

Course #:

Prereq.:

Course Description

Legend

Course Title $[\mathbf{A} - \mathbf{B} - \mathbf{C}]$

A: Theoretical hrs

B: Practical hrs

C: Credit hrs

Engineering Workshops (1) [0 – 3 - 1]	Course #: 0905100	Prereq.:	
Safety in the workshop and hand skills. Development of basic skills in fields of carpentry, manual sheet metal fabrication, welding processes and household electrical circuits.			
Engineering Drawing [0 - 6 - 3]	Course #: 0905103	Prereq.:	
Introduction. Lettering. Drawing instruments and their use. Lines, Curves and Geometrical construction. Multi view sketching and drawing with instruments. Pictorials. Sectional views. Dimensioning, Auxiliary views.			
Advanced Engineering Mathematics $[3 - 0 - 3]$	Course #: 0905201	Prereq.:0300102	
Linear algebra. Matrix algebra Eigenvalues, Eigenvectors. First, second, and higher order ordinary differential equations. Systems of differential equations. Laplace transforms.			
Materials Science and Engineering $[3 - 0 - 3]$	Course #: 0905205	Prereq.:0303101	
Diffusion in solid and solid solutions. Effect of stresses and heat on the microstructure. Physical and mechanical properties. Strengthening of metallic materials. Equilibrium phase diagrams in binary alloys. Fe-carbon phase diagram. Principles of heat treatment. Ferrous alloys (steels and cast irons). Non ferrous alloys (Al-, Mg-, Ti-, Cu-, Ni-, and Zn-alloys). Composite materials. Corrosion of metals and alloys			
Mechanical Drawing [0 - 4 - 2]	Course #: 0905206	Prereq.:0905103	
Sectional views; sectioning in machine parts drawing; threads; bolted joints: studded; screw fastening, cotter; keyed; splinted joints, gears and bearing. Detailing drawing, assembly drawing, reading and drawing diagrams tolerances; fittings and surface roughness; CAD Applications.			
Mechanics of Materials $[3 - 0 - 3]$	Course #: 0905213	Prereq.:0902221	
Introduction to mechanics of deformable bodies. Concepts of stress and strain. Mechanical properties of materials. Axially loaded members. Torsion of circular shafts and tubes. Bending and shearing stresses in beams. Stresses in thin-walled members and pressure vessels. Combined loadings. Stress and strain transformations. Beam deflection (method of integration). Concept of buckling of columns.			



Mechanics of Materials Lab [0 – 3 - 1]	Course #: 0905214	Prereq.:0905213*
Measurements of stresses and strains. Tensile test. Compression test. Hardness test. Creep and fatigue Tests. Impact test. Torsion test. Buckling of columns. Deflection of beams and plates. Strain gauge measurements.		
Applied Mathematics $[2 - 0 - 2]$	Course #: 0905301	Prereq.:0905201
Fourier series, Fourier Integrals and Transforms. Partial di dimensional wave equations (string, beam, membrane), one- Laplacian in rectangular and polar coordinates. Complex numb	fferential equati and two-dimensions ers and functions	ions, one- and two- ional heat equations, s.
Dynamics $[3 - 0 - 3]$	Course #: 0905311	Prereq.:0902221
Kinematics of particles. Planar kinematics of rigid bodies. K bodies: equations of motion, work and energy, impulse and mo	inetics of partic mentum. Introdu	les and planar rigid ction to vibrations.
Thermodynamics (1) $[3 - 0 - 3]$	Course #: 0905321	Prereq.:0300121
The concept of a thermodynamic system. Properties of pure so law of thermodynamics. The first law analysis for a co- thermodynamics. Entropy. The second law analysis for a control	substances. Worl ntrol volume.	c and Heat. The first The second law of
Thermodynamics (2) $[3-0-3]$	Course #: 0905322	Prereq.:0905321
Irreversibility and availability. Power and Refrigeration System. Gas Mixture. The Psychometric Chart. Thermodynamics Relations. Compressible Flow. Mach numbers and shockwaves.		
Thermodynamics Lab $[0-3-1]$	Course #: 0905323	Prereq.:0905322*
Boyle's law, measurement of calorific value, first law of thermodynamics, conservation energy, turbine shaft power, characteristic of the power turbine, specific fuel consumption, turbine efficiency, calculate the exhaust velocity of Nozzle, study the relation between pressure and temperature, demonstration of the effect of air in a cooling system, effect of evaporation and condensation temperature in the cooling rate and in the heat transfer at the condenser.		
Manufacturing Processes $[3-0-3]$	Course #: 0905330	Prereq.:0905213
Classification of manufacturing processes. Casting: Sand casting, permanent mold casting, centrifuged casting. Mechanical behavior of metals, true stress-true strain, plastic instability, yields criteria. Forming processes: Forging, rolling, extrusion, rod and wire drawing. Material removal processes: Mechanics of chip formation, main parameters affecting M.R.P., speed, feed, depth of cut, force analysis (Merchant's Circle). Turning, milling, vibration and chatter in machine tools.		
Theory of Wachines $[3-0-3]$	0905331	Fieldq0905511
and acceleration analysis in mechanisms. Inertia forces. Principles of balancing in rotating & reciprocating.		



