Dr. D. Y. Patil Group of Institutions' Technical Campus
Dr. D. Y. PATIL SCHOOL OF ENGINEERING
Dr. D. Y. Patil Knowledge City, Charholi Bk., Via. Lohegaon,
Pune – 412 105.

COURSE OUTCOMES

1] Department of Engineering Sciences

2] Department of E&TC Engineering

3] Department of Mechanical Engineering

4] Department of Computer Engineering

5] Department of Civil Engineering

Dr D Y Patil School of Engineering Lohegaon, Pune

Dept. of Engineering Sciences (FE)

COURSE OUTCOMES (CO's)

Savitribai Phule Pune University		
First Year Engineering (2019 Course)		
107001 – Engineering Mathematics – I		
Teaching Scheme: **TH : 3 Hrs./Week** **TUT : 1 Hr/Week**	**Credits** **04**	**Examination Scheme:** **In-Semester Exam :30 Marks** **End-Semester Exam :70 Marks** **TW :25 Marks**
Prerequisites: Differentiation, Integration, Maxima and Minima, Determinants and Matrices.		
Course Objectives: To make the students familiarize with concepts and techniques in Calculus, Fourier series and Matrices. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.		
Course Outcomes (COs): The students will be able to learn **CO1**: Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems. **CO2:** the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems. **CO3:** to deal withderivative of functions of several variables that are essential in various branches of Engineering. **CO4:** 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. **CO5**: 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		
Teaching Scheme: **TH: 04 Hr/week** **PR: 02 Hr/Week**	**Credits** **05**	**Examination Scheme:** **In-Semester :30 Marks** **End-Semester :70 Marks** **PR :25 Marks**
Prerequisite Courses, if any: Fundamentals of: optics, interference, diffraction polarization, wave-particle duality, semiconductors and magnetism		
Companion Course, if any: Laboratory Practical		
Course Objectives: To teach students basic concepts and principles of physics, relate them to laboratory experiments and their applications		
Course Outcomes: On completion of the course, learner will be able to– **CO1**: Develop understanding of interference, diffraction and polarization; connect it to few engineering applications. **CO2**: Learn basics of lasers and optical fibers and their use in some applications. **CO3**: Understand concepts and principles in quantum mechanics. Relate them to some applications. **CO4**: Understand theory of semiconductors and their applications in some semiconductor devices. **CO5**: Summarize basics of magnetism and superconductivity. Explore few of their technological applications. **CO6**: Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.		

102003 - Systems in Mechanical Engineering		
Teaching Scheme: **TH : 3 Hrs./week** **PR : 2 Hrs./Week**	**Credits** **04**	**Examination Scheme:** **In-Semester :30 Marks** **End-Semester :70 Marks** **PR :25 Marks**

Course Objectives:

1. To identify the sources of energy and their conversions
2. To explain the basic concept of engineering thermodynamics and its application
3. To understanding the specifications of vehicles
4. To get acquainted with vehicle systems
5. To introduce manufacturing processes applying proper method to produce components
6. To be able to select and compare domestic appliances

Course Outcomes

On completion of the course, learner will be able to

CO1: Describe and compare the conversion of energy from renewable and non-renewable energy sources

CO2: Explain basic laws of thermodynamics, heat transfer and their applications

CO3: List down the types of road vehicles and their specifications

CO4: Illustrate various basic parts and transmission system of a road vehicle

CO5: Discuss several manufacturing processes and identify the suitable process

CO6: Explain various types of mechanism and its application

103004: Basic Electrical Engineering

Teaching Scheme:	Credits	Examination Scheme:
TH : 03 Hr/week PR : 02 Hr/Week	04	In-Semester : 30 Marks End-Semester : 70 Marks PR : 25 Marks

Prerequisite Courses, if any: Engineering physics, electron theory, electricity, potential and kinetic energy

Course Overview: This course aims at enabling students of all Engineering Branches to understand the basic concepts of electrical engineering. This course is designed to provide knowledge of fundamentals and various laws in electromagnetic and magnetic circuits, electrostatics. The steady state analysis of AC and DC circuits, and its applications transformer, batteries and different energy conversion techniques are also included in this course.

Course Objectives:

1. To introduce fundamental concepts, various laws-principles and theorems associated with electrical systems.
2. To impart basic knowledge of all electrical quantities such as current, voltage, power, energy, frequency along with different types of fields.
3. To provide knowledge about fundamental parameters such as resistance, inductance and capacitance and magnetic circuits, AC and DC circuits.
4. To provide knowledge of the concepts of transformer, different energy conversions techniques.

Course Outcomes:

At the end of course students will be able to

CO1: Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.

CO2: Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic

CO3: Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.

CO4: 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

CO5: Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply.

CO6: Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.

110005: Programming and Problem Solving

Teaching Scheme:	Credits	Examination Scheme:
TH: 03 Hrs/Week	04	In-Semester : 30 Marks
PR : 02 Hrs/Week		End-Semester : 70 Marks
		PR : 25 Marks

Prerequisite Courses, if any: students are expected to have a good understanding of basic computer principles.

Companion Course, if any: Programming and Problem Solving Laboratory (110005)

Course Objectives:

Prime objective is to give students a basic introduction to programming and problem solving with computer language Python. And to introduce students not merely to the coding of computer programs, but to computational thinking, the methodology of computer programming, and the principles of good program design including modularity and encapsulation.

1. To understand problem solving, problem solving aspects, programming and to know about various program design tools.
2. To learn problem solving with computers
3. To learn basics, features and future of Python programming.
4. To acquaint with data types, input output statements, decision making, looping and functions in Python
5. To learn features of Object Oriented Programming using Python
6. To acquaint with the use and benefits of files handling in Python

Following Fields are applicable for courses with companion Laboratory course

Course Outcomes: On completion of the course, learner will be able to–

CO1: Inculcate and apply various skills in problem solving.

CO2: Choose most appropriate programming constructs and features to solve the problems in diversified domains.

CO3: Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.

CO4: Demonstrate significant experience with the Python program development environment.

111006 -Workshop Practice

Teaching Scheme:	Credits	Examination Scheme:
PR : 2 Hrs/Week	01	PR : 25 Marks

Course Objectives:

1. To understand the construction and working of machine tools and functions of its parts.
2. To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shop leading to understanding of a production processes.
3. To understand workshop layout and safety norms.

Course Outcomes:

CO1: Familiar with safety norms to prevent any mishap in workshop.

CO2: Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.

CO3: Able to understand the construction, working and functions of machine tools and their parts.

CO4: Able to know simple operations (Turning and Facing) on a centre lathe.

101007: Environmental Studies-I

TH:02 Hrs./week **(Mandatory Non-Credit Course)**

Course Objectives:

1. To explain the concepts and strategies related to sustainable development and various components of environment.
2. To examine biotic and abiotic factors within an ecosystem, to identify food chains, webs, as well as energy flow and relationships.
3. To identify and analyze various conservation methods and their effectiveness in relation to renewable and nonrenewable natural resources.
4. To gain an understanding of the value of biodiversity and current efforts to conserve biodiversity on national and local scale.

Course Outcomes: On completion of the course, learner will be able to–

CO1:Demonstrate an integrative approach to environmental issues with a focus on sustainability.

CO2: Explain and identify the role of the organism in energy transfers in different ecosystems.

CO3: Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.

CO4: Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.

107008 – Engineering Mathematics – II		
Teaching Scheme: **TH : 4 Hrs./Week** **TUT : 1 Hr./Week**	**Credits** **05**	**Examination Scheme:** **In-Semester : 30 Marks** **End-Semester : 70 Marks** **TW : 25 Marks**

Prerequisites:

Integration, Differential Equation, Three-dimensional coordinate systems

Course Objectives:

To make the students familiarize with Mathematical Modeling of physical systems using differential equations advanced techniques of integration, tracing of curve, multiple integrals and their applications. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power, useful in their disciplines.

Course Outcomes (COs): The students will be able to learn

CO1: 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.

CO2: 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.

CO3: to trace the curve for a given equation and measure arc length of various curves.

CO4: the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.

CO5: evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

107009: Engineering Chemistry

Teaching Scheme:	Credits	Examination Scheme:
TH : 04 Hrs/week	05	In Semester : 30 Marks
PR : 02 Hrs/Week		End Semester: 70 Marks
		PR : 25 Marks

Prerequisite Courses, if any:
Types of titrations, volumetric analysis, structure property relationship, types of crystals, periodic table, classification and properties of polymers, electromagnetic radiation, electrochemical series

Companion Course, if any: Laboratory Practical

Course Objectives:

1. To understand technology involved in analysis and improving quality of water as commodity.
2. To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials.
3. To understand structure, properties and applications of speciality polymers and nano material.
4. To study conventional and alternative fuels with respect to their properties and applications.
5. To study spectroscopic techniques for chemical analysis.
6. To understand corrosion mechanisms and preventive methods for corrosion control.

Course Outcomes:
On completion of the course, learner will be able to–

CO1: Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.

CO2: Select appropriate electro-technique and method of material analysis.

CO3: Demonstrate the knowledge of advanced engineering materials for various engineering applications.

CO4: Analyze fuel and suggest use of alternative fuels.

CO5: Identify chemical compounds based on their structure.

CO6: Explain causes of corrosion and methods for minimizing corrosion.

104010:Basic Electronics Engineering

Teaching Scheme:	Credits	Examination Scheme
TH : 03 Hrs./week	04	In - Semester : 30 Marks
PR : 02 Hrs./week		End - Semester : 70 Marks
		PR : 25 Marks

Course Objectives:

1. The principle of electronics and working principle of PN junction diode and special purpose diodes.
2. The functioning of transistors like BJT, MOSFETs and OPAMP.
3. Basics of various logic gates, digital circuits and their applications.
4. Working and functions of various electronic instruments.
5. The operating principles and applications of various active and passive sensors.
6. Basic principles of communication systems.

Course Outcomes: On completion of the course, learner will be able to–

CO1: Explain the working of P-N junction diode and its circuits.

CO2: Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.

CO3: Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.

CO4: Use different electronics measuring instruments to measure various electrical parameters.

CO5: Select sensors for specific applications.

102012: Engineering Graphics

Teaching Scheme:	Credits	Examination Scheme:
TH : 01 Hr/week	02	End-Semester : 50 Marks
PR : 02 Hrs/Week		TW : 25 Marks
TUT : 01 Hr/Week		

Course Objectives

1. To acquire basic knowledge about engineering drawing language, line types, dimension methods, and simple geometrical construction.
2. To draw conic sections by various methods, involutes, cycloid and spiral.
3. To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views.
4. To visualize three dimensional engineering objects and shall be able to draw their isometric views.
5. To imagine visualization of lateral development of solids.
6. To acquire basic knowledge about the various CAD drafting software's and its basic commands required to construct the simple engineering objects.

Course Outcomes

On completion of the course, learner will be able to

CO1: Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.

CO2: Construct the various engineering curves using the drawing instruments.

CO3: 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.

CO4: Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.

CO5: Draw the development of lateral surfaces for cut section of geometrical solids.

CO6: Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

110013: Project Based Learning

Teaching Scheme:	Credits	Examination Scheme:
PR: 04 Hrs/Week	02	PR : 50 Marks

Preamble:

For better learning experience, along with traditional classroom teaching and laboratory learning; project based learning has been introduced with an objective to motivate students to learn by working in group cooperatively to solve a problem.

Project-based learning (PBL) is a student-centric pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Students learn about a subject by working for an extended period of time to investigate and respond to a complex question, challenge, or problem. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Problem based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development.

Course Objectives:

1. To emphasizes learning activities that are long-term, interdisciplinary and student-centric.
2. To inculcate independent learning by problem solving with social context.
3. To engages students in rich and authentic learning experiences.
4. To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism

Course Outcomes:

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

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

- There should be team/group of 5 -6 students
- A supervisor/mentor teacher assigned to individual groups

101014: Environmental Studies-II

TH: 02 Hr/week **Mandatory Non-Credit Course**

Course Objectives:

1. To provide a comprehensive overview of environmental pollution and the science and technology associated with the monitoring and control.
2. To understand the evolution of environmental policies and laws.
3. To explain the concepts behind the interrelations between environment and the development.
4. To examine a range of environmental issues in the field, and relate these to scientific theory.

Course Outcomes: On completion of the course, learner will be able to–

CO1: Have an understanding of environmental pollution and the science behind those problems and potential solutions.
CO2: Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO3: Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO4: 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.

Course Outcomes (COs)

SE E&TC Engineering (2015 Course), Semester I

1) 204181: Signals and Systems

CO1: To understand the mathematical description of continuous and discrete time signals and systems.

CO2: To classify signals into different categories.

CO3: To analyse Linear Time Invariant (LTI) systems in time and transform domains.

