

**AZƏRBAYCAN RESPUBLİKASI ELM VƏ TƏHSİL
NAZİRLİYİ
BAKİ DÖVLƏT UNİVERSİTETİ**

BAKALAVRİAT PİLLƏSİ ÜÇÜN

İXTİSAS- Fizika müəllimliyi

FƏNN – Lazerlər Fizikası

BAKİ 2024

Mövzular üzrə saatların bölgüsü

№	Mövzular	Saatlar		
		Cəmi 75	Müh. 45	Lab. 30
1	Basics of the theory of radiation of light. Light and general radiation laws. Coherence and incoherence. Emission, absorption and amplification of radiation. Units and physical constants.		2	
2	Physical basis and principle the effect of lasers Negative absorption. Inverse population of levels. Light amplification with the help of a three-level system.		2	
3	Characteristics of a wave. Light is a particle. Photoelectric effect. Heisenburg uncertainty principle.		2	
4	Overview of laser technology What are lasers usedfor? Laser in telecommunications, in research and medicine, graphics and grocery stores, in the military and other.		2	
5	Laser interaction with matter.Laser spectroscopy. Exampels of Spectroscopy applications. Light soutces. Non-dispersive elements. Dispersive elements. Fiber Optics Cabels and Spectrometry.		2	
6	Solid and gas lasers Principle of action, energy diagrams, basic elements and parameters of ruby, neodymium and helium-neon lasers.		2	
7	Semiconductor lasers What are semiconductors? Properties of some specific semiconductors. Heterojunctions, heterostructures and their advantages.		2	
8	Principles of construction of some semiconductor devices. Integral microcircuits. Principle of operation of a semiconductor laser.		2	
9	Liquid and terahertz lasers Liquid lasers. Terahertz lasers. Razery and grazery. Lasers on free transitions. Eta carinae is a laser created by nature itself.		2	
10	Properties of laser radiation		2	

	Monochromaticity of laser radiation. Directivity of laser radiation. Intensity of laser radiation. Application of lasers.			
11	Experimental technique for determining the parameters of laser radiation Determination of the emission spectra of an nd:yag laser. Determination of the duration of a liquid (dye) laser. Optical filters for laser radiation.		2	
12	Determination of the polarization of the radiation of a helium-neon laser. Determination of the main parameters of a semiconductor laser diode. Dependence of the energy of laser radiation on the pump voltage.		2	
13	Measuring technique for laser researches Pump-probe spectroscopy. Nonlinear interferometer. The technique of radial distortion. Four-wave mixing.		2	
14	Controlled nuclear synthesis Laser thermonuclear fusion (Its). Heating a mixture of deuterium and tritium under the action of high-power laser radiation. The main stages in the development of laser thermonuclear synthesis.		2	
15	Optical holography Is it possible to "freeze" the light wave? What are the basic principles of optical holography? Recording and reading the hologram.		2	
16	Lasers in nanotechnology Classification of nanoparticles and nanomaterials. Methods for obtaining nanoparticles and nanomaterials.		2	
17	Obtaining nanoparticles and nanostructures by laser ablation. Laser method for obtaining thin films and nanoparticles of indium and gallium monoselenide.		2	
18	Laser cooling of atoms to ultra-low temperatures. BOSE - EINSTEIN CONDENSATION IN GASES Cooling and capture of atoms by laser light. The Doppler effect.		2	

19	Bose-Einstein condensation in gases. Atomic laser. Atomic clock. Atomic interferometer. Measurements		2	
20	Nonlinear optics Nonlinear polarization. Generation of the second optical harmonic. Generation of the third optical harmonic. Parametric light generators.		2	
21	Multiphoton absorption Single-photon and multiphoton transitions. Multiphoton processes and virtual transitions. Two-phonon processes. Three-photon processes.		2	
22	Filling zones The pauli principle is fermions. Lambert-bouguer's law. The kramers-kronig relation. Semiconductor laser.		2	
23	Brief summary of lessons		1	
	Laboratoriya işi			
1	Determination of absorption coefficient in a substance			3
2	Study of the spectrum of the emission coefficient in a thin film			3
3	Measurement of photocurrent to stationary mode			3
4	Study of photocurrent kinetics			3
5	Study of spectral characteristics of photoresistor			3
6	Study of spectral characteristics of photodiode			3
7	A study of the lux-ampere characteristic of a photodiode			3
8	Study of the spectral characteristics of the light diode			3
9	Study of the lux-ampere characteristic of the light diode			3
10	Study of the spectral characteristics of a semiconductor laser			3