ELECTIVES

OF

B. TECH., B. TECH. WITH HONORS, B. TECH. + M. TECH. DUAL DEGREE AND M. TECH. PROGRAMS

IN

AEROSPACE ENGINEERING, IIT BOMBAY

FOR

BATCHES OF 2022 AND ONWARDS

(Updated 3rd February, 2026)

Introduction

The courses that can be counted towards satisfying the electives requirements of various academic programs of the Aerospace Engineering Department of IIT Bombay are given below. This applies to B. Tech. (with and without Honors), B. Tech. + M. Tech. Dual Degree (called Dual Degree or DD here onwards) and M. Tech. programs of 2022 batch and onwards.

There are three sets of tables: Table A, B and C. Table A has three sub-tables – Tables A(i)-(iii). Tables B and C have four sub-tables each, from (1) to (4). Tables A(i), A(ii) and B(1)-(4) comprise of courses offered by the Aerospace Department. The remaining tables – viz. Tables A(iii) and Tables C(1)-(4) – comprise of some of the courses offered by other departments.

The below table enumerates the various possibilities for fulling the elective requirements of the different academic programs of the department.

Academic Program	Elective Type	Available Tables
B. Tech.	Departmental Elective	A(i), A(ii), B(1)-(4)
B. Tech.	Honors Elective	A(i), A(ii), B(1)-(4)
B. Tech. + M. Tech. Dual Degree	PG Elective	A(i)-(iii), B(1)-(4), C(1)-(4)
M. Tech. AE 1 Specialization	Departmental Elective	A(i), A(iii), B(1), C(1)
M. Tech. AE 2 Specialization	Departmental Elective	A(i), A(iii), B(2), C(2)
M. Tech. AE 3 Specialization	Departmental Elective	A(i), A(iii), B(3), C(3)
M. Tech. AE 4 Specialization	Departmental Elective	A(i), A(iii), B(4), C(4)

Table A(i) – Aerospace Engineering Electives Available to All Students[$]	
AE 429	Aircraft Design Project (Exposure to AE 332/714 is recommended)
AE 501	Virtual Instrumentation for Aerospace Engineers
AE 650[*]	Mini Project
AE 653[*]	Engineering Mathematics (*not available with CL 602/ME 673*)
AE 663	Software Development Techniques for Engineering and Scientists
AE 665	Aircraft Stealth Technology (Prerequisite: AE 332/714)
AE 714[*]	Introduction to Aircraft Design (*not available with AE 332*)
AE 725	Air Transportation
AE 755	Optimization for Engineering Design (*not available with CE 771/CL 603/ME 782*)
AE 759	Systems Engineering Principles
AE 771	Matrix Computations
AE 777	Dynamics and Bifurcations (*not available with ME 621*)
AE 779	Optimization of Multi-Disciplinary Systems
AE 6102	Parallel Scientific Computing and Visualization
AE 6103	Introduction to Space Technology

[$]Available for all B. Tech., Dual Degree students for their PG electives and for all M. Tech. students

[*]Not available for B. Tech. or Dual Degree students

Table A(ii) – Electives Available in B. Tech. and Dual Degree Programs Only[$]	
AE 673	Fibre Reinforced Composites
AE 695	State Space Methods for Flight Vehicles (Prerequisite: MA 106/110 for BTech/DD)
AE 715	Structural Dynamics

[$]Not available as elective for all M. Tech. students (these are core courses for some specializations)

Table A(iii) – Non-Departmental Electives Common to All M. Tech. Specializations[$]	
CE 771/CL 603/ ME 782	Optimization in Civil Engineering / Optimization / Design Optimization (*not available with AE 755*)
CL 602/ME 673[*]	Mathematical and Statistical Methods in Chemical Engineering / Mathematical Methods in Engineering (*not available w/ AE 653*)
CS 725	Foundations of Machine Learning
ME 621	Mathematical Methods for Mechanics and Dynamics (*not available with AE 777*)
ME 781	Statistical Machine Learning and Data Mining

[$]Not available for B. Tech. students either as Department Elective or Honors Elective; only available for Dual Degree students for their PG electives and for M.Tech. students

