

SPECIALIZATION ELECTIVES

IN

M.TECH. PROGRAM

OF

**AEROSPACE ENGINEERING
DEPARTMENT**

IIT BOMBAY

(Updated 4th August, 2022)

Table II(a) – List of Specialization Electives for Aerodynamics, AE 1

AE 617	Numerical Methods for Conservation Laws
AE 622	Computing of High Speed Flows
AE 624	Hypersonic Flow Theory
AE 625	Particle Methods for Fluid Flow Simulation
AE 639	Continuum Mechanics
AE 649	Finite Element Method (<i>not available with CE 620 or ME 613</i>)
AE 650	Mini Project
AE 651	Aerodynamics of Compressors and Turbines
AE 653	Engineering Mathematics (<i>not available with ME 673 or CL 602</i>)
AE 663	Software Development Techniques for Engineering and Scientists
AE 664	Lighter-Than-Air Systems
AE 667	Rotary Wing Aerodynamics
AE 668	Reduced Order Strategies for Structures and Fluids
AE 678	Aeroelasticity
AE 682	Introduction to Thermoacoustics
AE 702	Advanced Flight Dynamics (Prerequisite: AE 717)
AE 710	Aeroacoustics
AE 711	Aircraft Propulsion
AE 713	Space Flight Dynamics
AE 714	Introduction to Aircraft Design
AE 717	Aircraft Flight Dynamics
AE 718	Hydrodynamic Stability Theory (<i>not available with ME 783</i>)
AE 720	Advanced Numerical Methods for Compressible Flows (Prerequisites: AE 616, AE 706)
AE 724	Experimental Methods in Fluid Mechanics
AE 725	Air Transportation
AE 726	Heat Transfer: Aerospace Applications
AE 736	Advanced Aeroelasticity (Pre-requisite: AE 678)
AE 755	Optimization for Engineering Design (<i>not available with ME 782</i>)
AE 759	Systems Engineering Principles
AE 774	Special Topics in Aerodynamics and CFD
AE 779	Optimization of Multi-Disciplinary Systems (Prerequisite: AE 755 or ME 782)
AE 780	Computational Heat Transfer and Fluid Flow
AE 782	Flow Control
AE 6102	Parallel Scientific Computing and Visualization
CE 620	Finite Element Methods (<i>not available with AE 649 or ME 613</i>)
CL 602	Mathematical and Statistical Methods in Chemical Engineering (<i>not available w/ AE 653 or ME 673</i>)
ME 613	Finite Element and Boundary Element Methods (<i>not available with AE 649 or CE 620</i>)
ME 619	Experimental Methods in Thermal and Fluids Engineering
ME 651	Fluid Dynamics
ME 663	Advanced Heat Transfer
ME 673	Mathematical Methods in Engineering (<i>not available with AE 653 or CL 602</i>)
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 781	Statistical Machine Learning and Data Mining
ME 782	Design Optimization (<i>not available with AE 755</i>)
ME 783	Fundamentals of Waves and Instabilities in Fluids (<i>not available with AE 718</i>)
ME 789	Computational Tools for Process Modelling

Table II(b) – List of Specialization Electives for Dynamics & Control, AE 2

AE 619	Nonlinear Systems Analysis (<i>not available with CL 714, EE 613, ME 670 or SC 602</i>)
AE 626	Spacecraft Attitude Dynamics and Control
AE 641	Introduction to Navigation and Guidance
AE 650	Mini Project
AE 653	Engineering Mathematics (<i>not available with ME 673 or CL 602</i>)
AE 662	Applied Optimal Control
AE 663	Software Development Techniques for Engineering and Scientists
AE 665	Aircraft Stealth Technology
AE 666	Adaptive and Learning Control Systems
AE 678	Aeroelasticity
AE 679	Advanced Guidance and Control
AE 690	Control System Design Techniques (Prerequisites: AE 695, AE 775)
AE 702	Advanced Flight Dynamics (Prerequisite: AE 717)
AE 712	Flight Dynamics and Control (Pre-requisites: AE 695, AE 717, AE 775)
AE 713	Spaceflight Dynamics
AE 714	Introduction to Aircraft Design
AE 715	Structural Dynamics
AE 725	Air Transportation
AE 755	Optimization in Engineering Design (<i>not available with CE771, CL 603 or ME 701</i>)
AE 759	Systems Engineering Principles
AE 779	Optimization of Multi-Disciplinary Systems (Prerequisite: AE 755)
AE 6102	Parallel Scientific Computing and Visualization
CE 771	Optimization in Civil Engineering (<i>not available with AE 755, CL 603 or ME 701</i>)
CL 602	Mathematical and Statistical Methods in Chemical Engineering (<i>not available w/ AE 653 or ME 673</i>)
CL 603	Optimization (<i>not available with AE 755, CE771 or ME 701</i>)
CL 653/EE 638	State Estimation: Theory and Applications / Estimation and Identification
CL 686	Advanced Process Control
CL 692	Digital Control
CL 714	Nonlinear System Analysis (<i>not available with AE 619, EE 613, ME 670 or SC 602</i>)
EE 603	Digital Signal Processing and its Applications
EE 613	Nonlinear Dynamical Systems (<i>not available with AE 619, CL 714, ME 670 or SC 602</i>)
EE 622/SC 604	Optimal Control Systems
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	Probabilistic Models (<i>not available with SC 629</i>)
IE 614	Linear Systems
ME 604	Mechatronics and Robotics
ME 637	Manufacturing Automation
ME 670	Nonlinear Systems Analysis and Control (<i>not available with AE 619, EE 613 or SC 602</i>)
ME 673	Mathematical Methods in Engineering (<i>not available with AE 653 or CL 602</i>)
ME 701	Optimization Methods in Engineering Design (<i>not available with AE 755, CE771 or CL 603</i>)
ME 781	Statistical Machine Learning and Data Mining
PH 542	Nonlinear Dynamics
SC 602	Control of Nonlinear Dynamical Systems (<i>not available with AE 619, CL 714, EE 613 or ME 670</i>)