CO4: To build basics for understanding of courses such as signal processing, control system and communication.

CO5: To develop basis of probability and random variables.

2) 204182 :Electronic Devices and Circuits

CO1: To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications.

CO2: To introduce concepts of both positive and negative feedback in electronic circuits.

CO3: To analyse and interpret FET and MOSFET circuits for small signal at low and high frequencies.

CO4: To simulate electronics circuits using computer simulation software and verify desired results.

CO5: To study the different types of voltage regulators.

3) 204183 :Electrical Circuits and Machines

CO1: To analyse AC and DC networks with network simplification techniques.

CO2: To gain basic knowledge of transformers and their types.

CO3: To conduct experimental procedures on different types of electrical machines.

CO4: To understand the constructional details, characteristics, features and application areas of various types of electric motors.

4) Data Structures and Algorithms

CO1: To assess how the choice of data structures and algorithm design methods impacts the performance of programs.

CO2: To choose the appropriate data structure and algorithm design method for a specified application.

CO3: To study the systematic way of solving problems, various methods of organizing large amounts of data.

CO4: To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.

To employ the different data structures to find the solutions for specific problems

5) Digital Electronics

CO1: To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.

CO2: To lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor.

6) 204186: Electronic Measuring Instruments and Tools

CO1: To make student competent for handling measuring instruments and to able to select right instrument for the purpose of measurement under different conditions.

SE E&TC Engineering (2015 Course), Semester II

1) 207005: Engineering Mathematics -III

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

CO1: Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.

CO2: Transforms such as Fourier transform, Z-transform and applications to Communication systems and Signal processing.

CO3: Vector differentiation and integration required in Electro-Magnetics and Wave theory.

CO4: Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

2) 204187 : Integrated Circuits

CO1: To understand characteristics of IC and Op-Amp and identify the internal structure.

CO2: To introduce various manufacturing techniques.

CO3: To study various op-amp parameters and their significance for Op-Amp.

CO4: To learn frequency response, transient response and frequency compensation techniques for Op-Amp.

CO5: To analyse and identify linear and nonlinear applications of Op-Amp.

CO6: To understand functionalities of PLL and its use in various applications in communication and control systems.

3) 204188 : Control Systems

CO1: To introduce the elements of control system and their modelling using various Techniques.

CO2: To introduce methods for analyzing the time response, the frequency response and the stability of systems.

CO3: To introduce the concept of root locus, Bode plots, Nyquist plots.

CO4: To introduce the state variable analysis method.

CO5: To introduce concepts of PID controllers and digital and control systems.

CO6: To introduce concepts programmable logic controller.

4) 204189: Analog Communications

The students are expected to demonstrate the ability to:

CO1: Describe and analyze the mathematical techniques of generation, transmission and reception of amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) signals.

CO2: Evaluate the performance levels (Signal-to-Noise Ratio) of AM, FM and PM systems in the presence of additive white noise.

CO3: Convert analog signals to digital format and describe Pulse and digital Modulation techniques.

5) 204190 : Object Oriented Programming

CO1: Make the students familiar with basic concepts and techniques of object oriented programming in C++ & Java.

CO2: Develop an ability to write programs in C++ and Java for problem solving.

6) 204191 : EMPLOYABILITY SKILL DEVELOPMENT

CO1: To develop analytical abilities

CO2: To develop communication skills

CO3: To introduce the students to skills necessary for getting, keeping and being successful in a profession.

CO4: To expose the students to leadership and team-building skills.

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Department of Electronics &Telecommunication Engineering

Course Outcomes (COs)

TE E&TC Engineering (2015 Course), Semester I

1) 304181: Digital Communication

CO1: Graduates able to understand the building blocks of digital communication system.

CO2: Students able to prepare mathematical background for communication signal analysis.

CO3: To understand and analyze the signal flow in a digital communication system

CO4: To analyze error performance of a digital communication system in presence of noise and Other interferences.

CO5: To understand concept of spread spectrum communication system.

2) 304182 : Digital Signal Processing

CO1: To introduce students with transforms for analysis of Discrete time signals and systems.

CO2: To understand the digital signal processing, sampling and aliasing .

CO3: To use and understand implementation of digital filters.

3) 304183 : Electromagnetics

CO1: To introduce the basic mathematical concepts related to electromagnetic vector fields.

CO2: To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.

CO3: To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.

CO4: To impart knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.

CO5: To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission

4) 304184 : Microcontrollers

CO1: To understand architecture and features of typical Microcontroller.

CO2: To understand need of microcontrollers in real life applications.

CO3: To learn interfacing of real world peripheral devices

CO4: To study various hardware and software tools for developing applications.

5) 304185: Mechatronics

CO1: To understand the concept and key elements of Mechatronics system, representation into block diagram.

CO2: To understand principles of sensors their characteristics.

CO3: To Understand of various data presentation and data logging systems.

CO4: To Understand concept of actuator .

CO5: To Understand various case studies of Mechatronics systems.

6) 304193: Electronic System Design

CO1: Design working, reliable and electronic system to meet specifications.

CO2: Inculcate circuit designing skills and ability and to use modern design tools.

CO3: Enhance employability based on knowledge and understandings of electronic system design.

CO4: To learn basics of database systems used in design / simulation software.

CO5: To create an interest in the field of electronic design as a prospective career option.

TE E&TC Engineering (2015 Course), Semester II

1) 304186 : Power Electronics

CO1: To introduce students to different power devices to study their construction, characteristics and turning on circuits.

CO2: To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.

CO3: To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

2) 304187: Information Theory Coding Techniques and Communication Networks

CO1: To understand information theoretic behavior of a communication system.

CO2: To understand various source coding techniques for data compression

CO3: To understand various channel coding techniques and their capability.

CO4: To Build and understanding of fundamental concepts of data communication and networking.

3) 304188: Business Management

CO1: To get awareness about various domains in Business Management.

CO2: To understand concept of Quality Management, Financial Management and Project Management.

CO3: To learn Human Resource Management, marketing management are the major tasks in Business

CO4: To promote Entrepreneurship.

4) 304189: Advanced Processors

CO1: To understand need and application of ARM Microprocessors in embedded system.

CO2: To study the architecture of ARM series microprocessor .

CO3: To understand architecture and features of typical ARM7& DSP Processors.

CO4: To learn interfacing of real world input and output devices .

CO5: To learn embedded communication systems

5) 304190: System Programming and Operating System

CO1: To understand system software concepts, like the use and implementation of assembler, macros, linker, loaders and compiler.

CO2: To get acquainted with software tools for program development.

CO3: To explore memory allocation methods, input output devices and file system w. r. t. various operating system.

CO4: To study and implement various processes scheduling techniques and dead lock avoidance schemes in operating system.

6) 304196 : Employability Skills and Mini Project

CO1: To understand the ―Product Development Process‟ including budgeting through Mini Project.

CO2: To plan for various activities of the project and distribute the work amongst team members.

CO3: To inculcate electronic hardware implementation skills by -

CO4: Learning PCB artwork design using an appropriate EDA tool.

CO5: Imbibing good soldering and effective trouble-shooting practices.

CO6: Following correct grounding and shielding practices.

CO7: To develop student‘s abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.

CO8: To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (COs)

BE E&TC Engineering (2015 Course), Semester I

1) 404181 :VLSI Design & Technology

CO1: To explore HDL and related design approach.

CO2: To nurture students with CMOS circuit designs.

CO3: To realize importance of testability in logic circuit design.

CO4: To overview ASIC issues and understand PLD architectures with advanced features.

2) 404182:Computer Networks & Security

CO1: To understand state-of-the-art in network protocols, architectures, and applications

CO2: To provide students with a theoretical and practical base in computer networks issues

CO3: To outline the basic network configurations

CO4: To understand the transmission methods underlying LAN and WAN technologies.

CO5: To understand security issues involved in LAN and Internet.

3) 404183: Radiation and Microwave Techniques

CO1: To introduce fundamental theory of radiation and microwaves.

CO2: To understand design principles of various radiating elements.

CO3: To understand theory of passive and active components of microwave systems.

CO4: To learn microwave measurement techniques.

4) 404184: Digital Image and Video Processing (Elective-I)

CO1: Understand the fundamental concepts of Digital Image Processing with basic relationship of pixels and mathematical operations on 2-D data.

CO2: Learn design and integrate image enhancement and image restoration techniques

CO3: Understand object segmentation and image analysis techniques

CO4: Learn the need for effective use of resources such as storage and bandwidth and ways to provide effective use of them by data compression techniques

CO5: Learn basic concepts of video processing

5) 404184 :Industrial Drives and Control (Elective-I)

CO1: Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology

CO2 Study and understand the operation of electric motor drives controlled from a power electronic converter and to introduce the design concepts of controllers for closed loop operation

CO3: Study DC, AC, special machines like stepper motor, servo motor and brushless motor and their control

6) 404184 :Embedded Systems and RTOS(Elective-I)

CO1: To understand and able to design an application specific systems.

CO2: To develop implementation skill for application specific systems.

CO3: To understand design and implementation of real time system using RTOS

CO4: To understand open source platform for embedded system

7) 404184 :Internet of Things (Elective-I)

CO1: To study fundamental concepts of IoT

CO2: To understand roles of sensors in IoT

CO3: To Learn different protocols used for IoT design

CO4: To be familiar with data handling and analytics tools in IoT

8) 404184 :Internet of Things (Elective-I)

CO1: To study fundamental concepts of IoT

CO2: To understand roles of sensors in IoT

CO3: To Learn different protocols used for IoT design

CO4: To be familiar with data handling and analytics tools in IoT

9) 404185 :Wavelets (Elective-II)

CO1: Learn and understand basic linear algebra

CO2: Understand the need of time frequency resolution

CO3: Understand the basics of Discrete Wavelet transform and various wavelets available

CO4: Learn the signal analysis using multi-resolution analysis

CO5: Study the applications of Wavelets in compression, enhancement, noise removal etc.

10) 404185 :Electronic Product Design (Elective-II)

CO1: To understand the stages of product (hardware/ software) design and development.

CO2: To learn the different considerations of analog, digital and mixed circuit design.

CO3: To be acquainted with methods of PCB design and different tools used for PCB Design.

CO4: To understand the importance of testing in product design cycle.

CO5: To understand the processes and importance of documentation.

11) 404185 :Artificial Intelligence (Elective II)

CO1: To learn various types of algorithms useful in Artificial Intelligence (AI).

CO2: To convey the ideas in AI research and programming language related to emergingtechnology.

CO3: To understand the concepts of machine learning, pattern recognition, and natural language processing.

CO4: To understand the numerous applications and huge possibilities in the field of AI that gobeyond the normal human imagination.

12) 404185 :Optimization Techniques (Elective II)

CO1: To understand the need and origin of the optimization methods.

CO2: To get a broad picture of the various applications of optimization methods used in engineering

CO3: To define an optimization problem and its various components.

13) 404185 :Electronics in Agriculture (Elective II)

CO1: To inculcate the ability to recognize environmental problems and to provide solutions to agricultural sector.

CO2: An over view of technology of advanced topics like DAS, SCADA and Virtual Instrumentation.

CO3: The ability to select the essential elements and practices needed to develop and implement the Engineering Automation for Agricultural sector.

TE E&TC Engineering (2015 Course), Semester II

1) 404189 : Mobile Communication

CO1: To understand switching techniques for voice and data traffic.

CO2: To nurture students with knowledge of traffic engineering to design networks.

CO3: To realize importance of cellular concepts and its propagation mechanism.

CO4: To understand architecture of GSM system.

CO5: To overview 4G LTE and 5G technologies.

2) 404190 :Broadband Communication Systems

CO1: To comprehend the three primary components of a fiber optic communication system.

CO2: To understand the system design issues and the role of WDM components in advanced light wave systems.

CO3: To understand the basics of orbital mechanics and the look angles from ground stations to the satellite.

CO4: To apply subject understanding in Link Design.

3) 404191 :Machine Learning (Elective III)

CO1: Explore supervised and unsupervised learning paradigms of machine learning used for regression and classification.

CO2: To design and analyze various machine learning algorithms using neural networks

CO3: To explore Deep learning technique and various feature extraction strategies.

4) 404191: PLC & Automation (Elective III)

CO1: Student will get the ability to recognize industrial control problems suitable for PLC control

CO2: The learners will get an over view of technology of advanced topics such as SCADA, DCS Systems, DigitalController, CNC Machines.

CO3: Student will gain the ability to select the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

5) 404191:Audio and Speech Processing (Elective III)

CO1: To understand basics of speech production and perception mechanism.

CO2: To understand classification of speech sounds based on acoustic and articulatory phonetics.

