Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2024

Academic Program Description Form

Department of Astronomy and Space

University Name: University of Baghdad

Faculty/Institute: College of Science

Scientific Department: Astronomy and Space

Academic or Professional Program Name: Program of Astronomy and Space

Final Certificate Name: Bachelor of Astronomy and Space Sciences

Academic System: Semester

Description Preparation Date: 1/4/2024

File Completion Date: 2/4/2024

Signature:
Assis. Prof. Dr. Abdullah Kamil Ahmed
Head of Department Name:
Date:

Signature:
Prof. Dr. Namir Ibrahim Abbas
Scientific Associate Name:
Date:

The file is checked by:
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department:
Prof. Dr. Israa Ali Zidan
Date:
Signature:

Approval of the Dean

1. Program Vision

Study and understand the scientific facts related to astronomy and space science, both theoretical and practical, and keep pace with rapid scientific developments in the field of astronomy and space, and work to prepare students who possess solid scientific and practical skills for the purpose of supplying institutions, scientific departments, and various ministries with graduates to work in the fields of scientific research and education in order to play an active role in Leading society and effectively contributing to building and serving development in our dear country.

2. Program Mission

The department seeks to create a distinguished scientific base in the fields related to astronomy and space, and prepares and implements plans aimed at developing study tools to ensure that the requirements of quality standards are met. The department is keen to provide distinguished, capable graduates and keep pace with the amazing development in the field of astronomy and space technology. The department seeks to prepare scientific generations armed with professional scientific and ethical knowledge to continue research, innovation and innovation in this specialty in the service of the scientific movement in the world in general and Iraq in particular.

3. Program Objectives

1. Preparing the student for life as an active citizen in a conscious and responsible society.
2. Developing various personal skills.
3. Improving educational transparency and quality of education.
4. Preparing graduates specialized in the field of astronomy and space sciences who possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country.
5. Conducting specialized scientific research, whether in the department or through participation with ministries and other scientific institutions for the purpose of contributing to the advancement of astronomy and space sciences and keeping pace with scientific development in this field.
6. Providing scientific consultations to various scientific departments and institutions, including, for example, the Ministry of Higher Education, Universities, Science, Technology and Environment, the Ministry of Youth, and the Civil and Military Aviation Authority.
7. Encouraging distinguished students in this field to become teaching assistants in the department and faculty members in the future
8. Working to achieve educational quality and academic accreditation by developing and updating curricula to suit modern scientific development

9. Providing a practical course parallel to the theoretical course helps students understand the educational outcomes during theoretical education, as well as helping the student how to use the electronic calculator and keep up with global progress in the field of electronic computers, information technology, networks and their applications, and software used in the field of astronomy.
10. Preparing qualified scientific staff to develop integrated plans for the organizations they supervise that help in making the right decisions.
11. Studying modern astronomy from new theories and facts to understand the development taking place in astronomy and space, the emergence of the universe, its nature, origin and future, and the physical properties related to various astronomical aspects, and to realize the ability of the Almighty Creator to create the universe.
12. The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.
13. Develop the student's transferable personal skills such as oral and written communication, making tables, handling and analyzing data, leading group work, etc.
14. Providing all facilities and possibilities available for the student's academic study, which in turn encourages the student to persevere and compete.
15. Demonstrating the improvement in the student's critical and quantitative thinking by applying the scientific method in reality and theory in classroom learning, astronomical, physical, mathematical, and computer scientific activities.
16. Encouraging doctoral graduates to join the International Astronomical Union (IAU) through the Department of Astronomy and Space, the only official representative of the Union from Iraq.

4. Program Accreditation
There is not

5. Other external influences
There is not

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements				
College Requirements				
Department Requirements	51	113		
Summer Training	1	--		After the third stage
Other	--	--	--	--

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
Second Stage (First Semester)			theoretical	practical
	AS 201	Celestial Mechanics	3	-
	AS 203	Computer III	-	2
	AS 205	Applied Mathematics	2	-
	AS 207	Thermodynamics	1	-
	AS 209	Atomic Physics	2	2
	AS 211	Numerical Analysis	2	2
	AS 213	Stellar Physics	1	2
	AS 215	English language	2	-
Year/Level	Course Code	Course Name	Credit Hours	
Second Stage (Second Semester)			theoretical	practical
	AS 202	Orbital Dynamic	2	2
	AS 204	Computer IIII	-	2
	AS 206	Differential Equations	2	-
	AS 208	Atmospheric physics	1	-

	AS 210	Modern Physics	2	2
	AS 212	Complex Analysis	2	2
	AS 214	Astronomical Imaging	1	2
Year/Level	Course Code	Course Name	Credit Hours	
Third Stage (First Semester)			theoretical	practical
	AS 301	Astronomical Applications	2	2
	AS 303	Galaxies I	2	–
	AS 307	Fundamentals of Remote Sensing	1	2
	AS 311	Mathematical Modeling I	1	2
	AS 313	Optics I	2	2
	AS 305	Statistical Mechanics	2	–
	AS 315	Cosmic Plasma	1	2
	AS 309	Elective Subject –Ionosphere of Earth –Extra Galactic Astronomy I	2	–
Year/Level	Course Code	Course Name	Credit Hours	
Third Stage (Second Semester)			theoretical	practical
	AS 302	Astronomical Techniques	2	2
	AS 304	Quantum Mechanics	2	–
	AS 306	Galaxies II	2	–
	AS 308	Mathematical modeling II	1	2
	AS 312	Optics II	2	2
	AS 310	Geographic Information System	1	2
	AS 314	Elective Subject	2	–

	AS 316	English language	2	–
Year/Level	Course Code	Course Name	Credit Hours	
Fourth Stage (First Semester)			theoretical	practical
	AS 401	Digital Image Processing I	2	2
	AS 403	Radio Astronomy I	2	2
	AS 407	Nuclear Physics I	2	2
	AS 413	Satellites I	2	–
	AS 409	Cosmology I	2	–
	AS 411	Spectroscopy	2	–
	AS 415	Observational Techniques	1	2
	AS 405	Elective Subject –Solar Magnetism I –Radiation Astronomy I –Planetary physics I	2	–
	AS 417	English language	2	–
Year/Level	Course Code	Course Name	Credit Hours	
Fourth Stage (Second Semester)			theoretical	practical
	AS 410	Digital Image Processing II	2	2
	AS 404	Radio Astronomy II	2	2
	AS 402	Nuclear Physics II	2	2
	AS 412	Satellites II	2	–
	AS 408	Cosmology II	2	–
	AS 414	Photometry	2	–
	AS 406	Elective Subject	2	–
	AS 416	Research Project	2	–

