

COURSE LIST

Institute of Natural and Applied Sciences

Field : Physics

Course Title	Code	Ects Credit	COMU Credit	Lecturer
Advanced Electromagnetic Theory I	ULP-21-FZ001	7,5	3	Assoc. Prof. Hilal Göktaş, Assoc. Prof. Dr. Hüseyin Çavuş
Advanced Quantum Mechanics I	ULP-21-FZ003	7,5	3	Prof. Dr. Serhat Özder Assist. Prof. Dr. Ayşe Küçükarslan
Remote Sensing Techniques I	ULP-21-FZ005	7,5	3	Prof. Dr. Osman Demircan
Variable Stars	ULP-21-FZ006	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
Advanced Nuclear Pyhsics I	ULP-21-FZ010	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
Group Theory and Applications in Physics II	ULP-21-FZ012	7,5	3	Prof. Dr. İsmail Tarhan
High Energy Physics	ULP-21-FZ013	7,5	3	Assist. Prof. Dr. Ayşe Küçükarslan
Internal Structures Of the Stars I	ULP-21-FZ016	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Optpelectronics	ULP-21-FZ017	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Kıvanç Sel Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr Hilal Göktaş Assoc. Prof. Dr Hilal Göktaş
Molecular Pyhsics I	ULP-21-FZ018	7,5	3	Prof. Dr. Serhat Özder
Lazer Design	ULP-21-FZ020	7,5	3	Assoc. Prof.

				Dr Hilal Gökteş Assist. Prof. Dr Mustafa Kurt
Theory Of Many Particle Systems II	ULP – 21 – FZ021	7,5	3	Prof. Dr. Serhat Özder
High Energy Astrophysics I	ULP – 21 – FZ022	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Fundamentals of Silicon Technology II	ULP – 21 – FZ023	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assist Pro. Dr. Kıvanç Sel
Advanced Solid States Physics I	ULP – 21 – FZ026	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assist Pro. Dr. Kıvanç Sel
Theory of Many-Particle Systems I	ULP – 21 – FZ028	7,5	3	Prof. Dr. Serhat Özder
Fundamentals of Silicon Technology I	ULP – 21 – FZ030	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
Space Physics	ULP – 21 – FZ031	7,5	3	Prof. Dr. Osman Demircan
Quantum Field Theory I	ULP – 21 – FZ032	7,5	3	Assist. Prof. Dr. Ayşe Küçükarslan
Nuclear Physics II	ULP – 21 – FZ033	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
Magnetohydrodynamics	ULP – 21 – FZ035	7,5	3	Assoc. Prof. Dr. Hüseyin Çapıs
Nuclear Physics I	ULP – 21 – FZ036	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
Physical Archaeometry	ULP – 21 – FZ037	7,5	3	Prof. Dr. Osman Demircan
Nuclear Reactor Theory	ULP – 21 – FZ038	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın

				Assist. Prof. Dr. Ayşe Küçükarslan
Alternative Energy Sources II	ULP – 21 – FZ039	7,5	3	Prof. Dr. Osman Demircan
Material Science and Optoelectronics	ULP – 21 – FZ040	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
Physics of Ionosphere	ULP – 21 – FZ041	7,5	3	Prof. Dr. Osman Demircan
Alternative Energy Sources I	ULP – 21 – FZ042	7,5	3	Prof. Dr. Osman Demircan
Advanced Photometry	ULP – 21 – FZ043	7,5	3	Prof. Dr. Osman Demircan
Fluid Dynamics in Physics	ULP – 21 – FZ044	7,5	3	Assoc. Prof. Dr. Hüseyin Çavuş
Neutron Transport Theory	ULP – 21 – FZ045	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın
Plasma Physics	ULP – 21 – FZ046	7,5	3	Assoc. Prof. Dr. Hilal Göktaş Assoc. Prof. Dr. Hüseyin Çavuş
Numerical Methods in Radiation Transport	ULP – 21 – FZ047	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın
Radio Astronomy I	ULP – 21 – FZ048	7,5	3	Prof. Dr. Osman Demircan
X-Ray Astronomy II	ULP – 21 – FZ049	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Interstellar Medium	ULP – 21 – FZ050	7,5	3	Prof. Dr. Osman Demircan
Stellar Sismology I	ULP – 21 – FZ051	7,5	3	Prof. Dr. Osman Demircan
Introduction to Photometry	ULP – 21 – FZ052	7,5	3	Prof. Dr. Osman Demircan
Interacting Binary Stars I	ULP – 21 – FZ053	7,5	3	Prof. Dr. Osman Demircan
Spectroscopy	ULP – 21 – FZ054	7,5	3	Prof. Dr. Osman Demircan
Medical Physics and Biological Effect of Radiation	ULP – 21 – FZ055	7,5	3	Assoc. Prof. Dr.. Emine Dilara Aydın
X-Ray Astronomy I	ULP – 21 – FZ056	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Advanced Nuclear Physics II	ULP – 21 – FZ057	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın

