Aviation Science and Technologies Master's Program Course Contents

Course Code	Course Name	Credit	ACTS
HBT 5000	Specialization Field Course (Master)	0-0-0	24

Course Content:
Information and evaluation about basic studies in the field, Interpretation of current approaches and methods related to the thesis, Determination of data collection and methods to be used in the thesis, Literature follow-up about the field and method, Literature follow-up about the theoretical background of the thesis, General evaluation in the context of theoretical framework, method, and basic works, Preparation of the temporary plan of the thesis, determination of main and subheadings, Reading and evaluation within the time-space boundaries and temporary plan of the thesis, Literature follow-up, note-taking and evaluation, Completion of deficiencies in primary sources, Comment, assessment and analysis, Solution of existing problems in the context of method and content, Evaluation, report preparation and presentation.

Course Code	Course Name	Credit	ACTS
HBT 5010	Master Seminar	0-2-0	6

Course Content:
What is scientific research? Why is research important? What are the ethical rules in research? Research approaches in social sciences Basic features of the qualitative approach. Basic features of the quantitative approach Studies where both methods are used together. What are the basic stages of research? Determining the research topic Literature review (journals, e-journals, books, Internet sources). Finding appropriate keywords for the review of National and international refereed journals in special education. Points to consider when summarizing the found sources Defining the research problem. Determining the purpose and sub-objectives of the research Data collection Qualitative data collection. Determining the purpose and sub-objectives of the research Data collection Qualitative data collection. Quantitative data collection Planning the data collection schedule. Analyzing and interpreting data Analyzing qualitative data. Analyzing qualitative data. Analyzing quantitative data. Analyzing quantitative data. Reporting the research Preparing a research project.

Course Code	Course Name	Credit	ACTS
HBT 5020	Master Thesis	0-0-0	24

Course Content:
Introduction to Research: Philosophy of Science. Researcher Competencies. Research design. Dimensions of the open and distance learning field. Periodicals in the open and distance learning field. Conferences in the open and distance learning field. Professional organizations in the open and distance learning field. Article review. Paper review. Evaluation. Reporting.

Course Code	Course Name	Credit	ACTS
HBT 5030	Aircraft Performance and Operations Analysis	3-0-3	6

Course Content:
Performance analysis, Equations of motion, Thrust systems, Drag curves and analysis, Power curves and analysis, Range and Endurance analysis, Glide analysis, Climbs analysis, Thrust and power curves and analysis, Takeoff and Landing analysis, Turns calculations, v-n diagrams, Energy height calculations, Specific energy excess calculations.

Course Code	Course Name	Credit	ACTS
HBT 5040	Rotary Wing Aerodynamics and Aeroacoustics	3-0-3	6

Course Content:
Introduction and introduction to rotary wings, Froude disk theory, and propeller examination, Calculation of propeller coefficients, Propeller efficiency, Propeller power coefficient, Propeller efficiency factor, Glide analyses, Blade element theory, Propeller pitch, Flow analyses around the propeller, Aeroacoustics, Acoustic calculations, Acoustic analysis, Acoustic improvement examples

Course Code	Course Name	Credit	ACTS
HBT 5050	The Effect of Light Aircraft Construction Techniques on Performances	3-0-3	6

Course Content:
Light aircraft construction: Wing structure, Body structure, Power group, Tail gear, Landing gear, Equipment, Typical construction materials used in light aircraft: Wood, Metals, Composite materials, Basic performances and factors affecting them: Basic performances, Effect of wing profile change on performances, Effect of wing area change on performances, Effect of weight change on performances, Effect of engine power change on performances, Study of construction and performance characteristics I, Study of construction and performance characteristics II

Course Code	Course Name	Credit	ACTS
HBT 5060	Airline Operations and Planning	3-0-3	6

Course Content:
Network flows and integer programming models, Flight Scheduling, Fleet Assignment, Aircraft Routing Crew Scheduling, Airline Workforce Planning, Revenue Management, Fuel Management System, Management of Unplanned Operations in Airline Operations, Airport Gate Assignment, Passenger Boarding Strategy, Runway Capacity Planning.

Course Code	Course Name	Credit	ACTS
HBT 5070	Modeling and Simulation of Flight Systems	3-0-3	6

Course Content:
Aviation Simulation and Modeling Fundamentals, Mathematical Modeling Fundamentals, Discrete Event Simulation Methodology and Simulation in Aviation, Aviation Simulation Software and Tools, Flight Simulators, Protocol Testing and Real Life Use, Airport Modeling, Airport Capacity and Delay Analysis and Simulation, Air Traffic Flow, Space Traffic Management Modeling and Simulation, Airport Capacity and Delay Analysis and Simulation, Aviation Safety Simulations, Testing the Accuracy and Validity of Simulation Models, Flight Dynamics and Control Modeling, Accident and Post-Simulation Analysis, Simulation with VR, UAV and Future City Air Traffic Systems Simulation.

