ERCIYES UNIVERSITY

FACULTY OF AERONAUTICS AND ATRONAUTICS

ASTRONAUTICAL ENGINEERING

Course Contents (English)

Semester 1 (Fall)

UZM101 Introduction to Astronautical Engineering

This course aims to introduce various aspects of their profession to students who will become aerospace engineers. General information is provided on Rocket and Satellite Technologies, Communication, Materials, Spacecraft Design and Robotics. Students are provided with different perspectives with the contributions of experts and/or faculty members who may be invited. In addition, the development of our country's space technologies and science and engineering ethics issues are discussed in the course.

UZM103 Calculus I

Univariate Functions, Limit and Continuity, Derivative, Applications of Derivative, Curve Drawing, Asymptotes, Integral, Basic Theorem of Integral Calculus, Applications of Integral, Transand Functions, Integral Techniques, Forms of Uncertainty, L'Hopital's Rule, Generalized Integrals.

UZM 105 Physics I

Physical Quantities and Measurement, Unit Systems, Vectors, Kinematic Quantities and Description of Motion, Newton's Laws of Motion, Concepts of Work and Energy, Conservation of Forces and Conservation of Energy, Description of the Movement of Momentum and Particle Systems, Conservation of Momentum, Kinematics and Dynamics of Fixed Rotational Motion, Static Equilibrium, Periodic Motion, Gravity.

UZM 107 Chemistry

Properties and Measurement of Substances, Atoms and Atomic theory, Electron Structure of Decays, Periodic Table and Atomic Properties, Chemical Compounds, Chemical Reactions, Introduction to Aqueous Solution Reactions, Gases, Thermochemistry, Chemical Bonds (Basic Concepts and Bond Theories), Intermolecular Forces, Liquids and Solids, Solutions and Their Physical Properties, Chemical Equilibrium and Principles, Acids and Bases, Voluntary Exchange, Entropy and Gibbs Energy.

UZM 109 Computer Programming

Flow Diagrams, Introduction to Computer Programming, General Structure and Concepts of the Python Programming Language, Basics of Software Development with the Python Programming Language, Expressions and Operators in Python, Problem Solving, Assignment and Input/Output Commands, Selection Structures and Loops, Functions and Algorithms.

UZM 111 Turkish Language I

Introduction The Content and Purpose of the Language, What is the Language? October Decipherment of the Turkish Language, The Place and Importance of the Language in the Life of the Nation as a Social Institution, The Relationship between Language and Culture, The Place of the Turkish Language Among the World Languages, The Development and Historical Circuits of the Turkish Language, The Current State and Dissemination of the Turkish Language, Sounds and Classification in Turkish, The Sound Characteristics of the Turkish Language and the Rules Related to Sound Knowledge, Syllabic Knowledge Spelling Rules and Practice, Punctuation Marks and Practice, Construction Attachments and Practice of the Turkish Language, General Information about Composition, The Plan and Application to be Used in Writing an Essay, Turkish Noun and Verb Conjugations, Forms of Expression and Application in Composition, Ways of Using Adverbs and Prepositions in Turkish.

UZM 113 Ataturk's Principles and the History of the Turkish Renovation-I

The Political and Social Structure in the Ottoman Empire, the Change and Decline in the Classical Ottoman Order, the French Revolution and its Impact on the Ottoman Empire XIX. Century of Ottoman Modernization, The Tanzimat Period, I. The Constitutional Period, from the Ittihad-ı Osmani Society to Ittihat ve Terakki, II. May October January March 31, The First World War and the Ottoman Empire, the First World War from the Point of View of the Ottoman Empire, the Consequences of the First World War, the Armenian Question in the Ottoman Empire, the Armistice of Mondros October 30, 1918, the Implementation of the Armistice of Mondros and the Occupation, Political Developments during the Armistice and the Ottoman Governments, the Paris Peace Conference January 18, 1919, the Occupation of Izmir May 15, 1919, Mustafa Kemal Pasha during the Armistice Period, the Period of Circulars and Congresses, Delegation April 23, 1920, The Opening of the First Parliament, The Situation before the Opening of Parliament, Riots After the Opening of Parliament, Measures Taken by the Parliament, the Peace Treaty of Sevres, the Establishment of the Regular Army, the Eastern Front, the Southern Front, the Western Front, the Adoption of the National Anthem, Relations with the Soviets and the Treaty of Moscow, the Battle of İnönü, Kütahya and the Moscow Government, the Amasya Meeting, The Arrival of Mustafa Kemal Pasha and Delegation Representation in Ankara, The Opening of the First Parliament April 23, 1920, The Situation before the Opening of the Parliament, The Riots that Broke Out After the Opening of the Parliament, the Establishment of the Regular Army, the Adoption of the National Anthem, the Establishment of the Regular Army, the Establishment of the Regular Army, the Establishment of the Regular Army, the Establishment of the Regular Army, the Establishment of the Regular Army, the Establishment of the The Battles of Eskişehir, the

Battle of Sakarya Square, the Great Offensive and its Consequences, the Armistice of Mudanya.