CO3: To understand the motivation of short-term analysis of speech and audio.

CO4: To understand various audio and speech coding techniques.

CO5: To perform the analysis of speech signal using LPC.

CO6: To extract the information of the speech or audio signals in terms of cepstral features.

CO7: To provide a foundation for developing applications in the field of speech and audio processing.

6) 404191 :Software Defined Radio (Elective III)

CO1: To understand ―Modern Radio Communication System ― that can be reconfigured

CO2: To understand GNU Radio

CO3: To understand how SDR platform provides easy access to wireless network system

CO4: To understand how unlike simulation in Communication Projects, SDR allows easy

CO5: access to both PHY and MAC layer

CO6: To understand the concept of Cognitive Radio and Spectrum sharing

7) 404191 :Audio Video Engineering (Elective III)

CO1: After learning AVE course, students will get benefit to learn and understand the working of real life video system and the different elements of video system plus the encoding/decoding techniques.

CO2: The learners will be groomed up to understand different channel allocations, difference between various systems present in this world, their transmission and reception techniques.

CO3: Students will get insight on functioning of individual blocks, different standards of compression techniques and they will be acquainted with different types of analog, digital TV and HDTV systems.

CO4: The students will get overview of fundamentals of Audio systems and basics of Acoustics

8) 404192 : ROBOTICS (Elective-IV)

CO1: To understand the history, concept development and key components of robotics technologies.

CO2: To understand basic mathematics manipulations of spatial coordinate representation and transformation.

CO3: Able to solve basic robot forward and inverse kinematic problems

CO4: To understand and able to solve basic robotic dynamics, path planning and control problems

9) 404194:Biomedical Electronics (Elective-IV)

CO1: To study Human Physiological Systems from Engineering Perspectives

CO2: To understand the basic signals in the field of biomedical.

CO3: To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, PCG, Pulse.

CO4: To understand Sources and characteristics of noise and artifacts in bio signals.

CO5: To understand use of bio signals in diagnosis, patient monitoring and physiological investigation

10) 404194 Wireless Sensor Networks (Elective-IV)

CO1: To learn basic concepts of Wireless sensor networks

CO2: To be familiar with architecture and protocols used in Wireless sensor networks

CO3: To provide knowledge of deployment and security issued of Wireless sensor networks

11) 404194: Renewable Energy Systems (Elective-IV)

CO1: To study energy generation, different energy sources and their utilization and impact on environment

CO2: To gain knowledge of solar radiation and its applications

CO3: To understand the wind energy and its nature

CO4: To analyze the performance of solar collectors and wind turbines

CO5: To learn fuel cell and its efficiency

Dr. D Y Patil School of Engineering Lohegaon,Pune

Dept. of Mechanical Engineering (SE)

COURSE OUTCOMES (CO's)

207002: Engineering Mathematics III (Mechanical + SW / Production + SW / Industrial /Automobile Engineering)

Teaching Scheme:	**Credit Scheme:**	**Examination Scheme:**
Lectures: 4 Hrs./Week	**Theory: 04**	**Ins-Sem:** 50 Marks
Tutorials: 1 Hr./Week	**Tutorial: 01**	**End-Sem:** 50 Marks

Term work: 25 Marks

Prerequisites: - Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and

first degree, Fourier series, Measures of central tendency and dispersion, Vector algebra

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:

1. Ordinary and partial differential equations applied to Mechanical engineering problems such as mechanical vibrations and heat transfer.
2. Integral Transform techniques such as Laplace transform, Fourier transform and applications to ordinary and partial differential equations in Vibration theory, Fluid dynamics, Heat transfer and Thermodynamics.
3. Statistical methods such as correlation, regression analysis and probability theory in analyzing and interpreting experimental data applicable to Reliability engineering
4. Vector differentiation and integration applied to problems in Fluid Mechanics.

Course Outcomes:

At the end of this course, students will be able to:

1) Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
2) Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
3) Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
4) Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
5) Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.

202041: Manufacturing Process- I

Teaching Scheme:	Credits	Examination Scheme:
TH: 03 Hrs/week	Th: 03	In-Sem: 50
	Tut:--	End-Sem: 50
PR: 02 Hrs/week	PR/OR/TW: 01	PR: --
		OR: --
		TW: 50

Course Objectives:

- To make acquaintance of foundry processes pattern making and casting
- To study metal forming processes such forging, rolling, extrusion and wire drawing.
- To make study of different plastic molding processes
- To study metal joining processes
- To design and development of product with Sheet metal working process
- Introduction to center lathe

Course Outcomes:

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

- Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects.
- Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
- Understand different plastic molding processes, Extrusion of Plastic and Thermoforming
- Understand different Welding and joining processes and its defects
- Understand, Design and Analyze different sheet metal working processes
- Understand the constructional details and Working of Centre Lathe

202042: Computer Aided Machine Drawing

Teaching Scheme:	Credits	Examination Scheme:
TH: 01 hr/week	Th:01	TH In-Sem: 50
		End-Sem: 50
PR: 02 hrs/week	PR/OR/TW:01	PR: 50
		OR: --
		TW: --

Prerequisites: -

1. Fundamentals Engineering Drawing
2. Projection of Solids
3. Basic knowledge of 2-D drafting using graphics software

Course Objectives:

• To understand Parametric Modeling Fundamentals, Procedure, and "Shape before Size" Approach.
• To develop an ability to Create Parametric 2-D Sketches, and Create and Edit Parametric Dimensions.
• To develop an ability to Create Solid Models of machine components. The student should be able to apply these skills to the solution of a variety of practical problems and be able to employ their knowledge to solve more complicated problems.
• To develop an ability to Create assembly models of simple machine (minimum 5 components). The student should be prepared to continue the study of computer aided machine drawing through further subjects/projects in further years of engineering.
• To develop the ability to apply Limits, Fits, and Dimensional Tolerances, as well as Geometric Tolerances to components and assemblies on Engineering Drawings.
• To develop an ability to create 2D drawings from 3D models

Course Outcomes:

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

• Understand the importance of CAD in the light of allied technologies such as CAM, CAE, FEA, CFD, PLM.
• Understand the significance of parametric technology and its application in 2D sketching.
• Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling.
• Ability to create 3D assemblies that represent static or dynamic Mechanical Systems.
• Ability to ensure manufacturability and proper assembly of components and assemblies.
• Ability to communicate between Design and Manufacturing using 2D drawings.

2043: Thermodynamics

Teaching Scheme:	Credits	Examination Scheme:
TH: 04 Hr/week	Th:04	TH In-Sem: 50
		End-Sem: 50
PR: 02 Hrs/week	PR/OR/TW:01	PR: --
		OR: 50
		TW: --

Prerequisites: -

1. Engg. Mathematics
2. Engg. Physics/Chemistry
3. Fundamental Concepts and laws of Thermodynamics.

Course Objectives:

• Identify and use units and notations in Thermodynamics.
• State and illustrate first and second laws of Thermodynamics.
• Explain the concepts of entropy, enthalpy, reversibility and irreversibility.
• Apply the first and second laws of Thermodynamics to various gas processes and cycles.
• To get conversant with properties of steam, dryness fraction measurement, vapor processes and Thermodynamic vapor cycles, performance estimation.
• To get conversant with Psychrometric Charts, Psychrometric processes, human comfort conditions.

Course Outcomes:

• On completion of the course, learner will be able to–
• Apply various laws of thermodynamics to various processes and real systems.
• Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes.
• Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
• Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle.
• Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
• Use Psychromertic charts and estimate various essential properties related to Psychrometry and processes

202044: Material Science

Teaching Scheme:	Credits	Examination Scheme:	
TH: 03 Hrs/week	Theory: 03	TH	In-Sem: 50
			End-Sem: 50
TUT: 01 Hr/week	Tutorial: 01		PR: 50
			OR: --
			TW: 25

Course Objectives:

• To acquaint students with the basic concepts and properties of Material Science
• To impart a fundamental knowledge of Materials Processing
• Selection and application of different Metals & Alloys
• To understand the structure of Engineering Materials
• To develop futuristic insight into Materials

Course Outcomes:

On completion of the course, learner will be able to–
• Understand the basic concepts and properties of Material.
• Understand about material fundamental and processing.
• Select proper metal, alloys, nonmetal and powder metallurgical component for specific requirement
• Detect the defects in crystal and its effect on crystal properties.
• Evaluate the different properties of material by studying different test
• Recognize how metals can be strengthened by cold-working and hot working

202051: Strength of Materials

Teaching Scheme:	Credits	Examination Scheme:	
TH: 04 hr/week	Th:04	TH	In-Sem: 50
			End-Sem: 50
PR: 02 hrs/week	PR/OR/TW:01		PR: --
			OR: 50
			TW: --

Prerequisites: -

1. Fundamentals of engineering mechanics
2. Analysis of forces and moments
3. Laws of motion, kinetics, kinematics
4. Algebra and trigonometry

Course Objectives:

To understand

• Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit.

• Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope an deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure

Course Outcomes:

Student should be able to

• Apply knowledge of mathematics, science for engineering applications

• Design and conduct experiments, as well as to analyze and interpret data

• Design a component to meet desired needs within realistic constraints of health and safety

• Identify, formulate, and solve engineering problems

• Practice professional and ethical responsibility

• Use the techniques, skills, and modern engineering tools necessary for engineering practice

202054: Value Education

Teaching Scheme:	Credits	Examination Scheme:	
TH: --	**Tut:01**	**TH**	**In-Sem: --**
			End-Sem: --
Tutorial: 01 hr/ week	**TW:--**		**PR: --**
			OR: --
			TW: 25

Course Objectives:

• To enable the students to understand meaning of values and select their goals by self-investigation based on personal values.
• To enable the students to understand value of truth, commitments, honesty, sacrifice, care, unity, team work and relationship.
• To educate and make the young generation students aware of their social responsibilities.
• To increase awareness among students about environment and create attitude towards sustainable lifestyle.

Course Outcomes:

On completion of the course, learner will be able to–
• Understood human values, their significance and role in life.
• Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
• Practice respect for human rights and democratic principles.
• Familiarized with various living and non-living organisms and their interaction with environment.
• Understood the basics regarding the leadership and to become a conscious professional

202054 A: Innovations in Engineering Field/ Agriculture

Prerequisites:

1. Knowledge of Mathematics, Physics, and Chemistry is necessary.
2. Out of box/ unconventional thinking for solving typical problems.
3. Adapting analytical tools traditionally.
4. Application oriented thinking of learnt topics

Course Objectives:

• To develop holistically built thinking habit needed for innovative ideas.
• To make students aware about key field of agriculture contributing to sustenance and development of a mankind.
• To expose students to their roles and responsibilities of building a nation through engineering insights in agriculture
• To be updated with innovations and technological advancements in respective fields of engineering.

Course Outcomes:

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

• Understand what is thinking, its tools and process and its application to innovation
• Practice application of innovation in engineering
• Understand important terms like national productivity, sustainable development and inclusive growth
• Throw a light on developing technologies in agriculture
• Learn Interdisciplinary Engineering applications in Agriculture

202054 B : Road Safety

Prerequisites:

1. Awareness about traffic rules and road accidents.
2. Understanding the need of studying such topics.
3. Considerations to other, sensitivity and care while travelling/ driving.

Course Objectives:

- To acquire knowledge and understanding of the road environment.
- To inculcate decision making and behavioral skills necessary to survive in the road environment.
- To impart knowledge and understanding of the causes and consequences of accidents.
- To understand roles and responsibilities in ensuring road safety.

Course Outcomes:

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

- Generate awareness about number of people dyeing every year in road accidents, traffic rules and characteristics of accident.
- Gain information and knowledge about people responsible for accidents and their duties
- Understand the importance of multidisciplinary approach to planning for traffic safety and rehabilitation
- Acquire a certificate of coordination/ participation in compulsory events based on the topic under study

202045: Fluid Mechanics

Teaching Scheme:	Credits	Examination Scheme:	
TH: 04 hr/week	Th:04	TH	In-Sem: 50
			End-Sem: 50
PR: 02 hrs/week	PR/OR/TW:01		PR: 50 OR: -- TW: --

Prerequisites: -

1. Engineering Mathematics
2. Engineering Physics

Course Objectives:

- To understand of various properties of fluids
- To learn fluid statics and dynamics.
- To understand of Boundary layer, Drag, and Lift
- To understand of Bernoulli's equation
- To Know of various applications of Bernoulli's equation

Course Outcomes:

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

- Use of various properties in solving the problems in fluids
- Use of Bernoulli's equation for solutions in fluids
- Determination of forces drag and lift on immersed bodies

202047: Soft Skills

Teaching Scheme:	Credits	Examination Scheme:	
TH: -- hr/week	Th/Tut: --	TH	In-Sem: --
			End-Sem: --
PR: 02 hrs/week	PR: 01		PR: --
			OR: --
			TW: 25

Course Objectives:

• To develop students overall personality.
• To understand and aware about importance, role and contents of soft skills through instructions, knowledge aquisitiion, demonstration and practice.To improve his writing and documentation skills.

