

UNIVERSITY of BAGHDAD

جامعة بغداد



Bachelor of Science Honours (B.Sc. Honours) – Space and Astronomy

بكالوريوس علوم الفلك والفضاء



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1. Overview

This guide is about the courses (modules) given by the program of the Department of Astronomy and Space to gain the Bachelor degree in Science. The program delivers (48) Modules with (6000) total student workload hours and (240) total ECTS. The module delivery of study materials is based on the Bologna Process.

نظرة عامة

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم الفلك والفضاء للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (٤٠) مادة دراسية مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

1

Code	Course/Module Title	ECTS	Semester
AST1101	Fundamentals of Astronomy	8	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	4	109	91
Description			
The Fundamentals of Astronomy module provides an introduction to the basic principles and concepts of astronomy, which is the scientific study of celestial objects, such as stars, planets, galaxies, and the universe as a whole. This module covers various topics that help lay the foundation for understanding the field of astronomy.			

2

Code	Course/Module Title	ECTS	Semester
AST1102	General Physics	7	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	3	109	66
Description			
<p>This module helps to understand the fundamental concepts of physics and develop problem solving skills through the application of techniques. The module also helps to comprehend the basic concept of mechanics and electricity to understand mechanic law, the vector, position, velocity, and forces. also electrical laws, voltage, current, and power. This is the basic subject for all electrical and mechanics.</p>			

3

Code	Course/Module Title	ECTS	Semester
AST1103	Differentiation and Integration	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	77
Description			
<p>The module on Differentiation and Integration provides a comprehensive understanding of two fundamental concepts in calculus. It covers the techniques, principles, and applications of both differentiation and integration. The module begins with an introduction to differentiation, focusing on the concept of limits and the calculation of derivatives. Students learn how to find derivatives of various functions, including polynomial, exponential, logarithmic, and trigonometric functions.</p>			

4

Code	Course/Module Title	ECTS	Semester
AST1104	Geophysics	5	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	77
Description			
<p>Geophysics is a scientific discipline that focuses on studying the physical properties and processes of the Earth and other planetary bodies. It combines principles from physics,</p>			

mathematics, geology, and chemistry to understand the Earth's structure, composition, and dynamic behavior. Geophysicists use a variety of observational, experimental, and computational techniques to investigate phenomena such as earthquakes, volcanic eruptions, plate tectonics, magnetic fields, gravity, and the flow of fluids within the Earth. They aim to unravel the mysteries of the Earth's interior and its interactions with the atmosphere, hydrosphere, and biosphere.

5

Code	Course/Module Title	ECTS	Semester
UoB1105	English Language	2	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
The English Language module is designed to provide students with a comprehensive understanding of the English language, including its grammar, vocabulary, pronunciation, and usage. The module aims to enhance students' proficiency in written and spoken English, enabling them to communicate effectively in various contexts.			

6

Code	Course/Module Title	ECTS	Semester
UoB1106	Computer Skills I	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
	4	62	13
Description			
This course presents an overview of fundamental computer science topics and an introduction to Windows operating systems. Overview topics include an introduction to computer hardware, operating systems, computer security, Internet, and e-mail. This course also covers the essential concepts and skills relating to the use of devices, file creation and management. It help students to demonstrate the ability to use a Microsoft word processing application to accomplish small tasks associated with creating, formatting, finishing small-sized word processing documents, such as letters and other everyday documents. It also help students to demonstrate the ability to use a Microsoft power point application to accomplish tasks associated with creating, and formatting a presentation, and demonstrate the ability to use a Microsoft Excel application to accomplish a spreadsheet for tasks.			

7

Code	Course/Module Title	ECTS	Semester
AST1207	Astrophysics	7	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	4	94	81
Description			
<p>The module "Introduction to Astrophysics" provides a comprehensive overview of the fundamental concepts and principles in the field of astrophysics. It is designed to introduce students to the study of celestial objects, their properties, and the physical laws governing the universe.</p>			

8

Code	Course/Module Title	ECTS	Semester
AST1208	Atmospheric Sciences	8	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	94	106
Description			
<p>The module on Atmospheric Sciences provides a comprehensive understanding of the Earth's atmosphere, its composition, physical properties, and processes that govern its behavior. It covers a wide range of topics related to weather, climate, and atmospheric dynamics, offering insights into the complex interactions between the atmosphere, oceans, land surface, and biosphere. The module is designed to equip students with the knowledge and skills necessary to study and analyze atmospheric phenomena, make weather forecasts, assess climate patterns, and understand the impact of human activities on the atmosphere. It combines theoretical concepts with practical applications, utilizing both observational and computational methods.</p>			