[*]Not available for B. Tech. or Dual Degree students

Table B(1) – M. Tech. Aerospace Electives for Aerodynamics Specialization, AE 1[$]	
AE 617	Numerical Methods for Conservation Laws
AE 622	Computing of High Speed Flows
AE 623	Computing of Turbulent Flows
AE 624	Hypersonic Flow Theory
AE 625	Particle Methods for Fluid Flow Simulation
AE 639	Continuum Mechanics
AE 649	Finite Element Method (Prerequisite: AE 227 for BTech/DD) (*not available with CE 620/ME 613*)
AE 651	Aerodynamics of Compressors and Turbines
AE 664	Lighter-Than-Air Systems
AE 667	Rotary Wing Aerodynamics
AE 668	Reduced Order Strategies for Structures and Fluids
AE 678	Aeroelasticity (Prerequisite: AE 227 for BTech/DD)
AE 682	Introduction to Thermoacoustics
AE 683	Fluid Dynamics (*not available with ME 651*)
AE 684	Data-Driven Flow Modelling
AE 702	Advanced Flight Dynamics (Prerequisite: AE 341/AE 717)
AE 710	Aeroacoustics
AE 711	Aircraft Propulsion
AE 713	Space Flight Dynamics
AE 717	Aircraft Flight Dynamics
AE 718	Hydrodynamic Stability Theory (*not available with ME 783*)
AE 720	Advanced Numerical Methods for Compressible Flows (Prerequisites: AE 339/616, AE 706)
AE 724	Experimental Methods in Fluid Mechanics
AE 726	Heat Transfer: Aerospace Applications (Prerequisite: AE 223 for BTech/DD) (*not available with ME 663*)
AE 736	Advanced Aeroelasticity (Pre-requisite: AE 678)
AE 774	Special Topics in Aerodynamics and CFD
AE 780	Computational Heat Transfer and Fluid Flow (Prerequisite: AE 726/ME 663 for BTech/DD) (*not available with ME 415*)
AE 782	Flow Control

[$]Also available for all B. Tech. and Dual Degree students

Table C(1) – M. Tech. Non-Departmental Electives for Aerodynamics Specialization, AE 1[$]	
CE 620/ME 613	Finite Element Methods / Finite Element and Boundary Element Methods (*not available with AE 649*)
ME 415	Computational Fluid Dynamics and Heat Transfer (*not available with AE 780*)
ME 619	Experimental Methods in Thermal and Fluids Engineering
ME 651	Fluid Dynamics (*not available with AE 683*)
ME 663	Advanced Heat Transfer (*not available with AE 726*)
ME 704	Computational Methods in Thermal and Fluid Engineering
ME 724	Essentials of Turbulence
ME 757	Galerkin Methods for Fluid Dynamics
ME 766	High Performance Scientific Computing
ME 776	Fluid Structure Interaction
ME 783	Fundamentals of Waves and Instabilities in Fluids (*not available with AE 718*)
ME 789	Computational Tools for Process Modelling

[$]Not available for B. Tech. students either as Department Elective or Honors Elective; only available for Dual Degree students for their PG electives and for M. Tech. students of AE 1 specialization

Table B(2) – M. Tech. Aerospace Electives for Dynamics & Controls Specialization, AE 2[$]	
AE 503	Introduction to Autonomous Systems
AE 619	Nonlinear Systems Analysis (*not available with CL 714, EE 613, ME 670 or SC 602*)
AE 626	Spacecraft Attitude Dynamics and Control
AE 641	Introduction to Navigation and Guidance
AE 662	Applied Optimal Control (*not available with EE 622, SC 604*)
AE 666	Adaptive and Learning Control Systems
AE 678	Aeroelasticity (Prerequisite: AE 227 for BTech/DD)
AE 679	Advanced Guidance and Control
AE 685	UAS Design – Systems Engineering Approach
AE 686	Guidance of Aerospace Vehicles
AE 688	Navigation of Autonomous Vehicles
AE 690	Control System Design Techniques
AE 700	Guidance and Control of Unmanned Autonomous Vehicles
AE 702	Advanced Flight Dynamics (Prerequisite: AE 341/AE 717)
AE 712	Flight Dynamics and Control
AE 713	Spaceflight Dynamics
AE 715	Structural Dynamics
AE 6106	Bayesian Estimation for Tracking and Navigation