UZM 115 Foreign Languages I

Tenses (present, present continuous); Tenses (past, past continuous); Tenses (present perfect, present perfect continuous); Present tenses for the future; going to, will/shall; Modal verbs (can, could, must may); Modal verbs (have to, must, should, would); if and wish; Passive voice; Reported speech; Questions and auxiliary verbs; -ing and to; Articles and nouns; Reading and speaking; Reading and speaking (continued).

UZM 117 University Culture

Definition of university culture, Units affiliated to the University and ways of communication, University regulations and legislations, Free cultural activities.

Semester 2 (Spring)

UZM 102 Computer Aided Drafting

Teaching the basic commands of AutoCAD-2D; AutoCAD application examples with geometric drawings, Teaching the basic concepts of engineering drawing such as the scale and dimensioning, Teaching drawing of standard views and doing application examples, Doing application examples with standard views, Teaching drawing of isometric views, teaching drawing a isometric view from standard views and doing application examples, Doing application examples with standard views and isometric views, Teaching drawing of special views and doing application examples relevant to the theme, Teaching drawing of section views and teaching the section types and doing application examples.

UZM 104 Calculus II

Infinite sequences and Series, Polar Coordinates, Vectors in Space, Vector-valued Functions, Multivariate Functions and Partial Derivatives, Multiplicative Integrals.

UZM 106 Physics II

Point electric charges, features and Coulomb force, Point charge electric field of the electric field and the motion of charged particles, Continuous load of the electric field, electric field lines, Electric flux and Gauss's law, Gauss's law applications in dielectrics and conductors, Faraday's Law, Dielectric capacitors and the stored energy, problem solving, Current and resistance, Ohm's law and its applications, resistance and temperature problems, Direct current circuits, electromotive force, mixed circuit analysis, RC circuits, filling and discharging of capacitors, electrical measuring devices, Magnetic field, Magnetic field sources, Ampere's law, Maxwell's Equations.

UZM 108 Statics

Static principles, the vector of the particle force balance, a couple of momentum, equilibrium of rigid bodies, planar forces, center of gravity, Pappus-Guldinus Theorem, distributed loads, and hydrostatic forces, support reactions and support, Gerber beam frames, simple machines, scissors, cables, friction, virtual work.

UZM 110 Career Planning

Your Career Journey Has Started First Stop: Career Center, Intelligence and Personality, Personal Characteristics, The Key to Making a Difference in Your Career Path: Skills, What is a Career? How Do I Prepare for My Career? Sector Days- Non-Governmental Organizations, National Sector Days- Non-Governmental Organizations International, Sector Days Public Sector, Sector Days- Private Sector, Sector Days-Academy, Sector Days-Entrepreneurship, Talent Gate I am Writing My First Resume. Course Evaluation.

UZM 112 Turkish Language II

The sentence elements, sentence analysis and application, literature and the world of thought-reading and analysis of related works and rhetorical practices, written composition types and application, operating system and their correction, the rules of preparation of scientific manuscripts (reports, articles, papers, etc.), the selected texts in the history of Turkish and world literature and thought on the basis of the student's rhetorical development of correct and good speaking and writing skills and related practices.

UZM 114 Ataturk's Principles and the History of the Turkish Renovation-II

The Lausanne Peace Conference, Proclamation of the Republic and Reactions, Abolition of the Caliphate, The Progressive Republican Party and the Sheikh Sait Rebellion, The Free Republican Party and the Menemen Incident, The Separation of Atatürk-İnönü, An Overview of the Revolutions and Their Objectives, Innovations in the Field of Law, The Organization Esasiye Law of 1924, The Adoption of the Turkish Civil Code, The Adoption of Other Basic Laws, Women's Rights, Revolutions in Social Life, Revolutions in Education and Culture, A Look at the Pre-Republican Education System, Radical Change in the Education and Training System, The Law on Monotheism Education, The Adoption of the New Turkish Alphabet, New Understanding of History and Language, Darulfunun to Istanbul University, Fine Arts, Developments in the Economic Field, The Recent Ottoman Economy, The Turkish Economic Congress and Its Results, Economic Activities in the Early Years of the Republic, Transition to the Practice of Statism, Atatürk's Principles and integrative principles, Turkish Foreign Policy during the Period of National Struggle (1919-1923), Turkish Foreign Policy in the era of Mustafa Kemal Ataturk (1923-1938), Ismet Inonu Period (1938-1950), The Period of Adnan Menderes (1950-1960), The 1960 Coup and its aftermath (1960-1971), March September 12, 1971 Memorandum, September 12, 1980 Coup and its aftermath (1971-1990).

UZM 116 Foreign Languages II

General Review: verbs, get, +adverb/preposition, Rollover clauses, Formal and informal use of language, Types of conditional sentences: If Clause type I & If Clause Type II, Time stating sentences, Punctuation, Adjective clauses: defining and non-defining, The use of participles, Tenses of the participle in the sentence the use of the particular use of the verb participle, Possessive structures, Genitive "s", "of the' structure, Use of language, Highlighting, Language levels, Expressing assumptions, Hypothetical sentences, The present subjunctive, Present Simple, Past Simple, Advanced listening and note taking skills.