Course Code	Course Name	Credit	ACTS
HBT 5080	Advanced Thermodynamic Analysis of Gas Turbine Engines	3-0-3	6

Course Content:
The First Law of Thermodynamics; Control Volumes, Conservation of Mass; Conservation of Energy, The Second Law of Thermodynamics; Application of the Second Law to Cycles; Carnot Cycle, Entropy; Entropy Balance in Closed and Open Systems, Isentropic Changes of State; Isentropic Efficiency of Turbines and Compressors, Exergy Balance in Open and Closed Systems; Exergy Efficiency, Thermomechanical Exergy; Chemical Exergy, Exergy Analysis of Chemical Systems, Examination of Application Areas of Exergy Analysis, Energy and Exergy Analysis in Internal Combustion Engines, Exergy Analysis in Steam Power Plants, Energy and Exergy Analysis in Turbojet Engines, Energy and Exergy Analysis in Turbojet Engines, Energy and Exergy Analysis in Turboprop Engines, Energy and Exergy Analysis in Turbofan Engines.

Course Code	Course Name	Credit	ACTS
HBT 5090	Active Control of Aircraft Vibrations	3-0-3	6

Course Content:
Definition and principles of vibration. Elements of a vibration system. Scope of vibration control, Programming principles with Matlab. Simple harmonic motion, Complex numbers, and vector expressions, Vector representation of harmonic motions, Harmonic analysis, Obtaining the equation of motion in a single degree of freedom systems, Overview of modeling of dynamic systems and vibration analysis, Solution of undamped single degree of freedom systems. Properties of undamped single-degree-of-freedom systems, Damped single-degree-of-freedom systems, Solution of damped system (homogeneous solution), Solution of damped system (special solution), Homogeneous solution of damped system, Frequency response method, Impedance method, Transfer function, Transient response analysis, Impulse response analysis, convolution integral, step response analysis, Analysis of ground driven systems, Harmonic drive-Rotating unbalances, Vibration isolation and permeability. Practical isolation approaches, Vibration measurement, Piezoelectric accelerometer structure, System response for periodic forcing, Deterministic signals and their harmonics, Multi-degree-of-freedom systems, state-space equation, Two-degree-of-freedom system-undamped free vibration, Multi-degree-of-freedom torsional systems, Normal mode solution, Natural frequencies, and mode shapes, Forced vibrations-harmonic excitation case, Infinite dynamic absorber, Modeling of structural systems, Obtaining the equations of motion using Lagrange equation, Modeling of

continuous systems, Vibration control, LQR method and its applications, Controllability, and observability. Vibration control Observer-based control. Project work

Course Code	Course Name	Credit	ACTS
HBT 5100	Performance Optimization of Aircraft Propulsion Systems	3-0-3	6

Course Content:
Historical development of gas turbine engines, Introduction of gas turbine engine systems, Analysis of parametric cycle equations of ramjet and pulsejet systems, Analysis of parametric cycle equations of turbojet engines, Analysis of parametric cycle equations of turbofan engines, Analysis of parametric cycle equations of turboprop engines, Calculation of performance parameters of turbojet engines with a genetic algorithm, Calculation of performance parameters of turbojet engines with genetic algorithm, Calculation of performance parameters of turbofan engines with genetic algorithm, Calculation of performance parameters of turboprop engines with genetic algorithm, Calculation of turbojet parameters with particle swarm optimization technique, Calculation of turbofan parameters with particle swarm optimization technique, Calculation of turboprop parameters with particle swarm optimization technique, Comparison of performance parameters of gas turbine engines.