Course Outcomes:

On completion of the course, learner will be able to–
• Improved communication, interaction and presentation of ideas.
• Right attitudinal and behaviouralchange
• Developed right-attitudinal and behavioral change

202048: Theory of Machines – I

Teaching Scheme:	Credits	Examination Scheme:	
TH: 04 hr/week	**Th: 04**	**TH**	**In-Sem: 50**
			End-Sem: 50
Tutorial: 01 hr/week	**Tut: 01**		**PR: --**
			OR: 25
			TW: 25

Prerequisites: -

1. Engineering Mathematics
2. Engineering Physics
3. Engineering Mechanics

Course Objectives:

• To make the student conversant with commonly used mechanism for industrial application.
• To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism.
• To develop analytical competency in solving kinematic problems using complex algebra method.
• To develop competency in graphical and analytical method for solving problems in static and dynamic force analysis.
• To develop competency in conducting laboratory experiments for finding moment of inertia of rigid bodies,

Course Outcomes:

On completion of the course, learner will be able to–
• Identify mechanisms in real life applications.
• Perform kinematic analysis of simple mechanisms.
• Perform static and dynamic force analysis of slider crank mechanism.
• Determine moment of inertia of rigid bodies experimentally.
• Analyze velocity and acceleration of mechanisms by vector and graphical methods.

202048: Engineering Metallurgy

Teaching Scheme:	Credits	Examination Scheme:	
TH: 03 hr/week	Th:03	TH	In-Sem: 50
			End-Sem: 50
Tutorial: 01 hr/week	PR/OR/TW:01		PR: -- OR: 25 TW: --

Course Objectives:

- To acquaint students with the basic concepts of Metal Structure
- To impart a fundamental knowledge of Ferrous & Non Ferrous Metal Processing
- Selection and application of different Metals & Alloys
- To Know Fundamentals of Metallography
- To develop futuristic insight into Metals

Course Outcomes:

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

- describe how metals and alloys formed and how the properties change due to microstructure
- apply core concepts in Engineering Metallurgy to solve engineering problems.
- conduct experiments, as well as to analyze and interpret data
- select materials for design and construction.
- possess the skills and techniques necessary for modern materials engineering practice
- recognize how metals can be strengthened by alloying, cold-working, and heat treatment

202050: Applied Thermodynamics

Teaching Scheme:	Credits	Examination Scheme:	
TH: 04 hr/week	Th:04	TH	In-Sem: 50
			End-Sem: 50
PR: 02 hrs/week	PR/OR/TW:01		PR: 50
			OR: --
			TW: --

Prerequisites: -

1. Engineering Thermodynamics.
2. Engineering Mathematics

Course Objectives:

• To get familiar with fundamentals of I. C. Engines, Construction and working Principle of an Engine and Compare Actual, Fuel-Air and Air standard cycle Performance.
• To study Combustion in SI and CI engines and its controlling factor in order to extract maximum power.
• To study emission from IC Engines and its controlling method, Various emission norms.
• Perform Testing of I. C. Engines and methods to estimate Indicated, Brake and Frictional Power and efficiencies
• To understand theory and performance Calculation of Positive displacement compressor.

Course Outcomes:

On completion of the course, learner will be able to–
• Classify various types of Engines, Compare Air standard, Fuel Air and Actual cycles and make out various losses in real cycles.
• Understand Theory of Carburetion, Modern Carburetor, Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.
• Understand Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Theory of Detonation in CI Engines and Comparison of SI and CI Combustion and Knocking and Factors affecting, Criteria for good combustion chamber and types.
• Carry out Testing of I. C. Engines and analyze its performance.
• Describe construction and working of various I. C. Engine systems (Cooling, Lubrication, Ignition, Governing, and Starting) also various harmful gases emitted from exhaust and different devices to control pollution and emission norms for pollution control.
• Describe construction, working of various types of reciprocating and rotary compressors with performance calculations of positive displacement compressors.

203152: Electrical and Electronics Engineering

Teaching Scheme:	Credits	Examination Scheme:	
TH: 03 hr/week	Th:03	TH	In-Sem [Online]: 50 End-Sem: 50
PR: 02 hrs/week	PR/OR/TW:01		PR: -- OR: -- TW: 25

Prerequisites: -

1. Basic Electrical Engineering
2. Basic Electronics Engineering

Course Objectives:

To understand

1. Principle of operation and speed control of DC machines
2. Induction motor principle and its applications
3. Working principle of special purpose motors
4.Microcontrollers
5. Embedded systems terminologies and sensors
6. Data acquisition system for mechanical applications

Course Outcomes:

Student should be able to

1.Develop the capability to identify and select suitable DC motor / induction motor / special purpose motor and its speed control method for given industrial application.
2. Program Arduino IDE using conditional statements
3. Interfacing sensors with Arduino IDE

Dr. D Y Patil School of Engineering Lohegaon,Pune

Dept. of Mechanical Engineering (TE)

COURSE OUTCOMES (CO's)

Course Code: 302041		**Course Name : Design of Machine Elements – I**	
Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: -- 4 Hrs/ Week	**TH:--04**	**TH**	**In-Sem: -- 30**
			End-Sem: -- 70
PR: - 2 Hrs/ Week	**TW:--01**		**TW: -- 50**

Course Objective:

1. Student shall gain appreciation and understanding of the design function in Mechanical Engineering, different steps involved in designing and the relation of design activity with manufacturing activity.

2. The student shall learn to choose proper materials for different machine elements depending on their physical and mechanical properties. They will learn to apply the knowledge of material science in real life situations.

3. Student shall gain a thorough understanding of the different types of failure modes and criteria. They will be conversant with various failure theories and be able to judge which criterion is to be applied for a particular situation.

4. Student shall gain design knowledge of the different types of elements used in the machine design process, for e.g. fasteners, shafts, couplings etc. and will be able to design these elements for each application.

Course Outcome:

1. Ability to identify and understand failure modes for mechanical elements and design of machine elements based on strength.
2. Ability to design Shafts, Keys and Coupling for industrial applications.
3. Ability to design machine elements subjected to fluctuating loads.
4. Ability to design Power Screws for various applications.
5. Ability to design fasteners and welded joints subjected to different loading conditions.
6. Ability to design various Springs for strength and stiffness.

Course Code: 302042 **Course Name : HEAT TRANSFER**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: - 4 Hrs/ Week	**TH:--04**	**TH**	**In-Sem: -- 30**
			End-Sem: -- 70
PR: - 2 Hrs/ Week	**PR:--01**		**PR: -- 50**

Course Objectives:

1. Identify the important modes of heat transfer and their applications.
2. Formulate and apply the general three dimensional heat conduction equations.
3. Analyze the thermal systems with internal heat generation and lumped heat capacitance.
4. Understand the mechanism of convective heat transfer
5. Determine the radiative heat transfer between surfaces.
6. Describe the various two phase heat transfer phenomenon. Execute the effectiveness and rating of heat exchangers.

Course Outcomes:

CO 1: Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.
CO 2: Implement the general heat conduction equation to thermal systems with and without internal heat generation and transient heat conduction.
CO 3: Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
CO 4: Interpret heat transfer by radiation between objects with simple geometries.
CO 5: Analyze the heat transfer equipment and investigate the performance.

Course Code: 302043 **Course Name : Theory of Machine – II**

Teaching Scheme:	Credits	Examination Scheme:	
TH: -- 03 Hrs/week	TH:--03	TH	In-Sem: -- 30
			End-Sem: --70
Tut.:- 01 Hr /week			TW/OR:--01
			OR: -- 25
			TW: -- 25

Course Objectives:

1. To develop competency in understanding of theory of all types of gears.
2. To understand the analysis of gear train.
3. To develop competency in drawing the cam profile.
4. To make the student conversant with synthesis of the mechanism.
5. To understand step-less regulations.
6. To understand mechanisms for system control – Gyroscope.

Course Outcomes:

1. Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design.
2. Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
3. The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
4. Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
5. The student will synthesize a four bar mechanism with analytical and graphical methods.
6. a. The student will analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle.
b. Student will choose appropriate drive for given application (stepped / step-less).

Course Code: 302044 **Course Name : Turbo Machines**

Teaching Scheme:	**Credits:**	**Examination Scheme:**	
TH: -- 03 hrs/week	**TH:-- 03**	**TH**	**In-Sem: -- 30**
PR: -- 02 hrs/week	**OR:-- 01**		
			End-Sem: -- 70
			OR: -- 25

Course Objectives:

1. To provide the knowledge of basic principles, governing equations and applications of turbo machine.
2. To provide the students with opportunities to apply basic thermo-fluid dynamics flow equations to Turbo machines.
3. To explain construction and working principle and evaluate the performance characteristics of Turbo Machines.

Course Outcomes:

On successful completion of the course, the student will be able to,

1. Apply thermodynamics and kinematics principles to turbo machines.
2. Analyze the performance of turbo machines.
3. Ability to select turbo machine for given application.
4. Predict performance of turbo machine using model analysis.

Course Code: 302045 **Course Name : Metrology And Quality Control**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: 03 Hrs/week	**TH:--03**	**TH**	**In-Sem: -- 30**
			End-Sem: -- 70
PR: 02 Hrs/week	**OR:--01**		
			OR: -- 25

Course Objectives:

Students are expected to –

1. Select suitable instrument / gauge / method of inspection for determining geometrical and dimensional measurements.
2. Calibrate measuring instruments and also design inspection gauges.
3. Understand the advances in Metrology such as use of CMM, Laser, Machine Vision System for Metrology etc.
4. Select and apply appropriate Quality Control Technique for given application.
5. Select and Apply appropriate Quality Management Tool and suggest appropriate Quality Management System (QMS).

Course Outcomes:

The student should be able to –

1. Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis.
2. Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
3. Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
4. Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.

Course Code: 302046 **Course Name: Skill Development**

Teaching Scheme:	**Credits**	**Examination Scheme:**
PR: -- 2 Hrs/ Week	**TW/PR:--01**	
		TW:-- 25
		PR:-- 25

COURSE OBJECTIVES

1. To develop the skill for required in shop floor working.
2. To have knowledge of the different tools and tackles used in machine assembly shop.
3. Use of theoretical knowledge in practice.
4. Practical aspect of the each component in the assembly of the machine.

Course Code: 302047 Course Name : Numerical Methods and Optimization

Teaching Scheme:	Credits	Examination Scheme:	
TH: -04 hrs/week	TH:--04	TH	In-Sem: -- 30
			End-Sem: --70
PR: 02 hrs /week	PR:--01		PR: -- 50

Course Objectives:

Students are expected to –

1 Recognize the difference between analytical and Numerical Methods.
2 Effectively use Numerical Techniques for solving complex Mechanical engineering Problems.
3 Prepare base for understanding engineering analysis software.
4 Develop logical sequencing for solution procedure and skills in soft computing.
5 Optimize the solution for different real life problems with available constraints.
6 Build the foundation for engineering research.

Course Outcomes:

The student should be able to –

1. Use appropriate Numerical Methods to solve complex mechanical engineering problems.
2. Formulate algorithms and programming.
3. Use Mathematical Solver.
4. Generate Solutions for real life problem using optimization techniques.
5. Analyze the research problem

Course Code: 302048 **Course Name : Design of Machine Elements – II**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: -- 4 Hrs/ Week	**TH:--04**	**TH:**	**In-Sem: -- 30**
			End-Sem: -- 70
PR: - 2 Hrs/ Week	**TW/OR:--01**		**TW: -- 25**
			OR: -- 25

Course Objective:

1. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements required in transmission systems.
2. Reinforce the philosophy that real engineering design problems are open-ended and challenging
3. Impart design skills to the students to apply these skills for the problems in real life industrial applications
4. Inculcate an attitude of team work, critical thinking, communication, planning and scheduling through design projects
5. Create awareness amongst students about safety, ethical, legal, and other societal constraints in execution of their design projects
6. Develop an holistic design approach to find out pragmatic solutions to realistic domestic and industrial problems

Course Outcome:

The student should be able to –

CO 1: To understand and apply principles of gear design to spur gears and industrial spur gear boxes.
CO 2 : To become proficient in Design of Helical and Bevel Gear
CO 3: To develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.
CO 4: To learn a skill to design worm gear box for various industrial applications.
CO 5: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.
CO 6: To achieve an expertise in design of Sliding contact bearing in industrial applications.

