



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Mechanical Engineering Department

Course Outcomes (COs)

B.E. Mechanical Engineering (2019 Course)

Course Code: 402041

Name of Course: Heating Ventilation Air-Conditioning and Refrigeration

C401.1	ANALYSE different air-craft refrigeration systems and EXPLAIN the properties, applications and environmental issues of different refrigerants.
C401.2	ANALYSE multi pressure refrigeration system used for refrigeration applications.
C401.3	DISCUSS types of compressors, condensers, evaporators and expansion valves along with regulatory and safety controls and DESCRIBES Transcritical and ejector refrigeration systems.
C401.4	ESTIMATE cooling load for air conditioning systems used with concern of design conditions and indoor quality of air.
C401.5	DESIGN air distribution system along with consideration of ventilation and infiltration.
C401.6	EXPLAIN the working of types of desiccants, evaporative, thermal storage, radiant cooling, clean room and heat pump systems.

Course Code: 402042

Name of Course: Dynamics of Machinery

C402.1	APPLY balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
C402.2	ANALYZE the gyroscopic couple or effect for stabilization of Ship, Airplane and Four wheeler vehicles.
C402.3	ESTIMATE natural frequency for single DOF un-damped & damped free vibratory systems
C402.4	DETERMINE response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces
C402.5	ESTIMATE natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems
C402.6	DESCRIBE noise and vibration measuring instruments for industrial / real life applications along with suitable method for noise and vibration control



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Course Code:402043

Name of Course: Turbomachinery

C403.1	VALIDATE impulse moment principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
C403.2	DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses.
C403.3	MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
C403.4	EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.

Course Code: 402044D

Name of Course: Industrial Engineering

C404D.1	EVALUATE the productivity and IMPLEMENT various productivity improvement techniques.
C404D.2	APPLY work study techniques and UNDERSTANDS its importance for better productivity.
C404D.3	DEMONSTRATE the ability to SELECT plant location, appropriate layout and material handling equipment.
C404D.4	USE of Production planning and control tools for effective planning, scheduling and managing the shop floor control.
C404D.5	PLAN inventory requirements and EXERCISE effective control on manufacturing requirements.
C404D.6	APPLY Ergonomics and legislations for human comfort at work place and UNDERSTANDS the role of value engineering in improving productivity.



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Course Code: 402045A

Name of Course: Product Design and Development

C405A.1	UNDERSTAND Product design and Product development processes
C405A.2	UNDERSTAND Processes, tools and techniques for Market Survey & Product Specification Finalization
C405A.3	UNDERSTAND Processes, tools and techniques for Concept Inception, Verification and selection
C405A.4	UNDERSTAND Processes, tools and techniques for Concept Exploration & Development
C405A.5	UNDERSTAND Processes, tools and techniques for Design Verification and Validation
C405A.6	UNDERSTAND Processes, tools and techniques for Robust Design and Development

Course Code: 402045D

Name of Course: Operations Research

C405D.1	EVALUATE various situations of Games theory and Decision techniques and APPLY them to solve them in real life for decision making.
C405D.2	SELECT appropriate model for queuing situations and sequencing situations and FIND the optimal solutions using models for different situations.
C405D.3	FORMULATE various management problems and SOLVE them using Linear programming using graphical method and simplex method.
C405D.4	FORMULATE variety of problems such as transportation, assignment, travelling salesman and SOLVE these problems using linear programming approach.
C405D.5	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.
C405D.6	APPLY concepts of simulation and Dynamic programming



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Course Code: 402046

Name of Course: Data Analytics Laboratory

C406.1	UNDERSTAND the basics of data analytics using concepts of statistics and probability.
C406.2	APPLY various inferential statistical analysis techniques to describe data sets and withdraw useful conclusions from acquired data set.
C406.3	EXPLORE the data analytics techniques using various tools
C406.4	APPLY data science concept and methods to solve problems in real world context
C406.5	SELECT advanced techniques to conduct thorough and insightful analysis and interpret the results

Course Code: 402047/402053

Name of Course: Project (Stage – I & II)