Semester 3 (Fall)

UZM 201 Dynamics

Kinematics of particles, linear motion, Plane curvilinear motion, Rectangular coordinates, normal and tangential coordinates, Polar coordinates, Relative motion, Plane kinematics of rigid bodies, Rotation, Absolute motion, Relative velocity, Instantaneous center of zero velocity, Relative acceleration, Motion relative to the rotating axis, The three-dimensional dynamics of rigid bodies, Fixed axis rotation.

UZM 203 Fundamentals of Electricity and Electronics

Electric terminology, charge, current, voltage, power, energy. DC Circuits. Basic laws, resistances, Ohm's law, Kirchhoff's laws, elements in serial and parallel, Wye-Delta conversions. Methods of Analysis, node and mesh/loop analysis, Resistive Network Analysis, Thevenin's Theorem, Norton's Theorem, Capacitors and Inductors. AC Circuits. AC Network Analysis, Operational Amplifiers. Electronics, Analog Electronics. Semiconductors and Diodes. Transistor Fundamentals. Digital Electronics, Logic Circuits.

UZM 205 Aerospace Materials

Introduction to aerospace materials, Metallic alloys for aerospace applications, Metal forming, Composite materials for aerospace applications, Composite production methods, Smart materials, Nano-materials, High-temperature materials for aerospace applications, Corrosion, wear and erosion, Fracture mechanics and Fatigue failure mechanisms, Non-destructive evaluation methods.

UZM 207 Strength of Materials

Deformable bodies stability, internal forces in structural members; shear force and bending moment diagrams of structural elements; stress, normal stress, shear stress; stresses in oblique plane, allowable stress, factor of safety, shape-shifting Concept: strain rate (strain), Angle of change; mechanical properties of materials, stress-strain diagrams, hooks Law; general installation Form: the generalized hook's law: axial loading, Saint Venant's principle, and specific statically indeterminate Problems; Thermal Stress, Stress Stacking; Plane shape change condition, Properties of plane shape change; Fracture criteria, Comparison of fracture criteria.

UZM 209 Linear Algebra

Linear Equations in Linear Algebra, Introduction to Systems of Linear Equations, Linear Reduced and Parallel Form, Vector Equations, Matrix Equation, Solution Sets of Linear Systems, Linear Independence and Dependence, Introduction to Linear Transformations, Matrix Algebra, Matrix Operations, Matrix Inverse, Matrix Decomposition, Determinants, Introduction to Determinants, Determinant Properties, Conditions for the Existence of the Inverse of the Matrix, Cramer Method, Volume and Linear Transformations, Vector Spaces, Vector Spaces and Subspace, Zero Space, Column Space and Linear Transformations, Bases, Coordinate Systems, Dimension of Vector Space, Vector Spaces, Rank, Change of Bases, Eigenvector and Eigenvalue, Characteristic Equation, Diagonalization.

UZM 211 Differential Equations

Introduction to differential equations. Solutions and initial value problems. Direction field; First-order Differential Equations: Equations that can be divided into their variables. Linear differential equations; Variable substitution and transformations. Mathematical models containing first-order equations; Second-Order Differential Equations: Linear homogeneous equations. Characteristic equations with complex roots; Inhomogeneous differential equations: The method of indefinite coefficients; The method of variation of parameters. Equations with variable coefficients; Applications of second-order differential equations; Theory of Linear Differential Equations of higher order; Series Solutions of Differential Equations: Power series and analytical functions. Serial Solutions of Differential Equations: Frobenius method; Laplace Transforms: Introduction and definition. Laplace transform properties; Laplace Transforms: Inverse Laplace transform. Solution of the initial value problem by Laplace method; Transformations of discontinuous and periodic functions.

UZM 213 Engineering English

Word order in Sentences; Location; Verb tenses – Simple, Past, Perfect Tenses; Instructions at an Airport, Basic Sentence Structure; Basic Aviation Terminology; Basic Air Communication; Purpose Conjunctions; Possibility, Probability, Necessity, Conditions; Comparisons; Movement; Active and passive; Explaining Problems.

Semester 4 (Spring)

UZM 202 Fluid Mechanics

Basic Concepts; Fluid dynamics; Bernoulli's Theorem, venturi; Fluids and physical properties; Fluid statics; Kinematics of fluids; Potential flows; Fluid kinetics (Equations of Motion); Lubrication problems, the current flow between rotating coaxial cylindrical tubes); The impulse-momentum equation and applications; Free and Forced Vortex movements; Dimensional analysis and its applications. Specific gravity and density; Viscosity, fluid resistance of the flow effects.

UZM 204 Thermodynamics

Energy transformations and general energy Analysis; properties of pure substances; energy analysis of closed systems; control volume mass and energy analysis of closed systems energy analysis; Control-Volume Analysis of mass and energy; Second Law of thermodynamics; Entropy; Exergy; gas power cycles; gas power cycles

UZM 206 System Dynamics

Signs, Systems, Dynamical Systems, Linearization of Nonlinear Systems, Frequency Domain Modeling, Laplace Transform, Transfer Function, Time Domain Modeling, State-Space Model, Block (Heap) Schemes and Simplification, System Analysis in Time Domain, Response and Performance, System Analysis in Frequency Domain, Response and Performance.

