

ELECTIVES
B. Tech., Dual Degree, Honors & Minor Programmes in Aerospace Engineering,
IIT Bombay
For Students of 2021 Batch and Earlier
(Last Update on 24th July, 2023)

Table II – Departmental Electives[@]

Course No.	Course Title	Prerequisites
AE 429	Aircraft Design Project	NIL
AE 604	Advanced Topics in Aerospace Structures	NIL
AE 6102	Parallel Scientific Computing and Visualization	NIL
AE 617	Numerical Methods for Conservation laws	NIL
AE 619	Nonlinear Systems Analysis	NIL
AE 621	Inelasticity Theory	NIL
AE 622	Computation of High-Speed Flows	NIL
AE 623	Computation of Turbulent Flows	NIL
AE 624	Hypersonic Flow Theory	NIL
AE 625	Particle Methods for Fluid Flow Simulation	NIL
AE 626	Spacecraft Attitude Dynamics and Control	NIL
AE 639	Continuum Mechanics	NIL
AE 647	Plasma Physics for Engineers	NIL
AE 648	Energy Methods in Structural Mechanics	NIL
AE 649	Finite Element Method (not with CE 620, ME 434/613)	AE 227
AE 651	Aerodynamics of Compressors and Turbines	NIL
AE 656	Aviation Fuels and their Combustion (not with EN 648, ME 760)	NIL
AE 658	Design of Power Plants for Aircraft	NIL
AE 660	Interfacial Phenomena in Liquid Atomization	NIL
AE 662	Applied Optimal Control	NIL
AE 663	Software Development Techniques	NIL
AE 664	Lighter-Than-Air Systems	NIL
AE 665	Aircraft Stealth Technology	AE 332
AE 666	Adaptive and Learning Control Systems	NIL
AE 667	Rotary Wing Aerodynamics	NIL
AE 668	Reduced Order Strategies for Structures and Fluids	NIL
AE 669	Machine Learning based Uncertainty Quantification for Composites	NIL
AE 673	Fiber Reinforced Composites	NIL
AE 676	Elastic Analysis of Plates and Laminates	NIL
AE 678	Aeroelasticity	AE 227
AE 679	Advanced Guidance and Control	NIL
AE 681	Combustion of Solid Propellants	NIL
AE 682	Introduction to Thermoacoustics	NIL
AE 690	Control Systems Design Techniques	NIL
AE 695	State Space Methods for Flight Vehicles	MA 106
AE 700	Guidance and Control of Unmanned Autonomous Vehicles	NIL
AE 706	Computational Fluid Dynamics	NIL
AE 710	Aeroacoustics	NIL
AE 712	Flight Dynamics and Control	NIL

AE 718	Hydrodynamic Stability Theory	NIL
AE 720	Advanced Numerical Methods for Compressible Flows	AE 616, AE 706
AE 724	Experimental Methods in Fluid Mechanics	NIL
AE 725	Air Transportation	NIL
AE 726	Heat Transfer: Aerospace Applications	AE 223
AE 730	Experimental Methods in Structural Dynamics	NIL
AE 731	Multiscale Modelling of Materials	NIL
AE 732	Composite Structures Analysis and Design	NIL
AE 736	Advanced Aero elasticity	AE 678
AE 738	Tensors for Engineers	NIL
AE 755	Optimization for Engineering Design	NIL
AE 759	Systems Engineering Principles	NIL
AE 771	Matrix Computations	NIL
AE 773	Applied Mechatronics	NIL
AE 774	Special Topics in Aerodynamics and CFD	NIL
AE 779	Optimization of Multidisciplinary Systems	NIL
AE 780	Computational Heat Transfer and Fluid Flow	NIL
AE 782	Flow Control	NIL