[$]Also available for all B. Tech. and Dual Degree students

Table C(2) – M. Tech. Non-Departmental Electives for Dynamics & Control Specialization, AE 2[$]	
CL 653/EE 638	State Estimation: Theory and Applications / Estimation and Identification
CL 686	Advanced Process Control
CL 692	Digital Control
CL 714/EE 613/ ME 670/SC 602	Nonlinear System Analysis / Nonlinear Dynamical Systems / Nonlinear Systems Analysis and Control / Control of Nonlinear Dynamical Systems (*not available with AE 619*)
EE 603	Digital Signal Processing and its Applications
EE 622/SC 604	Optimal Control Systems (*not available with AE 662*)
EE 640/SC 613	Multivariable Control Systems
EE 675	Microprocessor Applications in Power Electronics
EE 712	Embedded Systems
EE 749	Decentralized Control of Complex Systems
EE 794	Microsystems: Analysis and Design
EP 222	Classical Mechanics
IE 502/SC 629	Probabilistic Models / Introduction to Probability and Random Processes
IE 614	Linear Systems
ME 604	Mechatronics and Robotics
ME 637	Manufacturing Automation
PH 542	Nonlinear Dynamics
SC 617	Adaptive Control Theory
SC 618	Analytical and Geometric Mechanics
SC 619	Control of Lagrangian and Hamiltonian Systems
SC 620	Automation and Feedback Control
SC 621	Quantitative Feedback Theory I
SC 622	Quantitative Feedback Theory II
SC 623	Optimal and Robust Control
SC 624	Differential Geometric Methods in Control
SC 625	Systems Theory
SC 627	Motion Planning and Coordination of Autonomous Vehicles
SC 630	Variable Structure and Sliding Mode Control
SC 635	Advanced Topics in Mobile Robotics
SC 640	Applied Predictive Analytics
SC 643	Stochastic and Networked Control
SC 649	Embedded Control & Robotics
SC 655	Random Processes in Learning and Control
SC 664	Active Vibration Control
SC 702	Linear Systems Theory for PDE

[$]Not available for B. Tech. students either as Department Elective or Honors Elective; only available for Dual Degree students for their PG electives and for M. Tech. students of AE 2 specialization

Table B(3) – M. Tech. Aerospace Electives for Propulsion Specialization, AE 3[$]	
AE 616	Gas Dynamics (*not available with ME 678*)
AE 617	Numerical Methods for Conservation Laws
AE 622	Computing of High Speed Flows
AE 623	Computing of Turbulent Flows
AE 624	Hypersonic Flow Theory
AE 625	Particle Methods for Fluid Flow Simulation
AE 639	Continuum Mechanics
AE 647	Introduction to Plasmas for Engineering
AE 649	Finite Element Method (Prerequisite: AE 227 for BTech/DD) (*not available with CE 620/ME 613*)
AE 651	Aerodynamics of Compressors and Turbines
AE 656	Aviation Fuels and their Combustion
AE 658	Design of Power Plants for Aircraft
AE 660	Interfacial Phenomena in Liquid Atomization (*not available with ME 6118*)
AE 667	Rotary Wing Aerodynamics
AE 670	Liquid Propellant Rocket Engines
AE 678	Aeroelasticity (Prerequisite: AE 227 for BTech/DD)
AE 681	Combustion of Solid Propellants
AE 682	Introduction to Thermoacoustics
AE 684	Data-Driven Flow Modelling
AE 706	Computational Fluid Dynamics
AE 710	Aeroacoustics
AE 713	Spaceflight Dynamics
AE 717	Aircraft Flight Dynamics
AE 720	Advanced Numerical Methods for Compressible Flows (Prerequisites: AE 339/616, AE 706)
AE 724	Experimental Methods in Fluid Mechanics
AE 726	Heat Transfer - Aerospace Applications (Prerequisite: AE 223 for BTech/DD) (*not available with ME 663*)
AE 780	Computational Heat Transfer and Fluid Flow (Prerequisite: AE 726/ME 663 for BTech/DD) (*not available with ME 415*)
AE 782	Flow Control