Course Code: 302049 Course Name : Refrigeration and Air Conditioning

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH : 03 hrs/week	**TH:-- 03**	**TH**	**In-Sem: -- 30**
			End-Sem: -- 70
PR : 02 hrs/ week	**OR:- 01**		**OR: -- 25**

Prerequisites:

Basic Thermodynamics- Laws of thermodynamics, Ideal gas processes, Thermodynamic cycles, Properties of pure substance, Mollier Charts, Basic Psychrometry terms and process, Fluid properties, Fluid dynamics, Modes of heat transfer, Governing Equations in Heat Transfer, Extended Surfaces, Condensation and Boiling, Heat Exchangers.

Course Objectives:

- Learning the fundamental principles and different methods of refrigeration and air conditioning.
- Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or refrigerant property tables.
- Comparative study of different refrigerants with respect to properties, applications and environmental issues.
- Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
- Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems

Course Outcomes:

At the end of this course the students should be able to

- Illustrate the fundamental principles and applications of refrigeration and air conditioning system
- Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
- Present the properties, applications and environmental issues of different refrigerants
- Calculate cooling load for air conditioning systems used for various
- Operate and analyze the refrigeration and air conditioning systems.

Course Code: 302050 **Course Name : Mechatronics**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: -- 03 hrs/week	**TH:--03**	**TH**	**In-Sem: -- 30**
			End-Sem: --70
Tut.: - 01 hr/week	**OR:- 01**		
			OR: --25

Course Objectives:

• Understand key elements of Mechatronics system, representation into block diagram
• Understand concept of transfer function, reduction and analysis
• Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller
• Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
• Understand the system modeling and analysis in time domain and frequency domain.
• Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications

Course Outcomes:

On completion of the course, students will be able to –
• Identification of key elements of mechatronics system and its representation in terms of block diagram
• Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
• Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
• Time and Frequency domain analysis of system model (for control application)
• PID control implementation on real time systems
• Development of PLC ladder programming and implementation of real life system.

Course Code: 302051 **Course Name : MANUFATCURING PROCESS – II**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
TH: -- 3 Hrs/ Week	**TH:03**	**TH**	**In-Sem: -- 30**
			End-Sem: -- 70

Course Objective:

1. To analyze and understand the metal cutting phenomena.
2. To select process parameter and tools for obtaining desired machining characteristic
3. To understand principles of manufacturing processes.

Course Outcome:

1. Student should be able to apply the knowledge of various manufacturing processes.
2. Student should be able to identify various process parameters and their effect on processes.
3. Student should be able to figure out application of modern machining.
4. Students should get the knowledge of Jigs and Fixtures for variety of operations

Course Code: 302052 Course Name : MACHINE SHOP – II

PR: -2 Hrs/ Week	**Credits**	**Examination Scheme:**
	TW:-01	
		TW: 50

Course Objective:

1. To set the manufacturing set–up appropriately and study the corresponding set up parameters.
2. To select appropriate process parameter for obtaining desired characteristic on work piece.
3. To understand the operational problems and suggest remedial solution for adopted manufacturing process.

Course Outcome:

1. Ability to develop knowledge about the working and programming techniques for various machines and tools

Course Code: 302053 **Course Name : SEMINAR**

Teaching Scheme:	**Credits**	**Examination Scheme:**	
PR:-- 2 Hrs/Week	**OR:--01**	**TH**	**In-Sem: --**
			End-Sem: --
			TW: -- 25
			OR: -- 25

Prerequisites:

Course Objective:

1. Identify and compare technical and practical issues related to the area of course specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

Course Outcome:

With this seminar report and presentation, the student is expected to learn/achieve the following:

- Establish motivation for any topic of interest and develop a thought process for technical presentation.
- Organize a detailed literature survey and build a document with respect to technical publications.
- Analysis and comprehension of proof-of-concept and related data.
- Effective presentation and improve soft skills.
- Make use of new and recent technology (e.g. Latex) for creating technical reports

Code: 302054 **Course Name : Audit Course I :- Fire & Safety Technology**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ	
PR:	**Th/Tut:--**	**TH**	**In-Sem: --**
			End-Sem: --
Tut:	**TW:**		**PR: --**
			OR: --

Description:

To generate, develop and sustain a voluntary movement on Fire & Safety Engineering at the National Level aimed at educating and influencing society to adopt appropriate policies, practices and procedures that prevent and mitigate human suffering and economic loss arising from all types of accidents.

Course Objective:

On completion of this Basic Fire Safety Course, participants will be able to:-

- Describe the chemistry of fire
- Identify fire hazards in the workplace
- Follow evacuation procedures
- Select and use appropriate firefighting equipment

Course Outcome:

- **Students will be able**

1. To create and sustain a community of learning in which students acquire knowledge in fire, safety and hazard management and learn to apply it professionally with due consideration for ethical, human life & property safety issues. 2. To pursue research and development in fire safety engineering, hazard management and disseminate its findings. 3. To meet the challenges of today and tomorrow in the most effective, efficient and contemporary educational manner. 4. To help in building national capabilities in fire safety engineering, disaster management, hazard management, industrial safety education through practical training to ensure a fire safe nation.

Course Code: 302054 **Course Name : Audit Course II - Entrepreneurship Development**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ	
PR:	**Th/Tut:--**	**TH**	**In-Sem: --**
			End-Sem: --
	Tut:		**PR: --**
			OR: --

Description:

EDP is a program meant to develop entrepreneurial abilities among the people. In other words, it refers to inculcation, development, and polishing of entrepreneurial skills into a person needed to establish and successfully run his enterprise. Thus, the concept of entrepreneurship development programme involves equipping a person with the required skills and knowledge needed for starting and running the enterprise.

This course will help in developing the awareness and interest in entrepreneurship and create employment for others. Students get familiar with the characteristics and motivation of successful entrepreneurs. Students learn how to identify and refine market opportunities, how to secure financing, how to develop and evaluate business plans and manage strategic partnerships. Students learn various concepts including the basics of management, leadership, motivation, decision-making, conflict management, human resource development, marketing and sustaining an organization. Students also get basic knowledge of accounting practices and finance. The core course in Entrepreneurship Development & Management equips students with skills and knowledge required to start and sustain their own business.

Course Objective:

- To impart basis managerial knowledge and understanding;
- Develop and strengthen entrepreneurial quality, i.e., motivation or need for achievement.
- To analyze environmental set up relating to small industry and promoting it.
- Collect and use the information to prepare project report for business venture.
- Understand the process and procedure involved in setting up small units.
- Develop awareness about enterprise management.

Course Outcome:

The students will be able to

- Appreciate the concept of Entrepreneurship
- Identify entrepreneurship opportunity.
- Develop winning business plans

Course Code: 302054 **Course Name : Audit Course III - Intellectual Property Right**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ	
PR:	**Th/Tut:--**	**TH**	**In-Sem: --**
			End-Sem: --
Tut:	**TW:**		**PR: --**
			OR: --

Objective:

Intellectual property refers to the rights which are attached to the creation of the mind and which take the form of a property. Though intangible in nature, intellectual property has become the driving force of many companies today. Fortune 500+ companies undoubtedly are the best examples of what a company can achieve through the proper understanding and management of IPR.

Thus the study of intellectual property rights is inevitable for managers, considering the fact that India is fast emerging as an economy with considerable investment in cutting-edge research and development. India is also emerging as an economy where foreign companies propose to invest considerably, both technically and financially, provided proper protection is guaranteed to their intangible assets which form the cornerstone of their business.

Course Code: 302054 **Course Name : Audit Course IV - Lean Management**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit (P/F) Written and MCQ	
PR:	**Th/Tut:--**	**TH**	**In-Sem: --**
			End-Sem: --
Tut:	**TW:**		**PR: --**
			OR: --

Course Objective:

- To learn Lean Thinking and its applications
- To get knowledge of Tools & Techniques used in Lean Management
- To understand Business Impact of Lean Management

Course Outcome: Students

- Will be able to do practice Lean Management at the workplace
- Will be able to contribute in Continuous Improvement program of the Organization

Course Code: 302054 **Course Name : Audit Course Ⅴ - Smart Manufacturing**

Teaching Scheme:	**Credits**	**Examination Scheme:** Audit(P/F) Written and MCQ	
PR:	**Th/Tut:--**	**TH**	**In-Sem: --**
			End-Sem: --
Tut:	**TW:**		**PR: --**
			OR: --

Description:
Smart Manufacturing is an amalgamation of Information Technology, Cloud Computing & traditional Mechanical, Production Engineering towards achieving excellence in manufacturing. Maximum results with minimum resources being used. The course will introduce the concepts of Smart Manufacturing, how various technologies can be leveraged to achieve minimum breakdowns, First Time Right Production, 100% Delivery on Time with minimum turnaround time. Nine Pillars of Smart Manufacturing will be explained to the Students.
The course will make the students aware of developments in Technology those are going to alter the Traditional Manufacturing scenario. The following topics may be broadly covered in the classroom. The practical will be in the form of Group Discussion based on Case Study.

Course Objective:
- To know more about Smart Manufacturing & Industry 4.0
- To get knowledge of various converging Technologies
- To prepare ourselves for the ever changing Manufacturing Techniques

Course Outcome: The students will be
- Comfortable with terminology and practices in Smart Manufacturing
- Able to face the challenges in Industry & also contribute towards advancement.
- Active part of Industry 4.0 (Fourth Industrial Revolution)

Dr. D Y Patil School of Engineering Lohegaon,Pune

Dept. of Mechanical Engineering (BE)

COURSE OUTCOMES (CO's)

Course Code : 402041 **Course Name : Hydraulics and Pneumatics**

Teaching Scheme:		**Credits**		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: 25**
							TW	**: 25**

Pre-requisites :

Fluid Mechanics, Manufacturing Processes and Machines, Mechatronics

Course Objectives:

- To study governing laws used in fluid power systems
- To study fluid power applications
- To study working principles of various components
- To study selection of different components
- To study how to design fluid power systems
- To study low cost automation

Course Outcomes:

On completion of the course, students will be able to -

- Understand working principle of components used in hydraulic & pneumatic systems
- Identify various applications of hydraulic & pneumatic systems
- Selection of appropriate components required for hydraulic and pneumatic systems
- Analyses hydraulic and pneumatic systems for industrial/mobile applications
- Design a system according to the requirements
- Develop and apply knowledge to various applications

Course Code : 402042 **Course Name : CAD CAM and Automation**

Teaching Scheme:		Credits		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: 50**
Practical	**: 02 Hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: --**
`							**TW**	**: 25**

Pre-requisites

: Engineering Graphics, Engineering Mathematics, Numerical Methods & Optimization, Computer Aided Machine Drawing, Strength of Materials, Manufacturing Processes

Course Objectives:

- To apply homogeneous transformation matrix for geometrical transformations of 2D/3D CAD entities
- To model mathematically analytical and synthetic curves, surfaces
- To predict performance of simple mechanical components viz. beam, shafts, plates, trusses using FEA (Mathematical and Software treatment)
- To generate CNC program for appropriate manufacturing techniques viz. turning and milling
- To select and apply suitable Rapid Prototyping techniques for engineering applications
- To study role and components of different Automation strategies.

Course Outcomes:

On completion of the course, students will be able to -

- Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
- Use analytical and synthetic curves and surfaces in part modeling.
- Do real times analysis of simple mechanical elements like beams, trusses, etc. and comments on safety of engineering components using analysis software.
- Generate CNC program for Turning / Milling and generate tool path using CAM software.
- Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.
- Understand the robot systems and their applications in manufacturing industries.

Course Code : 402043 **Course Name : Dynamics of Machinery**

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: 04 Hrs Per Week	TH	: 04	Theory	In-Sem	: 30	PR	: --
Practical	: 02 Hrs per week	TW	: 01		End-Sem	: 70	OR	: 25
							TW	: 25

Pre-requisites:

Strength of Materials, Engineering Mechanics, Engineering Mathematics and Numerical Methods,

Course Objectives:

- To conversant with balancing problems of machines.
- To understand fundamentals of free and forced vibrations.
- To develop competency in understanding of vibration and noise in Industry.
- To develop analytical competency in solving vibration problems.
- To understand the various techniques of measurement and control of vibration and noise.

Course Outcomes:

On completion of the course, students will be able to -

- Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
- Estimate natural frequency for single DOF undamped & damped free vibratory systems.
- Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
- Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
- Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
- 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)

Teaching Scheme:		Credits		Examination Scheme:				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: 25**

Pre-requisites

: Fluid Mechanics, Heat transfer, Numerical methods, Programming Languages.

Course Objectives:

 To understand the philosophy and general procedure of Finite Element Method as applied to solid mechanics and thermal analysis problems.

 To familiarize students with the displacement-based finite element method for displacement and stress analysis and to introduce related analytical and computer tools.