Course Code	Course Name	Credit	ACTS
HBT 5110	Space Physics	3-0-3	6

Course Content:
Space Regions, Role of Space Observations, Plasma State, Standard Atmosphere, Structure of the Atmosphere, Scale Height, Solar Radiation, Electrical Conductivity, Ionospheric Layers, Ionospheric Disturbances, Radio Wave Propagation in the Ionosphere, Radiative Ionization in an Exponential Atmosphere, Diffusive Balance in Multicomponent Plasma, Electrical Conductivity in Magnetized Plasma, Appleton-Hartree Equation, Geomagnetic Field, Structure of the Magnetosphere, Earth's Radiation Belts, Dynamics of the Magnetosphere, Auroras, Motion of Magnetically Trapped Particles, Size, Mass and Power, Thermonuclear Fusion Reactions, Energy Transport, Solar Atmosphere, Magnetic Field of the Sun, Rotation of the Sun, Solar Activity, Solar Cycle, Solar Wind, Gas Dynamics of the Sun

Course Code	Course Name	Credit	ACTS
HBT 5120	Material Selection in Aviation	3-0-3	6

Course Content:
Important issues in selecting materials for aircraft construction, Limiting factors in selecting materials for aircraft structures, Main steps in selecting materials for aircraft structures, Importance of destructive tests in selecting materials, Order of importance of material properties, Comparison of material properties, Selection of candidate materials for aircraft structures, Properties of carbon composites, Properties of superalloys, Properties of metal matrix composites, Properties of aluminum alloys, Properties of titanium alloys, Production methods of metal alloys and composite materials

Course Code	Course Name	Credit	ACTS
HBT 5130	Structure and Properties of Aircraft Materials	3-0-3	6

Course Content:
Interatomic bonds, Stress, deformation theories, Elastic modulus, Hooke's Law. Yield strength, tensile strength, hardness, Yield strength, tensile strength, hardness and ductility, toughness, Fracture and fatigue, Diffusion, Arrhenius and Fick's Laws, Creep and creep fractures, Case Studies, Titanium and its alloys, Magnesium and its alloys, Aluminum and its alloys, Foam Materials, Composite Materials, Comments on case studies.

Course Code	Course Name	Credit	ACTS
HBT 5140	Damage Analysis of Aircraft Materials	3-0-3	6

Course Content:
Introduction to failure analysis causes and mechanisms of failure, Fracture processes of aerospace materials, Stress concentration effects, application of fracture mechanics to aerospace materials, Fatigue behavior, Fatigue stress, Fatigue life (S-N) curves, Fatigue of metals used in aerospace industry, Fatigue of fiber-polymer composites, Creep behavior, creep of metallic materials, Creep of polymer and polymer-based composites, Creep resistant materials, Wear and abrasion damage, Corrosion damage, Welding defects, Mechanical processing damage, Casting defects.

Course Code	Course Name	Credit	ACTS
HBT 5150	Satellite Communication Systems	3-0-3	6

Course Content:
Fundamentals of satellite communication systems, Satellite frequency bands, Communication Satellites, Satellite communication hardware, Satellite ground station communication hardware, Satellite antenna systems, Satellite mobile communication systems, Cellular mobile phone, Satellite image detection and distribution systems, Satellite radio broadcast detection and distribution systems, Inter-satellite communication, Existing satellite systems, Software and modulation techniques in satellite systems, Future developments and applications.

Course Code	Course Name	Credit	ACTS
HBT 5160	High-Temperature Materials in Aircraft	3-0-3	6

Course Content:
Definition and history of superalloys, Use in gas turbines. Cobalt-based superalloys, nickel-based superalloys, and their varieties, Corrosion resistance and manufacturing methods, Casting, powder metallurgy, forging, heat treatment and joining processes, Effect of alloying elements, solid solution hardened Ni-based superalloys, phase diagrams, precipitation hardened Ni-based superalloys, oxide dispersion hardened alloys and their mechanical properties and surface stability, Single crystal superalloys and their properties, Damage in superalloys, Thermal barrier coatings of jet engines, Alternative materials, and future expectations.

Course Code	Course Name	Credit	ACTS
HBT 5170	Nanotechnology in Aviation	3-0-3	6

Course Content:
Introduction, Introduction to the lesson plan, Definition of nanotechnology, Definition of nanostructures and nanomaterials, Properties and preparation of nanomaterials, Modern surface treatment techniques, Chemical properties of nanomaterials, Optical properties of nanostructures, Physical properties of nanomaterials (mechanical, thermal and electrical transport, fluidity, magnetic properties), Nanocomposites, Application areas and performances of nanomaterials, Nanotechnology Solutions in Aviation.

Course Code	Course Name	Credit	ACTS
HBT 5180	Finite Elements Method in Aviation	3-0-3	6

Course Content:
Finite Element Analysis, Basic computer program teaching and modeling applications, Mechanical analysis, Vibration analysis, Flow analysis (Air aerodynamics), Acoustic analysis, Aeroacoustic analysis, and Thermal analysis.

