



National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Minor Degree in Aerospace Engineering	Year of Regulation	2026
Department of Mechanical Engineering	Semester	VI

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 364	Aerospace Vehicle Stability, Control, and Instrumentation	3	0	0	3	50	50	100	200

Course Objectives	To provide students with fundamental knowledge of aircraft stability, flight control systems, flight and navigation instruments, and basic control theory concepts for understanding the analysis, operation, and control of modern aerospace systems.	Course Outcomes	ME364.1	Explain the principles of aircraft stability and analyze longitudinal, lateral, directional, static, and dynamic stability characteristics of aircraft
			ME364.2	Describe the construction, operation, and performance of aircraft flight control systems including primary and secondary flight controls, powered controls, and autopilot systems.
			ME364.3	Interpret the working principles and applications of flight and navigation instruments such as Pitot-static instruments, gyroscopic instruments, AHRS, compass systems, and electronic flight displays.
			ME364.4	Apply the fundamentals of control theory to aerospace systems using block diagrams, transfer functions, state-space analysis, state transition matrices, and PID controller concepts.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	ME364.1															
2	ME364.2															
3	ME364.3															
4	ME364.4															

SYLLABUS

No.	Content	Hours	COs
I	Stability of Aerospace Vehicles: Longitudinal stability, lateral stability, Sweepback and lateral stability, fin area and lateral stability, directional stability, lateral and directional stability, static stability, dynamic stability. Static stability of launch vehicle, dynamic stability of launch vehicle, three-axis stability, Spin stability, roll, pitch, and yaw stability of rocket, supersonic and hypersonic stability.	10	ME364.1
II	Primary Flight Controls, Elevator, T-Tail, Stabilator, Canard, Rudder, V-Tail, Secondary Flight Controls, Flaps, Leading Edge Devices, Spoilers, Trim Tabs, Balance Tabs, Servo Tabs, Antiservo Tabs, Ground Adjustable Tabs, Adjustable Stabilizer, Autopilot, balanced controls, control at low speeds, powered controls, Flight Control Systems, Launch vehicle control, guidance system of launch vehicle, navigation system of launch vehicle, Roll, pitch and yaw control, Flight Control of Reusable Launch Vehicles; Missile guidance and control systems.	12	ME364.2
III	Instruments and Navigation Instruments: Pitot-Static Flight Instruments, Altimeter, Vertical Speed Indicator (VSI), Airspeed Indicator (ASI), Blockage of the Pitot-Static System, Electronic Flight Display (EFD), Gyroscopic Flight Instruments, Telemetry system, Attitude and Heading Reference System (AHRS), Outside Air Temperature (OAT) Gauge, Compass Systems, Radar, Optical, and infrared sensor.	12	ME364.3
IV	Basics of control theory: Block Diagram; Open Loop and Closed Loop Transfer Function; State Space Analysis; State Transition Matrix; Relationship between Transfer Function and State Space Equation, PID Controllers.	08	ME364.4
Total hours		42	

Essential Readings	
1.	R. H. Barnard and D. R. Philpott, Mechanics of Flight, Pearson Education Limited, 11 th Edition, 2006
2.	L. J. Clancy, Aerodynamics, Himalayan Books, 1996.
3.	J. D. Anderson, Jr and M. L. Bowden, Introduction to Flight, McGraw Hill, Ninth edition, 2022
4.	J. J. Sellers, Understanding Space-An Introduction to Astronautics, McGraw Hill, 2004.
5.	G. M. Siouris, Missile Guidance and Control Systems, Springer, 2004.
Supplementary Readings	
1.	U.S. Department of Transportation FEDERAL AVIATION ADMINISTRATION Flight Standards Service, Pilot's Handbook of Aeronautical Knowledge, 2016.
2.	K. Ogata, Modern Control Engineering, Pearson, Fifth edition, 2010