9

Code	Course/Module Title	ECTS	Semester
AST1209	Applied Mathematics	6	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>The Applied Mathematics module is designed to provide students with a comprehensive</p>			

understanding of mathematical concepts and techniques as they apply to real-world problems and situations. This module bridges the gap between theoretical mathematics and its practical applications in various fields, such as Astronomy, physics, engineering, computer science, economics, and social sciences. The module aims to develop students' critical thinking and problem-solving skills by equipping them with the necessary mathematical tools and methods required to analyze and solve complex problems. Students will learn how to model real-world phenomena mathematically, formulate and optimize mathematical models, and interpret the results in the context of the problem at hand.

10

Code	Course/Module Title	ECTS	Semester
CoS12010	General Chemistry	5	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	46
Description			
<p>The General Chemistry module provides a comprehensive introduction to the fundamental principles and concepts of chemistry. It covers a wide range of topics, including atomic structure, chemical bonding, stoichiometry, chemical reactions, and the behavior of matter. The module begins with an overview of the structure of atoms, including the arrangement of subatomic particles and the periodic table. It explores the concept of atomic number, mass number, and isotopes, as well as electron configuration and the periodic trends in the properties of elements. Next, the module delves into chemical bonding, discussing various types of chemical bonds such as ionic, covalent, and metallic bonds. It explores Lewis dot structures, molecular geometry, and the intermolecular forces that influence the physical properties of substances.</p>			

11

Code	Course/Module Title	ECTS	Semester
UoB12011	Arabic Language	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	33	17
Description			
<p>This module is concerned with the study of the Arabic language in all its fields. It is based on students reaching the level of professionalism, rhetoric, and fluency in the language. It aims to provide them with the skills of analysis, criticism, thinking, writing, rhetoric, reading and listening, in addition to producing texts in Arabic. Until the pioneers of specialization eventually reach a level of linguistic creativity.</p>			

12

Code	Course/Module Title	ECTS	Semester
UoB12012	Human Rights and Democracy	2	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The Human Rights and Democracy module aims to provide a comprehensive understanding of the principles and concepts related to human rights and democracy. The module explores the fundamental principles, historical development, international legal frameworks, and contemporary challenges associated with the promotion and protection of human rights and democracy.</p>			

13

Code	Course/Module Title	ECTS	Semester
AST23013	Celestial Mechanics	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	64	86
Description			
<p>The module study all type of motions in plain and in space. The Coordinate spherical or Cartesian systems depend on the origin and on the inclination, the spherical geometry application on the Horizontal, equatorial and ecliptic Systems, as well as the transformation between systems. Also study the times and dates with the Earth, the Sun and the Moon motions, the module included observation the Sun, the Moon and some planets to find the position, distance, direction, times and dates.</p>			

14

Code	Course/Module Title	ECTS	Semester
AST23014	Atomic Physics	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	71
Description			
<p>This module description provides a fundamentals concepts of the atomic physics and the related topics to the basic components and parts of the atom, their discovery and calculations, with an</p>			

introduction to atomic hypotheses and theories and their historical development, with a review of the mathematical formulas for calculating atomic energy levels, electron binding energy, atomic series and the atomic spectrums.

15

Code	Course/Module Title	ECTS	Semester
AST23015	Numerical and Complex Analysis	6	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	56
Description			
<p>Numerical and complex analysis are two important branches of mathematics that deal with the study of numbers and their properties. While numerical analysis focuses on the development and application of numerical methods for solving mathematical problems, complex analysis deals with the study of complex numbers and their functions.</p>			

16

Code	Course/Module Title	ECTS	Semester
AST23016	Thermodynamics	5	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			
<p>Thermodynamics is a branch of physics that deals with the study of energy transformations and the relationship between heat, work, and energy. It is a fundamental theory that governs the behavior of systems at macroscopic scales, such as gases, liquids, and solids. Thermodynamics provides a framework for understanding and predicting the behavior of these systems, including their equilibrium states, energy transfers, and the efficiency of energy conversion processes.</p>			

17

Code	Course/Module Title	ECTS	Semester
AST23017	Stellar Physics	5	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	46
Description			

The Stellar Physics module provides an in-depth exploration of the physical processes and properties of stars. It covers a wide range of topics, including stellar structure, evolution, nucleosynthesis, stellar atmospheres, and stellar populations. The module aims to develop a comprehensive understanding of the underlying physics that governs the life cycles and behaviors of stars.