Manufacturing Processes Lab $[0-3-1]$	Course #: 0905332	Prereq.:0905330*
Experiments concerning basic material processing operations: casting: pattern design and sand casting, welding: effect of welding variables in spot welding and arc welding, tensile test for welded specimens, cutting: tool geometry, calculations of cutting forces in turning and drilling processes, metal forming: forging process, open die, impression die and close die forging, drop hammer process extension process. Deep drawing process and blanking process		
Fluid Mechanics (1) $[3-0-3]$	Course #: 0905341	Prereq.:0905311
Fluid properties, fluid statics, fluid kinematics, fluid dyna equation, applications; momentum and energy principles, pipe	mics, conservati flow.	ion laws, Bernouli's
Mechanical Vibrations $[3 - 0 - 3]$	Course #: 0905361	Prereq.:0905311 + 0905201
Fundamentals of vibration (definitions, elements of vibrating systems, classification and description of vibration). Derivation of governing differential equations using Newton's second law of motion, Principle of virtual work and Lagrange's equations. Free un damped and damped vibrations of simple oscillators. Harmonically excited vibrations. Transient vibrations. Two and multi degree of freedom systems: free and forced vibrations, Eigen values and eigenvectors, orthogonality relationships, Control of vibrations.		
Dynamics and Vibrations Lab $[0 - 3 - 1]$	Course #: 0905362	Prereq.:0905361*
Mathematical, physical and reversible pendulums. Mass moment of inertia and radius of gyration. Center of percussion. Filar suspension. Torsional oscillation of single and two rotor systems. Transverse vibration of beams. Mass spring system (measurement of spring constant, damping ratio and amplification factor). Static and dynamic balance. Measurement of natural frequencies of different systems.		
Practical Training for Mechanical Engineering**	Course #: 0905400	115 credit hours
A practical engineering training for a period of 8 weeks period in an engineering institute (firm, factory) approved by the department.		
Machine Design (1) $[3 - 0 - 3]$	Course #: 0905430	Prereq.:0905213
Introduction and Definitions. Standards and codes. Review of stress and strain in mechanical elements under the action of different types of loads. Deflection of mechanical elements including energy methods. Buckling of Columns. Static theories of failure. Fatigue and dynamic theories of failure. Design of shafts		
Machine Design (2) $[3 - 2 - 4]$	Course #: 0905435	Prereq.:0905430+0 905331
Design of screws, fasteners, and connections. Welded, brazed, and bounded joints. Mechanical springs. Rolling and journal bearing. Spur, helical, bevel, and worm gears. Clutches, brakes, coupling, and Flywheels. Flexible mechanical elements (belts, chains, rope). Case studies and design projects.		