C407.1	IMPLEMENT suitable methodology to solve the societal Problems pertaining to the mechanical engineering by utilizing the knowledge gained during the curriculum
C407.2	CREATE the sustainable, economic and environmental friendly solution to the considered problem and analyze the same by effective utilization of relevant tools and techniques.
C407.3	DEVELOP managerial skills and work as a team for obtaining the solution of mechanical or interdisciplinary engineering related problems within stipulated time, following morality and ethics.
C407.4	CONCEPTUALIZE a novel idea / technique into a product and DEMONSTRATE the final product for Functionality, Designability, and Manufacturability

Course Code: 402048

Name of Course: Computer Integrated Manufacturing

C408.1	EXPLAIN CIM and factory automation.
C408.2	UNDERSTAND the integration of hardware and software elements for CIM
C408.3	APPLY CNC program for appropriate manufacturing techniques.
C408.4	ANALYZE processes planning, quality and MRP integrated with computers.
C408.5	INTERPRET flexible, cellular manufacturing and group technology.
C408.6	ANALYZE the effect of IOT, Industry-4.0 and cloud base manufacturing.



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Course Code: 402049

Name of Course: Energy Engineering

C409.1	EXPLAIN the power generation scenario, the layout components of thermal power plant and ANALYZE the improved Rankine cycle.
C409.2	ANALYZE the performance of steam condensers, cooling tower system; RECOGNIZE an environmental impact of energy systems and methods to control the same.
C409.3	EXPLAIN the layout, component details of diesel engine plant, hydel and nuclear energy systems
C409.4	ANALYZE gas and improved power cycles.
C409.5	EXPLAIN basic principles of energy management, storage and economics of power generation.
C409.6	EXPLAIN the fundamentals of renewable energy systems.

Course Code: 402050A

Name of Course: Quality and Reliability Engineering

C4050A.1	UNDERSTAND the quality concepts and tools
C4050A.2	Formulate various problems on control chart and process capability and SOLVE them by different methods
C4050A.3	UNDERSTAND the concept of reliability
C4050A.4	EVALUATE system reliability
C4050A.5	KNOWS various failure modes and FORM fault tree diagram.
C4050A.6	KNOWS the concept of reliability centered maintenance and APPLY reliability tests methods.

Course Code: 402050B

Name of Course: Energy Audit and Management

C4050B.1	EXPLAIN the energy need and role of energy management
C4050B.2	CARRY OUT an energy audit of the Institute/Industry/Organization
C4050B.3	ASSESS the Energy conservation opportunities using energy economics
C4050B.4	ANALYSE the energy conservation performance of Thermal Utilities
C4050B.5	ANALYSE the energy conservation performance of Electrical Utilities
C4050B.6	EXPLAIN the energy performance improvement by Cogeneration and WHR method



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Course Code: 402051B

Name of Course: Renewable Energy Technologies

C4051B.1	DESCRIBE fundamentals, needs and scopes of renewable energy systems.
C4051B.2	EXPLAIN performance aspects of flat and concentric solar collectors along with applications.
C4051B.3	DESIGN solar photovoltaic system for residential applications.
C4051B.4	DESIGN AND ANALYSIS of wind energy conversion system.
C4051B.5	APPLY Installation practices of Wind and Solar Photovoltaic Systems for grid connection.
C4051B.6	DETERMINE performance parameters of bio-energy conversion systems.

Course Code: 402051E

Name of Course: Electrical and Hybrid Vehicle

C4051E.1	UNDERSTAND the basics related to e-vehicle
C4051E.2	CLASSIFY the different hybrid vehicles
C4051E.3	IDENTIFY and EVALUATE the Prime Movers, Energy Storage and Controllers
C4051E.4	DISCOVER and CATAGORIZE the Electric Vehicle Configuration with respect to Propulsion, Power distribution and Drive-Train Topologies
C4051E.5	DEVELOP body frame with appropriate suspension system and TESTING of for e-Vehicles
C4051E.6	CLASSIFY and EVALUATE Battery Charging techniques and management



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Course Code: 402052

Name of Course: Mechanical Systems Analysis Laboratory

C4052.1	DEVELOP an understanding of the Systems Engineering Process and the range of factors that influence the product need
C4052.2	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.
C4052.3	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.
C4052.4	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.
C4052.5	PRIORITIZE the concept of quality and standards, including systems reliability, safety and fitness for the intended purpose.
C4052.6	INVENT yourself to face the challenges of future technologies and their associated Problems