 It provides a bridge between hand calculations based on mechanics of materials and machine design and numerical solutions for more complex geometries and loading states.

 To study approximate nature of the finite element method and convergence of results are examined.

 It provides some experience with a commercial FEM code and some practical modeling exercises.

Course Outcomes:

On completion of the course, students will be able to -

 Understand the different techniques used to solve mechanical engineering problems.

 Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

 Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

 Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.

 Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

 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**

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: 03 Hrs Per Week	TH	: 03	Theory	In-Sem	: 30	PR	: --
Practical	: 02 hrs per week	TW	: 01		End-Sem	: 70	OR	: --
							TW	: 25

Pre-requisites

: Fluid Mechanics, Heat transfer, Numerical methods, Programming Languages.

Course Objectives:

- Students should be able to model fluid / heat transfer problems and apply fundamental conservation principles.
- Students should be able to do discretize the governing equations by Finite Difference Method and Finite volume Method.
- Students should be able to develop programming skills by in-house code development for conduction, convection and fluid dynamics problems.
- Students should be able to solve basic convection and diffusion equations and understands the role in fluid flow and heat transfer.
- To prepare the students for research leading to higher studies.
- To prepare the students for career in CAE industry using software tools.

Course Outcomes:

On completion of the course, students will be able to -

- Analyze and model fluid flow and heat transfer problems.
- Generate high quality grids and interpret the correctness of numerical results with physics.
- Conceptualize the programming skills.
- 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

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: 03 Hrs Per Week	TH	: 03	Theory	In-Sem	: 30	PR	: --
Practical	: 02 hrs per week	TW	: 01		End-Sem	: 70	OR	: --
							TW	: 25

Pre-requisites:

Thermodynamics I and II, Refrigeration and Air Conditioning

Course Objectives:

- To understand the recent vapour compression cycle
- To provide the knowledge of analyze thermal design of refrigeration system components
- To understand practical aspects of vapour compression system
- To provide the knowledge of basic concepts of ventilation, infiltration and space distribution techniques
- To inculcate techniques of estimating building envelop load.
- To understand the working non-conventional air-conditioning systems.

Course Outcomes:

On completion of the course, students will be able to -

- Determine the performance parameters of trans-critical & ejector refrigeration systems
- Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
- Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
- Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
- Estimate heat transmission through building walls using CLTD and decrement factor &time lag methods with energy-efficient and cost-effective measures for building envelope.
- 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**

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: 03 Hrs Per Week	TH	: 03	Theory	In-Sem	: 30	PR	: --
Practical	: --	TW	: --		End-Sem	: 70	OR	: --
							TW	: --

Pre-requisites

: I. C. Engines, Theory of Machines, Basics of Electrical and Electronics

Course Objectives:

- To make the student conversant with fundamentals of automobile systems.
- To develop competencies in performance analysis of vehicles.
- To make the student conversant with automobile safety, electrical system and vehicle maintenance.
- To understand the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles. .

Course Outcomes:

On completion of the course, students will be able to -

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

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

Teaching Scheme:		**Credits**		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: --**	**TW**	**: --**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: --`**

Pre-requisites

Mathematics I, II and III

Course Objectives:

 To familiarize the students with the use of practice oriented mathematical applications for optimization functions in an organization.

 To familiarize the students with various tools of optimization, probability, statistics and simulation, as applicable in particular scenarios in industry for better management of various resources.

Course Outcomes:

On completion of the course, students will be able to -

 Apply LPP and Decision Theory to solve the problems

 Apply the concept of transportation models to optimize available resources.

 Decide optimal strategies in conflicting situations.

 Implement the project management techniques.

 Minimize the process time

 Optimize multi stage decision making problems

Course Code : 402045 C **Course Name : Elective – II**

Energy Audit and Management

Teaching Scheme:		Credits		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: --**	**TW**	**: --**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: --**

Pre-requisites:

Thermodynamics, Turbo Machines

Course Objectives:

Following concepts to be taught to the students,

- Importance of Energy Management.
- To Carry out Energy Audit.
- Methods to reduce consumption of energy and save cost.
- To improve energy efficiency of overall system.
- Significance of Waste heat recovery and Cogeneration.

Course Outcomes:

On completion of the course, students will be able to -

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

Course Code : 402046 **Course Name : Project – I**

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: --	TH	: --	Theory	In-Sem	: --	PR	: --
Practical	: 04 hrs per week	TW	: 02		End-Sem	: --	OR	: 25
							TW	: 25

Course Objectives:

- To have ideology of the industrial project.
- Hands on working with tools, tackles and machines
- To carry out literature survey
- To do brain storming for mechanical engineering system

Course Outcomes:

On completion of the course, students will be able to -

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

Course Code : 402047 **Course Name : Energy Engineering**

Teaching Scheme:		Credits		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: 25**
							TW	**: 25**

Pre-requisites:

Thermodynamics I and II and Heat Transfer

Course Objectives:

 To study the power generation scenario, the components of thermal power plant, improved Rankin cycle, Cogeneration cycle

 To understand details of steam condensing plant, analysis of condenser, the an environmental impacts of thermal power plant, method to reduce various pollution from thermal power plant

 To study layout, component details of hydroelectric power plant, hydrology and elements , types of nuclear power plant

 To understand components; layout of diesel power plant , components; different cycles ; methods to improve thermal efficiency of gas power plant

 To study the working principle , construction of power generation from non-conventional sources of energy

 To learn the different instrumentation in power plant and basics of economics of power generation.

Course Outcomes:

On completion of the course, students will be able to -

 Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle

 Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same

 Recognize the layout, component details of hydroelectric power plant and nuclear power plant

 Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle

 Emphasize the fundaments of non-conventional power plants

 Describe the different power plant electrical instruments and basic principles of economics of power generation.

Course Code : 402048 **Course Name : Mechanical System Design**

`Teaching Scheme:		Credits		**Examination Scheme:**				
Theory	**: 04 Hrs Per Week**	**TH**	**: 04**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: 25**
							TW	**: 50**

Pre-requisites:

Engineering Mechanics, Manufacturing Process, Strength of Materials, Machine design, Engineering Mathematics, Theory of Machines, Dynamics of Machinery, and IC Engines.

Course Objectives:

- To develop competency for system visualization and design.
- To enable student to design cylinders and pressure vessels and to use IS code.
- To enable student select materials and to design internal engine components.
- To introduce student to optimum design and use optimization methods to design mechanical components.
- To enable student to design machine tool gearbox.
- To enable student to design material handling systems.
- Ability to apply the statistical considerations in design and analyze the defects and failure modes in components

Course Outcomes:

On completion of the course, students will be able to -

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

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

Tribology

Teaching Scheme:		**Credits**		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: 25**

Pre-requisites

: Physics, Chemistry, Mathematics, Fluid Mechanics, Theory of Machine and Machine Design

Course Objectives:

 To provide the knowledge and importance of Tribology in Design, friction, wear and lubrication aspects of machine components.
 To select proper grade lubricant for specific application.
 To understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques.
 To introduce the concept of surface engineering and its importance in tribology.
 To understand the behavior of Tribological components.

Course Outcomes:

On completion of the course, students will be able to -

 The course will enable the students to know the importance of Tribology in Industry.
 The course will enable the students to know the basic concepts of Friction, Wear, Lubrications and their measurements.
 This course will help students to know the performance of different types of bearings and analytical analysis thereof.
 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**

Teaching Scheme:		Credits		Examination Scheme:				
Theory	: 03 Hrs Per Week	TH	: 03	Theory	In-Sem	: 30	PR	: --
Practical	: 02 hrs per week	TW	: 01		End-Sem	: 70	OR	: --
							TW	: 25

Pre-requisites:

NIL

Course Objectives:

- To introduce the concepts, principles and framework of contents of Industrial Engineering.
- To acquaint the students with various productivity enhancement techniques.
- To acquaint the students with different aspects of Production Planning and Control and Facility Design.
- To introduce the concepts of various cost accounting and financial management practices as applied in industries.
- To acquaint the students with different aspects of Human Resource activities and Industrial Safety rules.
- To acquaint students with different aspect of simulation modeling for various industrial engineering\applications.

Course Outcomes:

On completion of the course, students will be able to -

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

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

Robotics

Teaching Scheme:		**Credits**		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: 02 hrs per week**	**TW**	**: 01**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: 25**

Pre-requisites:

Engineering Mechanics, TOM, Mechatronics, Basics of Electrical and Electronics Engineering, Control system.

Course Objectives:

- To get acquainted with basic components of robotic systems.
- To study various gripper mechanisms and sensors and understand role of suitable control system.
- To understand statistics & kinematics of robots
- To develop competency in obtaining desired motion of the robot.
- To study various programming methods in robotics.
- To understand need of modern techniques in robotics.

Course Outcomes:

On completion of the course, students will be able to -

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

Course Code : 402050 A **Course Name : Elective – IV**

Advanced Manufacturing Processes

Teaching Scheme:		Credits		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: --**	**TW**	**: --**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: --**

Pre-requisites:

Basic Engineering Science - Physics, Chemistry, Material Science, Engineering Metallurgy, Manufacturing processes

Course Objectives:

- To analyze and identify applications of special forming processes
- To analyze and identify applications of advanced joining processes
- To understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
- To understand various applications and methods of micro and nano fabrication techniques
- To understand advanced Additive Manufacturing (AM) technology for innovations in product development
- To understand various material characterization techniques.

Course Outcomes:

On completion of the course, students will be able to -

- Classify and analyze special forming processes
- Analyze and identify applicability of advanced joining processes
- Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
- Select appropriate micro and nano fabrication techniques for engineering applications
- Understand and apply various additive manufacturing technology for product development
- 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

Teaching Scheme:		**Credits**		**Examination Scheme:**				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: --**	**TW**	**: --**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: --**

Pre-requisites

: Basic Mechanical Engineering, Basic Electrical and Electronics Engineering and Heat Transfer

Course Objectives:

- To understand fundamentals of solar and wind energies.
- To understand constructions, working principle and design procedure of solar and wind power plants.
- To apply basic engineering principle to design a simple solar and wind power system.

Course Outcomes:

On completion of the course, students will be able to -

- Design of solar food drier for domestic purpose referring existing system
- Design of parabolic dish solar cooker for domestic purpose referring existing system
- Design of solar photovoltaic system for domestic purpose referring existing system
- Design miniature wind mill for domestic purpose referring existing system

Course Code : 402050 C **Course Name : Elective – IV**

Product Design and Development

Teaching Scheme:		Credits		Examination Scheme:				
Theory	**: 03 Hrs Per Week**	**TH**	**: 03**	**Theory**	**In-Sem**	**: 30**	**PR**	**: --**
Practical	**: --**	**TW**	**: --**		**End-Sem**	**: 70**	**OR**	**: --**
							TW	**: -**

Pre-requisites

: Basic Engineering Science - Physics, Chemistry, Material Science, Engineering Metallurgy, Manufacturing processes

Course Objectives:

To explain student's significance of

- Product design and Product development process
- Customer needs, satisfaction and commercialization of product
- Forward & Reverse Engineering and its role in designing a product
- Design Aspects (DFA, DFMEA, Design for Reliability and Safety)
- Product Life Cycle Management and Product Data Management

Course Outcomes:

On completion of the course, students will be able to -

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

SEMESTER-1

210241: Discrete Mathematics

Course Objectives:

1. To use appropriate set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
2. Determine number of logical possibilities of events.
3. Learn logic and proof techniques to expand mathematical maturity.
4. Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO 1	Solve real world problems logically using appropriate set.
CO 2	Solve real world problems logically using appropriate function, relation models and interpret the associated operations and terminologies in context.
CO 3	Applying counting strategies and probability to real world problems and look for connections to algebra, geometry, number theory.
CO 4	Solve real world problems using tree strategies.
CO 5	Solve real world problems using Graph theory.
CO 6	Analyze and synthesize the real world problems using discrete mathematics.

210242: Digital Electronics & Logic Design

Course Objectives:

1. To understand the functionality and design of Combinational Circuits.
2. To understand the functionality and design of Sequential Circuits.
3. To understand and compare the functionalities, properties and applicability of Logic Families.
4. To understand concept of programmable logic devices and ASM chart and get acquainted with design of synchronous state machines.
5. To understand concept of ASM chart and get acquainted with design of synchronous state machines.
6. To design and implement digital circuits using VHDL.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes

CO1	Realize and simplify Boolean Algebraic assignments for designing digital circuits using K-Maps.
CO2	Design and implement Sequential digital circuits as per the specifications.
CO3	Design and implement Combinational digital circuits as per the specifications.
CO4	Apply the knowledge to appropriate IC as per the design specifications.
CO5	Design simple digital systems using VHDL.
CO6	Develop simple embedded system for simple real world application.