				Assist Prof. Dr. Ayşe Küçükarslan
Energy Production in Stars	ULP – 21 – FZ058	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Reactor Physics	ULP – 21 – FZ059	7,5	3	Assoc. Prof. Dr.. Emine Dilara Aydın
Radiation and Health Physics	ULP – 21 – FZ060	7,5	3	Assoc. Prof. Dr.. Emine Dilara Aydın
Biomedical Imaging Systems	ULP – 21 – FZ061	7,5	3	Assoc. Prof. Dr.. Emine Dilara Aydın
Advanced Electromagnetic Theory	ULP – 21 – FZ062	7,5	3	Assoc. Prof. Dr. Hüseyin Çavuş Assoc. Prof. Dr. Hilal Göktaş
Advanced Quantum Mechanics II	ULP – 21 – FZ064	7,5	3	Prof. Dr. Serhat Özder Assist Prof. Dr. Ayşe Küçükarslan
Advanced Solid State Physics II	ULP – 21 – FZ066	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
Techniques of Remote Sensing II	ULP – 21 – FZ067	7,5	3	Prof. Dr. Osman Demircan
Space-Time Geometry and Symmetries I	ULP – 21 – FZ068	7,5	3	Prof. Dr. İhsan Yılmaz Prof. Dr. İsmail Tarhan
Optical Properties of Semiconductors	ULP – 21 – FZ069	7,5	3	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
Quantum Field Theory II	ULP – 21 – FZ070	7,5	3	Assist Prof. Dr. Ayşe Küçükarslan
Solar System Astrophysics	ULP – 21 – FZ074	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis
Advanced Particle Physics II	ULP – 21 – FZ075	7,5	3	Assist Prof. Dr. Ayşe Küçükarslan
Stellar Atmospheres	ULP – 21 –	7,5	3	Prof. Dr. Osman

	FZ076			Demircan Assist. Prof. Dr. Gülnur İkis Gün
Stellar Models and Their Evolution	ULP – 21 – FZ078	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis
Neutron Transport Theory I	ULP – 21 – FZ079	7,5	3	Assoc. Prof. Dr. Emine Dilara Aydın
Galactic and Intergalactic Astronomy	ULP – 21 – FZ080	7,5	3	Prof. Dr. Osman Demircan
Meteoritics	ULP – 21 – FZ081	7,5	3	Prof. Dr. Osman Demircan
Advanced Astrophysics II	ULP – 21 – FZ082	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
Advanced Astrophysics I	ULP – 21 – FZ083	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
Stellar Sismology II	ULP – 21 – FZ084	7,5	3	Prof. Dr. Osman Demircan
X-Ray Astronomy II	ULP – 21 – FZ086	7,5	3	Assoc. Prof. Dr. Gülnur İkis Gün
Dynamics of Close Binary Stars	ULP – 21 – FZ087	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
Radyo Astronomy II	ULP – 21 – FZ088	7,5	3	Prof. Dr. Osman Demircan
Relativistic Astrophysics	ULP – 21 – FZ089	7,5	3	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
Advanced Magnetohydrodynamics	ULP – 21 – FZ090	7,5	3	Assoc. Prof. Dr. Hüseyin Çavuş
Advanced Plasma Physics	ULP – 21 – FZ091	7,5	3	Assoc. Prof. Dr. Hüseyin Çavuş
Electrodynamics of Continuous Media	ULP – 21 – FZ091	7,5	3	Assoc. Prof. Dr. Hüseyin Çavuş

Course Code	ULP –21–FZ001
Name of the Course in English	ADVANCED ELECTROMAGNETIC THEORY I
Name of the Course in Turkish	İLERİ ELEKTROMANYETİK TEORİ I
Language of the Course	English
Level of the Course	() Bachelor's / Undergraduate (x) Master () Doctorate
Lecturer	Assoc. Prof. Hilal Gökteş, Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5
COMU Credit	3
Description	Vector analysis, electrostatics, electrostatic energy, capacitance, boundary value problems, conformal mapping, variable separation, Green's functions, multipole expansion, electric polarization and atomic models, anisotropic media, contour integration and application to frequency-dependent dielectric constant, dielectrics, electrostatic energy, boundary value problems.

Course Code	ULP – 21 – FZ003
Name of the Course in English	ADVANCED QUANTUM MECHANICS I
Name of the Course in Turkish	İLERİ KUANTUM MEKANİĞİ I

Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	General theory of quantum mechanics including the Schrödinger, Heisenberg, and interaction pictures, the path integral formulation, orbital angular momentum and spin angular momentum, addition of angular momenta, central potential problems, Wigner-Eckart theorem, symmetry in quantum mechanics, scattering theory, time-independent perturbations and partial waves, phase shift, identical particles and its behaviour, time-dependent perturbations, approximation methods for time-independent and time-dependent perturbations, propagators.

Course Code	ULP – 21 – FZ005
Name of the Course in English	REMOTE SENSING TECHNIQUES I
Name of the Course in Turkish	UZAKTAN ALGILAMA TEKNİKLERİ I
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Prof. Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Description and development of remote sensing, electromagnetic spectrum, atmospheric (radiometric) corrections, reflection properties of objects on earth, detectors, satellites, air platforms, satellite orbits, image classification, applications

Course Code	ULP – 21 – FZ006
Name of the Course in English	VARIABLE STARS
Name of the Course in Turkish	DEĞİŞEN YILDIZLAR
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	Understanding the variable stars: Definition of variable stars, Structural variables, geometrical variables, pulsating stars, bursting stars, closeeclipsing variable stars, rotating variable stars,

	cataclismic variables, x-ray binaries.
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Course Code	ULP – 21 – FZ010
Name of the Course in English	ADVANCED NUCLEAR PHYSICS I
Name of the Course in Turkish	İLERİ NÜKLEER FİZİK I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	The fundamental properties of nuclei, nuclear models, compound nucleus, nuclear moments and spectra, nuclear forces, nuclear reactions and cross sections, radioactivity and nuclear stability, nuclear shell structure, nuclear collective modes, rotational states.