Fluid Mechanics Lab $[0-3-1]$	Course #: 0905440	Prereq.:0905341 *	
Viscosity and density measurements; venturimeter and orifice meter; laminar and turbulent flow; center of pressure; stability of floating body; impact of a jet, Pelton turbine; centrifugal pumps;			
Heat Transfer (1) $[3 - 0 - 3]$	Course #: 0905455	Prereq.:0905301+0 905322	
Introduction- to heat transfer, modes of heat transfer: Condu- state and transient one-dimensional heat conduction; forced a External flow, internal flow. Introduction to boiling and conder	ction, convection nd free convection sation.	n, Radiation, steady- on; heat exchangers.	
Heat Transfer Lab $[0-3-1]$	Course #: 0905458	Prereq.:0905455 *	
Marcet boiler. Joule experiment (work to heat). Bomb calorimeter. Heat pump and refrigeration cycle. Two-stage reciprocating compressor. Fuels and lubrication properties (flash and fire points, viscosity). Gas calorific value. Thermal conductivity. Convection heat transfer. Natural convection. Radiation heat transfer. Heat exchanger (counter parallel or cross flow). Boiling and condensation			
Engineering Measurements and Instrumentation $[3 - 0 - 3]$	Course #: 0905461	Prereq.:0905341	
Report writing, basics of metrology, inspection and measurements. Errors & error analysis, uncertainty analysis, statistical methods, least squares method. Basics of transducers. Static and dynamic characteristics of systems. Measurement of flow, pressure, and temperature.			
Strain gauges strain rosettes			
Automatic Control Systems $[3 - 0 - 3]$	Course #: 0905463	Prereq.:0905201+0 905361	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII	Course #: 0905463 vsical systems: el inear systems. sfer functions o tems, test signal automatic contro controllers.	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII Engineering Programming Language $[0 - 2 - 1]$	Course #: 0905463 vsical systems: el inear systems. sfer functions o tems, test signal automatic contro controllers. Course #: 0905464	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability Prereq.:0905463*	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII Engineering Programming Language $[0 - 2 - 1]$ Solving of Automatic Control Problems using Mat-Lab.	Course #: 0905463 vsical systems: el inear systems. sfer functions o tems, test signal automatic contro controllers. Course #: 0905464	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability Prereq.:0905463*	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII Engineering Programming Language $[0 - 2 - 1]$ Solving of Automatic Control Problems using Mat-Lab. Heating Ventilation and Air Conditioning (1) $[3 - 2 - 4]$	Course #: 0905463 vsical systems: el inear systems. sfer functions o tems, test signal automatic contro controllers. Course #: 0905464	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability Prereq.:0905463* Prereq.:0905455	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII Engineering Programming Language $[0 - 2 - 1]$ Solving of Automatic Control Problems using Mat-Lab. Heating Ventilation and Air Conditioning (1) $[3 - 2 - 4]$ Review of relevant thermodynamics and heat transfer topics conditioning processes; inside and outside design conditions; I cooling load calculations, Solar gain; heating systems design. Case studies and projects.	Course #: 0905463 vsical systems: el inear systems. sfer functions of tems, test signal automatic control controllers. Course #: 0905464 Course #: 0905481 ; psychometric; heating load calc Hot air systems	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability Prereq.:0905463* Prereq.:0905455 thermal comfort; air culations, Infiltration; s; baseboard heating.	
Strain gauges, strain rosettes. Automatic Control Systems $[3 - 0 - 3]$ Introduction to control systems. Mathematical modeling of phy hydraulic and pneumatic systems. Linearization of nonli- representations: block diagrams and signal-flow graphs. Tran- and closed-loop systems. Time domain analysis of control sys- time domain specifications, steady-state error. Performance of analysis of linear feedback Systems. Root locus techniques, PII Engineering Programming Language $[0 - 2 - 1]$ Solving of Automatic Control Problems using Mat-Lab. Heating Ventilation and Air Conditioning (1) $[3 - 2 - 4]$ Review of relevant thermodynamics and heat transfer topics conditioning processes; inside and outside design conditions; I cooling load calculations, Solar gain; heating systems design. Case studies and projects. Internal Combustion Engines $[3 - 0 - 3]$	Course #: 0905463 vsical systems: el inear systems. sfer functions of tems, test signals automatic control controllers. Course #: 0905464 Course #: 0905481 ; psychometric; heating load calc Hot air systems Course #: 0905571	Prereq.:0905201+0 905361 lectrical, mechanical, Graphical system of open-loop systems s, transient response, rol systems. Stability Prereq.:0905463* Prereq.:0905455 thermal comfort; air culations, Infiltration; s; baseboard heating. Prereq.:0905322	

