SYLLABUSES OF
MECHANICAL ENGINEERING COURSES
GRADUATE COURSES

Course No.	Course Title	Cr.	Pre.
ME502	Numerical Analysis for Engineers.	3	ES201, ES261
ME505	Advanced Automatic Control.	3	ME406
ME528	Advanced Material Science.	3	ME402
ME530	Advanced Mechanical Design.	3	ME314,ME316,ME324
ME531	Tribology.	3	ME203,ME306
ME532	Theory of Mechanical Vibrations.	3	ME316,ME502
ME533	Advanced Dynamics of Machinery	3	ME316,ME502
ME534	Advanced Mechanisms.	3	ME303
ME535	Advanced Mechanics of Materials.	3	ES216,ME323
ME537	Selec. Top. in Mech. Eng.	3	
ME550	Conduction Heat Transfer.	3	ME311,ES501,ME502
ME551	Convection Heat Transfer.	3	ME306,ME311,ES501,ME502
ME552	Laminar Boundary Layer	3	ME306,ES501,ME502
ME553	Turbulent Boundary Layer.	3	ME552
ME554	Advanced Thermodynamics.	3	ME212
ME555	Combustion.	3	ME554
ME556	New Energy Sources	3	ME407
ME557	Selec. Top. in Thermo-Fluid Eng	3	
ME559	Thesis.	12	

ME 502 : NUMERICAL ANALYSIS FOR ENGINEERS

3 Credits Prerequisite (s): ES2O1, ES261

Solution of nonlinear equations; Finite differences; Solving sets of equations; numerical solution of ordinary differential equations; Numerical integration; solution of partial differential equations; Curve fitting.

ME 505 : ADVANCED AUTOMATIC CONTROL

3 Credits Prerequisite (s): ME406

Review of linear control systems; Compensation techniques; Nonlinear control systems; Phase-plane analysis of nonlinear control systems; Stability analysis of nonlinear systems; Optimal and adaptive control of control systems.

ME528 ADVANCED MATERIAL SCIENCE

3 Credits Prerequisite: ME204

Quantitative metallography; Diffusion in solids; Strengthening in solids; Phase transformation in solids; Physical metallurgy of steels.

ME 530 : ADVANCED MECHANICAL DESIGN

3 Credits Prerequisite (s): ME314, ME3 16, ME324

Introduction to design process and optimization; Mechanical design principles and their application; Selected problems of advanced slide bearings and gears design.

ME 531 : TRIBOLOGY

3 Credits Prerequisite (s): ME203, ME306

Friction and wear theory, factors affecting wear; Lubricants and their properties; Lubrication and applications in engineering practice; Other means of avoiding excessive wear.

ME 532 : THEORY OF MECHANICAL VIBRATIONS

3 Credits Prerequisite (s): ME316, ME502

Vibration of two and multi-degree of freedom systems; Energy and numerical methods in mechanical vibration analysis; Vibration of continuous systems.

ME 533 : ADVANCED DYNAMICS OF MACHINERY

3 Credits Prerequisite (s): ME316, ME502

Dynamic analysis of linkages by analytical methods and balancing of linkages; Variational methods; Nonlinear vibration and stability criteria; Cam dynamics.

ME 534 : ADVANCED MECHANISMS

3 Credits Prerequisite (s): ME303

Introduction: degrees of freedom and linkage classification; Analytical methods in mechanisms analysis; Cam design; Path curvature theory; Geometric and analytical methods of kinematic synthesis.

ME 535 : ADVANCED MECHANICS OF MATERIALS

3 Credits Prerequisite (s): ES216, ME323

Introduction and basic motions; Plane stress and plane strain in Cartesian and polar coordinates; Axi-symmetric stress and deformations in a solid of revolutions; Elasticity problems in three dimensions.

ME 550 : CONDUCTION HEAT TRANSFER

3 Credits Prerequisite (s): ME3 11, ES5O1, ME502

Conduction heat transfer in steady and unsteady state including heat sources; Analytical solution of steady and fluctuating boundary conditions; solidification.

ME 551 : CONVECTION HEAT TRANSFER

3 Credits Prerequisite (s): ME311, ME306, ES5O1, ME502

Analytical derivation of laws governing convection heat transfer; forced convection; Free convection; Coupled free and forced convection; Heat transfer flow through conduits and over exterior surfaces; condensation; Boiling.

ME 552 : LAMINAR BOUNDARY LAYER

3 Credits Prerequisite (s): ME306, ES5O1, ME502

Navier-stockes equations; Two dimensional boundary layer equations, some exact solutions; Approximate methods; Axially symmetrical boundary layers; Boundary layer control.

ME 553 : TURBULENT BOUNDARY LAYER

3 Credits Prerequisite (s): ME552

Fundamental of turbulent flow; Turbulent boundary layer at zero pressure gradient; Turbulent layer with pressure gradient; Free turbulent flows.

ME 554 : ADVANCED THERMODYNAMICS

3 Credits Prerequisite (s): ME212

Review of first and second laws; Irreversibility and availability; Thermodynamic relations; Mixtures and solutions; Chemical reactions; Introduction to phase and chemical equilibrium.

ME 555 : COMBUSTION

3 Credits Prerequisite (s): ME554

Physical and chemical aspects of basic combustion phenomena; Rate processes and chemical kinetics; Chain reaction theory; Chain and thermal ignition; Detonation; Diffusion flames; Heterogeneous combustion.

ME 556 : NEW ENERGY SOURCES

3 Credits Prerequisite (s): ME407

Introduction to solar energy and conversion for use on earth; Fundamentals of solar radiation; Methods of solar collection and thermal conversion; Solar heating systems; Solar cooling and dehumidification; Solar electric power and process heat; Natural solar conversion systems; Energy; Economics of solar energy.