8. Expected learning outcomes of the program

Knowledge

1. Enabling students to obtain knowledge and understanding of the principles, scientific foundations and theories of astronomy and space.
2. Enabling students to gain an understanding of modern and advanced scientific topics in the field of astronomy and space.
3. Enabling students to gain an understanding of the basic principles of the operation of astronomical telescopes of various types and to build the image of our universe emerging from the Earth to the solar system to the galaxy to cosmology.
4. Enable students to gain an understanding of how to use optical and radio astronomical telescopes for astronomical observation purposes.
5. Enable students to gain an understanding of mathematical foundations, calculus exercises, differential equations, advanced mathematics, and equations for the study of astronomy and space.
6. Giving students a solid scientific curriculum that qualifies students for professional practical astronomical photography and monitoring the movement and orbits of satellites.
7. Introducing students to processing space images, space and frequency imaging systems, the method of representing digital images, remote sensing techniques, geographic information system, and remote sensing.
8. That the student will be able to learn about cosmology, the emergence and development of galaxies, stars, interstellar matter, gases, cosmic dust, high-energy radiation astronomy, radio astronomy, atomic, modern and nuclear physics, nuclear interactions and cosmic plasma in the basic structure of the universe, and to know and understand the theories and laws that were developed on this unique scientific basis.
9. Introducing the student to how to find the coordinates of a celestial body and determine its distance, speed, and momentum, as well as converting the known celestial coordinates between them.
10. Enabling the student to find many important astronomical values in determining prayer times and the new moon, monitoring the movement of planets, dwarf planets, asteroids, comets, the moon, and stars, and drawing some maps in this regard.
11. Study of classical, quantitative and statistical mechanics and the theory of relativity, which are considered the basic basis for understanding any system in the universe, whether it is a microscopic system. Without it, it is not possible to understand and study any system, including complex cosmic systems.
12. The study of the layers of the atmosphere, the physics of the atmosphere and space, and terrestrial and solar magnetism is one of its broadest scientific branches.
13. Enabling the student to know the basics of computers and software, understanding the art of printing, and developing the students' skills in dealing with computers through applying various programs such as MATLAB, BASIC, and Microsoft, and knowing the factors affecting mathematical functions and equations and the way they are represented.
14. Enabling the student to understand modern and advanced scientific topics related to astronomy and space sciences that rely on the English language.

Skills
1. Giving students specialized theoretical and practical scientific skills 2. Giving students thinking and analysis skills in both theoretical and practical aspects 3. Giving students skills related to developing the programming aspect and specialized mathematical calculations 4. Enabling students to obtain theoretical experiences and develop educational skills in the field of astronomy and space. 5. Training students on mathematical operations skills related to calculating some of the astronomical and physical coefficients and parameters necessary for study 6. Teaching the student the skills of typing and writing, making and organizing tables, dealing with and analyzing data, and presenting lectures and seminars in a simple, clear and productive manner. 7. Developing the student's skills and linguistic capabilities that help raise the student's level of dealing with and understanding the study materials given in the English language. 8. Developing the student's ability to deal with any computer system in general, including Windows...etc. 9. Practical experiments and the software used give students some experience and skills, and accustom them to deducing and analyzing scientific results. 10. Practical experiences help students think, discover, and research by training them in the method of scientific research.
Ethics
1. Urging students to commit, persevere, and make every effort to obtain academic knowledge 2. Positive and constructive interaction with students for the purpose of motivating them to accept the scientific material 3. Encouraging students to develop thinking and purposeful scientific research and moving away from the traditional memorization approach 4. Developing Internet research skills to expand students' cognitive horizons 5. Developing the creative ideas of gifted students through the use of brainstorming 6. Refine the student's personality by acquiring university values and exemplary good behavior 7. Developing the student's ability and his relationships with his colleagues for the better so that he always behaves honestly and ethically in all his dealings while at the university and after it. 8. Introducing the student to the importance of the scientific material given to him during his studies in relation to his specialty and the extent of benefiting from it for the post-graduation stage. 9. Teach the student the importance of simulation in understanding cosmic phenomena in an accurate scientific manner.

9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge

4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "advisory" assistance or receiving "advisory" assistance from these students.

10. Evaluation methods

1. Asking direct oral questions
2. Scientific reports and daily assignments
3. Short daily exams (Quiz) in the theoretical and practical aspects
4. Assigning students to make reports on the completed experiment, discuss the results, and set grades for homework assignments and scientific reports
5. Placing various problems at the end of each chapter to strengthen the student on the correct scientific solution and how to derive the mathematical and physical equations related to the topic.
6. Monthly exams (with various questions and multiple options) in the theoretical and practical aspects
7. Talking or discussing with students is not allowed during tests, which may lead to failure of the test and evaluation
8. Final semester exams.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
professor	7				7	
Assistant Professor	13				13	
Instructor	19				19	
Assistant Instructor	5				5	

Professional Development
Mentoring new faculty members
Participating in courses on teaching methods, Arabic and English language proficiency, passing the teaching aptitude exam, and other professional teaching courses.
Professional development of faculty members
1. Training in evaluating teaching performance of all kinds and giving it importance in teaching and development courses 2. Attending training courses 3. Attending continuing education courses and seminars 4. Online learning. 5. Discussions inside and outside the work environment, which helps in career development

12. Acceptance Criterion
Central - scientific specialization According to the instructions of the Ministry of Higher Education and Scientific Research, so that it matches the latest admission requirements in Iraqi universities, while setting standards for accepting students into the department, including (the general average of the baccalaureate degree)

13. The most important sources of information about the program
1. University requirements 2. Local scientific trends 3. Global scientific trends 4. Studies and questionnaires 5. Internet information network 6. Academic curricula 7. Experiences of Arab and international universities 8. Adoption of the European Credit Transfer and Accumulation System (ECTS)

14. Program Development Plan
1. Modernizing the educational system by adopting modern educational systems in the field of teaching and learning. 2. Adopting a system for managing and monitoring quality to ensure raising the level of performance at all levels (educational, research, and community service). 3. Developing the levels of educational services provided, including: faculty members, courses, teaching methods, training, and available educational resources. This development should be

compatible with the progress made in the field of astronomy, to the extent that it ensures the graduation of cadres capable of keeping pace with cultural development in this field.

4. Providing a curriculum that gives students the opportunity to choose between multiple specializations, to be able to prepare graduates with diverse and disparate specialized scientific backgrounds.

5. Contributing with ideas, projects and research for the benefit of community development.

6. Providing the appropriate climate to support students' cultural, social, and sporting activities to ensure the preparation of a generation capable of interacting positively with the movement of societal development.

7. The department seeks to obtain local or international program accreditation

8. Forming a technical committee for quality assurance to follow up on the department's efforts in preparing evaluation reports against institutional standards as part of the college's efforts to obtain institutional accreditation.

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4

- Please tick the boxes corresponding to the individual program learning outcomes under evaluation.

Course Description Form

1. Course Name:
Fundamentals of Remote Sensing
2. Course Code:
AS 307
3. Semester / Year:
First semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
1 theoretical hour * 15 weeks = 15 hours (theoretical) 2 working hours * 15 weeks = 30 hours (practical) Total number of hours = 45 hours Number of units = 3 units (theoretical 1 + practical 2)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Yasser Chasib Bakheet Email: yasser.bakheet@sc.uobaghdad.edu.iq
8. Course Objectives
The main purpose of the course is to study the basic principles of remote sensing by giving a comprehensive description of everything related to this important subject, starting with introducing the concept of remote sensing, the basic components of the remote sensing process, the benefits of remote sensing technology, applications of remote sensing technology, types of remote sensing systems based on Energy source, properties of electromagnetic rays, advantages of electromagnetic rays, wave and particle models of electromagnetic rays, properties of the electromagnetic spectrum, main regions of the electromagnetic spectrum, types of remote sensing systems based on the regions of the electromagnetic spectrum, optical, thermal and microwave remote sensing systems, interaction of electromagnetic rays with particles present in Earth's atmosphere, interaction of electromagnetic rays with the Earth's surface, spectral reflectivity fingerprint of plants, water and soil, types of platforms and sensors in remote sensing, components and types of digital images, characteristics and features of satellite images, sources of satellite images, analysis and interpretation of satellite images, satellites and others. Among the concepts related to this topic, the science of remote sensing is currently used in many uses, including: studying the Earth’s surface, exploring minerals, oil and gas, studying the environment, pollution, agriculture, forests, population, studying archaeological sites, and managing infrastructure in cities and population centers such as transportation, emergency services, and rescue.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge