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 621/622	Quantitative Feedback Theory I/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 629	Introduction to Probability and Random Processes (<i>not available with IE 502</i>)
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 702	Linear Systems Theory for PDE

Table II(c) – List of Specialization Electives for Propulsion, AE 3

AE 616	Gas Dynamics
AE 617	Numerical Methods for Conservation Laws
AE 622	Computing of High Speed 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 (<i>not available with CE 620 or ME 613</i>)
AE 650	Mini Project
AE 651	Aerodynamics of Compressors and Turbines
AE 653	Engineering Mathematics (<i>not available with ME 673 or CL 602</i>)
AE 656	Aviation Fuels and their Combustion
AE 658	Design of Power Plants for Aircraft
AE 660	Interfacial Phenomena in Liquid Atomization
AE 663	Software Development Techniques for Engineers and Scientists
AE 665	Aircraft Stealth Technology (Prerequisite: AE 714)
AE 667	Rotary Wing Aerodynamics
AE 678	Aeroelasticity
AE 681	Combustion of Solid Propellants
AE 682	Introduction to Thermoacoustics
AE 706	Computational Fluid Dynamics
AE 710	Aeroacoustics
AE 713	Space Flight Dynamics
AE 714	Introduction to Aircraft Design
AE 717	Aircraft Flight Dynamics
AE 720	Advanced Numerical Methods for Compressible Flows (Prerequisites: AE 616, AE 706)
AE 724	Experimental Methods in Fluid Mechanics
AE 726	Heat Transfer - Aerospace Applications
AE 755	Optimization for Engineering Design (<i>not available with ME 701</i>)
AE 759	Systems Engineering Principles
AE 779	Optimization of Multi-Disciplinary Systems (Prerequisites: AE 755, ME 701)
AE 780	Computational Heat Transfer and Fluid Flow
AE 782	Flow Control
AE 6102	Parallel Scientific Computing and Visualization
CE 620	Finite Element Methods (<i>not available with AE 649 or ME 613</i>)
CL 602	Mathematical and Statistical Methods in Chemical Engineering (<i>not available w/ AE 653 or ME 673</i>)
ME 613	Finite Element and Boundary Element Methods(<i>not available with AE 649 or CE 620</i>)
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 673	Mathematical Methods in Engineering (<i>not available with AE 653 or CL 602</i>)
ME 683	Cryogenic Engineering I

ME 701	Optimization Methods in Engineering Design (<i>not available with AE 755</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 781	Statistical Machine Learning and Data Mining

Table II(d) – List of Specialization Electives for Structures, 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 650	Mini Project
AE 653	Engineering Mathematics (<i>not available with ME 673 or CL 602</i>)
AE 663	Software Development Techniques for Engineering and Scientists
AE 665	Aircraft Stealth Technology
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 711	Aircraft Propulsion
AE 714	Introduction to Aircraft Design
AE 725	Air Transportation
AE 731	Multiscale Modelling of Materials
AE 736	Advanced Aeroelasticity (Prerequisite: AE 678)
AE 738	Tensors for Engineers
AE 755	Optimization in Engineering Design
AE 759	Systems Engineering Principles
AE 779	Optimization of Multi-Disciplinary Systems (Prerequisite: AE 755)
AE 6102	Parallel Scientific Computing and Visualization
CE 615	Structural Optimization (only if AE 755 is not offered)
CE 619	Structural Stability
CL 602	Mathematical and Statistical Methods in Chemical Engineering (<i>not available w/ AE 653 or ME 673</i>)
ME 601	Stress Analysis
ME 602	Fatigue, Fracture, and Failure Analysis
ME 616	Fracture Mechanics
ME 673	Mathematical Methods in Engineering (<i>not available with AE 653 or CL 602</i>)
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
ME 781	Statistical Machine Learning and Data Mining
MM 445	Continuum Plasticity of Metals

Document History

2022-08-04: Added ME 662 to Table II(c)
2022-07-29: Added AE 6102 to Tables II(a-d); added EE 749 to Table II(b)
2021-07-29: Added AE 681 to Table II(c)
2021-07-22: ME 781 added to Tables II(a)-(d)