2	EXPLAIN the infrastructure of logistics, its linkage with various types of communication modes
CO3	DESCRIBE the various dimensions of logistics management and transport, their inter-linkages with different types of freights
CO4	CALCULATE logistic costs and various classification methods of reducing the cost. Involving the information technology and its impacts
CO5	OUTLINE a typical logistic framework and services. ILLUSTRATE the linkages with its dynamic storage system / Customer Issues, Logistic and Business Issues in a real world context
CO6	DISCUSS modern real world logistical systems using the various concepts in the syllabus

Subject Elective (SE) Course

315 OSCM- Toyota Production Systems

CO1	DESCRIBE 14 principles of the Toyota Way.
CO2	RELATE the TPS with other business situations.
CO3	IMPLEMENT TPS principles to a real-life situation
CO4	EXAMINE the application of TPS principles in a service or manufacturing unit/ organization
CO5	BUILD an organization culture to foster continuous improvement

316 OSCM: Operations & Service Strategy

CO1	ENUMERATE the key components of operations strategy
CO2	EXPLAIN the linkages between operations strategy and competitive advantage as the basis of competitive position through superior product development, cost, quality, features
CO3	ILLUSTRATE the broader context of business strategy & fit between manufacturing and operations capabilities and the business strategy
CO4	EXAMINE the concepts of competitive leverage using manufacturing and Operations, the fit of the various elements of manufacturing and operations, the impact of the competitive environment, and the structure of the value chain.
CO5	DESIGN the operations and service strategy
CO6	FORMULATE an operations strategy (long-term plan) and link with operational decisions

317 OSCM: Six Sigma for Operations

CO1	DESCRIBE the Key Concepts and Definitions associated with Quality Management, Six Sigma and Process of Six Sigma
CO2	SUMMARIZE the six-sigma philosophy along with understanding of 7 QC Tools
CO3	PREDICT the change due to Six Sigma Implementation and Application of Six Sigma tools in new settings
CO4	APPRECIATE use of Six Sigma for services performance improvement and strengthening the Organizational Structures
CO5	DECIDE control chart to use for given set of data and ROSS (Return on Six Sigma)

CO6	CREATING a Case for Business Models in Different Industries/Proposing a Strategy by Studying the cases of Successful Six Sigma Implementation

Subject Elective (SE-IL) Course – Financial Management

315FIN: Indirect Taxation

CO1	Remembering the key concepts of Indirect Taxes in India Identifying and enumerating the various terms associated with GST and other indirect taxes
CO2	Explain how GST works as an Uniform Tax Structure, Illustrate the GST framework of India, & describe the important concepts such as supply, dual taxation method, registration process, etc.
CO3	Apply the theories and Principles and perform all calculation through numerical problems on valuation and calculation of taxes. Identify the time value of supply; determine the taxable person and tax levied on goods and services
CO4	Illustrate the e filling process of GST Categorize the Goods and Services under GST and amount of tax to be paid using Dual tax concept
CO5	Evaluate Input Tax Credit Process, reversal, late filing and New Amendments; appraise various indirect taxes; Interpret the GST framework in India & verify the tax levied on Goods and Services.
CO6	Elaborate all Provisions of GST and can correlate with filing of returns; virtual e filling can be done Estimate the GST, TDS, anticipate goods, services, tax payable person for the business

318 FIN–Digital Banking

CO1	Remember various concepts and products in Digital Banking
CO2	Explain and understand the significance and development of Digital Banking
CO3	Compare and contrast the Branchless Banking and Traditional Banking
CO4	Analyze the payment system of digital banking from consumer's point of view
CO5	Evaluate Role of digital banking and emerging technologies in economic development