Course Code	Course Name	Credit	ACTS
HBT 5190	Artificial Intelligence Applications in Aviation	3-0-3	6

Course Content:
Machine learning, Artificial neural networks, ANN layers, Digital data and types, Learning types, Classification process, Methods used in data classification, Deep learning, Advantages of deep learning, Hardware requirements in deep learning, Deep learning structure, Deep architectural models, Convolutional Neural Network model, Deep learning application.

Course Code	Course Name	Credit	ACTS
HBT 5200	Fuel Cells in Space Technologies	3-0-3	6

Course Content:

Hydrogen Energy; Production, Storage, Transportation, Fuel Cell Types and Electrochemical Equations, Use of Fuel Cells in Aviation and Space Applications, Modeling of Fuel Cell Systems Used in Aircraft, Modeling of Fuel Cell Hybrid Systems Used in Aircraft.

Course Code	Course Name	Credit	ACTS
HBT 5210	Payload Carriage	3-0-3	6

Course Content:
Conventional fuel use, Future aircraft, and fuel systems, Alternative energy use in aircraft, Energy storage, Efficient use of energy, and Maintenance techniques appropriate for carrying a payload.

Course Code	Course Name	Credit	ACTS
HBT 5220	Intuitive Systems in Aviation	3-0-3	6

Course Content:
Definition of intuitive systems, Fuzzy logic theory and applications in the aviation industry, Fuzzy logic in aircraft control, Fuzzy logic simulation applications, Evolutionary algorithms, Genetic algorithm, Methods used in data classification, artificial neural network (ANN) theory, ANN in aviation, Areas of use of ANN in aviation, Chaos and swarm intelligence, Probability in aviation, Fuzzy Logic Applications, ANN applications.

Course Code	Course Name	Credit	ACTS
HBT 5230	Sustainable Energy Use in Aviation	3-0-3	6

Course Content:
Energy requirements and carbon dioxide emissions on land and in the air, Improper energy use, Waste materials resulting from energy use, Waste materials resulting from energy use, Alternative energy systems in aviation, Examination of existing alternative energy systems in aviation, Planning the use of alternative energy in settlements around airports, Domestic legislation and international agreements on energy use in aviation, Use of clean energy in future air transportation, Storing energy and ensuring security.

Course Code	Course Name	Credit	ACTS
HBT 5240	Aircraft Diagnostic Methods	3-0-3	6

Course Content:

Faults and types of faults for aircraft, Definition of fault and determination of its area, Task management in case of faults, Fault detection and diagnosis methods, Fault control methods, Fault removal techniques, Examination of the structure of the fault diagnosis manual for flight crew, Examination of algorithms for determining whether a fault has occurred and where and to what extent it is in the system, Stages of determining the system structure or parameters that change due to the fault, Investigation of instabilities and failures that may be caused by the fault, Fault prevention algorithms, Reporting techniques, Fault legislation, Work safety principles.

Course Code	Course Name	Credit	ACTS
HBT 5250	Air Rail Systems	3-0-3	6

Course Content:
Providing basic information about air rail systems and explaining their historical development, Explaining the types of rail systems and the importance and advantages of rail systems in the field of transportation, Explaining the operating principle and structure of MAGLEV trains, Terms used in rail systems, Development of rail system technology and its application to air rail systems, Introduction of the requirements and components of air-rail systems, Supply and transmission of electrical energy in air-rail systems, Modeling of air-rail systems, Simulation and control stages of air-rail systems, Applicability of modern control systems to air rail systems, Types of faults that may occur in air-rail systems, Fault diagnosis methods that can be used in air-rail systems, Investigation of cost analysis stages in air-rail systems.

Course Code	Course Name	Credit	ACTS
HBT 5260	Remote Sensing in Aviation	3-0-3	6

Course Content:
Introduction to Aviation, Definition of Remote Sensing, Remote Sensing Principle, Components and Remote Sensing in Aviation, Active and Passive Remote Sensing, Data Acquisition in Aviation, Sensor Systems, Satellite Orbits and Scanning Area, Data Processing and Visual Interpretation, Types of Images Used in Aviation for Remote Sensing Purposes, Image Processing, Remote Sensing Sensors, Remote Sensing Sensors Used in Aviation Field, Relationship Between Remote Sensing and UAVs, Aircraft Communication Addressing and Reporting System.

Course Code	Course Name	Credit	ACTS
HBT 5270	Unmanned Aerial Vehicle Ground Station Management	3-0-3	6

Course Content:
Introduction of Unmanned Aerial Vehicles (UAV), introduction of UAV system components, explanation of UAV basic operating principle, UAV control hardware and software, UAV ground control station components, UAV ground station control system, UAV ground control station hardware, UAV ground control station software, UAV ground control station software algorithms, examination and interpretation of UAV ground control station examples, UAV mobile ground stations, UAV ground control station data links, UAV command and control.

