

K. D.K. College of Engineering, Nagpur
Department of Mechanical Engineering
M.Tech Mechanical Engineering Design

Course Outcomes

PGMED101T	Advanced Mechanisms
CO101.1	To study Introduction to kinematic synthesis type number and dimension synthesis practical applications, degree of freedom class -I, class-II chain Grubblers criteria, concept of transmission angle.
CO101.2	To study Synthesis of planar mechanism: Introduction to function generation, path generation, path generation & rigid body guidance. Problems, accuracy points chebychev's spacing, Graphical approaches for synthesis for above problem Central point curve, circle point curve, point position, inflection circle Bo-billior construction, Euler's savory equation, Hartman construction, vector approach & matrix approach, rotation matrix, displacement matrix, Freudenstein's equation, computer approach for the above problem .
CO101.3	To study Optimal synthesis of planar mechanisms, Powells search methods least square method penalty function computer approach.
CO101.4	To study Kinematic analysis & synthesis of spatial mechanisms Hi notations screw matrix, kinematic analysis for linkages like R-S-S-R, R-C-P-R-C etc.
CO101.5	To study Introduction to kinematics synthesis of Robot arms.
PGMED102T	Dynamics of Machinery
CO102.1	To study Dynamics of Mechanisms Forces in mechanisms, friction in links connection, stress distribution in links. Various approaches for dynamic analysis
CO102.2	To study Dynamic Motion Analysis: Energy distribution method, the rate of change of energy method, Balancing of linkages and flywheel requirements. Lagranjian Euler formulation, Hamilton's Formulation
CO102.3	To study Rotor Dynamics , Torsional Vibration in reciprocating machines, Critical speed, bending vibration of rotating shaft .Out of balance, balance of rigid rotors, whirling speed of shaft, hydrodynamic instability
PGMED103T	Mechanical Vibrations
CO103.1	To study Vibration problems in engineering causes and effects of vibration relevance of vibration analysis, free vibration and response to damped single degree freedom systems. Frequency response function-amplitude and phase plots, vibration isolation

CO103.2	To study Vibration problems in continuum and discrete modeling lumped parameter systems free vibration and response to damped single degree freedom systems. Frequency response function-amplitude and phase plots mechanical impedance and mobility
CO103.3	To study Vibration Response of Systems to Arbitrary Periodic Excitation: Duhamel's integral impulse response function – shock spectra –Laplace and Fourier transform methods.
CO103.4	To study Vibration problems in Multi Degree Freedom Systems: Matrix formulation Eigen values and Eigen formulation matrix iteration techniques – normal modes and orthgonality transient response of multidegree freedom system mode superposition technique tensional oscillations of faulty rotor systems.
CO103.5	To study Vibration Instrumentation: Vibration measurements – instrumentation – electrodynamics exciters –impact hammers piezoelectric accelerometers signal conditioning and amplification preamplifiers and power amplifiers real time analysis digital Fourier transforms FFT analysis structural frequency response measurement random sinusoidal and transient test methods model testing of beams.
CO103.6	To study Noise Control :Sound and Noise parameters prorogation of sound noise in carious machinery's noise measurements techniques. Noise Control Techniques, Sound absorption , sound insulation , methods.
PGMED104T	Computer Aided Mechanical Design
CO104.1	it helps to understand role of computer in design process. Requirement of hardware andsoftware, various analytical curves also help to develop skill in drafting
CO104.2	it helps to improve development of interactive design programmes for machine element.also useful to understand incorporating choice of material and other parameters
CO104.3	it help to enhance knowledge about mathematical representation of curves also useful to develop different assembly
PGOPENMED040	Robotics
CO105.1	To learn Basic concepts in Robotic and its Anatomy
CO105.2	To learn Kinematic Analysis of Robots
CO105.3	To learn Robot Dynamics using various formulation
CO105.4	To learn Drives, Control of Trajectory used in robotics

CO105.5	To learn Robotic Sensors and programming used in robotics
CO105.6	To learn Application of Robot in industry