@Each course listed has 6 credits

Table III – Non-Departmental Electives^{&+}

No.	Course Title
CE 611	Advanced Structural Mechanics
CE 615	Structural Optimization (only if AE 310/755 are not offered)
CE 619	Structural Stability
CE 620	Finite Element Methods (not with AE 649, ME 434/613)
CE 623	Advanced Solids Mechanics
CE 624	Nonlinear Analysis
CH 504	Computational Chemistry
CL 601	Advanced Transport Phenomena
CL 653	State Estimation: Theory & Applications
CL 686	Advanced Process Control
CS 747	Foundations of Intelligent and Learning Agents
GNR 649	Planetary Sciences: Earth and Beyond
EE 613	Nonlinear Dynamical Systems
EE 622	Optimal Control Systems
EE 623	Nonlinear Control Systems
EE 635	Applied Linear Algebra
EE 636	Matrix Computations
EE 638	Estimation & Identification
EE 640	Multivariable Control Systems (not with SC 613)
EE 712	Embedded Systems
EE 737	Introduction to Stochastic Control
EE 794	Microsystems: Analysis and Design
EN 648	Combustion Engineering (not with AE 656, ME 760)
IE 502	Probabilistic Models
IE 503	Operational Analysis (not with ME 407)
IE 614	Linear Systems
IE 630	Simulation Modeling and Analysis
MA 540	Numerical Methods for PDEs
ME 401	Microprocessors and Automatic Control
ME 407	Industrial Engineering & Operations Research I (not with IE 503)
ME 412	CFD and Heat Transfer Lab
ME 415	Computational Fluid Dynamics and Heat Transfer (not with AE 780)
ME 434/613	Finite Element and Boundary Element Methods (not with AE 649, CE 620)
ME 472	Nonlinear Dynamics & Chaos
ME 601	Stress Analysis
ME 602	Fatigue, Fracture and Failure analysis
ME 604	Robotics
ME 616	Fracture Mechanics
ME 637	Manufacturing Automation
ME 664	Advanced Finite Element and Boundary Element Methods
ME 679	Micromechanics of Composites
ME 699	Magnetohydrodynamics and its Engineering Applications
ME 704	Computational Methods in Thermal & Fluids Engineering
ME 724	Essentials of Turbulence
ME 741	Turbulence & Combustion Modeling
ME 744	Applied Random Vibrations
ME 755	Advanced Mechanics of Solids

ME 759	Nonlinear Finite Element Methods
ME 760	Fuels and Combustion (not with AE 656, EN 648)
ME 762	Advanced Engineering Dynamics
ME 766	High Performance Sci. Computing
ME 772	Processing of Aerospace Materials – I
ME 774	Processing of Aerospace Materials – II
ME 781	Data Mining and Applications
MM 445	Continuum Plasticity of Metals
MM 654	Advanced Composites
MM 657	Design & Application of Engineering Materials
MM 658	Fracture Mechanics & Failure Analysis
PH 251	Classical Mechanics
PH 426/556	Astrophysics
SC 202	Signals and Feedback Systems
SC 301	Linear and Nonlinear Systems
SC 601	Modelling and Identification of Dynamical Systems
SC 602	Control of Nonlinear Dynamical Systems
SC 607	Optimization (not with AE 755)
SC 613	Multivariable Control Systems (not with EE 640)
SC 617	Adaptive Control Theory
SC 618	Analytical and Geometric Dynamics
SC 619	Control of Lagrangian & Hamiltonian Systems
SC 620	Automation and Feedback Control
SC 624	Differential Geometric Methods in Control
SC 625	Systems Theory
SC 627	Motion Planning & Coordination of Autonomous Vehicles
SC 628	Guidance Strategies for Autonomous Vehicles
SC 633	Geometric and Analytical Aspects of Optimal Control
SC 635	Advanced Topics in Mobile Robotics
SC 637	Sparsity Methods in Systems & Controls
SC 643	Stochastic & Networked Control
SC 646	Distributed Optimization and Machine Learning
SC 649	Embedded Control & Robotics
SC 702	Linear System Theory for PDE

&Each course listed has 6 credits

+Courses not listed, if found appropriate, can be allowed with the approval of DUGC. The students interested in such courses, however, need to plan in advance, in order to complete the approval process well in time.

Document History

- 2023-07-24: Clarified in title that this document applies to UG+DD students of 2021 batch and earlier only; removed or reduced prerequisites for most courses in Table II
- 2022-12-26: Added AE 623 to Table II
- 2022-12-22: Added AE 700 to Table II
- 2022-07-29: Removed CS 725 from Table III as it is run as a strictly PG elective
- 2022-07-24: Added SC 649 to Table III
- 2022-07-11: Added AE 429 to Table II and CS 725 to Table III
- 2022-06-17: Added SC 646 to Table III
- 2022-06-06: Added AE 771 to Table II; Removed references to deleted UG equivalent courses of PG electives from Table II; Added CH 504, EE 737, GNR 649, EN 648, ME 637, ME 760, SC 202, SC 607, SC 635 to Table III
- 2022-01-01: Removed erstwhile Table II as all UG electives have been merged with their PG versions long ago; Added AE 6102 to the new Table II; corrected CL 486 in the new Table III to CL 686
- 2021-07-29: Added AE 681 to Table III
- 2021-07-03: AE 720 is now a 6-credit course
- 2021-04-09: Added CS 747 to Table IV
- 2021-01-08: Added PH 251, 556, IE 614, 630 and ME 412 to Table IV
- 2020-08-07: Added ME 699 to Table IV
- 2020-07-19: Added AE 669 and 679 to Table III; Added IE 503 to Table IV.
- 2020-04-24: Added IE 502 and ME 724 to Table IV.
- 2019-11-25: Added AE 626, 662, 667, 668 to Table III; Updated title of AE 780 in same; Added EE 712, 794 and MM 445 to Table IV
- 2019-08-29: Added AE 731, 738 to Table III; Added EE 635, 638, ME 472, 762, SC 643, 702 to Table IV
- 2019-05-14: Added AE 666 to Table III