



BHARATI VIDYAPEETH'S

COLLEGE OF ENGINEERING

Lavale, Pune-412115

Department of Mechanical Engineering

Final Year Engineering Course Outcome

(BE 2019 Course)

SEM I

1. 402041: Heating, Ventilation, Air Conditioning and Refrigeration

CO1. ANALYSE different air-craft refrigeration systems and EXPLAIN the properties, Applications and environmental issues of different refrigerants

CO2. ANALYSE multi pressure refrigeration system used for refrigeration applications.

CO3. DISCUSS types of compressors, condensers, evaporators and expansion valves along with regulatory and safety controls and DESCRIBES Transcritical and ejector refrigeration systems.

CO4. ESTIMATE cooling load for air conditioning systems used with concern of design conditions and indoor quality of air.

CO5. DESIGN air distribution system along with consideration of ventilation and infiltration

CO6. EXPLAIN the working of types of desiccants, evaporative, thermal storage, radiant cooling, clean room and heat pump systems.

2. 402042: Dynamics of Machinery

CO1. APPLY balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.

CO2. ANALYZE the gyroscopic couple or effect for stabilization of Ship, Airplane and Four wheeler vehicles.

CO3. ESTIMATE natural frequency for single DOF un-damped & damped free vibratory systems.

CO4. DETERMINE response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.

CO5. ESTIMATE natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems.

CO6. DESCRIBE noise and vibration measuring instruments for industrial / real life applications along with suitable method for noise and vibration control.

3. 402043: Turbomachinery

CO1: VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.

CO2: DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.

CO3: MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.

CO4: EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

4. 402044A: Automobile Design

CO1: DESIGN of Principal Engine Components

CO2: DESIGN of Drive train

CO3: DESIGN of brakes and Suspension

5. 402044B: Design of Heat Transfer Equipments

CO1: EXPLAIN the design aspect of heat exchanger considering fouling factor for Heat Transfer Applications

CO2: SELECT and DESIGN the double tube heat exchangers for process industry

CO3: DESIGN the Shell & Tube Heat Exchangers for specified conditions

CO4: DESIGN the condensers and evaporators for refrigeration applications

CO5: DESIGN the compact heat exchangers **CO6:** ANALYSE the performance of counter and cross flow cooling tower.

6. 402044C - Modern Machining Processes

CO1. UNDERSTAND and ANALYZE the mechanism, process parameters of mechanical assisted modern machining processes.

CO2. UNDERSTAND the mechanism, construction and working of laser, plasma and electron beam assisted machining.

CO3.CLASSIFY and ANALYZE the mechanism, process parameters of the chemical and electrochemical machining.

CO4.RELATE and ANALYZE the mechanism and select process parameters Electrical Discharge Machining for an application.

CO5.ILLUSTRATE the application of micromachining processes.

CO6.SUGGEST appropriate nanomachining process for the specific application

7. 402044D: Industrial Engineering

CO1. EVALUATE the productivity and IMPLEMENT various productivity improvement techniques.

CO2. APPLY work study techniques and UNDERSTANDS its importance for better productivity.

CO3. DEMONSTRATE the ability to SELECT plant location, appropriate layout and material handling equipment.

CO4. USE of Production planning and control tools for effective planning, scheduling and managing the shop floor control.

CO5. PLAN inventory requirements and EXERCISE effective control on manufacturing requirements.

CO6. APPLY Ergonomics and legislations for human comfort at work place and UNDERSTANDS the role of value engineering in improving productivity

8. 402044E: Internet of Things

CO1. EXPLAIN the Applications/Devices, Protocols and Communication Models of IoT

CO2. DEMONSTRATE small Mechanical Engineering IoT oriented applications using Sensors, Actuators, Microcontrollers and Cloud

CO3. SELECT commonly used IoT Simulation Hardware platforms

CO4. APPLICATION of Interfacing and Communication Technologies for IoT

CO5. ILLUSTRATE IoT Application Development and Security of IoT Ecosystem

CO6. EVALUATE Present and Future Domain specific Applications of IoT Ecosystem

9. 402044F: Computational Fluid Dynamics

CO1. DISTINGUISH and ANALYSE the governing equations of fluid mechanics and heat transfer in various formulations

CO2. ANALYZE and MODEL the conduction and advection problems

CO3. ANALYZE and MODEL the Convection-Diffusion problems

CO4. IDENTIFY and EVALUATE the External/Internal flow and its simulation

CO5. DISTINGUISH and COMPARE concepts of stability and turbulence.

