



NASHIK DISTRICT MARATHA VIDYA PRASARAK SAMAJ'S

Karmaveer Adv. Baburao Ganpatrao Thakare College of Engineering

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MECHANICAL ENGINEERING DEPARTMENT

Vission

To be the centre for excellence and centre of learning for innovation, incubation and research in the domain of product design, thermal engineering and manufacturing technology thereby path finder for professionalism, entrepreneurship and new knowledge contributing to the common masses.

Mission

To educate and train undergraduate and post graduate students in Mechanical Engineering by inculcating the values for discipline, quality and transparency and profession development in the job and self-employment emphasis industry based practices.

Program Education Objectives (PEO's)

PEO1: To prepare technocrats that can satisfy the need of mechanical and allied industries.

PEO2: To develop critical thinking, problem solving skills, research aptitude and career and professionalism among the students.

PEO3: To improve and expand technical and professional skills of students through effective teaching-learning and industry interaction.

Programme Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes(PSO's)

PSO1: Apply knowledge in the domain of design, thermal and manufacturing to solve engineering problems.

PSO2: Able to apply practical skills for the benefit of society.

PSO3: The Mechanical Engineering Graduates will be able to work in the industries in the sphere of operation, quality and maintenance.

Course Outcomes

Second Year(S.E.) Subjects Course Outcomes ACADEMIC YEAR: - 2018-19

Semester – I

Subject Code	Engineering Mathematics-III (207002)
C201.1	Students should be able to solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
C201.2	Students should be able to Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
C201.3	Students should be able to Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
C201.4	Students should be able to Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
C201.5	Students should be able to Apply Vector Integration to Compute line, surface and volume integrals.
C201.6	Students should be able to Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.

Subject Code	Manufacturing Process-I (202041)
C202.1	Students should be able to Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects.
C202.2	Students should be able to Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
C202.3	Students should be able to Understand different plastic molding processes, Extrusion of Plastic and Thermoforming
C202.4	Students should be able to Understand different Welding and joining processes and its defects
C202.5	Students should be able to Understand, Design and Analyze different sheet metal working processes
C202.6	Students should be able to Understand the constructional details and Working of Centre Lathe

Subject Code	Computer Aided Machine Drawing (202042)
C203.1	Student should understand the need of different 3D modeling software used in industry.
C203.2	Student should be able to create 2D sketch with proper constraints and dimensions
C203.3	Student should be able to create 3D parts using free form feature modeling.
C203.4	Student should have an ability to apply knowledge of mathematics and engineering for geometrical dimensioning and tolerances using ASME Y14.5.
C203.5	Student should be able to analyze the relationship between various components to create a assembly using proper constraints.
C203.6	Student should be create 2D production drawings of parts / assembly and apply appropriate dimension and tolerances.

Subject Code	Thermodynamics (202043)
C204.1	Student should be able to apply first and second law of thermodynamics to any thermodynamic system.
C204.2	Student should be able to evaluate entropy, heat transfer, work and other thermodynamic properties for various ideal gas processes.
C204.3	Student should be able to analyze various thermodynamic gas power cycles and gas refrigeration cycle.
C204.4	Student should be able to evaluate the performance of vapour power cycle and vapour compression cycle.
C204.5	Student should be able to estimate stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
C204.6	Student should be able to understand fundamentals of Psychrometry.

Subject Code	Material Science (202044)
C205.1	Student should be able to understand the basic concepts and properties of material.
C205.2	Student should be able to detect the defects in crystal and its effect on crystal properties.
C205.3	Student should be able to evaluate the different properties of material by studying different test
C205.4	Student should be able to recognize how metals can be strengthened by cold-working and hot working
C205.5	Student should be able to understand about material fundamental and processing.
C205.6	Student should be able to select proper metal, alloys, nonmetal and powder metallurgical component for specific requirement

Subject Code	Strength of Materials (202051)
C206.1	Student should be able to understand mechanical properties of material & to apply fundamentals of engineering mechanics
C206.2	Student should be able to understand shear force diagram & bending moment diagram.
C206.3	Student should be able to understand basics of shear stress & bending stress for different section.
C206.4	Student should be able to analyze slope and deflection problem.
C206.5	Student should be able to solve the problem on torsion and buckling of column.
C206.6	Student should be able to understand principal stress & strain using mohr's circle method.

