PHILADELPHIA UNIVERSITY
Faculty Of Engineering
Mechanical Engineering Dept

جامعة فيلادلفيا
كلية الهندسة
قسم الهندسة الميكانيكية

وصف المساقات في
تخصص الهندسة الميكانيكية

Course Description in

Mechanical Engineering Department

610211	**Electrical circuits (3 Cr. Hrs.)**
	Definitions and units, Basic concepts (Charge, Current, Voltage, Power, Energy), Circuit elements (Independent and Dependent Voltage, Power, Sources, Resistors, Capacitors, Inductors), KVL and KCL, Mesh and nodal Circuit analysis, Network theorems, Transient analysis of RL, RC, and RLC Circuits, Introduction to AC circuits. ***Prerequisite: Applied Physics (211104)***
640253	**Engineering Skills (3 Cr. Hrs.)**
	Introduction to technical reports, logical structures of technical reports, coherence on log reports. Way to use teamwork, editing for style and usage, scopes and aims of engineering ethics. Moral reasoning and ethical theories, engineering as social experimentation, the engineer responsibility to safety, responsibility to employers, rights of engineers. ***Prerequisite: English Language Skills (130102)***
610314	**Electrical Machines (3 Cr. Hrs.)**
	Transformers, DC Motors and Generators, Three-Phase Induction motors, Single-Phase Induction Motors, Three-Phase Synchronous Generator and Motor, Single-Phase Synchronous Generator and Motor, AC Series Motor, Repulsion Motor. ***Prerequisite: Electrical Engineering (610215)***
610316	**Electrical Machines Lab. (1 Cr. Hr.)**
	Experiments related to the material covered in 610381. ***Prerequisite: Electrical Machines (610381)+*** **Electrical Engineering Lab610219+**
650101	**Differentiation and integration (1) (3 Cr. Hrs.)**
	General Introduction, Differentiation, Mean value theorem, Integration- the fundamental theorem and applications, Techniques of integration, Sequences, Infinite and power series, Conic section, Polar coordinators, Vector functions, differentiation, Curves, Arc- length, Applications in mechanics. ***Prerequisite:*** -----
650102	**Differentiation and integration (2) (3 Cr. Hrs.)**

	Functions of several variables, Partial differentiation, Limits and continuity, The Gradient, Directional derivatives, The chain rule, Tangent lines, Tangent planes, The normal Line, Maxim and minim, The Second partial test, LaGrange method, Multiple integrals (double and triple), Line and surface integrals, Theorems of green, Gauss and stokes. ***Prerequisite:*** Differentiation and integration(1) *(210101)*
650260	**Engineering Analysis (1) (3 Cr. Hrs.)**
	Differential equations and mathematical modeling, First order differential equations, Linear second and high order differential equations, Modeling of electrical and mechanical systems, Laplace transform, Series solution of differential equations, Initial value problem, Simple nonlinear differential equations, Partial differential equations and boundary value problem. ***Prerequisite:*** Differentiation and integration(2) *(210102)*
630262	**Engineering Analysis (2) (3 Cr. Hrs.)**
	Matrices, Determinants and system of linear equations, Nonlinear equations, Direct and interactive solutions, Interpolation and curve fitting, Numerical integration and differentiation, Numerical solution of differential, Fourier series and Fourier transform. ***Prerequisite:*** Engineering Analysis (1)*(650260)*
620131	**Engineering drawing (3 Cr. Hrs.)**
	Instruments and their use, Graphic geometry, Lettering, Orthographic and isometric drawing and sketching, Sectional views, Introduction to descriptive geometry, Surface intersections and developments, Computer (ACAD). ***Prerequisite: -----***
620171	**Workshop (1) (1 Cr. Hr.)**
	Development of basic skills in fields of hand filing, Turning, Welding, Piping and plumbing, Carpentry, Sand casting, Glass works, Sheet metal fabrication, Metal forming. ***Prerequisite:---***
620172	**Workshop (2) (1 Cr. Hr.)**
	Household electric circuits, Florescent lamps circuits, parallel and series circuits, switches and fuses installations, electronic welding, electronic devices maintenance and circuit-boards design. *Prerequisite:* Workshop (1) (620171)(1)
620211	**Statics (3 Cr. Hrs.)**