18

Code	Course/Module Title	ECTS	Semester
AST23018	English Language	2	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The English Language module is designed to provide students with a comprehensive understanding of the English language, including its grammar, vocabulary, pronunciation, and usage. The module aims to enhance students' proficiency in written and spoken English, enabling them to communicate effectively in various contexts.</p>			

19

Code	Course/Module Title	ECTS	Semester
AST24019	Orbital Dynamic	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	71
Description			
<p>This module study Kepler and Newton laws, Energy and angular momentum conservation, the orbital types. Find the distance, velocity, orbital elements and momentum. Study the perturbations effect on the orbit. Also study the Moon orbit.</p>			

20

Code	Course/Module Title	ECTS	Semester
AST24020	Modern Physics	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	46

Description
This module description provides the main concepts of modern physics, including the concepts of the special theory of relativity and the basic hypotheses, in addition to the formulas, equations, and mathematical transformations of the theory. The module also includes the topic of X-rays (its properties, production, diffraction, absorption, refraction) Compton scattering, double emission, photoelectric phenomenon).

21

Code	Course/Module Title	ECTS	Semester
AST24021	Planetary Physics	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			
This module provides a broad overview of our current theoretical and observational understanding of the physical processes involved in star- and planet formation. The module consists of two parts. First, the cloud collapse leading to protostars with dense envelopes, circumstellar accretion disks and outflows is discussed. Second, the evolution of protoplanetary disks and the scenarios for the formation of giant and terrestrial planets are presented. Kuiper Belt Objects, comets and meteorites each tell their own story about the physical processes that took place in our own early Solar System. In contrast, exo-planetary systems show us how other protoplanetary systems evolved differently than our own. The student will learn also about the types of the techniques that used to detect exoplanet.			

22

Code	Course/Module Title	ECTS	Semester
AST24022	Space Weather	5	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			
The Space Weather module provides an in-depth exploration of space weather phenomena and their impact on Earth and space-based systems. It covers the fundamental concepts, processes, and tools used to study, monitor, and forecast space weather events. The module also examines the effects of space weather on various technological infrastructure, satellite communications, power grids, and human activities.			

23

Code	Course/Module Title	ECTS	Semester
AST24023	Mathematical Physics	6	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
<p>Mathematical physics is a field that combines mathematical methods and techniques with the principles and theories of physics to study and describe physical phenomena. It provides a framework for understanding and formulating the mathematical laws that govern the behavior of matter and energy in the universe. In a mathematical physics module, students typically learn and explore advanced mathematical concepts and techniques that are relevant to physics.</p>			

24

Code	Course/Module Title	ECTS	Semester
AST24024	Computer Skills II	3	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
	4	62	13
Description			
<p>This course presents an overview of fundamental computer science topics and an introduction to Windows operating systems. Overview topics include an introduction to computer hardware, operating systems, computer security, Internet, and e-mail. This course also covers the essential concepts and skills relating to the use of devices, file creation and management. It help students to demonstrate the ability to use a Microsoft word processing application to accomplish small tasks associated with creating, formatting, finishing small-sized word processing documents, such as letters and other everyday documents. It also help students to demonstrate the ability to use a Microsoft power point application to accomplish tasks associated with creating, and formatting a presentation, and demonstrate the ability to use a Microsoft Excel application to accomplish a spreadsheet for tasks.</p>			

25

Code	Course/Module Title	ECTS	Semester
AST25025	Astronomical Applications	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	46

Description
The Astronomical Applications module encompasses a wide range of topics related to the study and application of astronomy. It provides information and tools for various astronomical calculations, observations, and analyses. Overall, the Astronomical Applications module provides a comprehensive overview of astronomy and its practical applications in different domains. It aims to enable users to develop a deeper understanding of the universe, as well as utilize astronomical knowledge for practical purposes.

26

Code	Course/Module Title	ECTS	Semester
AST25026	Optics	7	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	3	109	66
Description			
Optics is the branch that deals with the behavior and properties of light and its interaction with matter. It encompasses the study of the generation, propagation, manipulation, and detection of light, as well as the understanding of vision and the optical phenomena that occur in various systems.			

27

Code	Course/Module Title	ECTS	Semester
AST25027	Cosmic Plasma	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	2	64	61
Description			
The module "Understanding Cosmic Plasma" provides a comprehensive introduction to the fascinating world of cosmic plasma, its properties, and its role in shaping the universe. Students will delve into the fundamental concepts of plasma physics and gain a deeper understanding of the unique characteristics exhibited by this state of matter in the cosmic context. By the end of this module, students will have developed a solid foundation in the principles of plasma physics as applied to cosmic environments. They will be equipped with the knowledge to analyze and interpret various astrophysical phenomena involving plasma, fostering a deeper appreciation for the intricate interplay between plasma, electromagnetic fields, and the evolution of the universe at large.			