319 FIN – Treasury Management

CO1	Remembering the key concepts of Treasury Management, Treasury markets,cash management, and internal controls.
CO2	Explain organisation structure and functions of treasury, Illustrate cash flow cycle, relate various types of risks; describe the important concepts such as liquidity, controls, etc.
CO3	Identify the market participants, treasury products, Apply the concepts of , forex cash management. Use concepts to mitigate financial and operational risks.
CO4	Outline the responsibilities and functions of Treasury Manager, Classify types of Treasury markets, Illustrate and analyse the risk
CO5	Explain the structure and organisation of Treasury; compare types of liquidity, controls and audits; appraise funding alternatives. Appraise the moral and ethical aspects in treasury management

CO6	Design the money and funds management plan in a given situation using various concepts and instruments used in treasury function

Second Year of MBA (2019 Course): SEM IV

Compulsory Generic Core Course

401: Enterprise Performance Management

CO1	Enumerate the different parameters & facets of management control of an enterprise
CO2	Illustrate the various techniques of enterprise performance management for varied sectors
CO3	Determine the applicability of various tools and metrics as a performance evaluation & management tools.
CO4	Analyse the key financial & non-financial attributes to evaluate enterprise performance
CO5	Formulate the various parameters to evaluate enterprise performance effectively through implementation of strategy

402: Indian Ethos & Business Ethics

CO1	DESCRIBE major theories, concepts, terms, models and framework of Indian ethos and business ethics. DISCOVER the contemporary Issues in Business Ethics
CO2	CLASSIFY and RECOGNIZE Karma, Karma Yoga and discover its relevance in business setting, ILLUSTRATE the business ethical decision rationale derived from Indian Heritage Scriptures
CO3	APPLY Principles, Theories, Models and Framework of Indian ethos and business ethics in order to incorporate value system in work culture and work place.
CO4	DEVELOP and EXHIBIT analytical, problem solving skills, and work ethos by COMPREHENSION and PRACTICE of Indian ethos and value system
CO5	IMPLEMENT, EVALUATE, and FACILITATE ethical business behavior and promote sustainable business ecology, improve profitability, foster business relation and employee productivity
CO6	ELABORATE Ethical dilemmas in different business areas of marketing, HRM and Finance and ADAPT dilemma resolution interventions by referring to certain norms, theories and models of Eastern Management

Generic Elective – University Level

406 – Technology Competition and Strategy

CO1	DEFINE the key terms and concepts
CO2	EXPLAIN how technology affects strategic interactions among firms and consumers
CO3	DETERMINE the linkages Technology & Business Strategies
CO4	EXAMINE the technology environment of a firm
CO5	APPRAISE the risks pertaining to technology and competition

408 – Corporate Social Responsibility & Sustainability

CO1	Enumerate the different concepts, legislative provisions, environmental Aspects, best practices, complexity, scope, reports, social framework etc. related to CSR, business ethics & sustainability development
CO2	Compare different CSR theories, cases, dimensions of Sustainability and demonstrate a multi stake holder perspective in viewing CSR, Business ethics & Sustainability issues etc.
CO3	Apply the different models, theories, approaches, cases etc. for implementation & monitoring of CSR activities & Sustainability and its impact on corporate culture & society at large.
CO4	Analyze the different reports, cases, various legal issues relating to CSR, different sustainability reports and various national and global initiatives related to CSR, Business ethics & Sustainability
CO5	Evaluate the level of commitment of different organizations to CSR, Business ethics in attaining Sustainability development & show its competitive advantages
CO6	Create & Implement a CSR policy in attaining Sustainability development and its impact on various stakeholders

Subject Core (SC) Course – Financial Management
404 FIN: Current Trends & Cases in Finance

CO1	DESCRIBE the concepts related to emerging areas of Microfinance, Small finance banks, Payment Banks, Start-Ups, SHG and Digitization and analytics
CO2	EXPLAIN in detail, all the theoretical concepts taught through the syllabus
CO3	APPLY the various theories and models of financial management in the case
CO4	ANALYSE the situation and decide the key financial as well as non-financial elements involved in the situation.
CO5	EVALUATE the financial impact of the alternative on the given case