Second Year(S.E.) Subjects Course Outcomes
ACADEMIC YEAR: - 2018-19
Semester – II

Subject Code	Fluid Mechanics (202045)
C207.1	Student should be able to understand properties of fluids, pascal's law, buoyancy and floatation.
C207.2	Student should be able to understand the continuity equation and different types of flows.
C207.3	Student should be able to understand and apply the conservation of momentum principle i.e. euler's equation of motion, conservation of energy principle i.e. bernoulli's equation.
C207.4	Student should be able to understand and apply the laminar and turbulent flow physics for a circular pipe and for fixed parallel plates.
C207.5	Student should be able to understand the losses in pipes, concept of equivalent pipe, dimensional analysis and important dimensionless numbers.
C207.6	Student should be able to understand the boundary layer phenomenon for flow over a flat plate, separation of boundary layer and methods of controlling the boundary layer.

Subject Code	Soft Skills (202047)
C208.1	Students should be able to do own SWOT analysis.
C208.2	Students should be able to develop Listening, presentation and Speaking Skills
C208.3	Students should be able to develop Corporate / Business Etiquettes
C208.4	Students should be able to improve writing skill by writing resume, email to corporate office and minutes of meeting.

Subject Code	Theory of Machines-I (202048)
C209.1	Students should be able to understand and identify mechanisms in real life applications
C209.2	Students should be able to perform static and dynamic force analysis of slider crank mechanism and determine moment of inertia of rigid bodies experimentally
C209.3	Students should be able to understand the working of different types of clutches, brakes and dynamometers and also able to evaluate loss of power due to friction
C209.4	Students should be able to analyze the velocity and acceleration of mechanisms by analytical methods
C209.5	Students should be able to analyze the velocity and acceleration of mechanisms by graphical methods
C209.6	Students should be able to evaluate velocity and acceleration of mechanisms involving coriolis component of acceleration and slider crank mechanism by using kien's construction

Subject Code	Engineering Metallurgy (202049)
C210.1	Student should be able to apply core concepts in engineering metallurgy to solve engineering problems.
C210.2	Student should be able to conduct experiments, as well as to analyze and interpret data
C210.3	Student should be able to describe how metals and alloys formed and how the properties change due to microstructure
C210.4	Student should be able to recognize how metals can be strengthened by alloying, cold-working, and heat treatment
C210.5	Student should be able to select materials for design and construction.
C210.6	Student should be able to possess the skills and techniques necessary for modern materials engineering practice

Subject Code	Applied Thermodynamics (202050)
C211.1	Student should be able to classify various types of engines, compare air standard, fuel air and actual cycles and make out various losses in real cycles.
C211.2	Student should be able to understand theory of carburetion, modern carburetor, stages of combustion in s. i. engines and theory of detonation, pre-ignition and factors affecting detonation.
C211.3	Student should be able to 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
C211.4	Student should be able to carry out testing of i. c. engines and analyze its performance.
C211.5	Student should be able to 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.
C211.6	Student should be able to describe construction, working of various types of reciprocating and rotary compressors with performance calculations of positive displacement compressors

Subject Code	Electrical and Electronics Engineering (203152)
C212.1	Student should be able to understand principle of operation and speed control of dc machines.
C212.2	Student should be able to understand working principle of induction motor, its speed control methods and applications.
C212.3	Student should be able to develop the capability to identify and select suitable dc motor/i.m./special purpose motor and its speed control method for given industrial applications.
C212.4	Student should be able to understand the features of microcontroller atmega328p and arduino ide.
C212.5	Student should be able to program arduino ide using conditional statements.
C212.6	Student should be able to interfacing sensors with arduino ide.

Subject Code	Machine Shop – I (202053)
C213.1	To Manufacture of spur gear on milling machine using indexing head
C213.2	Study of Surface grinding using table grinder
C213.3	Manufacturing sheet metal component involving minimum three different operation.
C213.4	To manufacture any two plastic component like bottle, bottle caps,
C213.5	To manufacture any machine handles.