28

Code	Course/Module Title	ECTS	Semester
AST25028	Galaxies	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	37
Description			
<p>This course aims to study topics related to galaxies in terms of their types and method of movement, in addition to studying most of the physical properties related to them in more than one wavelength (optical, radio, etc.), with a study of the variation that occurs with one of the most active celestial bodies, which is the active galaxies.). In addition to what was previously mentioned, we discuss in this course how to deal with scientific astronomical data and how to interpret them.</p>			

29

Code	Course/Module Title	ECTS	Semester
AST25029	Statistical Mechanics	4	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	37
Description			
<p>This module provides a framework for understanding the behavior of systems consisting of a large number of particles. It aims to connect the microscopic properties of individual particles to the macroscopic properties of the system as a whole. The foundation of statistical mechanics lies in the principles of classical and quantum mechanics. It employs statistical methods to describe the collective behavior of particles, taking into account the inherent randomness and uncertainty associated with their microscopic interactions.</p>			

30

Code	Course/Module Title	ECTS	Semester
AST23030	Satellites	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			

Satellite module aims to give students a modern scientific curriculum that qualifies students to know satellites, their composition, types and satellites orbit around the Earth, launching operations, maneuvering and monitoring the movement of satellites in space, and the most important modern scientific applications of satellites in all fields.

31

Code	Course/Module Title	ECTS	Semester
AST26031	Astronomical Observation Techniques	6	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	71
Description			
<p>This module introduces students to the observational approaches and instruments of modern astronomy. The first part of the course is focused on the theoretical background including Fourier transforms, radiation, the Earth's atmosphere, and optics. The second part introduces the most important observational techniques including optical and radio telescopes, detectors, spectrometers, and adaptive optics. Students will write their own codes to apply their knowledge.</p>			

32

Code	Course/Module Title	ECTS	Semester
AST26032	Renewable energy	7	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	112
Description			
<p>The Introduction to Renewable Energy module provides an overview of renewable energy sources, their significance in addressing climate change and energy sustainability, and their various applications. The module explores the fundamental concepts, technologies, and challenges associated with renewable energy.</p>			

33

Code	Course/Module Title	ECTS	Semester
AST26033	Computational Fourier Optics	8	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	3	109	91
Description			
<p>This module provides an introduction to optical propagation and diffraction using a scalar wave approach and Fourier theory of imaging. Topics introduced will include pupil function, point spread function, optical transfer function, image formation with coherent and incoherent light, and diffractive optical elements. Also, the module will teach the students how to implement Fourier optical theory and analytic methods on the computer using MATLAB programming.</p>			

34

Code	Course/Module Title	ECTS	Semester
AST26034	Quantum Mechanics	5	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	77
Description			
<p>This module is a substantial introduction to quantum mechanics and how to use it. It is specifically designed to be accessible to physicists and astronomers but also to students and technical professionals over a wide range of science and engineering backgrounds.</p>			

35

Code	Course/Module Title	ECTS	Semester
AST26035	English Language	2	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The English Language module is designed to provide students with a comprehensive understanding of the English language, including its grammar, vocabulary, pronunciation, and usage. The module aims to enhance students' proficiency in written and spoken English, enabling them to communicate effectively in various contexts.</p>			

36

Code	Course/Module Title	ECTS	Semester
AST23036	Scientific Research Methodology	2	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The module on Scientific Research Methodology provides students with a comprehensive understanding of the fundamental principles and techniques involved in conducting scientific research. It equips learners with the knowledge and skills necessary to design, execute, analyze, and report on scientific investigations in various fields of study.</p>			

37

Code	Course/Module Title	ECTS	Semester
AST47037	Digital Image Processing	7	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	3	109	66
Description			
<p>Image processing is a technique to carry out a particular set of actions on an image to obtain an enhanced image or extract some valuable information. This Module describe the main objective of image processing is to transform an image into digital form and perform certain operations on it in order to obtain specific models or to extract useful information from the image. In this semester, students will learn digital image processing techniques including representation, sampling and quantization, image acquisition, imaging geometry, image transforms, image enhancement, image smoothing and sharpening, and image restoration.</p>			

38

Code	Course/Module Title	ECTS	Semester
AST47038	Radio Astronomy	7	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
4	3	109	66
Description			
<p>Radio astronomy is a branch of astronomy that involves the study of celestial objects using radio</p>			

waves. It is based on the detection and analysis of radio frequency radiation emitted by various astronomical sources, such as galaxies, stars, pulsars, quasars, and the cosmic microwave background radiation.