4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	1	Introduction: Principle of Remote Sensing, Remote Sensing Definition, The Basic Components of Remote Sensing	Studying the basic principles of remote sensing science, defining remote sensing science, knowing the basic components of remote sensing science.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	1	Advantages of Remote Sensing Technology, Applications of Remote Sensing Technology, Types of Remote Sensing Systems Based on Source of Energy	Studying the benefits of remote sensing technology, applications of remote sensing technology, types of remote sensing systems based on the power source.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	1	Electromagnetic Radiation (EMR) Properties, Characteristics of Electromagnetic Radiation, The Wave Model of Electromagnetic Radiation	Study of the properties of electromagnetic rays, advantages of electromagnetic rays, wave and particle models of electromagnetic rays	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	1	The Particle Model of Electromagnetic Radiation, The Electromagnetic Spectrum (EMS) Properties, The Major Regions of the Electromagnetic Spectrum	Study of the characteristics of the electromagnetic spectrum, the main regions of the electromagnetic spectrum, types of remote sensing systems based on the regions of the electromagnetic spectrum.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

5th	1	Types of Remote Sensing Systems Based on Region of Electromagnetic Spectrum, Optical Remote Sensing Systems	Studying the types of remote sensing systems based on the regions of the electromagnetic spectrum, optical remote sensing systems.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	1	Thermal Infrared Remote Sensing Systems, Microwave Remote Sensing Systems	Study of thermal and microwave remote sensing systems	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	1	Interaction of Electromagnetic Radiation with Particles in the Atmosphere	Studying the interaction of electromagnetic rays with particles in the Earth's atmosphere	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	1	Interaction of Electromagnetic Radiation with Earth Surface	Study of the interaction of electromagnetic rays with the Earth's surface	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	1	Spectral Reflectance Signature, Spectral Reflectance for Vegetation, Spectral Reflectance for Soil, Spectral Reflectance for Water	Study of the spectral reflectance fingerprint of plants, water and soil	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	1	Remote Sensing Platforms and Sensors	Studying the types of platforms and sensors used in the remote sensing process	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	1	Components of digital images, Comparison of satellite images and Aerial photos	Study the components and types of digital images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	1	Technical characteristics of satellite imagery,	Study the characteristics and features of satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	1	Photographic sources of remote sensing	Study of photographic sources of satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

14th	1	Interpretation and analysis of satellite images	Study of analysis and interpretation of satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	1	Satellites	Study of the characteristics of artificial satellites	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

Course Structure: Practical

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Principles of Remote Sensing (Basic Concepts) Remote Sensing Definition, Remote Sensing Applications, Electromagnetic Spectrum Characteristics	Definition of remote sensing, the benefit of studying remote sensing, the most important applications of remote sensing, a review of the electromagnetic spectrum and knowing what are the most important bands useful in studying remote sensing.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Principles of Remote Sensing (Basic Concepts)	Knowing how satellites work and how to take satellite images of various terrestrial phenomena. Knowing what is meant by a digital satellite image and what its types are. Knowing how to record and represent digital satellite images.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Principles of Remote Sensing (Basic Concepts)	Knowing the most important satellites currently used that produce space images and their most important characteristics, knowing the difference between grayscale and color satellite images, getting an idea about the types of resolution of satellite images (simple, medium, and high).	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

4th	2	Explain ENVI 5.1 Program Interface, define interface icons Opening and Displaying Satellite Images, Explain Data Manager Window	Explanation of the ENVI program interface, explanation of the interface icons, knowledge of how to open and display satellite images, explanation of the space data management window	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Activation the Overview in the Layer Manager, Working with Layers and Multiple Views, Explain File Information Window, Explain Band Selection window	Explanation of activating satellite image preview in the layers management window, working with image layers and multiple display windows, explanation of the satellite image file information window, explanation of the window for selecting satellite image packages for the purposes of manipulating color components.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Explain Metadata Viewer window, Definition the Multiple Views for ENVI Program, Link Multiple Views (Link between two Images) in ENVI Program, Cursor Value window, Crosshairs Value window, Rotate Satellite Image to a Specified angle, Creating Regions of Interest	Explanation of the space image metadata review window, introduction to multiple display windows, knowledge of how to link two satellite images, knowledge of the details of the indicator value window, knowledge of the details of the intersection indicator window, knowledge of how to rotate satellite images at a specific angle, knowledge of how to build a study area	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Working with ENVI's Buttons and Sliders, working with Enhancement Tools, Brightness, Contrast, Sharpen, Transparency, Enhancement the Satellite image from Contrast Stretch Type, Mensuration, Portals	Knowing how to work with the buttons and sliders in the Envy program, working with tools to improve the features of a satellite image, brightness, contrast, sharpness or roughness, transparency, improving the features of a satellite image by changing the type of contrast extension,	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

			knowing how to measure the distance between two points, comparing two images from Through the motor gate		
8th	2	A General Review	A general and comprehensive review of all previously acquired curriculum items	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Experiment # 1 Atmospheric Correction for Satellite Images	Experience No. (1) A practical application aimed at removing the effect of the atmosphere from satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Experiment # 2 Spatial Subset of Study Area from Satellite Images	Experience No. (2) A practical application aimed at implementing spatial subtraction of the study area from satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Experiment # 3 Applying Unsupervised Classification for Satellite Images	Experience No. (3) A practical application aimed at implementing unsupervised classification of satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Experiment # 4 Creating a Mosaic Image from Satellite Images	Experience No. (4) A practical application that aims to build or generate a mosaic image from satellite images	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Experiment # 5 Compute the Surface Temperature from Landsat-8 (TIRS) images (Thermal Infrared Band)	Experience No. (5) A practical application aimed at calculating the surface temperature of a geographic area from Landsat-8 satellite images (infrared thermal band)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	General Review of all Experiments	A general and comprehensive review of all practical laboratory experiments (re-implementation and application of practical experiments in preparation for exams)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	(First Semester Exam)	(End of first semester exam)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	"Computer Processing of Remotely-Sensed Images an Introduction", Fourth Edition, Paul M. Mather, 2014
Main references (sources)	Remote Sensing Handbook, Volume I Book by (Prasad S. Thenkabail), 2016
Recommended books and references (scientific journals, reports...)	Practical Handbook of Remote Sensing, Book by (Samantha Lavender), 2016
Electronic References, Websites	1. United States Geological Survey (USGS) Earth Explorer Archive (http://Earthexplorer.usgs.gov/) 2. Harris Corporation (http://www.harris.com/) 3. (http://www.rsi.ca) 4. (http://rst.gsfc.nasa.gov/) 5. (http://www.earthsat.com/)