Course Outcomes

Third Year(T.E.) Subjects Course Outcomes ACADEMIC YEAR: - 2018-19 Semester – I

Subject Code	Design of Machine Elements-I (302041)
C3O1.1	Student should be able to identify and understand failure modes for mechanical elements and design of machine elements based on strength
C3O1.2	Student should be able to apply the knowledge to design shaft, keys and couplings
C3O1.3	Student should be able to understand the concept of fluctuating loads and apply it to design machine elements
C3O1.4	Student should be able to design power screw for screw jack and c- clamp and create design report and detail drawings
C3O1.5	Student should be able to design fasteners and welded joints subjected to different loading conditions
C3O1.6	Student should be able to design various springs for strength and stiffness

Subject Code	Heat Transfer (302042)
C3O2.1	Student should be able to understand the various modes of heat transfer and apply electrical analogy for steady, one dimensional without internal heat generation thermal system.
C3O2.2	Student should be able to apply the general heat conduction equation to thermal systems with and without internal heat generation.
C3O2.3	Student should be able to analyze the heat transfer rate in unsteady state conditions using lumped heat capacity system.
C3O2.4	Student should be able to analyze the heat transfer rate in natural and forced convection through experimentation investigation.
C3O2.5	Student should be able to understand the concept of radiation and analyze heat transfer rate by radiation between surfaces.
C3O2.6	Student should be able to analyze the heat exchanger equipment and investigate their performance.

Subject Code	Theory of Machine – II (302043)
C303.1	Student should be able to understand fundamentals of spur gear and analyze interference which will be the prerequisite for gear design.
C303.2	Student should be able to understand and analyze helical. spiral. bevel, and worm and worm gears.
C303.3	Student should be able to analyze speed and torque in epi-cyclic gear trains, this will be the prerequisite for gear box design.
C303.4	Student should be able to construct cam profile for given follower motions and understand cam jump phenomenon, advance cam curves.
C303.5	Student should be able to synthesize a four bar and slider crank mechanism with analytical and graphical methods.
C303.6	Student should be able to analyze the gyroscopic couple and its effect for stabilization of ship, aero plane and automobile and also able to choose appropriate drive for given application (stepped / stepless)

Subject Code	Turbo Machines (302044)
C304.1	Student should be able to understand impulse momentum principle and its applications
C304.2	Student should be able to understand and perform analysis of velocity diagrams, efficiencies and governing of impulse hydraulic turbines.
C304.3	Student should be able to understand and perform analysis of velocity diagrams, efficiencies and governing of reaction hydraulic turbines.
C304.4	Student should be able to understand and perform analysis of velocity diagrams, performance, compounding and governing of impulse and reaction steam turbines.
C304.5	Student should be able to understand the fundamental working principle of centrifugal pump and to analyse the velocity diagrams and efficiencies of centrifugal pump.
C304.6	Student should be able to understand the enthalpy-entropy diagram, dimensionless parameters and performance characteristics of centrifugal compressor and axial flow compressor.

Subject Code	Metrology and Quality Control (302045)
C305.1	Student should be able to understand basic concept of metrology and apply knowledge of tolerance, limits & fits which will be prerequisite for gauge design.
C305.2	Student should be able to understand and apply knowledge of comparator, thread, gear and surface roughness.
C305.3	Student should be able to understand the advanced methods of measurement such as

	cmm, laser m/c vision system.
C3O5.4	Student should be able to understand & apply qc techniques which will be prerequisite for mfg. & design engg.
C3O5.5	Student should be able to plot control chart for evaluating process & sampling inspection.
C3O5.6	Student should be able to understand and apply concept of total quality management & ISO standard.

Subject Code	Skill Development (302046)
C3O6.1	Student should be able to understand, identify and tackle different tools used in machine assembly shop
C3O6.2	Student should be able to understand practical aspect of each component in the assembly of machine
C3O6.3	Student should be able to apply skill required in shop floor working
C3O6.4	Student should be able to draw a sheet of assembly containing geometric tolerance, limits, fits, bom & dimension measurement technique.

Third Year (T.E.) Subjects Course Outcomes
ACADEMIC YEAR: - 2018-19
Semester – II

Subject Code	Numerical Method & Optimization{NMO} (302047)
C3O7.1	Student should be able to understand the types of errors and apply appropriate numerical method to determine the roots of equation
C3O7.2	Student should be able to apply appropriate numerical method for solving more than two equations simultaneously
C3O7.3	Student should be able to understand the concept of optimization and apply suitable techniques to obtain the optimum solution for real life problem
C3O7.4	Student should be able to evaluate appropriate numerical method to fit the best curve and solve complex interpolating mechanical problems.
C3O7.5	Student should be able to understand and apply the standard method of integration.
C3O7.6	Student should be able to Understand and apply numerical methods to solve differential equations.