Course Code	ULP – 21 – FZ012
Name of the Course in English	GROUP THEORY AND APPLICATIONS IN PHYSICS II
Name of the Course in Turkish	GRUP TEORİSİ VE FİZİKTE UYGULAMALARI II
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Prof. Dr. İsmail Tarhan
ECTS Credit	7,5
COMU Credit	3
Description	<p>Reductable representations, Unreductable representations of point groups, Big orthogonal term, Projection operators and their properties, Instructions on forming character tables, Importance of representing theory in quantum mechanic, Selection rules, Applications of group theory to molecules, Infrared and Raman spectrums, Hibrid orbitals, S-p bonds.</p>

Course Code	ULP – 21 – FZ013
Name of the Course in English	HIGH ENERGY PHYSICS
Name of the Course in Turkish	YÜKSEK ENERJİ FİZİĞİ
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3

Description	Historical Developments, Accelerators, Detectors, Measurement Techniques, Relativistic Kinematics, Mass Determination and Conservation of Half Life, Symmetry Principles, Spin Parity, Determination of isospin and other Quantum Numbers, Electromagnetic Interactions and Form Factor, Weak Interactions, Neutrinos, Neutral Caons.
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Course Code	ULP – 21 – FZ016
Name of the Course in English	INTERNAL STRUCTURES OF THE STARS I
Name of the Course in Turkish	YILDIZLARIN İÇ YAPISI I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	The virial theorem and some consequences; equilibrium of a star; energy transfer mechanisms in star; equation of state for stellar material; nuclear reactions in stellar interiors; polytopic gas spheres; stability of convection; structure of white dwarfs

Course Code	ULP – 21 – FZ017
Name of the Course in English	OPTPELECTRONICS
Name of the Course in Turkish	OPTOELEKTRONİK
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Kıvanç Sel Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr Hilal Göktaş Assoc. Prof. Dr Hilal Göktaş
ECTS Credit	7,5
COMU Credit	3
Description	Basic terms and concepts, Principles of quantum optic, Optoelectronic materials, rare-earth-doped silica fiber lasers, CW performance of fiber optics, basic laser theory, Q-switching of optical fiber lasers, digital optics, Atmospheric and intersatellite optical communications, thermal imaging, Ring laser gyroscope.

Course Code	ULP – 21 – FZ018
Name of the Course in English	MOLECULAR PHYSICS I
Name of the Course in Turkish	MOLEKÜL FİZİĞİ I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder
ECTS Credit	7,5

COMU Credit	3
Description	Introduction to molecular structure, vibrational and rotational energies of molecules. Dipole transitions; electronic structure analysis of diatomic molecules, hybridization; general methods of molecular calculations; spectroscopic methods and spectroscopic analysis of small molecules.

Course Code	ULP – 21 – FZ020
Name of the Course in English	LASER DESIGN
Name of the Course in Turkish	LAZER TASARIMI
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr Hilal Göktaş Assoc. Prof. Dr Mustafa Kurt
ECTS Credit	7,5
COMU Credit	3
Description	Principles of laser operation; excitation and oscillation problems in laser theory; standing and traveling waves in a laser and modes of oscillation of an optical cavity; stabilization and optimization conditions of a laser resonator; construction of gas lasers and liquid lasers; experimental techniques of

	a ring dye-laser and laser systems for Doppler-free multi-photon absorption.
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Course Code	ULP – 21 – FZ021
Name of the Course in English	THEORY OF MANY PARTICLE SYSTEMS II
Name of the Course in Turkish	ÇOK PARÇACIKLI SİSTEMLER KURAMI II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder
ECTS Credit	7,5
COMU Credit	3
Description	Field theory and physical systems in a particular temperature, simultaneous Green functions, canonic transformations, nuclear material, superconductivity.

Course Code	ULP – 21 – FZ022
Name of the Course in English	HIGH ENERGY ASTROPHYSICS I
Name of the Course in Turkish	YÜKSEK ENERJİ ASTROFİZİĞİ I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün

ECTS Credit	7,5
COMU Credit	3
Description	Cosmic ray data, detection of relativistic particles, supernovae, pulsars, quasars, and X-ray sources; particle and photon interaction of astrophysical significance.

Course Code	ULP – 21 – FZ023
Name of the Course in English	Fundamentals of Silicon Technology II
Name of the Course in Turkish	Silikon Teknolojisinin Temelleri II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assist Pro. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Bipolar transistors, multipolar transistors, theory of bipolar transistors, integrated circuit transistors, transistors with surface fields, design parameters and applications for bipolar transistors in integrated circuits.

Course Code	ULP – 21 – FZ026
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Name of the Course in English	Advanced Solid State Physics I
Name of the Course in Turkish	İleri Katıhal Fiziği I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Lattice vibrations (phonons), lattice Green's functions, local modes, electron energy bands, density of states calculations, optical properties of solids, transport properties.