Course Description Form

1. Course Name:
Extragalactic Astronomy I
2. Course Code:
AS 309
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week * 15 weeks = 30 hours
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Hareth Saad Mahdi **Email: hareth@uobaghdad.edu.iq**
8. Course Objectives
1. Introduce the fundamental applications of extragalactic sources and phenomena and their astrophysical applications. 2. Develop problem solving skills and understand the role of solving various astrophysical problems. 3. Study basic mathematical concepts and how to use them to solve astrophysical problems. 4. Develop the knowledge and skills of research scientific methodology and deal with various problems. 5. Understand various cosmological phenomena and the theories of formation and evolution of the Universe. 6. Understand the formation of astronomical structures such as galaxies, groups and clusters of galaxies, black holes …etc.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	General Introduction	Elementary Particles and constituents of matter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	General Introduction	Extragalactic sources and Phenomena	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Electromagnetic Radiation	Electromagnetic Spectrum	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Electromagnetic Radiation	Wavelength, frequency and energy	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Electromagnetic Radiation	The Doppler effect (redshift, radial velocity)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Formation and evolution of the Universe	The components of the Universe	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Formation and evolution of the Universe	Dark matter	Paper lectures, Electronic screen, Video lectures via electronic	Daily, semester, final exams, reports, and assignments

				classes	
8th	2	Formation and evolution of the Universe	The nature of dark matter (baryonic and non-baryonic)+ Candidates of dark matter (MACHOs, WIMPs, ….etc)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Formation and evolution of the Universe	Evidence for dark matter in spiral galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Black holes	Parts of black holes Types of black holes	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Black holes	Escape velocity from a black hole Schwarzschild radius	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Measurement of mass of spirals	Total mass and masses of visible and dark matter in spiral galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Formation of structures	Evidence for dark matter galaxy clusters	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Formation of structures	Virial mass and crossing time, classification scheme of dark matter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	Exam	Exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including Quizzes, Homeworks and Monthly exams) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Peter Schneider**, "Extragalactic Astronomy and Cosmology",** Springer, 2015.
Main references (sources)	Andrew Liddle, "**Astronomy Methods** ", John Wiley & Sons Ltd, 2003.
Recommended books and references (scientific journals, reports...)	Daniel Fleisch and Julia Kregenow, **"A Student's Guide to the Mathematics of Astronomy"**, Cambridge University Press, 2013.
Electronic References, Websites	استخدام المراجع العلمية الالكترونية الخاصة بالبحوث وخصوصاً موقع The SAO/NASA Astrophysics Data System Abstract Service

Course Description Form

1. Course Name:
Extragalactic Astronomy II
2. Course Code:
AS 314
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week * 15 weeks = 30 hours
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Hareth Saad Mahdi **Email: hareth@uobaghdad.edu.iq**
8. Course Objectives
1. Introduce the fundamental applications of extragalactic sources and phenomena and their astrophysical applications. 2. Develop problem solving skills and understand the role of solving various astrophysical problems. 3. Study basic mathematical concepts and how to use them to solve astrophysical problems. 4. Develop the knowledge and skills of research scientific methodology and deal with various problems. 5. Understand various cosmological phenomena and the theories of formation and evolution of the Universe. 6. Understand the formation of astronomical structures such as galaxies, groups and clusters of galaxies, black holes …etc.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Dark energy and t expansion of the Universe	The Hubble law and the expanding Universe	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Dark energy and t expansion of the Universe	Evidences for dark energy in the Universe	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Measurement of astronomical parameters	Angular size	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Measurement of astronomical parameters	Angular resolution	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Astronomical observations	Optical and radio observations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Formation of structures	Formation and evolution of structures in the Universe	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Formation of structures	Classification of Structures (galaxies, groups and clusters)	Paper lectures, Electronic screen, Video lectures via electronic	Daily, semester, final exams, reports, and assignments

				classes	
8th	2	Physical properties of structures	Color index and color Distribution	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Astrophysical properties of structures	Extragalactic distances	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Astrophysical properties of structures	Hubble distance+ Angular diameter distance	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Astrophysical properties of structures	Luminosity distance+ Distance modulus	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Concepts of extragalactic theories	Gravitational Lensing (Introduction)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Concepts of extragalactic theories	Types and applications of gravitational lensing	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Extragalactic concepts	The cosmological parameters	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	Exam	Exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11. Course Evaluation					
Overall score out of 100					

(Semester grade = 40, including Quizzes, Homeworks and Monthly exams) (End-of-semester exam score = 60)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Peter Schneider**, "Extragalactic Astronomy and Cosmology",** Springer, 2015.
Main references (sources)	Andrew Liddle, "**Astronomy Methods** ", John Wiley & Sons Ltd, 2003.
Recommended books and references (scientific journals, reports...)	Daniel Fleisch and Julia Kregenow, **"A Student's Guide to the Mathematics of Astronomy"**, Cambridge University Press, 2013.
Electronic References, Websites	استخدام المراجع العلمية الالكترونية الخاصة بالبحوث وخصوصاً موقع The SAO/NASA Astrophysics Data System Abstract Service

Course Description Form

1. Course Name:
Optics I
2. Course Code:
AS 313
3. Semester / Year:
First / 2023-2024
4. Description Preparation Date:
2024/4/24
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours **15 weeks * 2 = 30 hour**
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Ahmed Kamel **Dr. Lana Talib Ali** **Dr. Rasha Hashim Ibrahim** **Dr. Sura Esmael Jbori** **Email: ahmedKamil73@gmail.com** **lana.t@sc.uobaghdad.edu.iq** **Rasha.Ibrahim@sc.uobaghdad.edu.iq** **Sura.gbori@sc.uobaghdad.edu.iq**
8. Course Objectives
1. Preparing graduates specialized in the field of astronomy and space sciences who possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country. **2. Increasing students' knowledge about the nature of light and how it behaves in different media. In addition to learning about optical tools and devices and their importance in astronomical observations. Learn how to use optical tools and devices in astronomical observations.** **3. Develop the student's transferable personal skills such as oral and written communication, making tables, handling and analyzing data, leading group work, etc.** **4. Working to achieve educational quality and academic accreditation by developing and updating curricula to suit modern scientific development** **5. The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.**
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.

2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Scientific basics of a laboratory and the purpose of the laboratory	Increasing students' knowledge about the nature of light and how it behaves in different media	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
2nd	2	Determination of the refractive index of liquid.	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
3rd	2	Discussing previous experience Solve questions and explain Related derivations With the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
4th	2	Determination the Focal Length of Convex Lens	Learning about convex lenses and compound lenses and how to determine their focal length.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.

5th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
6th	2	Determination the Focal Length of Concave Lens	Learning about concave lenses and how to determine their focal length.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
7th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
8th	2	Aberration of Lenses	Learning about the aberration of lenses and how to determine the Axial Chromatic Aberration and dispersion power of convex lens.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
9th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
10th	2	The prism and estimation its dispersion and resolving powers	Learning how to find the prism apex angle, minimum deviation angle, refractive index	Paper lectures, Electronic screen,	Weakly reports, assignments, and quiz.

			of prism, and prism dispersion and resolving powers.	Video lectures via electronic classes	
11th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
12th	2	Polarization and analyzation	Learning about polarization and its types	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
13th	2	Discussing previous experience Solve questions and explain Related derivations with the topic	The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.
14th	2	Review the previous mention subjects	/	Paper lectures, Electronic screen, Video lectures via electronic classes	/
15th	2	Exam	/	/	final exams.