UZM 208 Engineering Mathematics

Linear equation systems and solution methods. Vector spaces, matrices, systems of linear equations, linear transformations, change of basis, eigenvalue problems, quadratic forms and diagonalization. Vector calculus, line, surface and volume integrals. Gradient, divergence, curl. Green, Gauss and Stoke's theorems.

UZM 210 Numerical Methods

Definition and Importance of Numerical Analysis, Mathematical Model Concept, Error Analysis; Taylor Series Numerical Error; In practice, MATLAB numerical definition; Finding the root equation, Indoor Methods; Finding the root equation, Open Methods; Muller Methods; Solution of Linear Equations, Gauss Elimination Method, Graphical Method, Cramel Rule, Gauss Jordan Method; Solution of Linear Equations, Gauss Seidel Method, Curve Fitting, fitting of the polynoms, Exponasiyel, Power and the saturation rate equation curve fitting; Interpolation, Linear, quadratic, Newton and Langrange interpolation; Numerical interpolation, Newton-Cotes integration formulas (trapezoidal, Simpson's rules (1/3 and 3/8)); Solution of Ordinary Differential Equations, Euler's equation, Heun's method, Runge Kunta Midpoint Equations, Equations 4. Point-to-Order Runge Kunta; Solution of Multiple Ordinary Differential Equations, Runge-Kutta Methods.

UZM 212 Mechanical Vibrations

Basic Concepts; Single degree of freedom vibration; Single degree of freedom vibration; Damped- undamped linear system, free-forced vibrations; Vibration isolation theory; Coulomb damping; Effective mass; Structural damping; Critical speeds of shafts, shaft lateral oscillations of the system; Two-Degree of Freedom Systems, Motion, damped-undamped free-forced vibrations; Two-Degree of Freedom Systems, Motion, damped-undamped free-forced vibrations; Two-Degree of Freedom Systems, Motion, damped-undamped free-forced vibrations; Natural Modes, Coordinate Transformation, Natural Coordinates, modal analysis; Natural Modes, Coordinate Transformation, Natural Coordinates, modal analysis.

UZM 214 Academic Writing in English

What is scientific writing; Origins of scientific writing; what a scientific paper is; types of scientific papers; manuscripts and thesis?; How to prepare the title; how to list the authors and addresses; how to prepare the abstract; how to prepare the long abstract; How to write the instruction; How to write the materials and methods section; How to write the results; how to present the results effectively; samples of tables and graphics; How to write the discussion section; How to write the conclusion section; How to state the acknowledgments; how the references are shown; how attribution is made to the references; Ethics, rights and permissions, How and when to use abbreviation; Samples of academic paper writing

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Semester 5 (Fall)

UZM 301 Aerodynamics

Fundamental principles and basic definitions; Fundamental equations; Potential flow; Aerodynamic forces; Factors affecting aerodynamic forces; Boundary layer theory; Analysis of airfoil and airfoil characteristics; Classical thin airfoil theory; Vortex panel method; Airfoil basics for incompressible flow; Airfoil basics for compressible flow; Compressibility and speed ranges, Mach number.

UZM 303 Aerospace Structures

Aerospace materials, airworthiness, air vehicle structural loads, thin-walled stiffened open section and closed section beams bending, torsion and shear analyses; structural idealization; stress analyses for airplane structures; experimental stress analysis.

UZM 305 Automatic Control

Introduction to Automatic Control and basic definitions; mathematical modeling of physical systems; mathematical modeling of physical systems; transfer functions, block diagrams, signal flow Graphs; analysis with state variables, state variables in the analysis, the closed-loop System Characteristics; Performance of control systems; control systems Performance; stability of linear control systems; root locus method; the root-locus Method; frequency domain analysis of control systems; frequency domain analysis of control systems.

UZM 307 Measuring Techniques

Metrology in General Concepts; Static And Dynamic Structure of Sensors; Dimensional Measurement Devices and Applications; Current, Voltage, Resistance Wheatstone Bridge Measurement; Pressure Measuring Devices and Applications; Applications Of Pressure Measurement Devices, Temperature, Torque, Acceleration, Pressure, Optical, And Ultrasonic Measurement Devices and Applications; Applications For Flow Measurement, Flow, Speed, Displacement, Speed, Electrical Measuring İnstruments and Their Applications; The Noise of Extracting From the Measured Quantities; The Error / Uncertainty Analysis.

UZM 309 Heat Transfer

Introduction to heat transfer, general heat conduction equation. Heat conduction in one-dimensional continuous regime, heat conduction in cylindrical and spherical elements. Continuous heat conduction, thermal resistances, critical insulation radius, heat transfer on the wings. Fundamentals of convection, convection boundary layers, laminar and turbulent flow, external flow, parallel flow on a flat plate, transport calculation methodology, flow on pipe bundles. Internal flow, hydrodynamic review. Natural convection, flow on a vertical surface, empirical correlations: external natural convection external flows, basic principles of radiation, black body radiation, shape factor, heat transfer by radiation.