CO6. USE and APPLY a CFD tool for effectively solving practical Fluid-Structure Interaction problems

10. 402045A: Product Design and Development

CO1. UNDERSTAND Product design and Product development processes

CO2. UNDERSTAND Processes, tools and techniques for Market Survey & Product Specification Finalization

CO3. UNDERSTAND Processes, tools and techniques for Concept Inception, Verification and selection

CO4. UNDERSTAND Processes, tools and techniques for Concept Exploration & Development

CO5. UNDERSTAND Processes, tools and techniques for Design Verification and Validation

CO6. UNDERSTAND Processes, tools and techniques for Robust Design and Development

11. 402045B: Experimental Methods in Thermal Engineering

CO1. IDENTIFY the suitable instrument for measuring parameters as per performance characteristics

CO2. ANALYZE experimental data by using different statistical techniques and estimate error

CO3. DISTINGUISH different methods of temperature measurements and thermal radiation

CO4. CLASSIFY various pressure measurement instruments and their comparison

CO5. EXPLAIN different flow measurement methods and flow visualization techniques

CO6. APPLY knowledge of modern engineering experimentation, including calibration, data acquisition, analysis and interpretation using different AI and ML techniques

12. 402045C: Additive Manufacturing

CO1. USE and CLASSIFY the fundamentals of Additive Manufacturing Technologies for engineering applications.

CO2. IDENTIFY and CATEGORIZE the methodology to manufacture the products using light-based photo-curing, LASER based technologies and STUDY their applications, benefits.

CO3. IDENTIFY and CATEGORIZE the methodology to manufacture the products using extrusion-based deposition, inkjet-based technologies and STUDY their applications, benefits.

CO4. SYNTHESIZE, RECOMMEND and DESIGN the suitable material and process for fabrication and build behavior of varieties of product.

CO5. DESIGN and CONSTRUCT the AM equipment's for appropriate applications and the input CAD model.

CO6. DEVELOP the knowledge of additive manufacturing for various real-life applications.

13. 402045D: Operations Research

CO1. EVALUATE various situations of Games theory and Decision techniques and APPLY them to solve them in real life for decision making.

CO2. SELECT appropriate model for queuing situations and sequencing situations and FIND the optimal solutions using models for different situations.

CO3. FORMULATE various management problems and SOLVE them using Linear programming using graphical method and simplex method.

CO4. FORMULATE variety of problems such as transportation, assignment, travelling salesman and SOLVE these problems using linear programming approach.

CO5. PLAN optimum project schedule for network models arising from a wide range of applications and for replacement situations find the optimal solutions using appropriate models for the situation.

CO6. APPLY concepts of simulation and Dynamic programming

402045E: Augmented Reality and Virtual Reality

CO1. UNDERSTAND fundamental Computer Vision, Computer Graphics and HumanComputer Interaction Techniques related to VR/AR

CO2. UNDERSTAND Geometric Modeling Techniques

CO3. UNDERSTAND the Virtual Environment

CO4. ANALYZE and EVALUATE VR/AR Technologies

CO5. APPLY various types of Hardware and Software in Virtual Reality systems

CO6. DESIGN and FORMULATE Virtual/Augmented Reality Applications

14. 402046: Data Analytics Laboratory

CO1: UNDERSTAND the basics of data analytics using concepts of statistics and probability.

CO2: APPLY various inferential statistical analysis techniques to describe data sets and withdraw useful conclusions from acquired data set.

CO3: EXPLORE the data analytics techniques using various tools

CO4: APPLY data science concept and methods to solve problems in real world context

CO5: SELECT advanced techniques to conduct thorough and insightful analysis and interpret the results

15. 402047: Project (Stage I)

CO1. Implement systems approach.

CO2. To conceptualize a novel idea / technique into a product

CO3. To think in terms of a multi-disciplinary environment

CO4. To take on the challenges of teamwork, and document all aspects of design work.