210244: Computer Organization and Architecture

Course Objectives:

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of digital computers.
3. To identify the elements of modern instructions sets and explain their impact on processor design.
4. To explain the function of each element of a memory hierarchy, identify and compare different methods for computer I/O.
5. To compare simple computer architectures and organizations based on established performance metrics.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
CO2	Analyze the principles of computer architecture using examples drawn from commercially available computers.
CO3	Evaluate various design alternatives in processor organization.

210243: Data Structures and Algorithms

Course Objectives:

7. To understand the standard and abstract data representation methods.
8. To acquaint with the structural constraints and advantages in usage of the data.
9. To understand the memory requirement for various data structures.
10. To operate on the various structured data.
11. To understand various data searching and sorting methods with pros and cons.
12. To understand various algorithmic strategies to approach the problem solution.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	To discriminate the usage of various structures in approaching the problem solution.
CO2	To design the algorithms to solve the programming problems.
CO3	To use effective and efficient data structures in solving various Computer Engineering domain problems.
CO4	To analyze the problems to apply suitable algorithm.
CO5	To analyze the problems to apply suitable data structure.
CO6	To use appropriate algorithmic strategy for better efficiency.

210245: Object Oriented Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP).
2. To understand object-oriented concepts such as data abstraction, encapsulation, inheritance, dynamic binding, and polymorphism.
3. To use the object-oriented paradigm in program design.
4. To lay a foundation for advanced programming.
5. Provide programming insight using OOP constructs.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Analyze the strengths of object oriented programming
CO2	Design and apply OOP principles for effective programming
CO3	Develop programming application using object oriented programming language C++
CO4	Percept the utility and applicability of OOP

SEMESTER-II

207003: Engineering Mathematics III

1. Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.
2. Transform techniques such as Fourier transform, Z-transform and applications to Image processing.

3. Statistical methods such as correlation, regression analysis and probability theory to analyze data and to make predictions applicable to machine intelligence.
4. Vector calculus necessary to analyze and design complex electrical and electronic devices as appropriate to Computer engineering.
5. Complex functions, conformal mappings and contour integration applicable to Image processing, Digital filters and Computer graphics.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
CO2	Solve problems related to Fourier transform, Z-Transform and applications to Signal and Image processing.
CO3	Apply statistical methods like correlation, regression analysis and probability theory for analysis and prediction of a given data as applied to machine intelligence.
CO4	Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.
CO5	Analyze conformal mappings, transformations and perform contour integration of complex functions required in Image processing, Digital filters and Computer graphics.

210251: Computer Graphics

Course Objectives:

1. To acquaint the learner with the basic concepts of Computer Graphics
2. To learn the various algorithms for generating and rendering graphical figures
3. To get familiar with mathematics behind the graphical transformations
4. To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Apply mathematics and logic to develop Computer programs for elementary graphic operations
CO2	Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
CO3	Develop the competency to understand the concepts related to Computer Vision and Virtual reality
CO4	Apply the logic to develop animation and gaming programs

210252: Advanced Data Structures

Course Objectives:

1. To develop a logic for graphical modelling of the real life problems.
2. To suggest appropriate data structure and algorithm for graphical solutions of the problems.
3. To understand advanced data structures to solve complex problems in various domains.
4. To operate on the various structured data
5. To build the logic to use appropriate data structure in logical and computational solutions.
6. To understand various algorithmic strategies to approach the problem solution.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	To apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain.
CO2	To design the algorithms to solve the programming problems.
CO3	To use effective and efficient data structures in solving various Computer Engineering domain problems.
CO4	To analyze the algorithmic solutions for resource requirements and optimization
CO5	To use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage.

210253: Microprocessor

Course Objectives:

1. To learn the architecture and programmer‘s model of advanced processor
2. To understand the system level features and processes of advanced processor
3. To acquaint the learner with application instruction set and logic to build assembly language programs.
4. To understand debugging and testing techniques confined to 80386 DX

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	To apply the assembly language programming to develop small real life embedded application.
CO2	To understand the architecture of the advanced processor thoroughly to use the resources for programming
CO3	To understand the higher processor architectures descended from 80386 architecture

210254: Principles of Programming Languages

Course Objectives:

1. To learn principles of programming language
2. To understand structural, computational and logical implications regarding programming languages
3. To explore main programming paradigms
4. To understand and apply Object Oriented Programming (OOP) principles using C++ and Java.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	To analyze the strengths and weaknesses of programming languages for effective and efficient program development.
CO2	To inculcate the principles underlying the programming languages enabling to learn new programming languages.
CO3	To grasp different programming paradigms
CO4	To use the programming paradigms effectively in application development.

SEMESTER-1

310241: Theory of Computation

Course Objectives:

1. To Study abstract computing models.
2. To learn Grammar and Turing Machine.
3. To learn about the theory of computability and complexity.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO 1	design deterministic Turing machine for all inputs and all outputs
CO 2	Subdivide problem space based on input subdivision using constraints.
CO 3	Apply linguistic theory.

310242: Database Management Systems

Course Objectives:

1. To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
2. To provide a strong formal foundation in database concepts, technology and practice.
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
4. Be familiar with the basic issues of transaction processing and concurrency control.
5. To learn and understand various Database Architectures and Applications.
6. To learn a powerful, flexible and scalable general purpose database to handle big data.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Design E-R Model for given requirements and convert the same into database tables.
CO2	Use database techniques such as SQL & PL/SQL.
CO3	Use modern database techniques such as NOSQL.
CO4	Explain transaction Management in relational database System.
CO5	Describe different database architecture and analyses the use of appropriate architecture in real time environment.
CO6	Use advanced database Programming concepts

310243: Software Engineering and Project Management

Course Objectives:

1. To learn and understand the principles of Software Engineering.
2. To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
3. To apply Design and Testing principles to S/W project development.
4. To understand project management through life cycle of the project.
5. To understand software quality attributes.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Decide on a process model for a developing a software project.
CO2	Classify software applications and Identify unique features of various domains.
CO3	Design test cases of a software system.
CO4	Understand basics of IT Project management.
CO5	Plan, schedule and execute a project considering the risk management.
CO6	Apply quality attributes in software development life cycle.

310244: Information Systems and Engineering Economics

Course Objectives:

1. To prepare the students to various forms of the Information Systems and its application in organizations.
2. To expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in Information Systems.
3. To Prepare engineering students to analyze cost / revenue data and should be able to do economic analyses in the decision making process to justify or reject alternatives / projects on an economic basis for an organization.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Understand the need, usage and importance of an Information System to an organization.
CO2	Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
CO3	Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations
CO4	Outline the past history, present position and expected performance of a

	company engaged in engineering practice or in the computer industry.
CO5	Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
CO6	Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

310245: Computer Networks

Course Objectives:

1. To understand the fundamental concepts of networking standards, protocols and technologies.
2. To learn different techniques for framing, error control, flow control and routing.
3. To learn role of protocols at various layers in the protocol stacks.
4. To learn network programming.
5. To develop an understanding of modern network architectures from a design and performance perspective

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies.
CO2	Demonstrate design issues, flow control and error control.
CO3	Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.
CO4	Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
CO5	Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
CO6	Demonstrate different routing and switching algorithms.

SEMESTER-II

Third Year of Computer Engineering (2015 Course)

310250: Design and Analysis of Algorithms

Course Objectives:

1. To develop problem solving abilities using mathematical theories.
2. To analyze the performance of algorithms .
3. To study algorithmic design strategies.

Course Outcomes: On completion of the course, student will be able to–

1. Formulate the problem.
2. Analyze the asymptotic performance of algorithms.
3. Decide and apply algorithmic strategies to solve given problem.
4. Find optimal solution by applying various methods.

Third Year of Computer Engineering (2015 Course)

310251: Systems Programming and Operating System

Course Objectives:

1. To understand basics of System Programming.
2. To learn and understand data structures used in design of system software.
3. To learn and understand basics of compilers and tools.
4. To understand functions of operating system.
5. To learn and understand process, resource and memory management.

Course Outcomes: On completion of the course, student will be able to–

1. Analyze and synthesize system software.
2. Use tools like LEX & YACC.
3. Implement operating system functions.

310252: Embedded Systems and Internet of Things

Course Objectives:

1. To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modeling.

2. To introduce students a set of advanced topics in embedded IoT and lead them to understand research in network.

3. To develop comprehensive approach towards building small low cost embedded IoT system.

4. To understand fundamentals of security in IoT.

5. To learn to implement secure infrastructure for IoT.

6. To learn real world application scenarios of IoT along with its societal and economic impact using case studies.

Course Outcomes: On completion of the course, student will be able to–

1. Implement an architectural design for IoT for specified requirement.
2. Solve the given societal challenge using IoT.
3. Choose between available technologies and devices for stated IoT challenge.

310253: Software Modeling and Design

Course Objectives:

1. To understand and apply Object Oriented(OO) concept for designing OO based model/application.
2. To transform Requirement document to Appropriate design .
3. To understand different architectural designs and to transform them into proper model.
4. To choose and use modern design tools for project development and implementation.
5. To choose and use appropriate test tool for testing web-based/desktop application .

Course Outcomes: On completion of the course, student will be able to–

1. Analyze the problem statement (SRS) and choose proper design technique for designing webbased/ desktop application.
2. Design and analyze an application using UML modeling as fundamental tool.
3. Apply design patterns to understand reusability in OO design.
4. Decide and apply appropriate modern tool for designing and modeling .

5. Decide and apply appropriate modern testing tool for testing web-based/desktop application.

Third Year of Computer Engineering (2015 Course)

310254: Web Technology

Course Objectives:

1. To understand the principles and methodologies of web based applications development process .
2. To understand current client side and server side web technologies .
3. To understand current client side and server side frameworks .
4. To understand web services and content management.

Course Outcomes: On completion of the course, student will be able to–

1. analyze given assignment to select sustainable web development design methodology.
2. develop web based application using suitable client side and server side web technologies .
3. develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.

Third Year of Computer Engineering (2015 Course)

310255: Seminar and Technical Communication

Course Objectives:

1. To explore the basic principles of communication (verbal and non-verbal) and active, empathetic listening, speaking and writing techniques.
2. To expose the student to new technologies, researches, products, algorithms, services.

Course Outcomes: On completion of the course, student will–

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

Third Year of Computer Engineering (2015 Course)

310256: Web Technology Lab

Course Objectives:

1. To use current client side and server side web technologies
2. To implement communication among the computing nodes using current client side and server side technologies
3. To design and implement web services with content management

Course Outcomes: On completion of the course, student will be able to–

1. develop web based application using suitable client side and server side web technologies.
2. develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.

Third Year of Computer Engineering (2015 Course)

310257: System Programming &Operating System Lab

Course Objectives:

1. To implement basic language translator by using various needed data structures.
2. To implement basic Macroprocessor .
3. To design and implement Dynamic Link Libraries.
4. To implement scheduling schemes.

Course Outcomes: On completion of the course, student will be able to–

1. Understand the internals of language translators.
2. Handle tools like LEX & YACC.
3. Understand the Operating System internals and functionalities with implementation point of view.

Third Year of Computer Engineering (2015 Course)

310258: Embedded Systems & Internet of Things Lab

Course Objectives:

1. To understand functionalities of various single board embedded platforms fundamentals.
2. To develop comprehensive approach towards building small low cost embedded IoT system.
3. To implement the assignments based on sensory inputs.

Course Outcomes: On completion of the course, student will be able to–

1. Design the minimum system for sensor based application.
2. Solve the problems related to the primitive needs using IoT.
3. Develop full-fledged IoT application for distributed environment.

SEM I

Fourth Year of Computer Engineering (2015 Course)

410241: High Performance Computing

Course Objectives:

1. To study parallel computing hardware and programming models.
2. To be conversant with performance analysis and modeling of parallel programs.
3. To understand the options available to parallelize the programs.
4. To know the operating system requirements to qualify in handling the parallelization.

Course Outcomes:

On completion of the course, student will be able to–

CO Number	Course Outcomes
CO1	Describe different parallel architectures, inter-connect networks, programming models.
CO2	Develop an efficient parallel algorithm to solve given problem.
CO3	Analyze and measure performance of modern parallel computing systems.
CO4	Build the logic to parallelize the programming task.

Fourth Year of Computer Engineering (2015 Course)

410242: Artificial Intelligence and Robotics

Course Objectives:

1. To understand the concept of Artificial Intelligence (AI)
2. To learn various peculiar search strategies for AI
3. To acquaint with the fundamentals of mobile robotics
4. To develop a mind to solve real world problems unconventionally with optimality

Course Outcomes:

On completion of the course, student will be able to–

CO Number	**Course Outcomes**
CO1	To Identify and apply suitable Intelligent agents for various AI applications.
CO2	To Design smart system using different informed search / uninformed search or heuristic approaches.
CO3	To Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO4	To Apply the suitable algorithms to solve AI problems.