11. Course Evaluation

1. Short daily written exams (Quiz) using multiple-choice questions that require scientific skill
2. Daily oral exams with various scientific questions
3. Evaluating and giving grades to students' homework and daily activities
4. Evaluating and giving grades to students through the completion of specialized scientific reports, both theoretical and practical
5. Evaluating students by conducting monthly and quarterly examinations

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1- John D. F., Astronomy Journey to the Cosmic Forntier, 4th Ed., MacGraw-Hill, USA, 2006. 2- Hannu K., Pekka K., Heikki O., Markku P. and Kar J. D., Fundamental Astronomy, 5th Ed., Springer Berlin Heidelberg, NY, 2007. 3- Diane F. M., Basics of Radio Astronomy for the Goldstone-Apple Valley Radio Telescope, California Institute of Technology,1998. 4- Roy A. and Cleark D., Astronomy Principle and Practice, 4th Ed., IOP, 2000.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Optics II
2. Course Code:
AS 312
3. Semester / Year:
Second / 2023-2024
4. Description Preparation Date:
2024/4/24
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours **15 weeks * 2 = 30 hour**
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Ahmed Kamel **Dr. Ala Fadhil Ahmed** **Dr. Lana Talib Ali** **Dr. Rasha Hashim Ibrahim** **Email: ahmedKamil73@gmail.com** **lana.t@sc.uobaghdad.edu.iq** **Rasha.Ibrahim@sc.uobaghdad.edu.iq**
8. Course Objectives
1. Preparing graduates specialized in the field of astronomy and space sciences who possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country. **2. Increasing students' knowledge about the wave nature of light, its phenomenon, effects on optical systems, and importance in astronomical observations.** **3.Develop the student's transferable personal skills such as oral and written communication, making tables, handling and analyzing data, leading group work, etc.** **4. Working to achieve educational quality and academic accreditation by developing and updating curricula to suit modern scientific development** **5. The student acquires thinking and problem-solving skills by developing systematic skills for dealing with problems, which includes the student's ability to approach the problem, divide it into various parts, recognize the knowledge he has, find the missing knowledge, and apply it to solve the problem.**
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.

2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation	metho
1st	2	Scientific basics of a laboratory and the purpose of the laboratory	Increasing students' knowledge about the wave nature of light and what its phenomenon, application, and effects in astronomy.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports, assignments, and quiz.	
2nd	2	Diffraction from a Single Slit	Learning about the diffraction phenomena and its type using single slit. Besides, studying the intensity distribution for Fraunhoffer diffraction.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.	
3rd	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.	
4th	2	Diffraction Grating	Studying diffraction phenomena via the diffraction grating and finding the wavelength of the combination of polychromatic light. Studying and	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.	

			calculating the dispersion and resolving power of the grating.		
5th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
6th	2	Multiple Reflection Interference - Newton's Rings	Study the interference phenomenon of multiple reflections of waves from variable air film thickness. (Newton's rings). Determine the wavelength of monochromatic light by calculation of the Newton's rings diameter.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
7th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
8th	2	Heisenberg's Uncertainty Principle	Verifying Heisenberg uncertainty principle for diffraction by a single slit.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
9th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
10th	2	Determination of Light Wavelength via Lloyd's Mirror Interference	Determine the wavelength of monochromatic light by using Lloyd's mirror	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
11th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
12th	2	Photo-Voltaic Cell	Verifying the inverse square law. Learning about the	Paper lectures, Electronic screen,	Weakly reports assignments, and quiz.

			spectral distribution Curve of the Photo-Voltaic Cell.	Video lectures via electronic classes	
13th	2	Discussing previous experience Solve questions and explain Related derivations With the topic	Learning about the index of refraction and how it can be determined in a given medium via different methods.	Paper lectures, Electronic screen, Video lectures via electronic classes	Weakly reports assignments, and quiz.
14th	2	Review the previous mention subjects	/	Paper lectures, Electronic screen, Video lectures via electronic classes	/
15th	2	Exam		Final exam	

11. Course Evaluation

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- John D. F., Astronomy Journey to the Cosmic Forntier, 4th Ed., MacGraw-Hill, USA, 2006. 2- Hannu K., Pekka K., Heikki O., Markku P. and Kar J. D., Fundamental Astronomy, 5th Ed., Springer Berlin Heidelberg, NY, 2007. 3- Diane F. M., Basics of Radio Astronomy for the Goldstone-Apple Valley Radio Telescope, California Institute of Technology,1998. Roy A. and Cleark D., Astronomy Principle and Practice, 4th Ed., IOP, 2000.
Main references (sources)	
Recommended books and references (scient journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Optics I
2. Course Code:
AS 313
3. Semester / Year:
First Semester/2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical Hours **2 Practical Hours**
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Ahmed Kamil Ahmed **Email: ahmed.ahmed@sc.uobaghdad.edu.iq**
8. Course Objectives
Preparing graduates specialized in the field of astronomy and space sciences that possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country. Conducting specialized scientific research, whether in the department or through participation with ministries and other scientific institutions for the purpose of contributing to the advancement of astronomy and space sciences and keeping pace with scientific development in this field.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by providi "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

❖ **Nature and Propagation of Light:**

1. Introduction.
2. Properties of light.
3. Refractive index.
4. Optical path.
5. Speed of light.
6. Shadows.
7. Wavelength of light.
8. Electromagnetic spectrum.
9. Visible region.
10. Dual nature of light.
11. Fermat principle.

❖ **Reflection and Refraction at Plane Surfaces:**

1. Light rays.
2. Reflection and refraction at plane surface.
3. Critical angles and total internal reflection.
4. Refraction by plane parallel plates.
5. Refraction by prism.
6. Minimum deviation angle.
7. Dispersion.

❖ **Reflection and Refraction at Spherical Surfaces:**

1. Sign convention.
2. Reflection and refraction at spherical surfaces.

3. Lateral and longitudinal magnification.
4. Focal points and focal lengths.
5. Virtual images.
6. Derivation of Gaussian formula.

❖ **Lenses:**

1. Lenses terminology.
2. Thin lenses.
3. Focal points and focal lengths.
4. Conjugate points.
5. Image tracing.
6. Lens maker's equation.
7. Gaussian formula of thin lenses.
8. Magnification.
9. Power of the lens.
10. Compound lenses and equivalent focal length.
11. Thick lens optics.

❖ **Lens Aberrations:**

1. First order theory.
2. Third order aberration.
3. Chromatic aberration.
4. Achromatic lenses.
5. Spherical aberration.
6. Astigmatism.
7. Distortion.
8. Coma.
9. Curvature of the field.

11. Course Evaluation	
Overall Score out of 100 (Semester Grade = 40, Including: 25 for Theoretical + 15 for Practical) (End-of-Semester Exam Score = 60, Including 40 for Theoretical + 20 for Practical)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Principles of Physics Series (OPTICS) By: Francis Weston Sears
Main references (sources)	Astronomy Journey to the Cosmic Forntier By: John D. F.
Recommended books and references (scientific journals, reports...)	Astronomy Principle and Practice By: Roy A. and Cleark D.
Electronic References, Websites	NED