Course Code	ULP – 21 – FZ028
Name of the Course in English	Theory of Many-Particle Systems I
Name of the Course in Turkish	Çok Parçacıklı Sistemler Kuramı I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder
ECTS Credit	7,5
COMU Credit	3
Description	Nonrelativistic many-particle systems, ground-state

	formalism, Green's function, Fermi systems, Bose systems, linear response and collective modes.
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Course Code	ULP – 21 – FZ030
Name of the Course in English	Fundamentals of Silicon Technology I
Name of the Course in Turkish	Silikon Teknolojisinin Temelleri I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Basic processes: oxidation, doping, silicon thin film growth (amorphous, polycrystalline, single- crystalline).

Course Code	ULP – 21 – FZ031
Name of the Course in English	Space Physics
Name of the Course in Turkish	Uzay Fiziği
Language of the Course	ENGLISH
Level of the Course	Master

Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	In this course, structure of Earth's upper atmosphere and Near-Space, and effect of solar particules and cosmic-rays on these mediums will be explained by extending to situations of other planets.

Course Code	ULP – 21 – FZ032
Name of the Course in English	Quantum Field Theory I
Name of the Course in Turkish	Kuantum Alanlar Kuramı I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	Classical field theory, Canonical quantization of Klein-Gordon, Dirac and Maxwell fields, Interacting fields, perturbation theory and Feynman diagrams, Elementary processes of quantum electrodynamics, Radiative corrections, Divergences, regularization and renormalization.

Course Code	ULP – 21 – FZ033
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Name of the Course in English	Nuclear Physics II
Name of the Course in Turkish	Çekirdek Fiziği II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	Electromagnetic and weak interactions with nuclei, electron scattering, beta decay, muon capture, neutrino reactions, weak neutral current effects, Hadronic interactions, pion-nucleus interaction, optical potential, nuclear reactions, heavy ion collisions.

Course Code	ULP – 21 – FZ035
Name of the Course in English	Magnetohydrodynamics
Name of the Course in Turkish	Manyetohidrodinamik
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5
COMU Credit	3

Description	Derivations of MHD and fluid equations, hydrostatic equilibrium and hydromagnetic stability, MHD distability, hydrodynamic waves, recent advances in MHD.
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Course Code	ULP – 21 – FZ036
Name of the Course in English	Nuclear Physics I
Name of the Course in Turkish	Çekirdek Fiziği I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	General properties of nuclei and nuclear N-body problem, nuclear forces, static properties, Hartree-Fock theory, nuclear layer model, models for nucleus, nuclear rotations, spin, particle states and reconnection in nucleus.

Course Code	ULP – 21 – FZ037
Name of the Course in English	Physical Archaeometry
Name of the Course in Turkish	Fiziksel Arkeometri

Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Physical methods used in dating archaeological and geological material, application examples.

Course Code	ULP – 21 – FZ038
Name of the Course in English	Nuclear Reactor Theory
Name of the Course in Turkish	Nükleer Reaktör Kuramı
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın Assist. Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	Neutron Nuclear Reactions: Nuclear Fission, Neutron Capture, Elastic and Inelastic Scattering, Nuclear Cross Sections, Characteristics of Neutron Cross Sections, Interaction of Neutron Beams with Matter, Differential Scattering Cross Sections, Elastic Scattering Kinematics, Physics of Fission Chain Reactions: Neutron Chain Fission Reaction, the Multiplication Factor and Nuclear Criticality, Simple Kinetics of Chain Reactions, Calculation of multiplication factor: The Four and Six Factor Formula, Controlled Neutron Chain Reaction and

General Description of Nuclear Reactors, Classification of Nuclear Reactors, The Neutron Transport Equation: Basic concepts and definitions of variables, Angular neutron density, flux, and current, Reaction rates, scalar flux, and net current, Derivation of time-dependent neutron transport equation, Initial and boundary conditions, The Diffusion Approximation of Neutron Transport Equation, Neutron Diffusion Theory: Thermal equilibrium, Energy Distributions, Effective Cross Sections, Equation of Continuity, Derivation of Fick's law, Derivation of One-Speed Diffusion Equation, Solutions of the One-Speed Diffusion Equation for Non-multiplying Media, Solutions of the One-Speed Diffusion Equation for Multiplying (Reactor Core) Media: Criticality Conditions in Bare Homogeneous Reactor, Reflected Reactor for special geometry, Numerical Solution of Diffusion Equation, Nodal Approximation, Introduction to multi-group diffusion theory, Problems in two-group diffusion theory: multiplying media and criticality conditions, Slowing-Down and Diffusion of Neutrons: Elastic scattering mechanics, energy loss, average logarithmic energy decrement, Effect of inelastic scattering, Collision and slowing-down densities, Resonance absorption, The neutron balance in energy dependent problems, Fast spectrum calculations.

Course Code	ULP – 21 – FZ039
Name of the Course in English	Alternative Energy Sources II
Name of the Course in Turkish	Alternatif Enerji Kaynakları II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Osman Demircan
ECTS Credit	7,5

COMU Credit	3
Description	Maintenance and quality of alternative energy sources, bor and energy, hydrogen energy, wave and stream energies, wind energy, biomass energy, energy reactors.