403 FIN: Financial Laws

CO1	Define and Describe the basic concepts related to Financial Laws
CO2	Illustrate the implications of various laws, Explain concepts and details of various financial laws
CO3	Make use of contextual financial laws applicable to organisations
CO4	Infer the application of financial laws to organisations
CO5	Appraise and perceive the benefits of applicable laws to the organisations

403 OSCM: E Supply Chains and Logistics

CO1	DESCRIBE the structure of modern days Logistics.
CO2	EXPLAIN the key concepts of Supply Chain Management and the – driving forces in contemporary Supply Chain Management
CO3	IDENTIFY the various flows in real world supply chains and Logistics. IDSCRIBE the importance of documentations
CO4	COMPARE and CONTRAST push and pull strategies in Supply Chain Management. ANALYSE the impact of tracking system linkage in Logistics.
CO5	EXPLAIN the key Operational Aspects of E Procurement
CO6	DEVELOP a framework for e-logistics

404 OSCM: Industry 4.0

CO1	DEFINE industrial revolutions and its different aspects
CO2	EXPLAIN the role of technology pillars of Industry 4.0
CO3	DEMONSTRATE the use of data in effective decision making
CO4	ILLUSTRATE the need of cyber physical system for sustainable competitive advantage
CO5	EXPLAIN the challenges faced by various industries in full fledge implementation of Industry 4.0
CO6	DEVELOP a framework for any organization using base of Smart Industry Readiness Index Proposed by Singapore EDB

Subject Elective (SE) Course- Financial Management
410 FIN – Business Valuation

CO1	RECALL concepts of value and valuation
CO2	EXPLAIN valuation process of business firms
CO3	CALCULATE business value using different techniques
CO4	EXAMINE special factors to be considered in business valuation
CO5	ASSESS the value of the firm in the light of business environment and regulatory aspects

410 OSCM- World Class Manufacturing

CO1	DEFINE the basic terms associated with Manufacturing Excellence and World Class Manufacturing
CO2	SUMMARIZE the features of various frameworks used for World Class Manufacturing
CO3	IDENTIFY the challenges to manufacturing industry in the information age
CO4	ANALYZE the usage of Information management tools, Material processing and handling tools.
CO5	EVALUATE the country's preparedness for World Class Manufacturing
CO6	ESTIMATE the performance of manufacturing firms with the measurement system to determine the readiness for World Class Manufacturing

414 FIN- Reinsurance

CO1	UNDERSTAND the major concepts and terms in Reinsurance
CO2	EXPLAIN the execution and legal applications in insurance contracts
CO3	IDENTIFY the forms of reinsurance according to the cases
CO4	ANALYSE the insurer policy
CO5	EVALUATE the insurer's security and claim procedure

414 OSCM- Purchasing and Supplier Relationship Management

CO1	DESCRIBE the Purchasing Process and its importance in organizations
CO2	Students will understand the impact of purchasing on competitive success and profitability of modern-day organizations

CO3	MAKE USE OF the various Negotiation technique in the context of Purchasing process
CO4	ILLUSTRATE how Supplier evaluation and selection is done in Organizations and its relationship with corporate Strategy.
CO5	EXPLAIN the importance of Performance Measurement & Evaluation in operations management
CO6	BUILD A purchasing strategy for a real world situation

Rural & Agri Business Management (MINOR ONLY SPECIALIZATION)
RABM – 01 Agriculture and Indian Economy (SC)

CO1	DEFINE the key terms in Indian Agriculture/Land Reforms/ economic holding.
CO2	EXPLAIN the key terms in The place of agriculture in the national economy/ The present position of Indian Agriculture with an advanced management perspective
CO3	IDENTIFY the various issues in the Agriculture Industry in India. DEMONSTRATE their significance from the perspective of Indian farmer & Indian Economy &business decision making
CO4	EXAMINE the inter-relationships between various facets of Agriculture & economy from the perspective of a farmer, Labour, firm, industry, market, competition and business cycles.
CO5	DEVELOP critical thinking based on changing pattern of ownership and operational holdings in India, Farms size, Productivity/ Profitability and farm efficiency
CO6	ANTICIPATE how other firms in an industry and consumers will respond to economic decisions made by a business, and how to incorporate these responses into their own decisions

