**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. |

**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. |

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| **CO 1** | Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity. |
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| **CO 5** | Identify chemical compounds based on their structure. |
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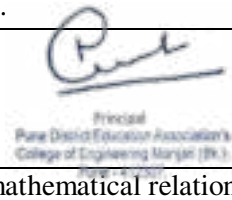


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**110005 : : Programming and Problem Solving**

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| **CO 6** | Design record management in structured document and files management using python |

**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. |

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**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. |

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**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.

**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.
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8. **PO8: Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
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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.

**Programme Specific Outcomes (PSOs)**

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**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 | U**nderstand** 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. |

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**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. |

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**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 | U**se** 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 |

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**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 |

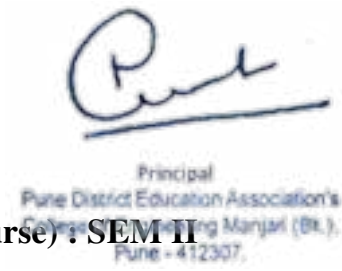
## 310249: Seminar and Technical Communication

| | |
|---|---|
| **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. |

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## 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**

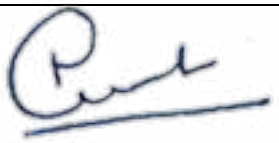
| | |
|---|---|
| **CO4** | Use tools and techniques in the area of Cloud Computing |
| **CO5** | Use cloud computing services for problem solving |
| **CO6** | Design and develop applications on cloud |

**310259: Audit Course 6**

**310259(C) - Leadership and Personality Development**

| | |
|---|---|
| **CO1** | Express effectively through communication and improve listening skills |
| **CO3** | Develop **e**ffective 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**



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**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**

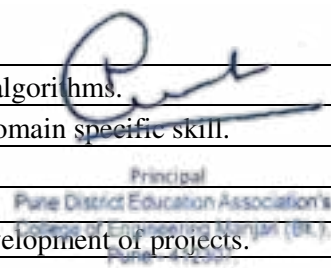
| | |
|---|---|
| CO1 | Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance. |
| CO2 | Design and develop project test plan, design test cases, test data, and conduct test operations |
| CO3 | Apply recent automation tool for various 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**

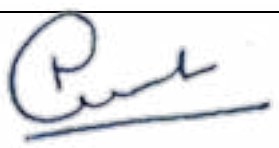
| | |
|---|---|
| CO1 | Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzylogic, fuzzy inference systems and genetic algorithms |
| CO2 | Design and development of certain scientific applications and genetic algorithms in specified applications. |
| CO3 | Commercial 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 |



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**Information Technology Department**

## 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.

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**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.

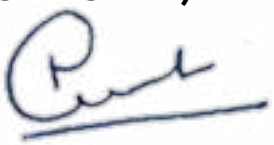
**2.PSO2:**An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems.

**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)



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### 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**

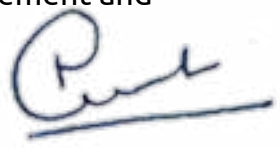
Course Outcomes:
On completion of the course, students will be able to–
CO1: Analyze algorithms and to determine algorithm correctness and time efficiency class.
CO2: Implement abstract data type (ADT) and data structures for given application.
CO3: Design algorithms based on techniques like brute -force, 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.



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**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**

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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.

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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**

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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.

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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)**

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**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.

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**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**

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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.

**Course Outcomes(CO)**

**Fourth Year of Information Technology (2015 Course)(SEMESTER-I)**

**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.

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

**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.

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## 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

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**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**

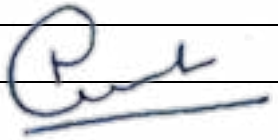
| | |
|---|---|
| CO1 | ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system. |
| CO2 | DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction. |
| CO3 | EVALUATE the heat transfer rate in natural and forced convection & validate 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**

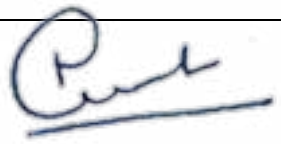
| | |
|---|---|
| CO1 | DEFINE metal cutting principles and mechanics of metal cutting and tool life. |
| CO2 | DESCRIBE features of gear and thread manufacturing processes. |
| CO3 | SELECT appropriate grinding wheel and demonstrate the various surface finishing processes. |
| CO4 | SELECT appropriate 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 |



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# 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 |

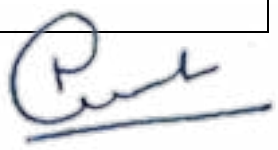
**302050: Computer Aided Engineering**

| | |
|---|---|
| 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**

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| | |
|---|---|
| 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 |

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## 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 |

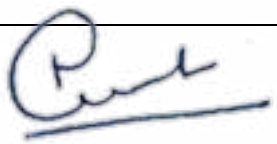
## Course Code : 402049 B Course Name : Elective – III
## Industrial Engineering

| | |
|---|---|
| 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.<br>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



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| | |
|---|---|
| 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 |

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

**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

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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.

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## 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.

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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

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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

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**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

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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

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**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**

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**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

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**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)**

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**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

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# 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.

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## 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<br>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<br>Hold Circuit. |

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| | |
|---|---|
| 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**

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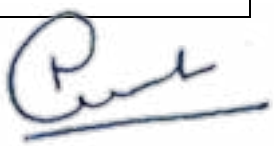
| | |
|---|---|
| CO1 | Identify and represent the type of signals and systems and Perform elementary operations on signals |
| CO2 | Classify systems based on their properties |
| CO3 | Understand fundamental properties of LTI systems and be able to determine response of the system for given input |
| 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 |

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| | |
|---|---|
| | 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. |

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**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. |

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# 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

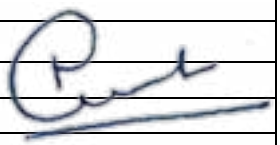
| | |
|---|---|
| CO1 | To make the students understand the fundamentals of automation and various automation systems used in industry such as PLC, DCS, and SCADA. |
| CO2 | Students should understand the working of these systems and should be able to determine hardware and software requirements of PLC, 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 |



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**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 |

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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

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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)

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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 |

GENERIC ELECTIVES UNIVERSITY LEVEL

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)

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|---|---|
| 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) |

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| 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<br>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<br>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 |

| | |
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| 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

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|---|---|
| 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

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|---|---|
| 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 |

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|---|---|
| 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)

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|---|---|
| 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 |

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| 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)

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|---|---|
| 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)

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|---|---|
| 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<br>Business proposals & expansions |

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