Faculty of Science and Mathematics / PHYSICS / PHYSICS OF ATOMS AND MOLECULES

Course:	PHYSICS OF ATOMS AND MOLECULES			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
12089	Mandatory	1	6	3+2+0
Programs	PHYSICS			
Prerequisites	none			
Aims	To familiarize students with the basics of atomic physics, introduce them to the structure of molecules and methods for describing the structure and phenomena related to molecular systems, with the aim of applying these results in solid state physics, laser physics, ionized systems. gases, plasma and other natural sciences.			
Learning outcomes	Acquisition of basic concepts related to the structure and properties of atoms, primarily hydrogen and helium, but also atoms with more electrons. Understanding and applying the apparatus of quantum mechanics to atomic systems. Adoption of basic terms and definitions from the field of molecular physics. Familiarity with the classification of types of molecular bonds and modern methods for the description and calculation of basic parameters of molecular systems. Overview of modern quantum mechanical methods for the description of molecules.			
Lecturer / Teaching assistant	prof. dr. Mara Šćepanović, prof. dr. Slavoljub Mijović			
Methodology	Lectures, calculus exercises, control tests, seminar papers, consultations, constant checking of knowledge through oral examination, independent study and homework.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Detailed presentation of the plan for the organization of lectures and exams to students. The simplest cases of movement of microparticles, division of the first seminar paper;			
I week exercises	Selected tasks that follow the lectures of the first week, the first control test;			
II week lectures	The simplest cases of movement of microparticles (continued), oral examination			
II week exercises	Selected tasks that follow the lectures of the second week, the second control test;			
III week lectures	Hydrogen atom and similar atoms,			
III week exercises	Selected tasks that follow the lectures of the third week, the third control test;			
IV week lectures	Magnetic and mechanical moments of atoms, interaction of atoms with the electromagnetic field,			
IV week exercises	Selected tasks that follow the lectures of the fourth week, the fourth control test;			
V week lectures	Interaction of atoms with an electromagnetic field (continued), oral examination,			
V week exercises	Selected tasks that follow the lectures of the fifth week, the fifth control test;			
VI week lectures	Multielectron Atoms, oral examination,			
VI week exercises	Selected tasks that follow the lectures of the sixth week, the sixth control test;			
VII week lectures	Presentation of the first seminar paper,			
VII week exercises	Presentation of the first seminar paper, continuation			
VIII week lectures	Chemical bonding of molecules, oral examination			
VIII week exercises	Selected tasks accompanying the lectures of the eighth week			
IX week lectures	Hydrogen molecule, oral examination, first homework;			
IX week exercises	Selected tasks that follow the lectures of the ninth week, defense of homework;			
X week lectures	Valence, second homework;			
X week exercises	Selected tasks that follow the lectures of the tenth week, defense of homework;			
XI week lectures	Molecular structure, third homework;			
XI week exercises	Selected tasks that follow the lectures of the eleventh week, defense of homework;			
XII week lectures	Vibrational and rotational molecular spectra, fourth homework;			
XII week exercises	Selected tasks that follow the lectures of the twelfth week, defense of homework;			

XIII week lectures	Electronic molecular spectra, fifth homework;
XIII week exercises	Selected tasks that follow the lectures of the thirteenth week, defense of homework;
XIV week lectures	Preparation for the final exam,
XIV week exercises	Preparation for the final exam, continued
XV week lectures	final exam
XV week exercises	
Student workload	per week 6 credits x 40/30=8 hours Structure: 3 hours of lectures, 1 hour of calculation exercises, 4 hours of independent work including consultations, exam: 8 hours x 16 = 120 hours; Necessary preparations before the beginning of the semester (administration, registration, certification): 2 x 8 hours = 16 hours; Total course load: 6h30=180 hours Additional work on exam preparation in the remedial period, including taking the remedial exam, is from 0 to 44 hours. Load structure: 120 hours (teaching) + 16 hours (preparation) + 44 hours (additional work)

Per week	**Per semester**
6 credits x 40/30=8 hours and 0 minuts 3 sat(a) theoretical classes 0 sat(a) practical classes 2 excercises **3 hour(s) i 0 minuts** of independent work, including consultations	Classes and final exam: **8 hour(s) i 0 minuts x 16 =128 hour(s) i 0 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **8 hour(s) i 0 minuts x 2 =16 hour(s) i 0 minuts** Total workload for the subject: **6 x 30=180 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **36 hour(s) i 0 minuts** Workload structure: **128 hour(s) i 0 minuts (cources), 16 hour(s) i 0 minuts (preparation), 36 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to regularly attend classes, take control tests, write and defend seminar papers. If, for any reason, a student misses two periods of lectures and exercises (in total) and does not do the seminar work, he will be prohibited from taking the exam.
Consultations	Consultations are carried out at the request of students, as a rule, after the practice session
Literature	A. N. Matveev; atomic physics; E. V. foreign; atomic physics; B.H. Bransden & C.J. Joachim; Physics of atoms and molecules; J. Purić and I. Dojčinović: Physics of atoms; S.I. Yeniže: Basics of atomic, quantum and molecular physics; M. Jurić: Atomic physics; S. Matsura and J. Radić-Perić: Atomistics; J. Purić and S. Đeniže: Collection of solved problems in atomic physics; B. Stanić and M. Marković: Collection of solved problems in atomic physics; S. Mijović Physics of Molecules-scripta 2022
Examination methods	In the first part, ending with the seventh week of classes: • six control tests each carry a maximum of seven points • one seminar carrying a maximum of eight points. In the second part five homework assignments, each carrying a maximum of five points final exam that carries a maximum of 25 points
Special remarks	Teaching can be organized in English
Comment	

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points