UZM 311 Orbital Mechanics

Dynamics of Point Masses: Kinematics. Mass, Force and Newton's Law of Gravitation. Newton's Law of Motion. Time Derivatives of Moving Vectors. Relative Motion; Two-Body Problem: Equations of Motion in an Inertial Frame. Equations of Relative Motion. Angular Momentum and the Orbit Formulas. The Energy Law. Circular Orbits; Two-Body Problem: Elliptic Orbits. Parabolic Trajectories; Two-Body Problem: Hyperbolic Trajectories. Perifocal Frame. Lagrange Coefficients; Two-Body Problem: Restricted Three-Body Problem (Lagrange Points, Jacobi Constant); Orbital Positions as a Function of Time: Time since Periapsis. Circular Orbits. Elliptic Orbits; Orbital Positions as a Function of Time: Parabolic Trajectories. Hyperbolic Trajectories. Universal Variables; Orbits in Three Dimensions. Ground Tracks; Preliminary Orbit Determination: Gibbs' Method of Orbit Determination from Three Position Vectors. Lambert's Problem; Preliminary Orbit Determination: Sidereal Time. Orbit Determination from Angle and Range Measurements; Orbit Maneuvers: Impulsive Maneuvers. Hohmann Transfer. Bi-Elliptic Hohmann Transfer. Other Maneuvers; Interplanetary Trajectories

UZM T31 Uzay Aracı Görevleri

Introduction of Different Spacecraft, Classification, Flight Dynamics, Mission Planning, Satellite Operations, Landing Ground Elements, Robotic Spacecraft that Go Out of the Earth's Atmosphere and into Space for Space Research, Sub-Orbital, Earth- and Sun-Centered Satellites, Exploration of Spacecraft Designed to Explore the Sun, Moon, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, Asteroids / Comets and Dwarf Planets.

UZM T33 Astronomi

The Relationship of the Science of Astronomy with Other Basic Disciplines, An Overview of the Topics of Astronomy, the Parameters Related to Celestial Bodies (Brightness, Position, Distance, Size, etc.), Theoretical and Observational Studies in its Direction, The History and Transformation of Our Understanding of the Solar System, Stars, Galaxies and the Cosmos, The Basic Processes that Explain the Observations of Phenomena in Our Universe.

Validation: https://uzm.erciyes.edu.tr/tr/ders-plani-ve-icerikleri

Semester 6 (Spring)

UZM 302 Experimental Engineering

Presentation of laboratory experiments; Standard experiments: boundary layer flows; Standard experiments: determination of drag coefficient of a cylinder; Preparation for Structural and Control Experiments; Standard experiments: structural mechanics tests (impact test and static strain measurements); Standard experiments: Control and electrical measurements (RC circuit, RLC circuit, Op-Amp circuit measurements); Reporting and discussion of results

UZM 304 Space Environment

Introduction to the space environment. Basic concepts of space. The location of our Earth in space and the characteristics of the space environment around us; The Neutral and Plasma Environment; The Earth's atmospheric layers; The Magnetosphere; Cosmic rays; The Sun, Solar Activities, Solar wind, Solar radiation, Cosmic rays, SEP events; The magnetic environment. Interaction of the Solar-Earth space environment, Magnetosphere, Magnetospheric variability, Radiation belts; Ionosphere. Ionospheric variability. Radio wave propagation and communication systems; Effects of the sun and magnetosphere on the neutral and plasma environment. Heat, friction, geomagnetic and magnetospheric storms; Satellite orbits, Low orbit satellites, Polar orbit satellites, Geosynchronous satellites; The concept of Space Weather, observation methods in space; Neutral gas flow around the satellite. The effect of the neutral environment on the satellite.

UZM 306 Compressible Aerodynamics

Compressible Flow: Some Preliminary Definitions; Thermodynamic Repetition; Compressibility. Conservation Equations For Inviscid Compressible Flow; Total Definition Of Terms; Shock Waves; Normal Shock Waves; Basic Normal Shock Equations; Normal Shock Waves; Speed Of Sound; Special Forms Of The Energy Equation; Normal Shock Waves: When The Stream Is Compressed?; Calculation of Properties of Normal Shock Wave; Measurement of Velocity in Compressible Flow; Oblique Shocks and Expansion Waves: Oblique Shock Equations; Oblique Shocks and Expansion Waves; The sound the higher the current and the wedge around the cone, Shock Interactions and reflections; Oblique Shocks and expansion waves; blunt-nosed body in front of the shock wave Discrete; Prandtl-Meyer expansion waves; Oblique Shocks and expansion waves; Shock-expansion theory of waves: ultrasonic applications for wing profiles; Lule, emitter and compressible flow in a wind tunnel; conservation equations for one dimensional flow Like; Lule, emitter and in the wind tunnel compressible flow; compressible isentropic flow in ringlets; Spreaders; supersonic wind tunnels

UZM 308 Attitude Determination and Control

Objective and types of the attitude determination and control systems, Coordinate systems, Attitude parameters: Euler angles, quaternions, Gibbs vector, The external forces and

moments affecting the space vehicle, Attitude kinematics and dynamics, Euler's equations, Reference directions in attitude determination, Attitude determination methods, Error analysis of attitude determination, Attitude sensors, Attitude control methods, Attitude control actuators, Momentum exchange techniques, Attitude stabilization methods, Attitude maneuver control.

