



JAIN
DEEMED-TO-BE UNIVERSITY

FACULTY OF
ENGINEERING
AND TECHNOLOGY

International Institute for Aerospace Engineering and Management (IIAEM)

Syllabus for PG JET – 2020

**Aerospace Structures, Aerodynamic Engineering, Propulsion Engineering and
Avionics**

Section 1

➤ **Linear Algebra**

Vector algebra, Matrix algebra, systems of linear equations, rank of a matrix, eigenvalues and eigenvectors.

➤ **Calculus**

Functions of single variable, limits, continuity and differentiability, mean value theorem, chain rule, partial derivatives, maxima and minima, gradient, divergence and curl, directional derivatives. Integration, Line, surface and volume integrals. Theorems of Stokes, Gauss and Green.

➤ **Differential Equations**

First order linear and nonlinear differential equations, higher order linear ODEs with constant coefficients. Partial differential equations and solution by separation of variables method.

➤ **Numerical Methods**

Numerical methods for linear and nonlinear algebraic equations, numerical integration, Fourier series.

Section 2

➤ **Strength of Materials**

States of stress and strain. Stress and strain transformation. Mohr's Circle. Principal stresses. Three-dimensional Hooke's law. Plane stress and strain; Failure theories: Maximum stress, Tresca and von Mises; Strain energy. Analysis of statically determinate and indeterminate trusses and beams. Elastic flexural buckling of columns.

Section 3

➤ **Structural Dynamics**

Free and forced vibrations of undamped and damped SDOF systems.

➤ **Fluid Statics**

Measurement of Pressure - manometers, Fluid properties, Forces on plane and curved surfaces, Buoyancy, stability of floating and submerged bodies.

➤ **Fluid Dynamics**

Governing equations of fluid flow, Bernoulli's equation and applications, Momentum principle and applications, Flow through pipes and pressure losses.

➤ Airfoil nomenclature, Kutta-Joukowski theorem; thin airfoil theory, Kutta condition, starting vortex; Finite wing theory: Induced drag, Prandtl lifting line theory; Critical and drag divergence Mach number.

➤ Basic concepts of compressibility, Conservation equations; one dimensional isentropic flows, normal and oblique shocks, Prandtl-Meyer flow; Flow through nozzles.

➤ Elementary ideas of viscous flows including boundary layers.

Section 4

➤ **Heat-Transfer** - Modes of heat transfer, one dimensional heat conduction, resistance concept & electrical analogy, lumped parameter system, thermal boundary layer, heat transfer correlations for flow over flat plates and through pipes, effects of turbulence, Stefan-Boltzmann law, Wien's displacement law.

➤ **Propulsion**- Laws of thermodynamics, Thrust, efficiency and engine performance of turbojet, turboprop, turbo shaft, turbofan and ramjet engines. Rocket propulsion: Thrust equation and specific impulse, vehicle acceleration, drag.

➤ **Atmosphere**: Properties, standard atmosphere. Classification of aircraft. Airplane (fixed wing aircraft) configuration and various parts.

Section 5

➤ **Airplane performance**: Pressure altitude; equivalent, calibrated, indicated air speeds; Primary flight instruments: Altimeter, ASI, VSI, and Turn-bank indicator. Drag polar; takeoff and landing; steady climb & descent, absolute and service ceiling; cruise, cruise climb, endurance or loiter; load factor, turning flight, V-n diagram; Winds: head, tail & cross winds.

➤ **Avionics**: Analog circuits, circuit theory, Basics of electro-magnetics. Basics of digital circuits. Fundamentals of communication.

➤ **Control Theory**: Fundamentals of control system design. Nyquist stability criteria; Bode and root-locus plots;