Course Code	ULP – 21 – FZ040
Name of the Course in English	Material Science and Optoelectronics
Name of the Course in Turkish	Materyal Bilimi ve Optoelektronik
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Optoelectronic materials, Inorganic materials, Optoelectronic semi-conductor materials, Layer structures, Multiquantum wells, Organic materials, Description of molecule and crystal structures and their optical properties, Basic Theory of Lasers, CW performances of fiber lasers, Linear optic and bi-stability, Fabry-Peort Etalon, Quantum wells in

	optoelectronic equipments, Source performance.
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Course Code	ULP – 21 – FZ041
Name of the Course in English	Physics of Ionosphere
Name of the Course in Turkish	İyonosfer Fiziği
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Formation of the ionosphere; photochemical or transport processes in the ionosphere; the D, E, F1 and F2 layers; the day-time and night-time ionosphere; example of irregular behavior and anomalies; geomagnetism and the ionosphere; the solar wind and its interaction with the Earth's magnetic field.

Course Code	ULP – 21 – FZ042
Name of the Course in English	Alternative Energy Sources I
Name of the Course in Turkish	Alternatif Enerji Kaynakları I
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Fundamental informations and definitions, classification of energy, the principle of alternative energy sources, complication of energy sources, the law of thermodynamics, heat conduction, production of energy, conduction and yield.

Course Code	ULP – 21 – FZ043
Name of the Course in English	Advanced Photometry
Name of the Course in Turkish	İleri Işıkolçüm
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Characteristic parameters of a photometric system and effects of bandwidths in photometric measurements. ,Using of multi-colour photometric system in determination of the interstellar extinction law.,Multi-Colour and Wide-Band Photometry: Comparison between the UBV and RGU systems-I.,Multi-Colour and Wide-Band Photometry: Comparison between the UBV and RGU systems-II,Description of energy distribution in multi-colour wide band photometric systems.,Intermediate band photometric systems.,Narrow-band photometric systems,Mid-term exam.,Combination of the intermediate and narrow-band photometric systems,Extensions of intermediate

photometric system, Intermediate pass band systems in UV region., Narrow pass band systems in IR region., Correlation between physical parameters and photometric parameters of stars.

Course Code	ULP – 21 – FZ044
Name of the Course in English	Fluid Dynamics in Physics
Name of the Course in Turkish	Fizikte Akışkanlar Dinamiği
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5
COMU Credit	3
Description	Thermodynamics reminding, definition of compressible and incompressible fluids, flow regimes (subsonic, sonic, supersonic, hypersonic) fluid equations (continuity, momentum transfer, energy transfer, state), laminar flow, viscosity, viscous flow, potential flow, vorticity, steady and unsteady one dimensional flow, two dimensional flow, instabilities, hydrodynamic waves, normal and

	oblique hydrodynamic shocks
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Course Code	ULP – 21 – FZ045
Name of the Course in English	Neutron Transport Theory
Name of the Course in Turkish	Nötron Transport Teorisi
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	The mathematical and physical properties of the Boltzmann equation, the approximate and exact solution of the linear Boltzmann equations, Case, Variational, PN and CN methods

Course Code	ULP – 21 – FZ046
Name of the Course in English	Plasma Physics
Name of the Course in Turkish	Plazma Fiziği
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Hilal Göktaş Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5

COMU Credit	3
Description	The basic equations and conservation laws, first order orbit theory, adiabatic invariants, ideal MHD model, plasma equilibrium and stability, energy principle, plasma waves, waves-particle interaction, wave-wave interaction, weak turbulence theory.

Course Code	ULP – 21 – FZ047
Name of the Course in English	Numerical Methods in Radiation Transport
Name of the Course in Turkish	Radyasyon Transportunda Sayısal Yöntemler
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	Mathematical methods for the solution of neutron/photon transport problems, radiation shielding, reactor analysis and discrete directions and Monte Carlo methods applied in biomedical dosimetry, iterative techniques.

Course Code	ULP – 21 – FZ048
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Name of the Course in English	Radio Astronomy I
Name of the Course in Turkish	Radyo Astronomi I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Electromagnetic radiation and its propagation, radio astronomy fundamentals, radio propagation fundamentals, radio telescope antennas and receivers, solar system and galactic radio astronomy, radio sky and spectra.

Course Code	ULP – 21 – FZ049
Name of the Course in English	X-Ray Astronomy II
Name of the Course in Turkish	X-Işın Astronomisi II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	X-Ray Satellites, Tools of X-ray astronomy, Data

	analysis techniques of different X-ray Satellites, diffuse X-ray background.
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Course Code	ULP – 21 – FZ050
Name of the Course in English	Interstellar Medium
Name of the Course in Turkish	Yıldızlararası Ortam
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Objective of this course is to let the student get acquainted with the dynamical and radiative properties of the interstellar medium (ISM); identification of the source and composition of the interstellar medium, propagation, characteristics of electromagnetic waves in the interstellar medium, the formation of the new stars, radiation sources MASER produced in stars and interstellar medium, understanding of the galaxy jets provide.

Course Code	ULP – 21 – FZ051
Name of the Course in English	Stellar Sismology I
Name of the Course in Turkish	Yıldız Sismolojisi I
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN

ECTS Credit	7,5
COMU Credit	3
Description	Understanding pulsating star species and pulsating mechanism.