	Introduction to mechanics of rigid bodies, Basic concepts: force and displacement vectors, Force systems, Equivalent force systems, Static equilibrium, Analysis of simple structures, Friction, Geometric properties: centroids and moments of inertia. *Prerequisite:* Differentiation and integration(2)(650101)
620212	**Dynamics** **(3 Cr. Hrs.)**
	Review of dynamics of particles, Two and Three-dimensional dynamics of rigid bodies; Force and acceleration, Work and Energy, Impulse and momentum. ***Prerequisite: Statics (620211)***
620213	**Solid Mechanics** **(3 Cr. Hrs.)**
	Introduction to mechanics of deformable bodies; concepts of stress and strain, Classification of material behavior, Stress-strain relations and generalized Hook's Law, Members under axial load, Torsion of circular rods and tubes, Bending and shear stresses in beams, Combined stresses in beams, Stress analysis and Mohr's circle, Thin wall cylinders, Deflection of beams, Buckling of columns. ***Prerequisite: Static (620211)***
620232	**Mechanical Drawing** **(2 Cr. Hrs.)**
	Auxiliary views, Temporary fasteners (threaded members, Keys, Feathers, Splines, Rivets, Cotters and springs), Their construction and standard, Power screws and welding symbols, Dimensioning, Tolerances, Limits and fits (ISO system), Detail and working drawing, Assembly drawing. ***Prerequisite:* Solid Mechanics *(620131)***
620333	**Theory of Machines** **(3 Cr. Hrs.)**
	Kinematic analysis of mechanisms, Velocity and acceleration polygons, Static and inertia force analysis of machinery, Dynamic analysis of cams, Gears, Gear trains, Balancing of machines, Governors. ***Prerequisite: Dynamics (620212)***
620320	**Fluid Mechanics (1)** **(3 Cr. Hrs.)**
	Hydrostatics, Steady and unsteady flow, Continuity equation, Flow of incompressible ideal flow, Potential flow, Bernoulli equation, One dimensional Euler's equation, Energy equation, Impulse-Momentum principles, Dimensional analysis, Introduction to boundary layer, Fluid flow in pipes, Pipe friction. ***Prerequisite* Analysis of engineering(1)(650260)**
620429	**Fluid Mechanics Lab**. **(1 Cr. Hr.)**
	Experiments related to the material covered in 620331. ***Prerequisite:* Fluid Mechanics (2)(620428)**
620323	**Thermodynamics (1)** **(3 Cr. Hrs.)**

	Basic course in engineering thermodynamics, Properties and behavior of pure substance, First law, Second law, Entropy, System and control volume analysis. ***Prerequisite:*** **Differentiation and integration (2)(650102)**
620324	**Thermodynamics (2) (3 Cr. Hrs.)**
	Availability and irreversibility, Vapor and air-standard power and refrigeration cycles, Thermodynamic relations, Ideal and real gases and generalized charts, Non-reacting mixtures and solutions, Chemical reactions and combustion. . ***Prerequisite: Thermodynamics (1) (620323)***
620344	**Engineering Measurements (3 Cr. Hrs.)**
	Errors, linear, angular and contour measurements, sine bar rotating table. Fits and tolerances: Interchangeability, ISO shaft and hole systems of fits and tolerances. Thread metrology. Gear metrology; surface texture, out of roundness and flatness measurements. Basic electrical measurements and sensing devices DC, AC bridge, and measuring systems, transducers, smart sensors and transmitters. Force, torque and strain measurements, design of load cells. ***Prerequisite:***
620373	**Properties of Engineering Materials (3 Cr. Hrs.)**
	Metal structures and crystallization, Materials used in engineering applications, Plastic deformation on the macro and micro-structure levels, Material failure, Heat treatment processes, Construction of alloys, Phase diagrams, Iron-Iron carbide equilibrium diagrams, Heat treatment of steel. ***Prerequisite: Solid Mechanics (620213)***
620475	**Strength and production Lab. (1 Cr. Hr.)**
	Experiments related to the material covered in 620361 & 620213. ***Prerequisite:*** **Manufacturing processes*(1) (620474)***
620434	**Machine Design (1) (3 Cr. Hrs.)**
	Introduction to design process, Design considerations, Tolerances, Fits and surface finish, Selection of materials, Mechanical properties of engineering materials, Stress analysis in machine elements and deflection, failure of machine elements, Fatigue, Power screws and threaded fasteners, Welded joints and riveted joints, Mechanical springs. ***Prerequisite: Theory of Machines (620333)***
620435	**Machine Design (2) (3 Cr. Hrs.)**

	Mechanical power transmission components, Couplings, Friction drives (belts and pulleys, clutches and brakes), Chain selection, Wire rope selection, Gear design, Sliding bearings, Rolling bearings, Prime-mover selection, applied engineering design of project selected by instructor with the emphasis on the design of practical mechanical engineering systems and/or components. ***Prerequisite:*** **Theory of Machines (620333)**
620350	**Project** **(1 Cr. Hr.)**
	Practical subjects related to several topics in mechanical engineering. ***Prerequisite:*** **Workshop (2) (620172)**
620436	**Training in Design** **(1 Cr. Hr.)**
	Practical subjects related to several topics in mechanical engineering. ***Prerequisite*** **Machine Design (2)(620435)**
620428	**Fluid Mechanics (2)** **(3 Cr. Hrs.)**
	Viscous flow equations of motion, Laminar boundary layer, methods of solution, transition of laminar boundary layers, turbulent flow, Fluid forces on objects in a flow, Applications, Isentropic flow through varying area channels, Normal shock waves, Oblique shock waves, Prandtle-Meyer expansion fan, Supersonic nozzle, Supersonic airfoils, Heat transfer and friction effects. ***Prerequisite: Fluid Mechanics (1) (620331)***
620420	**Heat Transfer (1)** **(3 Cr. Hrs.)**
	Introduction to modes of heat transfer; one-dimensional steady state conduction; unsteady state conduction, Lumped heat capacity system; introduction to convection, Flow and thermal boundary layers, Laminar and turbulent boundary layers; convection in internal and external flows; empirical relations for forced convection heat transfer; natural convection systems; condensation and boiling; introduction to thermal radiation. ***Prerequisite: Thermodynamics (1) (620323)***
620426	**Heat Transfer (2)** **(3 Cr. Hrs.)**