PGMED201T	ADVANCED MECHANICAL DRIVES
CO201.1	To study Belt Drives: Belt vibrations, additional stress due to vibration, modern development in toothed belt, fatigue, synchronization, slip due to wear. Dynamics & vibration of Arms of Pulleys by three Approaches (1) Equal sharing of load zone (2) Equilibrium of rim (3) FEM Approach.
CO201.2	To study Gears: Detailed dynamics of gear tooth, spur tooth vibrations, Estimation of additional stress under vibration. Fatigue in tooth due to contact stress. Exact estimation of gear meshes frequencies in signature analysis.
CO201.3	To study Gear Boxes: Kinematic Analysis of complex gear trains, Force Analysis including gyroscopic effects, Vibration Analysis of Gearboxes, Lubrication Methods, Contamination of Lubrication Oils, wear debris analysis.
CO201.4	To study Chain Drives :Detailed dynamics of chains considering Rolling friction of hanging portion of tracks, chain vibrations : Lateral & longitudinal, wear debris formation & effect on efficiency, impact loads in chains. Analysis of power & conveyor chains.
CO201.5	To study PIV Drives: Concept, Need, Classification & Types. Detailed kinematics & dynamics of 4/5 important drives.
CO201.6	To study Couplings: Stress analysis of coupling bolts during one rotation, Rubbing of coupling pins & its effect on signature, Analysis due to misalignment, Degree of shock absorption due to flexible elements in flexible couplings.
PGMED202T	Stress Analysis
CO202.1	To study Fundamentals of stress & strain, stress strain relationship, Elastic constant , plane stress, plane strain. Stress Analysis for two dimensional problems in Cartesian co-ordinate system, equations of Equilibrium, compatibility equation, Airy ,s stress function, Analysis of rectangular plates by polynomials.
CO202.2	To study Two dimensional problems in polar co-ordinates, general equations in polar co-ordinates for any symmetric case, pure bending of curved beams, crane hooks , bending of beams with initial curvature ,Analysis of piston rings, stresses in rotating discs, with variable and constant sections , Effect of holes on stress distribution in plates, contact stresses.
CO202.3	To study Torsion: Torsion of non circular section , St. Venants theory, Membrane analogy , Torsion of thin walled tubes.
CO202.4	To study Experimental stress analysis by strain gauge & photo elasticity technique, strain rosettes, recording instruments, Brittle coating techniques, polariscope, Isochromatic & isoclinic fringes, compensation techniques.

CO202.5	To study Thermal stresses: Thermo elasticity, thin circular discs, thermal stresses
	in turbine r o t o r s , Analysis of beams under thermal load.
CO202.6	To study fracture Mechanics.
PGMED203T	Design of Mechanical Handling System
CO203.1	To study Constructional features, operation, operational characteristics advantages, Disadvantages, Limitations of conveying machines, Design considerations of conveying machines.
CO203.2	To study Unit Load conveying: Fork lift Trucks, Trolley, conveyers. Cableways, Rope ways, Cranes , Over head cranes , Elevators, Drag lines , Robotic Handling , AGV Bulk solid us conveying: Belt conveyers ,chain conveyers, Roller conveyers, (Gravity & Powered), Screw conveyers, Tubular screw conveyers, Escalators, Vibrating conveyers, (Crank type & spring type), Pneumatic conveying.
PGMED204T	Elective -III (Discipline) Design of Hydraulic and Pneumatic System
CO204.1	To study Oil Hydraulic Systems: Hydraulic Power Generator, selection and specification of pumps, pump characteristics.
CO204.2	To study Hydraulic Actuators: Linear & Rotary Actuators, Selection, Specification and Characteristics.
CO204.3	To study Control & Regulation Elements: Pressure, direction and flow control valves, relief valves, non return and safety valves actuation systems.
CO204.4	To study Hydraulic Circuits : Reciprocating quick return, sequencing synchronizing circuits, accumulator circuits, industrial circuits, press circuits, hydraulic milling machine, grinding ,planning copying, forklift earthmover circuits, design and selection of components, safety and emergency modules.
CO204.5	To study Pneumatic System, and Circuits :Pneumatic fundamentals ,control elements, position and pressure sensing, logic circuits, switching circuits, fringe condition modules and their integration, sequential circuits , cascade methods, mapping methods, step counter method, compound circuit design, combination circuit design .
CO204.6	To study Installation, Maintenance and Special Circuits: Pneumatic equipments, selection of components, design calculations, application, fault finding, hydro pneumatic
PGMED205T	FOUNDATION COURSE-I
CO205.1	Introduction to philosophy of research.
CO205.2	Understand process to formulate research questions / idea
CO205.3	Understand process of planning of research time, resource

CO205.4	Understand different statistical analysis methods
CO205.5	Develop thesis and report writing.

PGMED30 2T	FOUNDATION COURSE-II
CO302.1	Conduct a basic needs assessment for a proposed project
CO302.2	Develop a project proposal
CO302.3	Develop a logical framework
CO302.4	Develop measureable indicators
CO302.5	Have ability to insert Monitoring and Evaluation into a project