CO5. To understand the management techniques of implementing a project

SEM-II

16. 402048: Computer Integrated Manufacturing

CO1. EXPLAIN CIM and factory automation

CO2. UNDERSTAND the integration of hardware and software elements for CIM

CO3. APPLY CNC program for appropriate manufacturing techniques.

CO4. ANALYZE processes planning, quality and MRP integrated with computers.

CO5. INTERPRET flexible, cellular manufacturing and group technology.

CO6. ANALYZE the effect of IOT, Industry-4.0 and cloud base manufacturing.

17. 402049: Energy Engineering

CO1: EXPLAIN the power generation scenario, the layout components of thermal power plant and ANALYZE the improved Rankine cycle.

CO2: ANALYZE the performance of steam condensers, cooling tower system; RECOGNIZE an environmental impact of energy systems and methods to control the same.

CO3: EXPLAIN the layout, component details of diesel engine plant, hydel and nuclear energy systems.

CO4: ANALYZE gas and improved power cycles.

CO5: EXPLAIN the fundamentals of renewable energy systems.

CO6: EXPLAIN basic principles of energy management, storage and economics of power generation.

18. 402050A: Quality & Reliability Engineer

CO1. UNDERSTAND basic concepts of quality and RELATE various quality tools

CO2. DEVELOP analytical competencies to SOLVE problems on control charts and process capability.

CO3. UNDERSTAND fundamental concepts of reliability.

CO4. EVALUATE system reliability.

CO5. IDENTIFY various failure modes and CREATE fault tree diagram.

CO6. UNDERSTAND the concept of reliability centered maintenance and APPLY reliability tests methods

19. 402050B: Energy Audit and Management

CO1. EXPLAIN the energy need and role of energy management

CO2. CARRY OUT an energy audit of the Institute/Industry/Organization

CO3. ASSESS the ENCON opportunities using energy economics

CO4. ANALYSE the energy conservation performance of Thermal Utilities

CO5. ANALYSE the energy conservation performance of Electrical Utilities

CO6. EXPLAIN the energy performance improvement by Cogeneration and WHR method

20. 402050C: Manufacturing System and Simulation

CO1. UNDERSTAND the concepts of manufacturing system, characteristics, type, etc.

CO2. UNDERSTAND the concepts of Facilities, manufacturing planning & control and Support System.

CO3. UNDERSTAND the concepts of manufacturing towards solving productivity related problems.

CO4. DEVELOP a virtual model to solve industrial engineering related issues such as capacity. utilization, line balancing.

CO5. BUILDING tools to view and control simulations and their results.

CO6. PLAN the data representation & Evaluate the results of the simulation.

21. 402050D: Engineering Economics and Financial Management

CO1. UNDERSTAND the business environment, concepts of economics and demand-supply scenario.

CO2. APPLY the concepts of costing and pricing to evaluate the pricing of mechanical components.

CO3. UNDERSTAND accounting systems and analyze financial statements using ratio analysis

CO4. SELECT and PREPARE the appropriate type of budget and understand the controlling aspects of budget.

CO5. UNDERSTAND the international business and trade system functioning

CO6. DEMONSTRATE understanding of financing decisions of new ventures and performance

22. 402050E: Organizational Informatics

CO1. Demonstrate an understanding of the scope, purpose and value of information systems in an organization.

CO2. Understand the constituents of the information system.

CO3. Demonstrate the Understanding of the management of product data and features of various PLM aspects.

CO4. Relate the basic concepts of manufacturing system and the ERP functionalities in context of information usage.

CO5. Understand the manufacturing execution system and its applications in functional areas.

CO6. Outline the role of the information system in various types of business and allied emerging technologies.

23. 402050F: Computational Multi Body Dynamics

CO1. APPLY the basic terminology and concepts used in Multibody Dynamics to solve varieties of motion related applications

CO2. IDENTIFY and EVALUATE the types of joints, its kinematics and relevant transformations

CO3. DISTINGUISH and COMPARE the formulation methods

CO4. DERIVE equations of motion and EVALUATE the kinematics and dynamics of rigid Planar inter-connected bodies

CO5. DERIVE equations of motion and EVALUATE the kinematics of rigid Spatial interconnected bodies

CO6. APPLY MBD tool effectively and SIMULATE it to solve and validate practical Multibody Dynamics problems and its solutions