UZM 310 Spacecraft Telecommunications

Overview of Spacecraft and Satellite Communication Systems, Conversion of Signals and Data into Formats Suitable for Transmission Via Lines-Optical Fibers-Waveguides and Radio Connections, Fourier Analysis of Signals, Formation and Propagation of Electromagnetic Waves, Amplitude and Angle Modulation, Analog/Digital Modulation, Introduction to Information Theory and Capacity, Antenna, Arrays, Pole Diagrams and Gain, Ground Stations, Orbits Used in Communication, Noise, Noise Sources, Error Correction Coding.

UZM T32 Spacecraft Propulsion Systems

Fundamentals of Propulsion Systems, Propulsion Physics, Chemical and Electronic Propulsion Systems, Basic Elements of Various Propulsion Systems Typically Used on Spacecraft, Subsystem Components and Performance Characteristics, Determination of Propulsion Subsystems, Interaction with Each Other, Dimensioning and Integration, Test Environment and Experimental Parameters.

UZM T34 Design of Aerospace Structures

Design Process of Aerospace Structures, Design Requirements of Aerospace Structures, Design Loads and Safety Factors of Aerospace Structures, Design-Oriented Selection of Aerospace Materials, Strength and Resistance of Aerospace Structural Elements, Elements that Increase Structural Strength, Holes and Connections, Wing Structure, Impedance Structure, Aircraft Body Structure, Rocket Body Structures, Satellite Structures, Aerospace Landing-Take-off System Structures, Engine-Propulsion System Connections, Launch Pad Structures, Structural Integrity and Fatigue Design, Structural Weight Estimation and Cost Analysis, Suitable Design of Aerospace Structures for Manufacturing, Structural Design Verification Tests, Certification and Quality Control.

UZM T36 Probability and Statistics

Basis concepts of probability, descriptions of events space, descriptions of relative frequency of probability; Probability theorems, Joint and conditional probability; Independent events, Bayes theorem; Random variable, Probability density and distribution functions; Expected value and variance; Multidimensional random variables, Correlation, regression analysis; Discrete distributions; Chebyshev inequation; Continuous random variables; Gaussian distribution and properties; Two dimensional random variables; Function that produces moment , z transform; Collection and arrangement of data; Means and scales of distribution; Indexes, statistical inference; Hypothesis tests.

MTH T38 The Space Radiation Environment and Its Effects

Space Environment and Its Effects, Space Radiation Environment and Its Effects, Space Radiation Environment Modeling and Analysis, Radiation Testing and Qualification, Radiation Measurements, Effects of Space Radiation on Manned Flights, Space Radiation Risk Assessments.

UZM S32 Engineering Ethics

The Concept of Ethics, Professional Ethics Rules, Principles of Engineering Ethics, History of Engineering Ethics Rules, Engineering and Individual-Community Relations, Engineers and Responsibilities, Examples of Applicable Ethical Rules, Examples of Applications Related to Engineering Ethics.

UZM S34 Human Health in Space

The Adaptation of Human Physiology to the Space Environment, Countermeasures Taken for the Harmony of the Body System, The History of Human Spaceflight, The Difficulties Faced by People Traveling to the Moon and Mars, The Transformational Potential of Space Research for Health on Earth.

Semester 7 (Fall)

UZM 401 Rocket Propulsion Systems

Classification, Definition and Fundamentals of Rocket Propulsion; Nozzle Theory and Thermodynamic Relations, Flight Performance, Chemical Rocket Propellant Performance Analysis, Liquid Propellant Rocket Engine Fundamentals, Solid Propellant Rocket Fundamentals. Reciprocating engines. Rocket Engines. Ideal engine cycle analysis. Performance of engine components, Non-ideal cycle analysis of turbojet, turboprop, turbofan, and nozzles. Axial and radial compressors and turbines. Combustion chamber, Engine off-design performance.

UZM 403 Occupational Health And Safety I

Introduction Occupational Health and safety culture; National Occupational Health and safety management system approach to occupational Health and Safety; Occupational Health and safety legislation; occupational health and safety services to be executed by the employer; the concept of occupational accident and disease and its attendant costs.

UZM 405 Final Project I

Satellite Tasks and Design Process, Model Satellite Mass and Power Analysis, Subsystem and System Development, Use and Development of a Model Satellite, Software Required to Manage the Satellite, Satellite Communication and Ground Operations.