Page 4 of 7



Design of Sanitary Systems [3-0-3]	Course #: 0905585	Prereq.:0905341
Basic definitions; plumbing materials; plumbing fixtures, Traps, Clean outs interceptors, and back water valves; indirect waste piping and special wastes; sizing of hot and cold water supply systems; drainage system design; vents and venting; design of storm water drains; fire fighting networks.		
Graduation Project (1) $[1 - 0 - 1]$	Course #: 0905591	Prereq.:0905400
Students (individually or in teams) are assigned engineering problems which may be theoretical, experimental or both and contains a major design component. The students study the problem assigned and its theoretical background, set the approach, conduct a literature review, make the problem analysis and preliminary design and write a proposal including a cost estimate and time table for implementation over the second semester.		
Graduation Project (2) $[2-0-2]$	Course #: 0905592	Prereq.:0905591
Continuation of Project I. The students carry out detailed design, construction and testing (if any), write a comprehensive report on the work as per the format posted on the department web site. The report should include, where applicable, economical and environmental assessments. The project work is presented by the students to an examination papel who judge the work		
Railways Technology for Mechanical Engineering $[3-0-3]$	Course #: 0905500	120 cr.hrs
The course will be an introduction to the railway engineering and rail infrastructures and their impacts on the society and on the environment. The course will focus on alignment, track geometry, superstructure and substructure components, switches, Railway planning and capacity, electrotechnical installations (power supply and signaling control system) together with operation and maintenance of railway		
Maintenance Management $[3-0-3]$	Course #: 0905504	Prereq.:0906302+0 905435
Maintenance Organization, Maintenance procedural design, analysis for preventive and urgent maintenance, Fault reduction methods, personnel safely, Maintenance planning, replacement analysis, reliability engineering, computerized maintenance systems, operations research in maintenance, Introduction to maintenance engineering.		
Facilities Planning and Design $[3 - 0 - 3]$	Course #: 0905505	Prereq.:0906302
Definition of the production and technological programs, the macro and microlocation of the production facility, location selection models, processes departments and facilities relationship and layout, material handling and layout, safety and security and layout; facility planning models, Computer applications in facility planning and layout.		
Finite Element Theory $[3 - 0 - 3]$	Course #: 0905506	Prereq.:0905361
Fundamental concepts of finite elements; one- and two-dimensional axial and flexural and elements. Derivation and assemblage of element stiffness and equivalent load matrices; numerical solutions and calculations of displacements, stresses and reactions, dynamic consideration (eigenfrequencies, eigenvectors), ME applications.		



