



COURSE TITLE: MODERN PHYSICS		
BACHELOR IN SCIENCE	YEAR: 2nd	SEMESTER: 2nd

COURSE SCHEDULE									
WEEK	SE-SSION	DESCRIPTION OF THE CONTENTS	GROUP (Tick X)		Indicate if a space different from the classroom is required (laboratory, computer classroom, etc)	Indicate YES/NO if It is a session with two teachers (*)	STUDENT'S WEEKLY SCHEDULE		
			Lecture Class	Practical Class			DESCRIPTION	CLASS HOURS	HOMEWORK HOURS Máximum 7 H
1	1	1 Postulates of the Special Theory of Relativity - Introduction - The Classical Relativity * The Galilean Principle of Relativity * The Galilean Transformation and Classical Mechanics - The Principle of Relativity and the Electromagnetic Theory - Einstein's Postulates	X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
1	2			X			- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
2	3	2 Relativistic Kinematics - Lorentz Transformation * Lorentz Transformation of Coordinates * Lorentz Velocity Transformation - Consequences of the Lorentz Transformation	X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5

		<ul style="list-style-type: none"> * Time Dilation * Contraction of Length * Relativity of Simultaneity 								
2	4			X				<ul style="list-style-type: none"> - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates 	1,66	
3	5	3 Relativistic Dynamics <ul style="list-style-type: none"> - Introduction - Relativistic Linear Momentum - Relativistic Expression of the Force - Relativistic Energy <ul style="list-style-type: none"> * Kinetic Energy * Definition of the Total Energy * Mass-Energy Equivalence * Energy-Momentum Relation 		X				<ul style="list-style-type: none"> - Reading of proposed topics - Work on the subject, including bibliographic research 	1,66	5
3	6			X				<ul style="list-style-type: none"> - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates 	1,66	
4	7	4 Introduction to the General Relativity <ul style="list-style-type: none"> - Introduction - Equivalence Principle - The Light in a Gravitational Field - Perihelion Precession of Mercury - Gravitational Redshift of Light - The Global Positioning System (GPS) - Black Holes 		X				<ul style="list-style-type: none"> - Reading of proposed topics - Work on the subject, including bibliographic research 	1,66	5
4	8			X				<ul style="list-style-type: none"> - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates 	1,66	
5	9	5 The Birth of Quantum Physics. Wave – Particle Duality <ul style="list-style-type: none"> - Introduction - Waves and Particles - The Nature of Light <ul style="list-style-type: none"> * Blackbody Radiation. Planck’s Hypothesis 		X				<ul style="list-style-type: none"> - Reading of proposed topics - Work on the subject, including bibliographic research 	1,66	5

		* Photoelectric Effect. Photons - De Broglie Hypothesis. Electron Diffraction. The Double Slit Experiment								
5	10	- Written test exam (*)		X				- Written test exam - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
6	11	6 Quantum Mechanics. Schrödinger Equation. Wave Function - The New Quantum Mechanics - Wave mechanics. Wave Function. Probabilistic Interpretation - The Schrödinger Equation - Time Independent Schrödinger Equation. Stationary States - One-dimensional Examples: * Particle in an Infinite Well Potential * The Harmonic Oscillator - Heisenberg Uncertainty Principle	X					- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
6	12			X				- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
7	13	6 (cont.)	X					- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
7	14			X				- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
8	15	7 Atoms and Molecules - Atomic Models. Bohr Model - Quantum Theory of the Hydrogen Atom. Quantum Numbers - Electron Spin. Pauli Exclusion Principle - Multielectronic Atoms. The Periodic Table - Spontaneous Emission and Stimulated Emission. The Laser - Molecules	X					- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5

		* The Ionic Bond * The Covalent Bond. Molecular Orbitals. Hybridation								
8	16	- Written test exam (*)		X				- Written test exam - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
9	17	8 The Solid State - Crystalline Solids - The Quantum Theory of Free Electrons in Metals - Band Theory of Solids. Conductors and Insulators - Semiconductors * Intrinsic and Extrinsic Semiconductors * Semiconductor Devices. The Diode and the Transistor - Superconductors		X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
9	18			X				- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
10	19	9 Electrons and Photons. Dirac Equation. Quantum Electrodynamics - Revolutions within the Revolution: the Dirac Equation. Consequences * Electron Spin * The Big Surprise: Antimatter - Quantum Electrodynamics. Virtual Photons and Electromagnetic Forces		X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
10	20	- Written test exam (*)		X				- Written test exam - Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and Debates	1,66	
11	21	10 Nuclear Physics - The Atomic Nucleus - Nuclear Stability. Radioactivity.The		X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5

		Radioactive Decay Law - Beta Disintegration. The Neutrino. The Weak Interaction - Yukawa and the Nuclear Forces. The Strong Interaction								
11	22			X				- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and debates	1,66	
12	23	11 Elementary Particles. The Structure of Matter - Elementary Particles. Accelerators and Colliders - The zoo of the Elementary Particles. Quarks - Quantum Chromodynamics - The Standard Model. Higgs Boson		X				- Reading of proposed topics - Work on the subject, including bibliographic research	1,66	5
12	24			X				- Solution of proposed exercises - Presentation of short proposed works - Participation in discussions and Debates	1,66	
13	25	11 (cont.) - Written test exam (*)		X				- Reading of proposed topics - Work on the subject, including bibliographic research - Written test exam	1,66	6.5
13	26	- Laboratory session: Seminar on Relativity		X				- Reading of the guideline document - Carrying out the laboratory session - Analysis of results - Preparation of the report	1,66	
14	27	- Laboratory session: Quantum Physics		X				- Reading of the guideline document - Data acquisition - Analysis of results - Preparation of the report	1,66	4.5
14	28	- Laboratory session: Quantum Physics		X				- Reading of the guideline document - Data acquisition - Analysis of results - Preparation of the report	1,66	4.5
15	29	- Laboratory session: Quantum Physics		X				- Reading of the guideline document - Carrying out the laboratory session	1,66	4.5

								- Analysis of results - Preparation of the report		
SUBTOTAL									48	+ 80 = 128
15		Support classes, delivery of proposed homework assignments, etc							2	2
16-18		Preparation for the final written exam and exam							3	15
TOTAL									150	

(*) Test dates are tentative.

() Laboratory session dates are tentative.**