Bachelor in Chemistry

Course Structure – Academic Year 2020-2021

Name of the Degree Course	Chemistry
Academic Year	2020-2021
Classe di Corso di Studio	L-27
Department	Department of Chemistry and Chemical Technologies
Head of the Department	Prof Alessandra Crispini
Website	https://www.unical.it/portale/strutture/dipartimenti_240/ctc/didattica/laureatriennale/manifestotriennale/index.cfm

Year	Semester	N°	Courses	ECTS	Lectures	Tutorial	Laboratory
1st	I	1	General and Inorganic Chemistry	9	7	2	
		2	Informatics for Chemistry	6	4	1	1
		3	Stoichiometry and Laboratory	6		4	2
		4	Maths I	6	4	2	
	II	5	Physics I	6	4	2	
		6	English	6	1		5
		7	Physical Chemistry I	9	4	2	3
		8	Organic Chemistry I	6	4	2	

Year	Semester	N°	Teachings	ECTS	Lectures	Tutorial	Laboratory
2nd	I	9	Maths II	6	4	2	
		10	Physics II	6	4	2	
		11	Analytical Chemistry and Laboratory (Part I)	6	6		
		12	Organic Chemistry II and Laboratory	12	6		6
		13	Physical Chemistry II	6	6		
	II	11	Analytical Chemistry and Laboratory (Part II)	6			6
		14	**Elective**	6			
		15	Inorganic Chemistry I	6	4	2	
		16	Physical Chemistry III and Laboratory	12	6		6

Year	Semester	N°	Teachings	ECTS	Lectures	Tutorial	Laboratory
3rd	I	17	Methodologies for Molecular Structures Determination	12	9	2	1
		18	Inorganic Chemistry II and Laboratory (Part I)	6	4	2	
		19	Instrumental Analytical Chemistry and Laboratory (Part I)	6	6		
		20	Organic Chemistry III and Laboratory	9	6		3
	II	18	Inorganic Chemistry II and Laboratory (Part II)	6	2		4
		19	Instrumental Analytical Chemistry and Laboratory (Part II)	6			6
		14	**Elective**	6			
			Traineeship	6			
			Final Examination	3			

Course	**Physical Chemistry I**
Contents	Theory: The course places the fundaments of thermodynamics and kinetics of chemical reactions. The topics are developed from basic principles of thermodynamics and molecular motions, definition and character of state functions of open and closed systems. The course is complemented by calculus exercises concerning the solutions of reaction thermodynamics and reaction kinetics problems. Laboratory: Thermodynamics and Chemical Reaction Kinetics: Concepts, Methods and Case Studies
Learning outcomes	Theory: The students will acquire the fundamentals of chemical thermodynamics and chemical kinetic, with the base mechanisms regulating the chemical reactivity from both the quantitative yields and time evolution points of views. In particular, students will acquire the ability to calculate: -The thermodynamic coordinates and state functions of closed systems, independently from the aggregation state. -The equilibrium concentration of reacting systems, as a function of control parameters such as initial concentrations, temperature and pressure. The temporal evolution of reacting systems. Laboratory: The main goal of the course consists in the improvement of the basic knowledge of Thermodynamics. Through the deepness of a real system, that means to give students the possibility to correlate theorical concepts with real applications. Therefore, the choice of suitable subjects is devoted to induce students to connect phenomenon experienced in laboratory with mathematical Analysis
Prerequisities	None
ECTS	9

Course	ANALITYCAL CHEMISTRY AND LABORATORY
Contents	Equilibrium studies in aqueous solution and applications in the analytical laboratory
Learning outcomes	The course aims to provide knowledge and skills for solving problems related to chemical equilibria in aqueous solution. At the end of the course the student acquires adequate skills for the understanding of the principles concerning the study of chemical equilibrium in aqueous solution. The student also acquires adequate skills that allow the reasoned application of the main analytical laboratory techniques.
Prerequisites	General and Inorganic Chemistry; Stoichiometry and Laboratory
ECTS	12

Course	PHYSICAL CHEMISTRY II
Contents	Fundamentals of Quantum Mechanics, with particular emphasis on Chemistry applications.
Learning outcomes	The Course should give knowledge and skills concerning: a) Basic concepts of Quantum Mechanics; b) mathematical tools of Quantum Mechanics. At the end of the Course, the students should be able: a) to address simple quantum chemistry problems; b) to decide about the suitable tools (quantum or classical mechanics) to treat the problems; c) to speak about the nature of QM problems with a certain degree of familiarity .
Prerequisites	Propaedeutic compulsory courses: Maths I; Physics I; General and Inorganic Chemistry; Stoichiometry and Laboratory, Physical Chemistry I. The acquired knowledge is considered an essential prerequisite for an effective fruition of the Course.
ECTS	6

Course	**PHYSICAL CHEMISTRY III AND LABORATORY**
Contents	Foundations of Spectroscopies (Vibrational Spectroscopy, in particular) with emphasis on Group Theory and its applications in Chemistry and Spectroscopy.
Learning outcomes	The Course should give knowledge and skills concerning the basic Information about: a) Radiation-matter Interactions; Foundations of Spectroscopy (in particular, vibrational spectroscopy); b) Mathematical tools and Group Theory. Then, the Students should be able : a) to properly manage the theoretical and applicative tools of Group Theory (also for the use in the future courses); b) to appreciate all the potentialities of molecular spectroscopy, in order to project suitable spectroscopic experiments; c) to speak about spectroscopic phenomena with a certain degree of familiarity. What just said above, will be combined with the experimental/practical aspects of the Laboratory part of the course, where an opportunity is given to the student to work closely with a professor in physical chemistry laboratory. Then, the students will perform experiments in physical chemistry covering some of the major topics in that discipline in order to analyze molecular properties of the matter.
Prerequisites	Basic knowledges about Linear Algebra (Matrices), Mathematical Analysis and Thermodynamics. Compulsory (propaedeutic) courses: Maths I; Physics I; General and Inorganic Chemistry; Stoichiometry and Laboratory, Physical Chemistry I. The acquired knowledge (in particular, about Mathematical Analysis and Thermodynamics) is considered an essential prerequisite for an effective fruition of the Course.
ECTS	12