UZM 407 Spacecraft Systems Design I

A system view of spacecraft. Payloads and Missions. Mission analysis. The space environment. Dynamics of spacecraft. Orbital mechanics. Propulsion systems. Launch vehicles. Atmospheric re-entry. Spacecraft structures. Attitude control. Electrical power systems. Thermal control of spacecraft. Telecommunications. Telemetry and command. Ground control.

UZM T41 Computational Aerodynamics

Fundamentals of Frictionless Incompressible Flow, General Solutions of Incompressible Potential Current Equations, Panel Methods, Singularity Elements and Effect Coefficients, Two-Dimensional Numerical Solutions, Three-Dimensional Numerical Solutions.

UZM T43 Aerial Spacecraft Instruments

General Information about Air and Spacecraft Sensors, Pressure Sensors, Static and Dynamic Pressure Sensors, Pressure Sensor Calibration, Pitot-Static Instruments and Sensors, Real Airspeed Sensors, Mach Number Indicator, Angle of Attack and Sidewall Sensors, Altitude Sensors, Baroaltimeter, Radar Altimeter, Inertial Measurement of Altitude, Vertical Flight Speed Sensor, Distance Measurement, Doppler Radar Speed Sensor, Inertial Sensors, Accelerometers (Accelerometers), Overload Indicator, Errors of Accelerometers, Gyroscopes, Biaxial and Uniaxial Gyroscopes, Laser Gyroscope, Orientation Sensors, Magnetometer, Analog and Discrete Solar Sensors, Horizon Scanner, Star Sensor, Position and Orientation Determination with GPS (Global Positioning System) Sensor, Astronomical Navigation Methods, Multiple Sensor Data Fusion.

UZM T45 Flight Dynamics and Control

Introduction to Basic Terms, fundamentals of aerodynamics. Equation of Motion, Linearization, Aerodynamic Force and Moment Representation. Static Stability, Aircraft Longitudinal Static Stability, Wing Contributions, Aircraft Longitudinal Static Stability, Tail Contributions, Aircraft Longitudinal Static Stability, Fuselage and Engine Contributions, Neutral Point, Static Margin, Longitudinal Control, Hinge Moment, Airspeed Stability, Directional Stability and Control, Lateral Stability and Control. Longitudinal, Directional and Lateral Stability Derivatives, Flight Dynamic Stability, Longitudinal Dynamics, Longitudinal Handling, Lateral Dynamics, Spiral and Roll Modes, Dutch Roll Modes, Lateral Handling, Modeling of System Dynamics, Automatic Control Theory.

MTH T47 Satellite Technologies and Markets

Sunday Sunday, Types of Satellites, The Principle of Operation of Communication Satellites, The Concept of Orbit, National and International Regulation, National and International Satellite Market, Strategic Thinking and Development of Moves According to the Market, Satellite Launch Systems, Satellite and Space Policies of Turkiye.

MTH T49 System Engineering

System Life Cycle, Scope and Requirements Management, System Design and Analysis, Integration, Verification and Validation, System Engineering Application Methods and Standards, System Engineering Management, System Engineering Case Study.

UZM T51 Turbulent Flows

Turbulent Flow Equations, Turbulent Flow Velocity Profiles, Turbulent Flow Solutions and Applications, Pressure Gradient, Heat Transfer by Convection in Turbulent Flow.

UZM T53 Combustion Technology

Classification of Fuels, Analysis of Fuels, Fuel and Air Mixture Properties, Combustion Technologies, Basic Combustion Reactions, Combustion Products, Combustion Efficiency.

UZM S41 Space Law

International Agreements Related to Space, Demilitarization of Space, Air Law and Space Law within the Scope of Spatial Rules of International Law in the Course, International Air Law International Legal Rules Related to the Airspace of States and Their Utilization, Legal Regime of Airspace, International Air Transportation Regime, International Legal Rules Related to Flight Safety and Air Traffic, Legal Regime of Space, Use of Space, Conducting Activities in Space Areas.

UZM S43 Project Management

Project Definition, Classification, Project Organization, Project Structure Plans, Programming Techniques, Time-Resource-Cost Planning, Project Risk Analysis, Project Documentation, Computer-Aided Project Planning.

Semester 8 (Spring)

UZM 402 Occupational Health and Safety II

Notification and the legal consequences of occupational accidents and diseases; Occupational Health and safety risk factors; individual and organizational factors in occupational health and Safety; Occupational Health and safety records to be kept.

UZM 404 Final Project II

Satellite Tasks and Design Process, Model Satellite Mass and Power Analysis, Subsystem and System Development, Use and Development of a Model Satellite, Software Required to Manage the Satellite, Satellite Communication and Ground Operations.

UZM 406 Spacecraft Systems Design II

Tasks of spacecraft, systems engineering, project definition; Spacecraft subsystems, mass and power budgets margin, other margins, trade study; task and trajectory reviews; space environment; propulsion systems; the determination of spacecraft orientation and control; Electrical power systems; thermal control; Command and data management; Communication; structure and mechanisms; Launch systems and operations; to operate the spacecraft and ground station operations; project reporting, presentation and evaluation.