Course Code	ULP – 21 – FZ052
Name of the Course in English	Introduction to Photometry
Name of the Course in Turkish	Işıkölçüme Giriş
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	The objective of this course is to let the student get acquainted to comprehend the structures of dedectors, to remember the magnitude systems to have the knowledge about energy distribution in stellar spectra Characteristic physical parameters of the continuous energy distribution to have the knowledge about the photoelectric photometries, photomultipliers and photometric filters, relationships, between two similar photometric systems, two-dimensional photometric classification of stars to learn atmospheric and interstellar extinction.

Course Code	ULP – 21 – FZ053
Name of the Course in English	Interacting Binary Stars I
Name of the Course in Turkish	Etkileşen Çift Yıldızlar I
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Understanding physical processes and evolutions of interacting binary stars.

Course Code	ULP – 21 – FZ054
Name of the Course in English	Spectroscopy
Name of the Course in Turkish	Tayfbilim
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Prof.Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Toopics to be covered in this course will include structure of atom and molecule, sprectral line formation, effects of electrical and magnetic field on atom and its spectra.

Course Code	ULP – 21 – FZ055
Name of the Course in English	Medical Physics and Biological Effect of Radiation
Name of the Course in Turkish	Tıbbi Fizik ve Radyasyonun Biyolojik Etkileri
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Assoc. Prof. Dr.. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	<p>Effect of radiation on living being: reason and importance, types of radiation, ionize radiation, units of radiation, tools and methods using in radiation</p> <p>measurement, radiation protection, effects of internal and external radiation, effects of radiation in molecular</p> <p>level, effects of radiation on DNA, radiation and formation of cancer, protective topics against radiation, nonionizing</p> <p>radiation, base stations and cell phones</p>

Course Code	ULP – 21 – FZ056
Name of the Course in English	X-Ray Astronomy I
Name of the Course in Turkish	X-Işın Astronomisi I
Language of the Course	ENGLISH

Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	X-ray sky, general description, galactic X-ray astronomy, supernova remnants; corona of the active stars; early type stars; normal galaxies; massive x-ray binaries; low mass X-ray binaries; Xray Binaries in globular clusters; cataclysmic variable stars; extragalactic X-ray astronomy, active galactic nuclei; clusters of the galaxies.

Course Code	ULP – 21 – FZ057
Name of the Course in English	Advanced Nuclear Physics II
Name of the Course in Turkish	İleri Nükleer Fizik II
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın Assist Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	Classical collisions and scattering problems, quantum theory of scattering, elastic and inelastic

	<p>scattering, Optical model, binding energies, α, β, γ decays, fission and fusion, nuclear energy and reactors, transfer reactions, multistep reactions, heavy ions, resonance and statistical theory of nuclear reactions, high energy nuclear phenomena, pion and kaon interactions with nuclei.</p>
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Course Code	ULP – 21 – FZ058
Name of the Course in English	Energy Production in Stars
Name of the Course in Turkish	Yıldızlarda Enerji Üretimi
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	<p>Understanding energy transfer process in stars. Some basic characteristic of stars, star clusters and population groups, transport of energy, energy transfer with conduction and radiation, transport of energy with convection, energy in adiabatic process and convective instability, internal structure equation in radiative and convective zones, opacity in stars, determination of opacity and opacity source (electron scattering, H- and opacity..), energy sources in stars and time scales, nuclear energy and reactions, P-P and CNO cycle, three alpha reactions, reactions for more heavy elements, Creation of heavy elements more than Si. and e,r,s,p functions, Interaction of photon with matter</p>

Course Code	ULP – 21 – FZ059
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Name of the Course in English	Reactor Physics
Name of the Course in Turkish	Reaktör Fiziği
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	Nuclear interactions, nuclear energy, operation principles of nuclear reactors, types of reactor, calculation of physical parameters in reactors, reactor kinetic and radiation safety.

Course Code	ULP – 21 – FZ060
Name of the Course in English	Radiation and Health Physics
Name of the Course in Turkish	Radyasyon ve Sağlık Fiziği
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	Definition and nature of radiation, Wave and particle structures of rays, Natural and artificial

	<p>radiation sources, Rays from atoms, Nuclei rays,</p> <p>Absorption: Interaction of</p> <p>electromagnetic rays with matter, Interaction of</p> <p>charged and un-charged particles with matter,</p> <p>Direct and</p> <p>indirect ionization, Linear Energy Transfer (LED),</p> <p>Radiation dose: definition and classification, Dose</p> <p>units,</p> <p>Calculation of dose, Biological effects of radiation.</p>
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Course Code	ULP – 21 – FZ061
Name of the Course in English	Biomedical Imaging Systems
Name of the Course in Turkish	Biyomedikal Görüntüleme Sistemleri
Language of the Course	ENGLISH
Level of the Course	Master
Lecturer	Assoc. Prof. Dr. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	<p>Nuclear radiation and radioactivity, Fundamentals</p> <p>of nuclear radiation detection and measurement,</p> <p>Biological effects of radiation and radiotherapy,</p>

	Medical image reconstruction techniques, Computerized tomography, Ultrasonic imaging, Nuclear magnetic resonance techniques, Laser applications, Thermography.
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Course Code	ULP – 21 – FZ062
Name of the Course in English	Advanced Electromagnetic Theory
Name of the Course in Turkish	İleri Elektromanyetik Teori II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş Assoc. Prof. Dr. Hilal Göktaş
ECTS Credit	7,5
COMU Credit	3
Description	Obtain the physical principles of electrostatics, boundary value problems and variable separation, understand and solve the Green's functions, able to perform multipole expansion, understand the physics of Maxwell equations.