Subject Code	Design of Machine element- II (302048)
C3O8.1	Student should be able to select appropriate gears and design of spur gears.
C3O8.2	Student should be able to design of helical and bevel gears
C3O8.3	Student should be able to select different types of rolling contact bearings from manufacturers' catalog.
C3O8.4	Student should be able to design of worm gears
C3O8.5	Student should be able to select appropriate drive and design, selection of drive from manufacturers' catalog.
C3O8.6	Student should be able to design hydrodynamic journal bearing and selection of proper lubricating oil.

Subject Code	Refrigeration & Air Conditioning (302049)
C3O9.1	Student should be able to study applications of refrigeration and air conditioning and learn different types refrigerants
C3O9.2	Student should be able to analyze vapour compression cycle using p-h chart and understand the working of vapour absorption system
C3O9.3	Student should be able to understand and analyze multi-compressor and multi-evaporator vapour compression systems
C3O9.4	Student should be able to understand psychrometric processes and their representation on psychrometric chart
C3O9.5	Student should be able to understand working of different air conditioning systems and learn the components of refrigeration and air conditioning system
C3O9.6	Student should be able to design and analyze the duct system

Subject Code	Mechatronics (302050)
C310.1	Student should be able to identification of key elements of mechatronics system and its representation in terms of block diagram
C310.2	Student should be able to understand concept of transfer function, block diagram reduction and its analysis
C310.3	Student should be able to understand the concept of signal processing and use of interfacing systems such as adc, dac, digital i/o and amplifiers.
C310.4	Student should be able to understand the concept of plc system and its ladder programming, and significance of plc systems in industrial application.
C310.5	Student should be able to understand the system modeling and analysis in time domain and frequency domain

C310.6	Student should be able to understand control actions such as proportional, derivative and integral and study its significance in industrial applications.
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Subject Code	Manufacturing -Process-II (302051)
C311.1	Student should be able to apply the knowledge of various manufacturing processes
C311.2	Student should be able to identify various process parameters and their effect on processes.
C311.3	Student should be able to figure out application of modern machining.
C311.4	Students should get the knowledge of Jigs and Fixtures for variety of operations.
C311.5	Students should get the knowledge of NC and CNC machine
C311.6	Student should be able to design Jigs and Fixtures.

Subject Code	Machine Shop– II (302052)
C312.1	Students should be able to perform various operations on lathe machine.
C312.2	Students should be able to development and execution of one simple turning job on CNC
C312.3	Students should be able to draw and read jigs and fixture drawings.
C312.4	Students should be able to prepare process planning sheets for job

Final Year (B.E.) Subjects Course Outcomes
ACADEMIC YEAR: - 2018-19

Semester – I

Subject Code	Hydraulics and Pneumatics (402041)
C401.1	Understand working principle of components used in hydraulic & pneumatic systems
C401.2	Identify various applications of hydraulic & pneumatic systems
C401.3	Selection of appropriate components required for hydraulic and pneumatic systems
C401.4	Analyse hydraulic and pneumatic systems for industrial/mobile applications
C401.5	Design a system according to the requirements
C401.6	Develop and apply knowledge to various applications

Subject Code	CAD/CAM and Automation (402042)
C402.1	Students should be able to apply homogeneous transformation matrix for geometrical transformations for 2d cad entities for basic geometrical transformations.
C402.2	Students should be able to understand and apply parametric equations of curves and surfaces.
C402.3	Students should be able to understand and apply fem for simple mechanical elements like beam, trusses etc.
C402.4	Students should be able to generate cnc programme for turning/milling and generate tool path using cam software.
C402.5	Students should be able to understand various advanced manufacturing techniques.
C402.6	Students should be able to understand the basics and types of automation

Subject Code	Dynamics Of Machinery (402043)
C403.1	Students should be able to understand the fundamentals of vibration and analyze free vibration of single degree of freedom system.
C403.2	Students should be able to create analytical competency in solving force vibration problems of single degree of freedom system
C403.3	Students should be able to evaluate the problems of free undamped vibration of two degree of freedom system
C403.4	Students should be able to apply solutions to balancing problems of machines.
C403.5	Students should be able to measure vibrations, vibration characteristics and understand various methods for vibration control for real life problem
C403.6	Students should be able to understand measurement and control of noise