RABM – 02 ICT for Agriculture Management (SE)

CO1	RECALL the basic terminologies related to ICT
CO2	UNDERSTAND the use of ICT with different aspects & various issues & challenges for ICT information services
CO3	Apply the GIS Applications in micro resource mapping
CO4	ANALYZE the different tools and techniques used under ICT in Agriculture Management
CO5	EVALUATE the common ICT platforms for information services
CO6	CHOOSE the right ICT as per the requirement of agriculture activity

RABM – 04 Rural Marketing – I (SC)

CO1	RECALL and REPRODUCE the various concepts, principles, frameworks, and terms related to the function and role of marketing in Rural areas
CO2	DISCUSS the Rural versus Urban Marketing concept and ILLUSTRATE the role that marketing plays in the 'tool kit' of a Rural Marketer
CO3	A P PLY the models of consumer behavior in the rural market
CO4	EXAMINE and LIST different aspects of segmentation, targeting and positioning, marketing environmental forces, consumer buying behavior, in the context of rural marketing
CO5	E V ALUATE the challenges of Rural marketing research with different approaches and tools

CO6	CREATE a new consumer behavior model on the rural consumer with the help of cases with rural marketing experiences

Pharma & Health Care Management

PHCM- 01 Fundamental of Pharma and Healthcare

Management (SC)

CO1	DESCRIBE concept of Pharma and healthcare management and FIND out the different role and responsibilities of managers
CO2	UNDERSTAND the different managerial functions of managers
CO3	IDENTIFY right the motivation for right stakeholder in the healthcare sector for effective delivery of service
CO4	ANALYZE modern Pharma and Healthcare models
CO5	EXPLAIN government initiatives to provide healthcare facilities in each part of country
CO6	CONSTRUCT model to provide effective service in healthcare management

PHCM- 06 Entrepreneurship in Pharma and Healthcare (SE)

CO1	DEFINE the key terms, LIST the Attributes and Characteristics of Entrepreneurs feature and ENUMERATE the Factors influencing Entrepreneurship Growth
CO2	DISCUSS the various theories of entrepreneurship
CO3	CONSTRUCT a framework for a typical EDP for the Pharma industry
CO4	EXAMINE the role of Government and various support organizations in encouraging and supporting Entrepreneurship
CO5	COMPOSE an inventory of possible entrepreneurial opportunities in contemporary local, regional and national the context for Pharma and Healthcare sector.
CO6	BUILD a business plan for an entrepreneurial pharma of healthcare venture.

Tourism & Hospitality Management (MINOR ONLY SPECIALIZATION)

Fundamentals of Hospitality Management (SC)

CO1	DESCRIBE different types of hotels & travel agents
CO2	UNDERSTAND the basic functioning of star hotels, major operational, Departments, government rules & regulations
CO3	USE of flow charts & diagrams of various Hospitality Sectors to know the hierarchy of the organization
CO4	EXAMINE current changes taking place in the Hotel & Tourism Industry
CO5	EVALUATE the changes required to improve traditional methods to suit the current market trends
CO6	DEVELOP Smart techniques adaptable to the present market scenario for better customer satisfaction

THM-06 Revenue Management for Hospitality (SE)

CO1	DESCRIBE Basic concepts & terminologies related to finance & revenue
CO2	EXPLAIN Flow of cash, capital, investment, loan & generation of revenue from various sectors of Hospitality Franchising, leasing & renting out properties
CO3	DETERMINE the utilization of available funds for business maximization
CO4	To ANALYSE Financial status of the organisation

CO5	MEASURE the relation between income & outflow of revenue, profit & loss of organization Budgeting of required necessities Forecasting business & making necessary investments
CO6	DEVELOP Business plan for future prospectus of organization Business proposals & expansions