UZM T42 Boundary Layer Theory

Introduction, Boundary Layer Equations, Incompressible Laminar Boundary Layers, Pressure Gradient Effect, Integral Methods, Transition to Turbulent Flow, Basic Concepts of Turbulent Flow, Turbulent Boundary Layer Calculation Methods, Compressible Boundary Layers, Separation and Boundary Layer Control.

UZM T44 Processing of Satellite Images

Examination of Communication Satellites and Mainly Observation Satellites, Types and Use of Satellite Data, Radiometric, Spectral, Temporal and Spatial Resolutions of Satellite Data and Areas of Use (Geology, Hydrology, Agriculture, Forestry, Environment, Urbanism), Signal and Image Processing Programs, Image Correction (Radiometric, Atmospheric, Geometric), Enrichment (Filtering, Transformations, Fusion, Tessellation, Classification, Change Analysis) Applications and Process Steps, New Technologies in the Field (Object-Based, Fuzzy Logic, Classification with Artificial Neural Networks) To be touched upon.

MTH T36 Fundamentals of Flight Dynamics

Introduction, Definitions, Coordinate Systems, Euler Angles, Transformation matrices, ISA Standard Atmosphere, Forces and Moments Affecting the Aircraft, Equations of Motion of a Point-Mass Aircraft, Flight Phases, Equations of Motion of a Fixed-Wing Aircraft, Trim (Balance) and Linearization, Static Stability, Dynamic Stability and Dynamic Modes, Introduction to Flight Control, Project Presentations and Evaluation.

MTH T46 Satellite Communication Systems

Basic Principles of Satellite Communication, Origin of Satellites, Communication via Satellites, Characteristics of Communication Satellites, Satellite Orbits, Orbital Errors, Satellite Networks, Satellite Power Systems, Satellite Links, Structure and Basic Principles of Ground Stations, Satellite Link Equations, Signal Noise and Interference Ratio, Satellite Communication Networks and Systems, Coding Techniques in Satellite Communication Systems, Mobile Satellite Systems and Architecture.

MTH T48 Modern Navigation Systems

Inertial Guidance Systems, Satellite Navigation Systems, Radio Systems for Long-Distance Navigation Systems, Radio Systems For Short-Distance Navigation Systems, Automatic Landing Systems, Associated Subsystems and Sensors, Guided Devices, Navigation Imaging Systems, Navigation in Unmanned Systems.

UZM T50 Candidate Engineering Program

The vocational education program includes educational applications in which students conduct their skills training in enterprises. Students who meet the appropriate conditions spend the last semester of their education in workplaces/institutions.

UZM T52 Alternative Energy Sources

Nuclear Energy, Solar Energy, Wind Energy, Wave Energy, Natural Gas, Geo-thermal Energy, Hydraulic Potential, Hydrogen, Bio-mass, Bio-diesel, Bio-gas.

UZM T54 Introduction to Machine Learning

Basic Concepts, Working with Data and Preparing Data, Python Anaconda Distribution and Introduction of the Necessary Libraries, Linear Regression and Multiple Regression, kNN, Attribute Selection, Classification Performance, Navie Bayes Classification, Logistic Regression, Support Vector Machines, Decision Trees and Improvement Methods, Size Reduction and Basic Component Analysis, Deep Learning and Artificial Neural Networks.

UZM T56 Computer Programming Applications

Introduction to Programming, Algorithm, Pandas Library, Data Frame Operations, Sample Applications, Data Frame Text File, Excel, CSV, XML Operations, Array Operations, Arithmetic Operations, Text and Table Operations, Table Merging, Matching Operations, Pandas Functions, Data Grouping and Statistical Analysis, Pivot Tables and Applications, Graph Drawing Operations, Numpy Library, Array Structure and Operations, Numpy Data Types, Numpy Applications, Graph Operations.

UZM 410 Summer Internship

The Summer Internship is conducted in order for the student to prepare for the business life in the public or private sector, where he will work in the field he graduated from, and to gain experience. Theoretically, there is an obligation to do an internship to improve their skills of applying the information they have learned in the relevant sector and to gain work experience.

LESSONS REMOVED FROM THE CURRICULUM

UZM 109 Introduction to Computer and Information Systems

Basic computer structure: Terminology in computer science; Processing of fundamental computer elements and their interactions with each other; Information in single and multi-command words; Basic terms related to memory; Processes in basic memory elements; Advantages and disadvantages of variable memory elements; Controlling of coding system; Topics in importance of coding in flight instruments.

UZM 206 Signals and System Modeling

Basic concepts for continuous-time / discrete-time signals and systems. Representation of linear time-invariant continuous and discrete systems (singularity functions, complex exponentials, differential and difference equations, Fourier representations, Laplace and z-transforms, convolution theorem, Parseval's relation, uncertainty principle and eigenfunctions of the Fourier operator, sampling theory and time scaling-shifting). Characterization and analysis of linear time-invariant continuous and discrete systems in the time-domain and frequency-domain (poles and zeros, impulse and step responses, frequency responses). Applications for signal processing, filtering, feedback and automatic control.