Subject Code	Finite Element Analysis(402044 A)
C404.1	Students should be able to learn the basics of fem & must be able to use the principal of mathematics
C404.2	Students will be able to derive 1d element stiffness matrices and load vector form various methods to solve for displacement and stress
C404.3	Students will be able to derive 2d element stiffness matrices and load vector form various methods to solve for displacement and stress
C404.4	Students should be able to learn the concept of isoparametric element, formulation of isoparametric element and coordinate mapping
C404.5	Students should be able to solve 1d steady state heat transfer practical problem
C404.6	Students should be able to perform analysis to finding natural frequency and model shape

Subject Code	Automobile Engineering (402045 A)
C405A.1	Students should be able to introduce the automotive system along with drive trains
C405A.2	Students should be able to compare and select the proper automotive system for the vehicle
C405A.3	Students should be able to compare and select the proper suspension & brake system for the vehicle
C405A.4	Students should be able to analyse the performance of the vehicle
C405A.5	Students should be able to diagnose the faults of automobile vehicles
C405A.6	Students should be able to apply knowledge of EVS, HEVS and solar vehicles

Subject Code	Energy Audit and Management (402045 C)
C405C.1	Student will be able to compare the energy scenario of India and world.
C405C.2	Student will be able to carry out Energy Audit of the Residence/Institute/Organization.
C405C.3	Student will be able to evaluate the project using financial techniques.
C405C.4	Student will be able to identify and evaluate energy conservation opportunities in thermal utilities.
C405C.5	Student will be able to identify and evaluate energy conservation opportunities in Electrical utilities
C405C.6	Student will be able to identify the feasibility of cogeneration and WHR use a CFD tool efficiently for practical problems and research.

Final Year (B.E.) Subjects Course Outcomes
ACADEMIC YEAR: - 2018-19

Semester – II

Subject Code	Energy Engineering (402047)
C407.1	Student will be able to have adequacy with design, erection and development of energy conversion plants
C407.2	Student will be able to understand the optimization of thermal power plant with respect to available resources
C407.3	Student will be able to understand the optimization of hydroelectric and nuclear power plant with respect to available resources
C407.4	Student will be able to understand the optimization of diesel and gas turbine power plant with respect to available resources
C407.5	Student will be able to apply the alternative erection of optimized, suitable plant at the location depending upon geographical conditions
C407.6	Student will be able to implement the knowledge of instruments used in power plant and the impact of power plant on environment

Subject Code	Mechanical System Design (402048)
C408.1	Student will be able to design machine tool gearbox
C408.2	Student will be able to apply the statistical considerations in design and analyze the defects and failure modes in components
C408.3	Student will be able to design material handling systems for the industrial applications.
C408.4	Student will be able to design cylinders and pressure vessels
C408.5	Student will be able to design various I. C. Engine components,
C408.6	Student will be able to understand optimum design and Design for manufacture, assembly and safety(DFMA) concepts to design mechanical component

Subject Code	Industrial Engineering (402049)
C409B.1	Student will be able to apply the industrial engineering concept in the industrial environment.
C409B.2	Student will be able to manage and implement different concepts involved in methods study and understanding of work content in different situations.
C409B.3	Student will be able to undertake project work based on the course content.
C409B.4	Student will be able to describe different aspects of work system design and facilities design pertinent to manufacturing industries.
C409B.5	Student will be able to identify various cost accounting and financial management practices widely applied in industries.
C409B.6	Student will be able to develop capability in integrating knowledge of design along with other aspects of value addition in the conceptualization and manufacturing stage of various products.

Subject Code	Advanced Manufacturing Processes (402050A)
C410A.1	Student will be able to classify and analyze special forming processes.
C410A.2	Student will be able to analyze and identify applicability of advanced joining processes.
C410A.3	Student will be able to understand and analyze the basic mechanisms of hybrid non-conventional machining techniques.
C410A.4	Student will be able to select appropriate micro and nano fabrication techniques for engineering applications.
C410A.5	Student will be able to understand and apply various additive manufacturing technology for product development.
C410A.6	Student will be able to understand material characterization techniques to analyze effects of chemical composition, composition variation and crystal structure.