[$]Also available for all B. Tech. and Dual Degree students

Table C(3) – M. Tech. Non-Departmental Electives for Propulsion Specialization, AE 3[$]	
CE 620/ME 613	Finite Element Methods / Finite Element and Boundary Element Methods (*not available with AE 649*)
ME 415	Computational Fluid Dynamics and Heat Transfer (*not available with AE 780*)
ME 623	Cryogenic Engineering II
ME 651	Fluid Mechanics
ME 653	Boundary Layer Theory
ME 661	Advanced Thermodynamics and Combustion
ME 662	Convective Heat and Mass Transfer
ME 663	Advanced Heat Transfer (*not available with AE 726*)
ME 678	Fundamentals of Gas Dynamics (*not available with AE 616*)
ME 683	Cryogenic Engineering I
ME 704	Computational Methods in Thermal and Fluid Engineering
ME 724	Essentials of Turbulence
ME 743	Optical Methods in Mechanical Engineering
ME 757	Galerkin Methods for Fluid Dynamics
ME 766	High Performance Scientific Computing
ME 6118	Spray Theory and Applications (*not available with AE 660*)

[$]Not available for B. Tech. students either as Department Elective or Honors Elective; only available for Dual Degree students for their PG electives and for M. Tech. students of AE 3 specialization

Table B(4) – M. Tech. Aerospace Electives for Aerospace Structures Specialization, AE 4[$]	
AE 402	Smart Materials and Structures
AE 604	Advanced Topics in Aerospace Structures
AE 621	Inelasticity Theory
AE 639	Continuum Mechanics
AE 648	Energy Methods in Structural Mechanics
AE 668	Reduced Order Strategies for Structures and Fluids
AE 669	Machine Learning based Uncertainty Quantification for Composites
AE 676	Elastic Analysis of Plates and Laminates
AE 731	Multiscale Modelling of Materials
AE 736	Advanced Aeroelasticity (Prerequisite: AE 678)
AE 738	Tensors for Engineers
AE 6104	Nonlinear Elasticity

[$]Also available for all B. Tech. and Dual Degree students

Table C(4) – M. Tech. Non-Departmental Electives for Aerospace Structures Specialization, AE 4[$]	
CE 615	Structural Optimization (only if AE 755 is not offered)
CE 619	Structural Stability
ME 601	Stress Analysis
ME 602	Fatigue, Fracture, and Failure Analysis
ME 616	Fracture Mechanics
ME 679	Micromechanics of Composites
ME 734	Vibro-acoustics
ME 748	Computer Aided Simulation of Machines
ME 755	Advanced Mechanics of Solids
ME 759	Nonlinear Finite Element Methods
ME 772	Processing of Aerospace Materials – I
ME 774	Processing of Aerospace Materials – II
MM 445	Continuum Plasticity of Metals

[$]Not available for B. Tech. students either as Department Elective or Honors Elective; only available for Dual Degree students for their PG electives and for M. Tech. students of AE 4 specialization

Document History

2026-02-03: Added AE 503 to Table B(2), SC 655 & 664 to Table C(2), ME 678 to Table C(3). Indicated equivalence of AE 616 in Table B(3) with ME 678 in Table C(3).

2026-01-23: Removed equivalences AE 339 ≡ AE 616, AE 341 ≡ AE 717, AE 341 ≡ AE 713, AE 344 ≡ AE 711. Removed AE 714 from Table B(4); it's already available through Table A(i). Removed AE 711 from Table B(4); it was there by mistake. Added prerequisite of AE 726/ME 663 for AE 780 for BTech/DD. Added AE 429 to Table A(i); omitted it from Table B(1).

2025-05-07: Added AE 777 to Table A(i), ME 621 to Table A(iii), AE 6106 to Table B(2), ME 415 to Tables C(1) & C(3), ME 663 to Table C(3). Equivalence established between AE 662 and EE 622 and SC 604, AE 726 and ME 663, AE 777 and ME 621, AE 780 and ME 415.

2024-12-23: Added '*' to AE 653 in Table A(i), '*' note to A(iii), AE 685 to B(2), AE 6104 to B(4)

2024-10-15: Added AE 684 to Tables B(1) & B(3), AE 686 & 688 to Table B(2)

2024-06-20: Added AE 501 & 6103 to Table A(i), AE 683 to Table B(1); ME 6118 to Table B(3)

2023-07-24: First version.

Earlier, separate documents were maintained for UG and PG students. Now, the different options available to UG and PG students are maintained in this one document. The electives available to UG students of batches 2021 and earlier were very different; this document does not apply to them. The electives available to PG students of batches 2021 and earlier were almost the same, except for the following changes:

Additions: AE 665, 725, 771, CE 771, CL 603, ME 782 for all specializations; AE 429 for AE 1

Deletions: ME 772, 774, MM 724 for AE 1; ME 701 for AE 2 and AE 3