Course Code	Course Name	Credit	ACTS
HBT 5280	Aviation Communication Systems	3-0-3	6

Course Content:
Introduction to communication systems, Noise, sampling theorem, filtering, oscillators, Amplitude modulation, phase and frequency modulation, FM and AM wave spectrum, Transmission lines, types and characteristics, Properties of incident and reflected waves, Antenna theory, Classification and parameters of antennas, Sound Control Panel, Passenger Announcement System, VHF Communication System, HF Communication System, Master Warning System, Data Recording System.

Course Code	Course Name	Credit	ACTS
HBT 5290	Flight Control	3-0-3	6

Course Content:
Flight mechanics, basic definitions of control and control surfaces, Aircraft static and dynamic stability and stability derivatives, Aircraft longitudinal and lateral dynamic equations, Non-linear dynamics, linearization and transfer functions, Modes of longitudinal motion, stability derivatives, short and long modes, longitudinal transfer functions, Analysis of transient and steady-state responses, Transfer functions and time responses of short and long modes, Basic concepts of aircraft control systems, Longitudinal autopilot design, Autopilot types, and design methods, design of position autopilot by root locus method, Inner and outer loop concepts, Autopilot design, design methods of aircraft pitch and heading control systems, Design methods of aircraft pitch and heading control systems, Use of Matlab/Simulink in aircraft dynamics and control systems.

Course Code	Course Name	Credit	ACTS
HBT 5300	Electrical Drive in Aviation	3-0-3	6

Course Content:
Aircraft propulsion systems, General information about engine types and engine selection, Manned and unmanned aerial vehicles, Electric motors as a propulsion source in aviation, General structure of electric motors, DC motors and generators, AC motors and generators, Electrical propulsion and the future of electrical propulsion in UAVs, Simulation and simulation of electrically driven aircraft in Matlab/Simulink environment.

Course Code	Course Name	Credit	ACTS
HBT 5310	Routing of Aircraft	3-0-3	6

Course Content:
Logistics and Logistics Management Concepts, Supply Chain and Logistics Relationship, Logistics as Supply Chain Integration, Structure of Distribution Systems and Distribution Strategies, Logistics Strategies, Logistics Network Designs, Logistics Problems, Solution Approaches and Applications, Outsourcing in Logistics, 3PL, 4PL, 5PL, etc., Reverse Logistics, Green Logistics and Recycling Logistics, The Place and Importance of Information Technology in Logistics and Supply Chain Management, The Future of Logistics.

Course Code	Course Name	Credit	ACTS
HBT 5320	Flight Tests	3-0-3	6

Course Content:
Basic concepts, Basic stages of flight testing, Flight performance tests: Pitot static system performance tests, Determination of minimum air holding speed, Take-off and landing performance, Horizontal flight performance, Residual power characteristics, Curve performance, Climb performance, Descent performance, Determination of standard mission suitability, Main factors affecting hardware system design, Basic elements forming the hardware system,
Flight test applications.

Course Code	Course Name	Credit	ACTS
HBT 5320	Flight Tests	3-0-3	6

Course Content:
Basic concepts, Basic stages of flight testing, Flight performance tests: Pitot static system performance tests, Determination of minimum air holding speed, Take-off and landing performance, Horizontal flight performance, Residual power characteristics, Curve performance, Climb performance, Descent performance, Determination of standard mission suitability, Main factors affecting hardware system design, Basic elements forming the hardware system,
Flight test applications.

Course Code	Course Name	Credit	ACTS
HBT 5330	Aviation Software Applications	3-0-3	6

Course Content:
Introduction to Matlab software, m-file creation, and basic calculations, Graphic creation and shape operations, Introduction to modeling in Simulink, Simulation applications in Simulink, Simscape applications-basic modeling, Simscape applications-Control application, Eurospace toolbox-3dof longitudinal airframe control, Eurospace toolbox -6 of airframe control, Eurospace toolbox-flight instruments.

Course Code	Course Name	Credit	ACTS
HBT 5340	Aviation Transport Security	3-0-3	6

Course Content:
History of aviation security and examination of illegal incidents against civil aviation. Terminology related to aviation security. Differences between Safety and Security, International regulations related to aviation security, National regulations related to aviation security, Plans and programs related to airport security, History of Attacks against Civil Aviation, Air Cargo Security, Airport Operator Security and Organization, Airport physical security measures, Aircraft security, Sample accident-incident investigations, Human factor in aviation security, Cyber Attacks and Air Traffic Management Security, New developments affecting aviation security, New trends related to the future status of aviation security.

