

Technical Officer
Aerospace Engineering
(Syllabus)

FM: 100, PM: 40

1. Fundamentals of Aerospace Engineering

- a) History of aeronautics
- b) The standard atmosphere
- c) Airfoils, wings, and aerodynamic shapes

2. Aerodynamics

- a) Fundamental principles and equations
- b) Inviscid, Incompressible flows
- c) Incompressible flow over airfoils and wings
- d) Compressible aerodynamics
- e) Viscous flows and boundary layer
- f) Hypersonic aerodynamics

3. Small satellite development and operation

- a) CubeSats and small satellites
- b) Mission system
- c) Communication system
- d) Sensor and actuator system
- e) Command & data handling system
- f) Power system

4. Instrumentation, Fault monitoring and diagnosis

- a) Sensors and transducers
- b) Calibration of sensors and instruments
- c) Digital signal processing
- d) Strain gauge
- e) Eddy current testing
- f) Ultrasonic testing
- g) Visual inspection techniques

5. Aircraft Materials and Manufacturing

- a) Materials and material requirement for aerospace structures and engine
- b) Aluminum, titanium, Iron, and their alloys
- c) Testing of aerospace materials

- d) Machining and processing of aerospace materials
- e) Fiber-polymer composite materials for aerospace structures and engine
- f) Wood, glass fiber, carbon fiber in small aircraft construction
- g) Material selection for piloted and unmanned aircraft

6. Aircraft Systems and Avionics

- a) Sensors in aircraft
- b) Display and man-machine-interaction
- c) Aircraft communication system
- d) Navigation system and radio wave propagation
- e) Flight control system
- f) Instrument landing system
- g) Engine and utility system
- h) Aeronautical Information Publication: GEN, ENR, and AD

7. Aerospace Propulsion

- a) Introduction to turbomachine and jet engine
- b) Types of aircraft engine and their operational characteristics
- c) Compressor and turbine
- d) Combustion Chamber and afterburner
- e) Intake, diffuser, and nozzle
- f) Losses in turbomachine

8. Flight Dynamics and Control

- a) Flight performance
- b) Static and dynamic stability
- c) Kinematics and dynamics of aircraft motion
- d) Flight testing and evaluation in simulator

9. Unmanned Aerial Systems

- a) UAS design methodology
- b) UAS design and simulation tools
- c) UAS Controller and its operation
- d) UAS Propulsion system selection
- e) UAS manufacturing techniques
- f) Autonomy level of unmanned systems
- g) UAS operation and regulation

10. Aircraft Maintenance Engineering

- a) Aircraft maintenance programme
- b) Aviation industry certification requirements

- c) Documentation for maintenance
- d) Requirement for maintenance program
- e) Line and base maintenance
- f) NCAR part 145 and 66

11. Aircraft Design

- a) Overview of aircraft design process
- b) Conceptual sketch
- c) Weight estimation and preliminary design calculation
- d) Thrust-to-weight ratio and wing loading
- e) Initial sizing and selection tradeoffs
- f) Propulsion system integration
- g) Landing gear and subsystem
- h) Flying and handling quality assessment
- i) Flight performance evaluation

12. Aerospace Structures

- a) Types of aircraft structure and structural layout of aircraft
- b) Loads acting on an aircraft
- c) Allowable stress, margin of safety, failsafe, safe life concept in structural design
- d) Semi-monocoque structure
- e) Bending, shear and torsional analysis of thin-walled structure
- f) Buckling of column and skin

Written Exam Questions [Full Marks: 100, 3Hrs]

Chapters	1	2	3	4	5	6	7	8	9	10	11	12	Total Marks
MCQ (1 marks each)	2	2	2	2	2	2	2	1	2	2	1	-	20
Short [5 marks each]	-	1	1	1	1	1	1	-	1	-	1	-	40
Long [10 marks each]	-	-	-	-	-	-	1	1	-	-	1	1	40