	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. ***Prerequisite:(620425)***
620427	**Thermal Lab. (1 Cr. Hrs.)**
	Experiments related to the material covered in 620441. ***Prerequisite: Heat transfer (2) (620426)***
620443	**Automatic Control (3 Cr. Hrs.)**
	Linear feedback control theory, Mathematical modeling of physical systems, Transfer functions, Block diagrams, and signal flow graph, Time domain analysis of control systems, Test signals, transient response, time domain specifications, steady state error and stability, Root locus techniques, Time domain design, PID controllers, and phase-lead and phase lag controllers, Introduction to frequency domain analysis, Nyquist criterion, Bode plots and Nichols charts. ***Prerequisite: Engineering Measurements (620344)***
620444	**Measurement and control Lab. `(1 Cr. Hr.)**
	Experiments related to the material covered in 620351. ***Prerequisite* Automatic Control *(620443 *)***
620474	**Manufacturing Processes (1) (3 Cr. Hrs.)**
	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. ***Prerequisite: (620373)***
620414	**Mechanical Vibrations (3 Cr. Hrs.)**

	Properties of oscillatory motion, Derivation of governing differential equations, Free and damped vibrations, Harmonically excited motion, Rotating and reciprocating unbalance, Support motion, Vibration measurements, Vibration isolation, Transient vibrations, Free and forced vibrations in multi degrees of freedom, Vibration absorbers, Continuous systems. ***Prerequisite: Engineering Analysis****(650163)*
620415	**Mechanical Vibration Lab. (1 Cr. Hr.)**
	Experiments related to the material covered in 620471. ***Prerequisite: (620414)***
620528	**Hydraulic Machines (3 Cr. Hrs.)**
	Theory of jets, Impulse turbine, General theory of machinery, reaction pressure turbines, Hydrodynamic pumps, Application of similarity to hydrodynamic machines, Positive displacement machinery, Design of hydraulic machines. ***Prerequisite: Fluid Mechanics (1) (620320)***
620523	**Design of Sanitary Systems (3 Cr. Hrs.)**
	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. ***Prerequisite: Fluid Mechanics (1) (620320)***
620524	**Power Hydraulics (3 Cr. Hrs.)**
	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. ***Prerequisite: Fluid Mechanics (1) (620320)***
620529	**Internal Combustion Engines (3 Cr. Hrs.)**
	Review of air standard power cycles; basic types of reciprocating IC engines; SI engines; CI engines; fuels; combustion; performance evaluation of IC engines; cooling and lubrication of engines; internal combustion gas turbine; air pollution. ***Prerequisite: Thermodynamics (2) (620324)***
620522	**Air Conditioning (1) (3 Cr. Hrs.)**

	Review of relevant thermodynamics and heat transfer topics; psychometric; thermal comfort; air conditioning processes; inside and outside design conditions; heating load calculations, Infiltration; cooling load calculations, Solar gain; heating systems, Design, Layout; hot water, Steam, Hot air systems; baseboard heating. ***Prerequisit:(620425)***
620520	**Internal Combustion Engines Lab. (1 Cr. Hr.)**
	Experiments related to the material covered in 620541. ***Prerequisite: Internal Combustion Engines *(620529)***
620526	**Thermal Power Plants (3 Cr. Hrs.)**
	Energy cycles, Steam generator, Steam condensers, Steam turbines, Power station auxiliaries, Load cures, Power plant station and economics. ***Prerequisite:* Thermodynamics (2) *(620324)***
620553	**Graduation Project (2) (2 Cr. Hrs.)**
	Based on the results obtained from the first stage, the student carries out the project suggested by the department. ***Prerequisite: ——***
620554	**Graduation Project (3) (3 Cr. Hrs.)**
	Based on the results obtained from the first stage, the student carries out the project suggested by the department ***Prerequisite: Graduation Project (2) (620554)***
620555	**Special Topics in Mechanical Engineering (3 Cr. Hrs.)**
	Up-to-date subjects in Mechanical Engineering. ***Prerequisite: Department Approval***
620437	**Reverse Engineering (3 Cr. Hrs.)**

	Dimensional analysis ,Customer Specifications, Design vs. Re-Design, Reverse Engineering Methodology ,Assembly vs. Disassembly, Data Collection ,Input-Output Measurements, System Identification ,Product Architecture ,System Modeling & Simulation , Rapid prototyping Functional Models, Design of Experiments ,Creativity Techniques ,Financial analysis ***Prerequisite: Engineering Skills 620350***
620455	**Engineering Training** **(3 Cr. Hrs.)**
	The student must be Training ten weeks without stop in any place related to mechanical work and gain a good skills ***Prerequisite:90 hours***

Thursday, March 30, 2017