Course Code	Course Name	Credit	ACTS
HBT 5350	Advanced Human Factors	3-0-3	6

Course Content:
Human Factors, Error Models, Cognitive Ergonomics, Human Error and System Safety, Human-Computer Interaction in Aviation, Research Methods: statistics and decision making, Safety Assessment of Aircraft Systems, Applied Safety Assessment, Aviation Safety Management, Aircraft Accident Investigation and Response, Flight Data Monitoring, Training and Simulation, Human Factors in Aviation Maintenance Applications, Human Factors in Air Traffic Control. Human Factors, Error Models, Cognitive Ergonomics, Human Error and System Safety, Human-Computer Interaction in Aviation, Research Methods: statistics and decision making, Safety Assessment of Aircraft Systems, Applied Safety Assessment, Aviation Safety Management, Aircraft Accident Investigation and Response, Flight Data Monitoring, Training and Simulation, Human Factors in Aviation Maintenance Applications, Human Factors in Air Traffic Control.

Course Code	Course Name	Credit	ACTS
HBT 5360	Unmanned Vehicle Systems Traffic Modeling	3-0-3	6

Course Content:
Introduction, Introduction to the lesson plan, Unmanned Vehicle Systems (UAS), Traffic modeling, Air Traffic Control Systems, Modern approaches in Air Traffic Control Systems, City Information Systems, Geographic Information Systems, Location Based Services, and applications of Mobile-GIS for location-based data collection in City Information System and Disaster Management, MobilGIS, Unmanned Aerial Vehicle applications in Geographic Information Systems, Unmanned vehicles and city information systems, Traffic modeling of unmanned vehicles.

Course Code	Course Name	Credit	ACTS
HBT 5370	Aviation Law	3-0-3	6

Course Content:
Introduction to air law and its historical development, development of civil aviation in the world, Civil aviation, definition and classification of its applications, civil aviation system, Organizations, conventions, rules, bilateral agreements, air traffic rights, Space law, legal regime of airspace, problems related to airspace in the Aegean Sea, public law dimension of air law, first agreements related to aviation, Turkish civil aviation system, Paris and Chicago conventions, bilateral agreements (Bermuda agreements), international organizations related to aviation, European civil aviation conference, a union of authorities, Eurocontrol, air law in particular, Air transport law, air transportation and carrier liability, damages to third parties, Turkish civil aviation legislation, aircraft identity, ownership, nationality, registry, aircraft operator, operator liability, air carriage contract, International agreements and organizations, Chicago convention, international civil aviation organization, Warsaw convention and carrier liability, Hague and Tokyo convention, air traffic rights

Course Code	Course Name	Credit	ACTS
HBT 5380	Aviation Policies	3-0-3	6

Course Content:
Introduction to aviation policies and introduction to the general structure of the course, General objectives and social effects of transportation policies, General overview of transportation systems and aviation sector in Turkey, Transportation economics and economic dynamics in aviation sector, Economic policies and strategies applied in aviation sector, Current status analysis of Turkish aviation sector and sectoral problems, Characteristics and functioning of different aviation sectors in Turkey, Structures and functions of airline transportation institutions in Turkey, Analysis and strategies of airline transportation companies in Turkey, Organization and operational processes of airport ground services, Transportation economic policies in Turkey and their effects on aviation sector, European Union transportation policies and their reflections on Turkish aviation sector, Analysis of aviation trends and policies worldwide, A general evaluation of the topics covered throughout the course and concluding comments.

Course Code	Course Name	Credit	ACTS
HBT 5390	Airworthiness	3-0-3	6

Course Content:
Certification of carriers, International civil aviation conventions, Aircraft airworthiness responsibilities, Flight manual, Relevant legislation, Aircraft minimum equipment list, Civil aviation authority, Structure of the General Directorate of Civil Aviation, Certification stages and types, International aviation authorities, JAR/SHY 145, JAR/SHY M, JAR/SHY 66, JAR OPS/SHY 6A, Contents of regulations.

Course Code	Course Name	Credit	ACTS
HBT 5400	Optimization in Aviation and Aerospace Sciences	3-0-3	6

Course Content:
Optimization Theor, Optimization Models in Aviation and Space Sciences, Flight Planning and Navigation Optimization, Air Traffic Management and Optimization Models, Optimization in Space Mission Design, Efficiency in Aviation Maintenance Processes, Aviation Safety and Risk Management Optimization, Matlab Solutions and Optimization Algorithms, Future Controlled and Uncontrolled Airspace and Air Traffic Management Optimization, Flight Planning and Management with Simulation and Artificial Intelligence, UAV and Space Missions and Rocket Trajectory Optimization, Air and Space Vehicle System Optimization, Decision Models and Aviation Management, Environmental and Economic Optimization in Aviation Operations, Optimization for Future City Air Traffic Management.