39

Code	Course/Module Title	ECTS	Semester
AST47039	Radiation Astronomy	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			
<p>This module describes the radiation energies of elementary particles, nuclei, and electromagnetic waves during their propagation through outer space and the universe through the application of the laws of astrophysics of high and low energies, including the laws of thermal, non-thermal, ionizing, and non-ionizing radiation, and the mechanism of their radiation in various celestial objects, for example, galaxies, stars and planetary nebulae and so on. As well as to understand the radiation transmitted between active particles or active waves through the universe or outer space with an indication of the importance of these radiations in the study of the most important astronomical phenomena and mysteries, including radiation of black holes, stars, energy and dark matter in the universe and the origin and future of the universe, and the application of mathematical equations related to radiation energies in this field.</p>			

40

Code	Course/Module Title	ECTS	Semester
AST47040	Nuclear Physics	5	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	79	46
Description			
<p>The module "Introduction to Nuclear Physics" provides an overview of the fundamental principles and concepts in nuclear physics. It explores the structure, properties, and interactions of atomic nuclei, as well as the applications and implications of nuclear physics in various fields. Throughout the module, emphasis will be placed on understanding the underlying principles, mathematical formalism, and experimental methods used in nuclear physics.</p>			

41

Code	Course/Module Title	ECTS	Semester
AST47041	English Language	2	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		33	17
Description			
<p>The English Language module is designed to provide students with a comprehensive understanding of the English language, including its grammar, vocabulary, pronunciation, and usage. The module aims to enhance students' proficiency in written and spoken English, enabling them to communicate effectively in various contexts.</p>			

42

Code	Course/Module Title	ECTS	Semester
UoB47042	Graduation Project	4	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	62	38
Description			
<p>The Graduation Project module is designed to provide students with an opportunity to apply the knowledge and skills acquired throughout their academic program to a real-world project. This module serves as the culmination of their studies and allows them to demonstrate their ability to work independently, think critically, and solve complex problems in their field of study.</p>			

43

Code	Course/Module Title	ECTS	Semester
AST48043	Weather Instruments and Observations	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	3	94	56
Description			
<p>The "Weather Instruments and Observations" module provides an in-depth understanding of the various instruments used to measure and observe weather conditions. It covers the fundamental principles behind these instruments, their applications, and the methods employed to collect and interpret weather data. This module is designed to equip learners with the knowledge and skills</p>			

necessary to conduct accurate weather observations and contribute to meteorological studies.

44

Code	Course/Module Title	ECTS	Semester
AST48044	Rocket Physics	4	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	52
Description			
The Rocket Physics module provides a comprehensive understanding of the fundamental principles and concepts related to rockets and their behavior in flight. It covers various aspects of rocket physics, including propulsion, aerodynamics, trajectory analysis, and stability.			

45

Code	Course/Module Title	ECTS	Semester
AST48045	Spectroscopy and photometry	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	87
Description			
The Spectroscopy and Photometry module provides an in-depth understanding of the principles, techniques, and applications of spectroscopy and photometry in the field of physics and Astronomy. Spectroscopy is the study of the interaction between matter and electromagnetic radiation, while photometry focuses on the measurement of light intensity. This module explores the underlying theories, experimental methods, and data analysis techniques used in these disciplines.			

46

Code	Course/Module Title	ECTS	Semester
AST48046	Laser Physics	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			

The module on Laser Physics is designed to provide students with a comprehensive understanding of the fundamental principles and applications of lasers. Laser stands for "Light Amplification by Stimulated Emission of Radiation" and is an important technology with a wide range of applications in various fields, including medicine, telecommunications, manufacturing, and scientific research.

47

Code	Course/Module Title	ECTS	Semester
AST48047	Cosmology	5	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
3	1	63	62
Description			
<p>The Cosmology module provides a comprehensive overview of the field of cosmology, which is the scientific study of the origin, evolution, and structure of the universe as a whole. This module covers various topics, including the Big Bang theory, the expansion of the universe, the cosmic microwave background radiation, dark matter, dark energy, and the formation of galaxies and large-scale structures.</p>			

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Code	Course/Module Title	ECTS	Semester
AST48048	Graduation Project	4	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	62	38
Description			
<p>The Graduation Project module is designed to provide students with an opportunity to apply the knowledge and skills acquired throughout their academic program to a real-world project. This module serves as the culmination of their studies and allows them to demonstrate their ability to work independently, think critically, and solve complex problems in their field of study.</p>			