نموذج وصف المقرر

1. اسم المقرر:
البصريات Optics (I)
2. رمز المقرر:
AS 313
3. الفصل/ السنة:
الفصل الدراسي الأول/العام الدراسي 2023-2024
4. تاريخ اعداد هذا الوصف:
2/4/2024
5. اشكال الحضور المتاحة:
اسبوعي حضوري
6. عدد الساعات (الكلي)/عدد الوحدات (الكلي):
2 ساعة نظري **2** ساعة عملي
7. اسم مسؤول المقرر الاساسي (اذا كان اكثر من اسم يذكر):
الاسم: أ.م.د. أحمد كامل أحمد **الايميل:** ahmed.ahmed@sc.uobdghdad.edu.iq
8. اهداف المقرر:
اعداد خريجين متخصصين في مجال علوم الفلك والفضاء يمتلكون مهارات علمية نظرية وعملية لغرض تلبية احتياجات الوزار والمؤسسات العلمية الاخرى بكوادر ذات كفاءة عالية يساهمون في خدمة وبناء البلد. أجراء البحوث العلمية التخصصية سواء في القسم أو من خلال المشاركة مع الوزارات والمؤسسات العلمية الاخرى لغر المساهمة في رفد علوم الفلك والفضاء ومواكبة التطور العلمي في هذا المجال.
9. استراتيجيات التعليم و التعلم:
1. توضيح وشرح المواد الدراسية من خلال الصفوف الالكترونية او اي وسائط التعليم الحضوري او الالكتروني المعتمدة من خلال التعليم المدمج وبالامكان استخدام وسائط السبورة البيضاء واستخدام (Power Point)) بواسطة شاشاتLCD)) و(Show) Data لهذا الغرض 2. تزويد الطلبة بالمعرفة من خلال الواجبات البيتية المتعلقة بالمنهج الدراسي النظري والعملي 3. مطالبة الطلاب بزيارة المكتبات العلمية للحصول على المعرفة الاكاديمية 4. تحسين وتوجيه ودعم المعرفة العلمية للطلبة من خلال تشجيعهم على زيارة المواقع الالكترونية المختلفة 5. دعم الدراسة العملية المختبرية للطلبة من خلال توفير امسيات رصد فلكية على مدار السنة الدراسية 6. الشرح المبسط والمتسلسل للموضوع نظرياً والاسترسال بالمواضيع من حيث الصعوبة وتطبيقها عمليا لايصال الفكرة بشكل واضح ومنها على سبيل المثال عمل الفيديوهات المناسبة لهذا الغرض 7. ترجمة المواضيع و المفردات النظرية الخاصة بمواد القسم التعليمية المتنوعة وكيف يمكن تحويل بعض المعالجات الى برامج حاسوبية ذات فائدة علمية وتعلمية كبيرة 8. تطوير الجانب البرمجي والرياضي التحليلي للطالب 9. مناقشة المعلومات والمفاهيم المشمولة في المحاضرة مع الطلاب من خلال تقديم المساعدة "الاستشارية" أو تلقيه المساعدة "الاستشارية" من هؤلاء الطلاب.

❖ Nature and Propagation of Light:

1. Introduction.
2. Properties of light.
3. Refractive index.
4. Optical path.
5. Speed of light.
6. Shadows.
7. Wavelength of light.
8. Electromagnetic spectrum.
9. Visible region.
10. Dual nature of light.
11. Fermat principle.

❖ Reflection and Refraction at Plane Surfaces:

1. Light rays.
2. Reflection and refraction at plane surface.
3. Critical angles and total internal reflection.
4. Refraction by plane parallel plates.
5. Refraction by prism.
6. Minimum deviation angle.
7. Dispersion.

❖ Reflection and Refraction at Spherical Surfaces:

1. Sign convention.
2. Reflection and refraction at spherical surfaces.
3. Lateral and longitudinal magnification.
4. Focal points and focal lengths.
5. Virtual images.
6. Derivation of Gaussian formula.

❖ Lenses:

1. Lenses terminology.
2. Thin lenses.
3. Focal points and focal lengths.
4. Conjugate points.
5. Image tracing.
6. Lens maker's equation.
7. Gaussian formula of thin lenses.
8. Magnification.
9. Power of the lens.
10. Compound lenses and equivalent focal length.
11. Thick lens optics.

❖ Lens Aberrations:

1. First order theory.
2. Third order aberration.

3. Chromatic aberration.
4. Achromatic lenses.
5. Spherical aberration.
6. Astigmatism.
7. Distortion.
8. Coma.
9. Curvature of the field.

11. تقييم المقرر:

الدرجة الكلية من 100
(درجة السعي الفصلي = 40 يشمل : 25 للنظري + 15 للعملي)
(درجة امتحان نهاية الفصل= 60 يشمل 40 للنظري+ 20 للعملي)

12. مصادر التعلم و التدريس:

الكتب المقررة المطلوبة (المنهجية ان وجدت)	Principles of Physics Series (OPTICS) By: Francis Weston Sears
المراجع الرئيسية (المصادر)	Astronomy Journey to the Cosmic Forntier By: John D. F.
الكتب و المراجع الساندة التي يوصى بها (المجلات العلمية و التقارير....)	Astronomy Principle and Practice By: Roy A. and Cleark D.
المراجع الالكترونية ، مواقع الانترنيت	استخدام أي مرجع الكتروني رصين وموثوق بة، ومن ضمنة الموقع العلمي الكبير التابع لوكالة ناسا الفضائية (NED).

Course Description Form

1. Course Name:
Optics II
2. Course Code:
AS 312
3. Semester / Year:
Second Semester/2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical Hours **2 Practical Hours**
7. Course administrator's name (mention all, if more than one name)
Name: Assistant Prof. Dr. Ahmed Kamil Ahmed **Email: ahmed.ahmed@sc.uobaghdad.edu.iq**
8. Course Objectives
Preparing graduates specialized in the field of astronomy and space sciences that possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country. Conducting specialized scientific research, whether in the department or through participation with ministries and other scientific institutions for the purpose of contributing to the advancement of astronomy and space sciences and keeping pace with scientific development in this field.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

❖ **Optical Instruments:**

1. The eye.
2. Defect of vision.
3. Spectacles.
4. Camera.
5. Simple microscope.
6. Eyepieces.
7. Compound microscopes.
8. Telescope.
9. Spectrometer.
10. Refractometer.
11. Prism binoculars.
12. Rangefinder.

❖ **Interference:**

1. Introduction.
2. Superposition of waves.
3. Coherent sources.
4. Double slit interference.
5. Michelson interferometer.

❖ **Diffraction:**

1. Introduction.
2. Fraunhoffer and Fresnel diffraction.
3. Diffraction by a single slit.

4. Diffraction by a circular aperture.

❖ **Resolving Power:**

1. Resolving power.
2. Rayleigh's limit of resolution.
3. Limit of resolution of the eye.
4. Limit of resolution of the lens.
5. Resolving power of optical instruments.

10. Course Evaluation

Overall Score out of 100
(Semester Grade = 40, Including: 25 for Theoretical + 15 for Practical)
(End-of-Semester Exam Score = 60, Including 40 for Theoretical + 20 for Practical)

11. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Principles of Physics Series (OPTICS) By: Francis Weston Sears
Main references (sources)	Astronomy Journey to the Cosmic Forntier By: John D. F.
Recommended books and references (scientific journals, reports...)	Astronomy Principle and Practice By: Roy A. and Cleark D.
Electronic References, Websites	NED

Course Description Form

1. Course Name:
Radio Astronomy I Lab.
2. Course Code:
AS 403
3. Semester / Year:
First Semester/ 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
1 Practical hours/week = 2 hours Total number of hours per semester = 2 * 15 weeks = 60 hours Number of units = 3 units (theoretical 2 + practical 1)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Kamal M. Abood **Email: kamal.abood@sc.uobaghdad.edu.iq** **Name: Dr. Uday E. Jallod** **Email: uday.jallod@sc.uobaghdad.edu.iq** **Name: Dr. Zina F. Kadhim** **Email:** zina.kadhim@sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to provide a course of study in the physics of radio astronomy, especially radio waves, based on Knowledge of basic principles of electromagnetic waves. To develop more practical astronomy skills in the field of radio astronomy. To prepare students for a number of natural sciences courses in radio astronomy, development and radio sources emissions, as well understanding the radio astronomy concepts such as brightness temperature, radio flux density, and Planck's radiation law, among others.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Radio Astronomy I Lab.	Study the physics of radio wa	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Radio Astronomy I Lab.	Calculation of the waveleng and frequency of Jupiter Decametric emission (DAM	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Radio Astronomy I Lab.	Study of Planck's Radiation L using Different Temperature	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Radio Astronomy I Lab.	Study the Effect of Coherence for the Radio Waves	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Radio Astronomy I Lab.	Determination of Sun Brightness Temperature at 21 cm Wavelength	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Radio Astronomy I Lab.	Calculate the wavelength and frequency of the radio wave using multi frequencies (Hz, KHz, MHz and GHz)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Radio Astronomy I Lab.	**Review**	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Radio Astronomy I Lab.	**First Exam**	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	Radio Astronomy I Lab.	Study of Planck's Radiation Law using Different Temperatures	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Radio Astronomy I Lab.	Determination of Sun Brightness temperature at 21 cm wavelength	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Radio Astronomy I Lab.	Explain the Oscilloscope Demonstration	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	Radio Astronomy I Lab.	Explain the Function Generator demonstration	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	**2**	Radio Astronomy I Lab.	Second Exam.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Radio Astronomy I Lab.	Review	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th			**امتحان نهاية الفصل الدراسي الاول)**		