Course Code	Course Name	Credit	ACTS
HBT 5410	Aviation Safety Incidents	3-0-3	6

Course Content:

Course Principles, Classification of Case Studies, General Overview of Aviation Safety, Aircraft Errors-Comet Accidents I Introduction of the Incident, Maintenance Errors I-AeroPeru 603, Maintenance Errors II-JAL 123, Maintenance Errors III-American 191, Maintenance Errors-MEDA Application, Maintenance Errors IV-British Airways 5390, Flight Operation Errors-Avianca 52, Air Traffic Control Errors I-Überlingen Accident, Air Traffic Control Errors II- Tenerife Accident, Air Traffic Errors-Discussion, External Factors and Unforeseen Situations-British Airways 9, Security Issues-Air France 8969.

Course Code	Course Name	Credit	ACTS
HBT 5420	Inspection and Repair in Unmanned Aerial Vehicles	3-0-3	6

Course Content:

Course Principles, Definition and History of UAV, UAV System Components, Examination of UAV component structures, Materials used in UAVs, Metallic and composite materials,
Non-destructive material testing techniques, Repair techniques in composite materials, UAV checklists, UAV pre-flight and post-flight checks, Examination of UAV accidents and their causes, UAV Maintenance and Repair Procedures.

Course Code	Course Name	Credit	ACTS
HBT 5430	Unmanned Aerial Vehicles Design and Project	3-0-3	6

Course Content:

What is a UAV? Classification of UAVs, Related regulations, Basic principles of aerodynamics: standard atmosphere, Basic principles of aerodynamics: Bernoulli's theorem, aerodynamic forces and moments, Aircraft basics: aircraft components, Mission profile: takeoff, climb, cruise, descent and landing, Conceptual design, Wing profile and geometry selection, Mini-class UAV production, Thrust/weight ratio and wing loading, Initial dimensioning of UAV, Wing and body configurations, Propeller and engine configurations, Design review, UAV simulators

Course Code	Course Name	Credit	ACTS
HBT 5440	Unmanned Aerial Vehicles Biomimetic	3-0-3	6

Course Content:

Course Principles, Biologically simulated structures in engineering, Biomimetics in UAVs, UAV wing structures, bird flight simulations, Biologically simulated structures used in landing gear, Bird wing feather simulations in aerodynamics, Aircraft materials inspired by nature, Aircraft materials inspired by nature, Nanotechnology solutions inspired by nature, Biomimetic UAV Usage Areas and Applications, Biological Flight Principles, Biomimetic Materials and Structures, Biomimetic UAV Power Systems, Biomimetic UAV Group Behaviors, Current studies on the subject of UAV simulation.

Course Code	Course Name	Credit	ACTS
HBT 5450	Aviation Meteorology	3-0-3	6

Course Content:

Course Principles, Concept of Meteorology, Branches of Meteorology, Composition, structure and layers of the atmosphere, Fundamentals of Aviation and Meteorology, Meteorological Data Collection and Processing, Meteorological Parameters and Measurements, Air-to-Ground and Ground-to-Air Communication, Severe Weather Conditions and Weather Threats, Climatic Changes and Aviation Effects, Radar and Its Use in Aviation, Radiosondes and Balloon Observations, Future Trends of Aviation Meteorology.

Course Code	Course Name	Credit	ACTS
HBT 5460	Simulation Theory with Artificial Intelligence in Aviation	3-0-3	6

Course Content:

Simulation Theory and Virtual Reality Concept with Artificial Intelligence, Fundamentals of Intelligent Simulation and Modeling in Aviation, Learning-Based Discrete Event Simulation Methodology and Simulation in Aviation, Artificial Intelligence-Based Airport and Airspace Simulation Software Tools, Modeling Theory with Artificial Intelligence and Digital Twins, Flight Simulators, Protocol Tests and Real-Life Use, Airport Modeling and Air Traffic Control Simulation Systems with Artificial Intelligence, Airport Capacity and Delay Analysis and Simulation, Intelligent Simulation in Aviation with Machine Learning Theory, Big Data and Cyber Security in Aviation, Testing the Accuracy and Validity of Artificial Intelligence Simulation Models, Autonomous Vehicles, Intelligent Flight Systems and Post-Simulation Analysis with Artificial Intelligence, Artificial Intelligence Simulation Software, Tools, Games, Animations in Aviation, Post-Simulation Analysis, Intelligent Simulation Tools and Their Uses, Future City Air Traffic Management, VR and Simulation with Artificial Intelligence.