Course Code	ULP – 21 – FZ064
Name of the Course in English	İleri Kuantum Mekaniği II
Name of the Course in Turkish	Advanced Quantum Mechanics II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Serhat Özder

	Assist Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	To gain basic knowledge about the theoretical foundation of quantum mechanics of many particles system.

Course Code	ULP – 21 – FZ066
Name of the Course in English	Advanced Solid State Physics II
Name of the Course in Turkish	İleri Katıhal Fiziği II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Photons, electron-photon interactions, atomic forces and atomic properties, principles of multiparticle techniques, superconductivity.

Course Code	ULP – 21 – FZ067
Name of the Course in English	Techniques of Remote Sensing II
Name of the Course in Turkish	Uzaktan Algılama Teknikleri II
Language of the Course	ENGLISH

Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Data collection, data types and structures, data and image processing, GIS, GPS, theory and applications, image processing, theory and applications, recent advances.

Course Code	ULP – 21 – FZ069
Name of the Course in English	Optical Properties of Semiconductors
Name of the Course in Turkish	Yarıiletkenlerin Optik Özellikleri
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Serhat Özder Assoc. Prof. Dr. Vildan Bilgin Assoc. Prof. Dr. Kıvanç Sel
ECTS Credit	7,5
COMU Credit	3
Description	Optical constant of solids, band structure of semiconductors, absorption processes in semiconductors, radiative recombination and

	photoconductivity in semiconductors
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Course Code	ULP – 21 – FZ070
Name of the Course in English	Quantum Field Theory II
Name of the Course in Turkish	Kuantum Alanlar Kuramı II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assist Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3
Description	Renormalization of the stress-energy tensor, methods of renormalization, renormalized stress-energy tensor, point-splitting method, zeta function method; examples from renormalization techniques, two dimensional examples, Robertson-walker model, examples in four dimensions.

Course Code	ULP – 21 – FZ074
Name of the Course in English	Solar System Astrophysics
Name of the Course in Turkish	Güneş Sistemi Astrofiziği
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman Demircan Assist. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3

Description	<p>This course includes the knowledge about the History of Sun and the Solar System, terrestrial planets:</p> <p>Mercury, Venus, Mars, Moon asteroid belt, gas giants, Galilean moons of Jupiter, Titan, comets, exploration of solar system by satellites and robot instruments, trans-Neptunian bodies, Kuiper Belt, Oort Cloud, Possibilities of life in solar system bodies, extrasolar planets and their comparative study,</p> <p>observational studies of planets.</p>
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Course Code	ULP – 21 – FZ075
Name of the Course in English	Advanced Particle Physics II
Name of the Course in Turkish	İleri Parçacık Fiziği II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assist Prof. Dr. Ayşe Küçükarslan
ECTS Credit	7,5
COMU Credit	3

Description	Symmetries and quarks; discoveries of the J, Upsilon, Dirac Formalism, Chirality, Helicity, Why Higgs?, Matrix, Decays, Cross Sections and Radiative Corrections, QCD, QED and EW Corrections within SM
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Course Code	ULP – 21 – FZ076
Name of the Course in English	Stellar Atmospheres
Name of the Course in Turkish	Yıldız Atmosferleri
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	This course includes the knowledge about Radiation equilibrium and energy transfer, solution of energy transfer equation, opacity of stellar materials, stellar atmosphere models, line formation theory, Applications of line formation theory, expansion curves and solar atmosphere/

Course Code	ULP – 21 – FZ078
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Name of the Course in English	Stellar Models and Their Evolution
Name of the Course in Turkish	Yıldız Modelleri ve Evrimi
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	In this course, stellar models and the stellar evolution are explained with the nuclear processes that take place in stars.

Course Code	ULP – 21 – FZ079
Name of the Course in English	Neutron Transport Theory I
Name of the Course in Turkish	Nötron Taşınım Kuramı I
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assoc. Prof. Dr.. Emine Dilara Aydın
ECTS Credit	7,5
COMU Credit	3
Description	Linear Boltzman equation, and its mathematical and physical properties, approximate and exact solutions of linear Boltzman equations, variational methods.

Course Code	ULP – 21 – FZ080
Name of the Course in English	Galactic and Intergalactic Astronomy
Name of the Course in Turkish	Gökadasal ve Gökadalararası Astronomi
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Interstellar space, structure and contents of galaxies, rotation of galaxies, neutral hydrogen distribution, magnetic fields in galaxies, space between galaxies, galaxy clustering, properties of cluster of galaxies, structure of visible universe.