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Rohlfs, K. and Wilson, T.L. Tools of Radio Astronomy. 4th Edition, Springer, New York. 2004.
Main references (sources)	John D. Kraus, "Radio Astronomy" 2nd edition, Copyright 1986 by John D. Kraus. Jonathan M Marr, Ronald L Snell and Stanley E Kurtz, "FUNDAMENTALS OF RADIO ASTRONOMY Observational Methods", by Taylor & Francis Group, LLC. 2016.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Radio Astronomy I Lab.
2. Course Code:
AS 404
3. Semester / Year:
Second Semester/ 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
1 Practical hours/week = 2 hours Total number of hours per semester = 2 * 15 weeks = 60 hours Number of units = 3 units (theoretical 2 + practical 1)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Kamal M. Abood **Email: kamal.abood@sc.uobaghdad.edu.iq** **Name: Dr. Uday E. Jallod** **Email: uday.jallod@sc.uobaghdad.edu.iq** **Name: Dr. Zina F. Kadhim** **Email:** zina.kadhim@sc.uobaghdad.edu.iq **Name: Mohammed Naji Al Najm** **Email: mohalnajm@uobaghdad.edu.iq**
8. Course Objectives
This course aims to provide a course of study in the radio astronomy observation, especially radio observation techniques, based on Knowledge of basic principles of antenna pattern of radio telescopes. To develop more practical astronomy skills in the field of radio astronomy. To prepare students for a number of natural sciences courses in radio astronomy, development and radio telescope components, as well understanding the radio astronomy concepts such as power pattern, antenna gain, and antenna directivity, among others.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Radio Astronomy II Lab.	Study the resolving power of a radio telescope	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Radio Astronomy II Lab.	Study the radio power spectr	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Radio Astronomy II Lab.	Determine the observe locatio	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Radio Astronomy II Lab.	Study of Radiation Pattern for Dipole Antenna	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Radio Astronomy II Lab.	Simulation of Antenna Power Pattern for a Small Radio Telescope	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Radio Astronomy II Lab.	Estimation of Antenna Gain for a Small Radio Telescope	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Radio Astronomy II Lab.	Numerical estimation of antenna directivity	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Radio Astronomy II Lab.	**First Exam**	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	Radio Astronomy II Lab.	Study the location of Jupiter and the Sun according to the sky map	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Radio Astronomy II Lab.	Explain the Function Generator demonstration	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Radio Astronomy II Lab.	Study the principles or radio interferometry	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	Radio Astronomy II Lab.	Review	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	**2**	Radio Astronomy II Lab.	Second Exam.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Radio Astronomy II Lab.	General Review.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th			**Final Exam**		

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Rohlfs, K. and Wilson, T.L. Tools of Radio Astronomy. 4th Edition, Springer, New York. 2004.
Main references (sources)	John D. Kraus, "Radio Astronomy" 2nd edition, Copyright 1986 by John D. Kraus. Jonathan M Marr, Ronald L Snell and Stanley E Kurtz, "FUNDAMENTALS OF RADIO ASTRONOMY Observational Methods", by Taylor & Francis Group, LLC. 2016.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Celestial Mechanic
2. Course Code:
AS201
3. Semester / Year:
2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours ➡ Total =15*3=45hrs.
7. Course administrator's name (mention all, if more than one name)
Name: AbdulRahman H. Saleh **Email: a.saleh@sc.uobaghdad.edu.iq**
8. Course Objectives
1. The motions types and the circular and rotational motion. **2. Newton's laws and applications.** **3. The times and dates types.** **4. The sidereal time and the conversions between times.** **5. The Julian date and it's calculation from date.** **6. The celestial coordinate systems(ecliptic , equatorial, horizontal).** **7. The transfer between the celestial coordinate systems.** **8. The transformation between the spherical and Cartesian coordinate systems.** **9. Using the observations to find the date and time and the north direction.** **10. Using the observations to find the observer latitude and the sun declination.** **11. Calculation the Sun equatorial coordinates and used to calculate the sunrise the sunset sidereal and local time.** **12. Using the observations to find the Earth radius.** **13. The Solar and Lunar eclipse**
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation

evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provi "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	3	The motions types a the circular a rotational motion	Classical mechanic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	3	Newton's laws a applications.	=		
3ed	3	The times and da types.	Physical units		
4th	2 1	The sidereal time a the conversions betw times. The Julian date and calculation from date. Desiccation applications	Astr. Applications		
5th	3	The celestial coordin systems(ecliptic syst).	Spherical geometry		
6th	3	The celestial coordin systems(, equator horizontal systems).	=		
7th	3	The transfer between celestial coordin systems.	=		
8th	2	The transformat between the spheri and Cartesian coordin systems	=		

9th	2	Desiccation applications	=		
10t	2	Examination1			
11	3	Using the observati to find the date and ti and the north directio	Astr. Observations		
12	2	.applications	=		
13	2	Using the observati to find the obser latitude and the declination.	=		
14	3	Calculation the equatorial coordina and used to calculate sunrise and the sur sidereal and local time	Celestial mechanic		
15	3	Using the observati to find the Earth radiu 13. The Solar Lunar eclipse	=		
16	2	Examination2			

11. Course Evaluation

Two examination as well as the class and home work

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	**Astronomy principles and practice by A E Roy and D Clarke.**
Recommended books and references (scientific journals, reports...)	فيزياء الميكانيك د. عبدالرحمن حسين صالح 2003 * Text book on spherical astronomy. By Smart W.M. * Astronomy. By Fix J. D. * Astronomical formations for calculators. By Meeus J.
Electronic References, Websites	Class room , telegram group you tube my page

Course Description Form

1. Course Name:
Orbital Dynamic
2. Course Code:
AS202
3. Semester / Year:
2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 hours+ **2 hour laboratory/ Total=15*4=60 hrs.**
7. Course administrator's name (mention all, if more than one name)
Name: AbdulRahman H. Saleh **Email: a.saleh@sc.uobaghdad.edu.iq**
8. Course Objectives
1-The two body Mechanic: Newton laws. Kepler laws. Equation of motion. 2- The ellipse orbit * introduction to ellipse orbit • * Calculate the position and velocity components in elliptical orbit. * Calculate the momentum components and the energy. *Calculate the position and velocity components in equatorial plane. * Gauss matrix. * Calculate the orbital elements. * calculating the position and velocity variation with time * applications. 3- another orbits type : * The parabola and hy-parabola description. * calculate the position in the orbits. * calculate the velocity in the orbits. * calculate the orbital elements and energy in orbits . 4- The perturbations * tidal forces * solar radiation pressure effects. * The perturbations effects on the satellite orbits. 5 – The coordinates transformation *spherical to Cartesian coordinate.

* geocentric to Heliocentric coordinate.

6- The moon orbits
*The moon orbit variation.
*The crescent visibility..
* The Moon periods and months.