Fourth Year of Computer Engineering (2015 Course)
410243: Data Analytics

Course Objectives:

1. To develop problem solving abilities using Mathematics .
2. To apply algorithmic strategies while solving problems.
3. To develop time and space efficient algorithms .
4. To study algorithmic examples in distributed, concurrent and parallel environments.

Course Outcomes: On completion of the course, student will be able to–

CO Number	**Course Outcomes**
CO1	Write case studies in Business Analytic and Intelligence using mathematical models
CO2	Present a survey on applications for Business Analytic and Intelligence.
CO3	Provide problem solutions for multi-core or distributed, concurrent/Parallel environments.

Fourth Year of Computer Engineering (2015 Course)

Elective I 410244(D): Data Mining and Warehousing

Course Objectives:

1. To understand the fundamentals of Data Mining
2. To identify the appropriateness and need of mining the data
3. To learn the preprocessing, mining and post processing of the data
4. To understand various methods, techniques and algorithms in data mining

Course Outcomes: On completion of the course, student will be able to–

CO Number	**Course Outcomes**
CO1	Apply basic, intermediate and advanced techniques to mine the data.
CO2	Analyze the output generated by the process of data mining.
CO3	Explore the hidden patterns in the data.
CO4	Optimize the mining process by choosing best data mining technique.

Fourth Year of Computer Engineering (2015 Course)
Elective II 410245(B): Software Testing and Quality Assurance

Course Objectives:

1. To introduce basic concepts of software testing.
2. To understand white box, block box, object oriented, web based and cloud testing.
3. To know in details automation testing and tools used for automation testing.
4. To understand the importance of software quality and assurance software systems development.

Course Outcomes: On completion of the course, Student will be able to -

CO Number	**Course Outcomes**
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.

Fourth Year of Computer Engineering (2015 Course)

Elective II 410245(D): Mobile Communication

Course Objectives:

1. To make students familiar with fundamentals of mobile communication systems.
2. To understand the operation of mobile communication systems and their generation division.
3. To study the recent trends adopted in cellular networks and Design.
4. To study medium access control.

Course Outcomes: On completion of the course, student will be able to–

CO Number	**Course Outcomes**
CO1	Percept to the requirements of next generation mobile network and mobile applications.
CO2	Make familiar with various generations of mobile communications
CO3	Use the 3G/4G technology based network with bandwidth capacity planning.
CO4	Make use of advances in mobile technology.

Fourth Year of Computer Engineering (2015 Course)

410246:Laboratory Practice I

Course Objectives and Outcomes: Practical hands on is the absolute necessity as far as employability of the learner is concerned. The presented course is solely intended to enhance the competency by undertaking the laboratory assignments of the core courses.

Fourth Year of Computer Engineering (2015 Course)

410247:Laboratory Practice II

Course Objectives and Outcomes: Practical hands on is the absolute necessity as far as employability of the learner is concerned. The presented course is solely intended to enhance the competency by undertaking the laboratory assignments of the core courses. Enough choice is provided to the learner to choose an elective of one's interest.

SEM II

Fourth Year of Computer Engineering (2015 Course)

410250 Machine Learning

Course Objectives:

1. To understand human learning aspects and relate it with machine learning concepts.
2. To understand nature of the problem and apply machine learning algorithm.
3. To find optimized solution for given problem.

Course Outcomes: On completion of the course, student will be able to–

1. Distinguish different learning based applications .
2. Apply different preprocessing methods to prepare training data set for machine learning.
3. Design and implement supervised and unsupervised machine learning algorithm.
4. Implement different learning models .
5. Learn Meta classifiers and deep learning concepts.

Fourth Year of Computer Engineering (2015 Course)

410251 Information and Cyber Security

Course Objectives:

1. To offer an understanding of principle concepts, central topics and basic approaches in information and cyber security.
2. To know the basics of cryptography.
3. To acquire knowledge of standard algorithms and protocols employed to provide confidentiality, integrity and authenticity.
4. To enhance awareness about Personally Identifiable Information (PII), Information Management, cyber forensics.

Course Outcomes: On completion of the course, student will be able to–

1. Gauge the security protections and limitations provided by today's technology.
2. Identify information security and cyber security threats.
3. Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
4. Build appropriate security solutions against cyber-attacks.

Fourth Year of Computer Engineering (2015 Course)

Elective III 410252(B): Compilers

Course Objectives:

1. To introduce process of compilation .
2. To introduce complier writing tools.
3. To address issues in code generation and optimization.

Course Outcomes: On completion of the course, student will be able to–

1. Design and implement a lexical analyzer and a syntax analyzer.
2. Specify appropriate translations to generate intermediate code for the given programming language construct .
3. Compare and contrast different storage management schemes.
4. Identify sources for code optimization.

Fourth Year of Computer Engineering (2015 Course)

Elective IV 410253(C): Cloud Computing

Course Objectives:

1. To understand cloud computing concepts;
2. To study various platforms for cloud computing .
3. To explore the applications based on cloud computing.

Course Outcomes: On completion of the course, student will be able to–

1. To install cloud computing environments.
2. To develop any one type of cloud .
3. To explore future trends of cloud .

Course Outcomes of Civil Engineering

S.E

- **BTM (201001)**

1) Identify types of building and basic requirements of building components.
2) Explain types of masonry, formwork, casting procedure and necessity of underpinning and scaffolding.
3) Elucidate different types of flooring and roofing materials.
4) Describe types of doors, windows, arches and lintel.
5) Illuminate means of vertical circulation and protective coatings.
6) Explain different materials especially eco-friendly materials and safety measures to be adopted at any construction site.

- **EM-III (207001):**

1) Solve higher order linear differential equations and apply to civil engineering problems such as bending of beams and whirling of shafts.
2) Solve system of linear equations using direct and iterative numerical techniques and develop solutions to ordinary differential equations using single step and multistep methods applied to structural systems.
3) Apply statistical methods like correlation, regression analysis in analyzing and interpreting experimental data and probability theory applied to construction management.
4) Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
5) Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.

- **Surveying (201006):**

1) Operate and use surveying equipment.
2) Draw plan or map of the existing permanent features on the ground.
3) Classify the ground features from the map or plan.
4) Analyze temporary adjustments and check permanent adjustments of the Theodolite

- **Strength of Materials: (201002):**

1) Compute different type of stresses in determinate, indeterminate, homogeneous and composite structures.
2) Develop bending and shear stress diagram.
3) Determine the torsional stresses and stresses due to strain energy for different loading conditions.
4) Explain the concept of principal stresses due to combined loading and able to compare the values of analytical and graphical (Mohr's circle) method.
5) Plot loading diagram, Shear Force Diagram (SFD) and Bending Moment Diagram(BMD).
6) Analyze axially and eccentrically loaded column

- **Geotechnical Engineering: (201003):**

1) Differentiate the different types of soil and their engineering properties and classify them;
2) Determine the soil properties in laboratory and develop a proficiency in handling experimental Data;
3) Understand of the concept of effective stress and its influence on soil behavior.
4) Develop an understanding of the influence of water flow on the engineering behaviour of soils.
5) Analyze engineering properties like compaction, permeability, soil shear strength.
6) Compute the lateral thrust due to backfill on the retaining walls.
7) Classify soil slopes and identify their modes of failure.

TE

- **Hydrology and Water Resource Engineering: (301001)**

1)To understand the measurement methods of Rainfall and its graphical representation, Also understand the distribution of rainfall in the environment in the form of runoff, infiltration, evaporation and evapotranspiration

2) To understand the construction and working of rain gauges along with other advance measurement devices like Radar and Doppler method.

3) To understand the term water requirement of crops, its types and suitability for Kharip, Rabi and Perennial season ,also understand the procedure of assessment of canal Revenues and how it is collected

4) To understand the topic of ground water hydrology, type and construction of dug wells, bore wells and tube wells and development of aquifer and its potential and methods of recharging.

5) To understand preparation and study of Hydrograph and Unit hydrograph, flood estimation methods, Reservoir planning and finding its capacity by mass curve method.

6) To understand different methods of water management and different techniques of prevention and curative methods.

- **Structural Design – I (301003)**

1) To understand different types of steel structures, various IS codes used for steel structure.

2) To understand design of tension members, columns, lacing and battens.

3) To understand design of eccentrically loaded column and column bases.

4) To understand design of laterally supported and unsupported beams with various checks require

5) To understand design of beam to beam and beam to column connections, welded plate girder.

6) To understand design of gantry girder and roof truss.

- **Fluid Mechanics II :** (301005)

1.how do you know the concept of fluid flow around submerged body.

2.What is specific energy curve and show relation between depth-energy

3.How hydraulic jump get occurred.

4.how force is exerted on series of vane.

5.What is turbine. what work is done by pelton wheel.

6. What is GVF profile.

7.What idea you have got from open channel flow.

- **Structural Analysis – II (301004)**

1) Students will be able to analyse the structure by Slope Deflection Method
2) Students will be able to analyse the structure by Moment Distribution Method
3) Students will be able to analyse the structure by Flexibility Method
4) Students will be e able to analyse the structure by Stiffness Method
5) Students will be able to analyse the structure by Finite Difference Method
6) Students will be able to analyse the structure by Finite Element Method

- **Infrastructure Engineering and Construction Techniques Teaching : (301002)**

1. To understand the infrastructure sectors like roads, railways, ports, airports, highways, tunnels according to five year plan.
2. To enable the students to understand components of broad gauge and Indian railways.
3. To enable the students to learn construction techniques of soil strengthening.
4. To understand any work on site using various construction techniques and equipments like dredging, cranes, slip form, tunnel formwork, pavers, boom placers and to calculate the output of the same.
5. To understand tunnel construction starting from selection of size and shape of tunnel and leading to modern techniques like NATM.
6. To study requirements of harbors, ports along with selection of site, design criteria and various methods of construction.

BE

- **Environmental Engineering II: (401 001)**

1. **To** understand in details, the techniques of waste water engineering and its applications in the field/ construction industry.
2. To acquired the ability to design and conduct experiments, sampling and analysis of data to interpret physical, chemical and bacteriological properties of waste water .
3. To acquired the ability to design sewage collection System , its treatment in conventional treatment plant comprising of treatment units giving preliminary, primary and tertiary treatment of sewage.
4. To acquired skill to design non conventional system of treatment of sewage.
5. To acquired the ability to design treatment flow sheet of Industrial waste water especially pertaining to sugar, dairy and distillery Industry.
6. To acquired the ability to design disposal system of treated sewage and Industrial waste water to safely dispose of into environment without violating the yardstick limits set by Central and Maharashtra pollution control Board.
7. To understand the field application of different treatments of sewage and Industrial waste water through practical/assignments.

- **TQM & MIS: (401 005)**

1. To understand the importance of quality in construction
2. To understand TQM philosophy of Six Sigma
3. To understand TQM in construction
4. To understand Kaizen and Benchmarking in TQM.
5. To understand FMEA and 5 s technique.
6. To understand MIS and its applications.

- **Structural Design-III (401 003)**

1) Engineers to understand fundamentals and mechanical behavior of Prestressed Concrete as well as Reinforced Cement Concrete structures
2) Engineers with ability to analyze and design structures resisting against natural calamities such as Earthquake, Landslide etc. using appropriate design codes
3) Engineers to understand the professional and ethical issues and learn lifelong learning skills in the field of Structural Engg.
4) Engineers to understand various system and the ability to work in multidisciplinary team encompassing Mechanical, Electrical and Management team.
5) Engineers to demonstrate ability to solve industry problems as well as to face sustainability challenges
6) Engineers to analyze, design and optimize structures with latest software

- **Transportation Engineering:- (401 002)**

1. It provides the student with skills in planning, design, operation, construction and maintenance of transportation system and facilities.
2. To study design of flexible and rigid pavement with respect to different variables as per IRC.
3. To learn different modes of transportation and geometric standards of flexible and rigid pavements.
4. To design and economize various constructions of different layers such as sub base, base and surface course.
5. To learn method for reducing traffic impacts on accidents reductions and parking management.
6. To understand the traffic characteristics and design of efficient road networks.

- **ADVANCED CONCRETE TECHNOLOGY : (401 004)**

1 To understand recent aggregates and their compatibility in concrete making.

2 To understand different types of concrete

3 To design modern concrete.

4 To understand basic of fiber reinforced concrete.

5 To understand different properties of fresh and hardened fiber.

6 Have you understood precast elements and concept of Ferro cement.