Course Code	ULP – 21 – FZ081
Name of the Course in English	Meteoritics
Name of the Course in Turkish	Meteor Bilimi
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN

ECTS Credit	7,5
COMU Credit	3
Description	<p>Historical notes, meteor falls and related phenomena, crater formation and indification, world crater inventory, meteorities and craters in Turkey, Crater counts and their interpretation, meteorite classification, physical, mineralogical and chemical properties of meteorites,</p> <p>origin of meteorites and their role in the evolution and future of life on Earth, near-Earth objects, asteroids.</p>

Course Code	ULP – 21 – FZ082
Name of the Course in English	Advanced Astrophysics II
Name of the Course in Turkish	İleri Astrofizik II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	<p>Prof. Dr. Osman DEMİRCAN</p> <p>Assist. Prof. Dr. Gülnur İkis Gün</p>
ECTS Credit	7,5

COMU Credit	3
Description	<p>In this course, Star formation and stellar evolution, the physics of stellar interiors and the equations of stellar structure, absorption processes, stellar atmospheres, convective envelopes, stellar winds, thermonuclear reactions and nucleosynthesis, weak interactions in stellar interiors, stellar stability and hydrodynamics, stellar magnetic fields, white dwarfs, novae and supernovae, neutron stars, black holes.</p>

Course Code	ULP – 21 – FZ083
Name of the Course in English	Advanced Astrophysics I
Name of the Course in Turkish	İleri Astrofizik I
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	<p>Prof. Dr. Osman Demircan</p> <p>Assoc. Prof. Dr. Gülnur İkis Gün</p>
ECTS Credit	7,5
COMU Credit	3

Description	Basics for important astrophysical processes radiation - matter interaction, thermal and non-thermal radiation, special and general relativity, cosmology.
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Course Code	ULP – 21 – FZ084
Name of the Course in English	Stellar Sismology II
Name of the Course in Turkish	Yıldız Sismolojisi II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN
ECTS Credit	7,5
COMU Credit	3
Description	Understanding physics of pulsating stars: Why do some stars pulsate ? Pulsation mechanism, period-density correlation, pulsations in blue and red zones of instability strip. Cause for cessation of pulsation, relation between pulsation and opacity, obtain total internal energy of stars, equilibrium in stars (dynamic equilibrium, thermal equilibrium and vibrational equilibrium) Lamb frequency, Brunt Vaisala frequency, homogenous model and classifications of modes, helioseismology, investigation of interior of Sun by forward and Inverse methods, determination of seismologic H-R diagram in pulsating stars like sun, impact of rotation and metallicity to pulsation, physics of pulsation in Ap stars.

Course Code	ULP – 21 – FZ086
Name of the Course in English	X-Ray Astronomy II
Name of the Course in Turkish	X-Işın Astronomisi II

Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	<p>Production and properties of x-rays; absorption and scattering of xrays; geometry of crystals; theory of x-ray diffraction; structure factors; experimental diffraction</p> <p>methods; space group and structure determination; ultrasonic wave propagation in solids, elasticity in crystals, determination of elastic wave velocities and the elastic module.</p>

Course Code	ULP – 21 – FZ087
Name of the Course in English	Dynamics of Close Binary Stars
Name of the Course in Turkish	Yakın Çift Yıldızların Dinamiği
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman Demircan

	Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	<p>Understanding dynamics of close binary systems</p> <p>Equipotential surfaces, distortion caused by rotation, tidal distortion, interaction between rotation and tides, effects of internal structure, dynamical gravitational effects, forced oscillations, generalized rotation. Rotation of deformable bodies, effects of viscosity and non uniform rotation, dynamics of close binary systems, period changes in eclipsing binary systems. Variable mass effects, perturbations caused by third body, roche model, stabilities of the components of close binary systems, evolution and origin of binary systems and its origin.</p>

Course Code	ULP – 21 – FZ088
Name of the Course in English	Radyo Astronomy II
Name of the Course in Turkish	Radyo Astronomi II
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman DEMİRCAN

ECTS Credit	7,5
COMU Credit	3
Description	Galactic and extragalactic radio sources, spectra, pulsars, quasars, superluminal sources, radio surveys, SETI

Course Code	ULP – 21 – FZ089
Name of the Course in English	Relativistic Astrophysics
Name of the Course in Turkish	Relativistik Astrofizik
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Prof. Dr. Osman Demircan Assoc. Prof. Dr. Gülnur İkis Gün
ECTS Credit	7,5
COMU Credit	3
Description	This course's main purpose is explain the relativite, including both theoretical underpinning and observational consequences on many type celestial body of the universe.

Course Code	ULP – 21 – FZ090
Name of the Course in English	Advanced Magnetohydrodynamics
Name of the Course in Turkish	İleri Manyetohidrodinamik
Language of the Course	ENGLISH
Level of the Course	Doctorate

Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5
COMU Credit	3
Description	In this course, nonlinear processes in magnetohydrodynamics and magnetohydrodynamics turbulence are explained.

Course Code	ULP – 21 – FZ091
Name of the Course in English	Advanced Plasma Physics
Name of the Course in Turkish	İleri Plazma Fiziği
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş
ECTS Credit	7,5
COMU Credit	3
Description	In this course, the kinetic description of plasma and the properties of hot plasma are explained.

Course Code	ULP – 21 – FZ092
Name of the Course in English	Electrodynamics of Continuous Media
Name of the Course in Turkish	Sürekli Ortamların Elektrodinamiği
Language of the Course	ENGLISH
Level of the Course	Doctorate
Lecturer	Assoc. Prof. Dr. Hüseyin Çavuş

ECTS Credit	7,5
COMU Credit	3
Description	In this course, electromagnetic waves and their propagation and scattering in (un)isotropic media are explained.