Course Code	Course Name	Credit	ACTS
HBT 5470	Optimization with Artificial Intelligence in Aviation	3-0-3	6

Course Content:
Aviation and Artificial Intelligence Theory, Artificial Intelligence Problems and Solution Methods in Aviation, Artificial Intelligence Models in Aviation, Deep Learning and Artificial Intelligence Optimization, Air Traffic Management and Artificial Intelligence, Data Collection and Analysis in Aviation, Big Data and Optimization Solutions in Aviation, Artificial Intelligence Optimization Algorithms, Smart Security and Risk Management, Flight Planning and Management with Artificial Intelligence, UAV and Artificial Intelligence Modeling, Heuristic Programming in Aviation Optimization Systems, Swarm and Biomimetic Algorithms in Aviation Optimization Systems, Optimization for Future City Air Traffic Management with Artificial Intelligence.

Course Code	Course Name	Credit	ACTS
HBT 5470	Optimization with Artificial Intelligence in Aviation	3-0-3	6

Course Content:
Aviation and Artificial Intelligence Theory, Artificial Intelligence Problems and Solution Methods in Aviation, Artificial Intelligence Models in Aviation, Deep Learning and Artificial Intelligence Optimization, Air Traffic Management and Artificial Intelligence, Data Collection and Analysis in Aviation, Big Data and Optimization Solutions in Aviation, Artificial Intelligence Optimization Algorithms, Smart Security and Risk Management, Flight Planning and Management with Artificial Intelligence, UAV and Artificial Intelligence Modeling, Heuristic Programming in Aviation Optimization Systems, Swarm and Biomimetic Algorithms in Aviation Optimization Systems, Optimization for Future City Air Traffic Management with Artificial Intelligence.

Course Code	Course Name	Credit	ACTS
HBT 5480	Radar Absorber Material Technology	3-0-3	6

Course Content:
Stealth Technology, Electromagnetic Wave Fundamentals and Absorption Theories, Microwave Absorption Properties of Different Materials, Electromagnetic Wave Absorption Measurement Techniques, Microwave Absorption Methods, Basic Structure of Radar Absorber Materials, Types of Radar Absorber Materials, Ceramic Radar Absorber Materials, Radar Absorber Paint Materials, Composite Radar Absorber Materials, Production Techniques of Radar Absorber Materials, Characterization of Radar Absorber Materials, Areas of Use of Radar Absorber Materials.

Course Code	Course Name	Credit	ACTS
HBT 5490	Electricity Generation and Distribution in Commercial Airplanes	3-0-3	6

Course Content:

Electrical Sources in Aircraft, Introduction to Electrical System in Two and Four Engine Aircraft, AC-DC Generating Sources and Their Operation in Two Engine Aircraft, AC-DC Generating Sources and Their Operation in Four Engine Aircraft, Main Distribution System in Two Engine Aircraft, Main Distribution System in Four Engine Aircraft, Priority Distribution System in Two Engine Aircraft, Priority Distribution System in Four Engine Aircraft, Emergency Distribution System in Two and Four Engine Aircraft, RAM Air Turbine (RAT) and Emergency Generator in Long Range Aircraft, Elements Used in Distribution Systems-1, Elements Used in Distribution Systems-2, Generator Control Unit, Synchronization and Voltage-Frequency Control, Investigation of Integrated Generator (IDG) and Variable Speed Constant Frequency (VSCF) Systems.

Course Code	Course Name	Credit	ACTS
HBT 5500	Renewable Energy Sources in Aviation	3-0-3	6

Course Content:

AC and DC Electrical Sources, Electrical Loads of Airports, Electrical Loads in Aircraft and Planes, Renewable Energy Sources for Electricity Generation, Renewable Energy Sources for Heat Generation, Operation Modes of Aircraft Using Solar Energy, Hydrogen Production Methods for Aircraft, Use of Fuel Cells and Hydrogen Storage Approaches in Aviation, Operation Modes of Aircraft Using Hydrogen Energy, Renewable Energy Sources for Transportation, Biofuel Production Methods for Aircraft, Comparison of Distributed Energy Aircraft with Conventional Electrical System, Future Targets of Renewable Energy Usage in Aviation, Creating a Hydrogen Powered Unmanned Aircraft Model in MATLAB/Simulink Environment.