24. 402051A: Process Equipment Design

- CO1.** INTERPRET the different parameters involved in design of process Equipments.
- CO2.** ANALYZE thin and thick walled cylinder
- CO3.** DESIGN cylindrical vessel, spherical vessel, tall vessels and thick walled high pressure vessels
- CO4.** DESIGN different process Equipments and select pump, compressor etc. and auxiliary services
- CO5.** EVALUATE Process parameters and their correlation
- CO6.** APPLY the concepts of process equipment design for specific applications

25. 402051B: Renewable Energy Technologies

- CO1.** DESCRIBE fundamentals, needs and scopes of renewable energy systems.
- CO2.** EXPLAIN performance aspects of flat and concentric solar collectors along with applications.
- CO3.** DESIGN solar photovoltaic system for residential applications.
- CO4.** DESIGN AND ANALYSIS of wind energy conversion system.
- CO5.** APPLY Installation practices of Wind and Solar Photovoltaic Systems for grid connection.
- CO6.** DETERMINE performance parameters of bio-energy conversion systems.

26. 402051C: Automation and Robotics

- CO1.** UNDERSTAND the basic concepts of Automation
- CO2.** UNDERSTAND the basic concepts of Robotics
- CO3.** IDENTIFY and EVALUATE appropriate Drive for Robotic Applications
- CO4.** COMPARE and SELECT End-effectors and Sensors as per Application
- CO5.** DEVELOPE the Mathematical Modeling Approaches of Robot
- CO6.** EVALUATE the fundamentals of robot programming and CLASSIFY the Applications

27. 402051D: Industrial Psychology and Organizational Behavior

- CO1.** DEMONSTRATE fundamental knowledge about need and scope of industrial - organizational psychology and behavior.

CO2. ANALYZE the job requirement, have understanding of fatigue, boredom and improve the job satisfaction.

CO3. UNDERSTAND the approaches to enhance the performance.

CO4. KNOWLEDGE of theories of organizational behavior, learning and social-system

CO5. UNDERSTAND the mechanism of group behavior, various aspects of team, leadership and conflict management.

CO6. EVALUATE the organizational culture, manage the change and understands organizational development approaches.

28. 402051E: Electric and Hybrid Vehicle

CO1. UNDERSTAND the basics related to e-vehicle

CO2. CLASSIFY the different hybrid vehicles

CO3. IDENTIFY and EVALUATE the Prime Movers, Energy Storage and Controllers

CO4. DISCOVER and CATAGORIZE the Electric Vehicle Configuration with respect to Propulsion, Power distribution and Drive-Train Topologies

CO5. DEVELOP body frame with appropriate suspension system and TESTING of for eVehicles

CO6. CLASSIFY and EVALUATE Battery Charging techniques and management

29. 402052: Mechanical Systems Analysis Laboratory

CO1. DEVELOP an understanding of the Systems Engineering Process and the range of factors that influence the product need, problem-specific information collection, Problem Definition, Task Specification, Solution Concept inception, Concept Development, System's Mathematical Modelling, Synthesis, Analysis, final solution Selection, Simulation, Detailed Design, Construction, Prototyping, Testing, fault-finding, Diagnosis, Performance Analysis, and Evaluation, Maintenance, Modification, Validation, Planning, Production, Evaluation and use of a system using manual calculation, computational tools to automate product development process, redesign from customer feedback and control of technological systems.

CO2. ILLUSTRATE the concepts and USE the developed skill-set of use of computational tools (FEA, CFD, MBD, FSI, CAE) to automate the complete product development process.

CO3. EVALUATE the knowledge of new developments and innovations in technological systems to carry forward to next stage of employment after passing your Undergraduate Degree Examination.

CO4. APPRAISE how technologies have transformed people's lives and can be used to SOLVE challenges associated with climate change, efficient energy use, security, health, education and transport, which will be coming your ways in the coming future.

CO5. PRIORITIZE the concept of quality and standards, including systems reliability, safety and fitness for the intended purpose.

CO6. INVENT yourself to face the challenges of future technologies and their associated Problems

30. 402053: Project (Stage II)

CO1. Implement systems approach.

CO2. To conceptualize a novel idea / technique into a product

CO3. To think in terms of a multi-disciplinary environment

CO4. To take on the challenges of teamwork, and document all aspects of design work.

CO5. To understand the management techniques of implementing a project