Computer Aided Design and Manufacturing $[3 - 0 - 3]$	Course #: 0905530	Prereq.:0905435
Fundamentals of computer aided engineering and design. CAD applications. Geometric modeling. Engineering analysis and finite element technique. Fundamentals of computer aided manufacturing. CNC concepts and part programming. CAD/CAM integration		
Dynamics of Machines $[3-0-3]$	Course #: 0905531	Prereq.:0905361+0 905435
Dynamics fundamentals. Dynamic Force Analysis. Static Dynamics. Multicylinder Engines. Cam Dynamics.	and Dynamic	Balancing. Engine
Turbines $[3 - 0 - 3]$	Course #: 0905541	Prereq.:0905321 +0905341
Definitions, basic laws, dimensional analysis, velocity triangles for impulse and reaction blades. Performance characteristics, thermodynamics applications on axial flow compressors and turbines; Radial flow gas turbines; centrifugal compressors; cascades. Theory of the propeller. Wind turbines. Various gas turbine cycles_introduction to hydraulic turbines.		
Fluid Mechanics (2) $[3-0-3]$	Course #: 0905542	Prereq.:0905301 +0905341
Basic equations in differential form, circulation, rotational and irrational flows, Euler's eqs, stream function and potential function Navier-stoke's equations, boundary layer theory, potential flow, compressible flow in nozzles and ducts, shock waves, expansion waves, introduction to turbomachinary		
Power Hydraulics $[3-0-3]$	Course #: 0905548	Prereq.:0905341
Fluid power principles, Fluids, Components, and how they are combined to produce common industrial and mobile fluid power systems, Emphasis is on fluids for power transmission and control purposes.		
Heat Transfer (2) $[3 - 0 - 3]$	Course #: 0905556	Prereq.:0905455
Review of basic concepts, Radiation properties and processes, Radiation exchange among surfaces, Two dimensional steady state conduction, analytical, graphical, and numerical solutions, One- dimensional transient conduction, Topics in connective heat transfer, Exact and Approximate problem solutions, Combined entry length solution in pipe flow, Heat transfer in turbulent and high speed flows, liquid metal heat transfer, freezing, melting, heat-pipe heat transfer, multimode heat transfer.		
Robotics $[3-0-3]$	Course #: 0905566	Prereq.:0905463
Introduction to robots, classification of robots, dynamics of robotics, power and forces of joints calculations, hydraulic, pneumatic and electric drive systems, control of robotics, kinematics of robots, artificial intelligence, applications in industry.		
Automation $[3-0-3]$	Course #: 0905567	Prereq.:0905463
Basic production concepts, analysis of serial production lines, assembly line balancing, computer numerical control, industrial robots, automated material handling systems, automated storage and retrieval systems. Lab experiments concentrate on familiarizing the student with the concepts studied in class and on PLC programming and applications.		

Page 6 of 7



Renewable Energy $[3 - 0 - 3]$	Course #:	Prereq.:0905455	
	0905570		
Fundamentals of solar radiation; methods of solar radiation col	lection; thermal	systems components	
and analysis; transfer of collected heat, Overview on renewab	ole energy sourc	es with emphasis on	
solar and wind energy systems. Introduction to direct energy c	conversion system	ms; photovoltaic and	
thermionic converters. Energy Storage.			
Thermal Power Plants $[3 - 0 - 3]$	Course #:	Prereq.:0905322	
	0905572		
Introduction to power plants and energy conversion. Load pr	rofile. Power pla	ant systems: cooling	
water systems, electrical system, fuel, water treatment and fe	ed water system	ns, steam generators,	
power plant cycles: simple cycle, combined cycle. Steam t	urbine (impulse	e and reaction). Gas	
turbine generators.			
Refrigeration Systems $[3-0-3]$	Course #:	Prereq.:0905322	
	0905580		
Basic definitions and concepts; review of vapor compression and absorption cycles;			
refrigeration loads, compressors, condensers, evaporators, expansion devices; refrigerants;			
cooling towers; components of an absorption cycles, controls.			
Heating Ventilation and Air Conditioning (2) $[3 - 0 - 3]$	Course #:	Prereq.:0905481	
	0905581		
Review of psychometric processes, air requirements, ventilation requirements; description of			
different HVAC systems; analysis and design of the all-air system; room air distribution, duct			
design, selection of fans and pumps, design of piping systems for all-water systems; selection of			
boilers, control systems and zoning.			
Special Topics in Mechanical Engineering (1) $[3 - 0 - 3]$	Course #:	5 th year level	
	0905594		
Special advanced topics selected from various subjects in mechanical engineering.			
Special Topics in Mechanical Engineering (2) $[3 - 0 - 3]$	Course #:	5 th year level	
	0905597	J	
Special advanced topics selected from various subjects in mechanical engineering			