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provi "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	3	The two body Mechanic: Newton laws. Kepler laws.	Orbital dynamic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Equation of motion. and Newton's laws applications.	=		

3ed	2		Physical units		
4th	2	introduction to ellipse orbit * Calculate the position and velocity.	Astr. Applicatio		
5th	2	Calculate the position and velocity components in elliptical orbit. Calculate the momentum components and the energy.	Spherical geometry		
6th	2	Examination 1	=		
7th	2	The perturbations * tidal forces * solar radiation pressure effects.	=		
8th	2	The perturbatic effects on the satell orbits	=		
9th	2	Desiccation nd applicatic	=		
10t	2	Examination2			
11	2	The coordinates transformation *spherical to Cartesian coordinate. * geocentric to Heliocentric coordinate.	Astr. Observatic		
12	2	. The moon orbit variation. *The crescent visibility.. * The Moon periods	=		

		and months. Applications			
13	2	Solve the equation motion with perturbations			
14	2	The parabola and hy-parabola description. * calculate the position in the orbits. * calculate the velocity in the orbits. * calculate the orbital elements and energy in orbits .	=		
15	2	Examination2			

11. Course Evaluation

Two examination as well as the class and home work

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	**Astronomy principles and practice by A E Roy and D Clarke chpters 9, 12,13,14**
Recommended books and references (scientific journals, reports...)	الميكانيك والدينامية الحرارية د. عبدالرحمن حسين صالح 2003 *** Practical astronomy with your calculator. By Smith P.D.** *** Astronomical formations for calculators. By Meeus J.**
Electronic References, Websites	Class room , telegram group you tube my page

Course Description Form

1. Course Name:
Complex Analysis
2. Course Code:
AS 212
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
1-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 9 weeks = 18 hours 2 Practical hours/week per section * 9 weeks = 18 hours Total number of hours per section = 36 hours Number of units = 4 units (theoretical 2 + practical 2)
7. Course administrator's name (mention all, if more than one name)
Name: **Dr. Huda Shaker Ali**
8. Course Objectives
1. Understanding Basic Mathematical Methods: Students learn methods for solving linear equations using techniques such as Jacobi and Gauss-Seidel, and acquire skills in data analysis and value estimation between points. 2. Applying Mathematics in Philosophical Analysis: Using mathematical methods to understand and analyze philosophical and religious concepts, such as applying interpolation to estimate philosophical values between known points. 3. Developing Direct and Approximate Solution Skills: Enhancing skills in solving complex mathematical problems and estimating values using methods of philosophical analysis. 4. Enhancing Critical Thinking: Encouraging students to think critically and analytically in using mathematics to understand and estimate philosophical and theological issues. 5. Developing Research and Analysis Skills: Strengthening students' ability to research, analyze, and think critically about philosophical and religious issues using mathematical methods.
9. Teaching and Learning Strategies
1. Discussion and Dialogue: Encouraging students to interact and participate in group discussions on academic topics, which enhances the exchange of ideas and development of concepts on a deeper level. 2. Cooperative Learning: Organizing students into small groups to work together problem-solving or projects, fostering social interaction and collaboration among students. 3. Utilizing Technology: Using technological tools such as computers, the interne and multimedia to present information in innovative and interactive ways. 4. Project-Based Learning: Organizing practical projects that allow students to ap the concepts and skills they have learned in a real-world context.

5. Teaching by Example: Using examples and practical applications to explain difficult concepts and illustrate how they can be applied in daily life.
6. Diversifying Assessment Methods: Employing a variety of assessment methods such as traditional tests, projects, and presentations to evaluate students' understanding and skills.
7. Self-Guidance: Encouraging students to develop critical and analytical thinking skills and enhancing their abilities to organize and manage their time and personal resources.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	**2**	Introduction to Basic Mathematical Methods in Complex Analysis	Introduction to Solution Methods and Basic Mathematical Techniques in Complex Analysis	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
2nd	**2**	Jacobi Method	It is used to solve systems of linear equations, where it estimates the unknowns of the system by iteration in the solution process.	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
3rd	**2**	Gauss-Seidel Method	Similar to the previous method, it is used to solve systems of linear equations, but it relies on updating the variable values at each step.	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
4th	**2**	Homework Sessions	Homework sessions help students reinforce the concepts and skills they have learned in class during previous study days	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
5th	**2**	Introduction to Interpolation	Interpolation is the method used to calculate intermediate or missing values between known data points.	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
6th	**2**	Linear Interpolation	Used to estimate values between two known points on the line passing through them	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams

7th	**2**	Quadratic Interpolation	Used to estimate values between three known points on a curve.	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
8th	**2**	Lagrange Interpolation	Used to estimate variable values between a set of known points, using a set of basic functions	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
9th	**2**	Homework Sessions	Homework sessions help students reinforce the concepts and skills they have learned in class during previous study days	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
10th	**2**	The First Semester Exam	This assessment helps identify the concepts that need further clarification and provides support to students in areas where they find difficulty	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
11th	**2**	Curve Fitting	A process used to determine the mathematical model that fits certain data, such as linear lines and other curves.	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
12th	**2**	. Linear Curve fitting	A technique used to represent known data in a straight line so that the relationship between them is linear.	Written lectures electronic screen Video lectures via online classroom	
13th	**2**	Nonlinear Curve Fitting	involves representing the relationship between variables in data using models that are not linear	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
14th	**2**	Homework Sessions	Homework sessions help students reinforce the concepts and skills they have learned in class during previous study days	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams
15th	**2**	The second Semester Exam	This assessment helps identify the concepts that need further clarification and provides support to	Written lectures electronic screen Video lectures via online classroom	Daily, semester and final exams

			students in areas where they find difficulty		
Course Structure: Practical					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1st	**2**	**Linear system**	**Gaussian elimination**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	**Linear system**	**Jacobi method**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	**Linear system**	**Gause – Sidel method**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	**Interpolation**	**Linear interpolation**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	**First monthly Examination**		Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	**Interpolation**	**Quadratic interpolation**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	**Interpolation**	**Lagrange Interpolation**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	**Curve fitting**	**Line Curve fitting**	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams

9th	**2**	**Second monthly examination**		Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)	
12. Learning and Teaching Resources	
Required textbo (curricular books, if any)	
Main references (sources)	Numerical Methods for Engineers" J Steven C. Chapra -2010
Recommended books and references (scientific journals, reports...)	Numerical Methods for Engineers" J Steven C. Chapra -2015
Electronic Referen Websites	https://www.vedantu.com/maths/numerical-analysis

Course Description Form

1. Course Name:
Satellites I
2. Course Code:
AS 413
3. Semester / Year:
1 semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = 30 hours Number of units = 2 units (theoretical 2)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Fouad Mahmood Abdullah **Email: fouad.abdulla@sc.uobaghdad.edu.iq**
8. Course Objectives
Teaching the subject (Satellites I) aims to give students a solid scientific approach that qualifies students to know Satellites, their types, their orbit around the Earth, monitoring the movement of satellites, and enabling the student to obtain An understanding of modern and advanced scientific topics in the field of astronomy and space.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introduction to Satellites. What is a Satellite? History of the Evolution of Satellit	Introduction to Satellites	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Satellites classifications by using	Introduction to Satellites	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Orbital classifications of satellite	Definition of an Orbit	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Newton's Law of Gravitation	Definition of an Orbit	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Newton's Second Law of Motion	Definition of an Orbit	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	--	Seasonal Exam		
7th	2	Kepler's laws	Orbiting Satellites	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Dynamic of Satellite orbits	Satellite Orbits and Trajectories	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	The Solution of the Two-Body Problem	Satellite Orbits and Trajectories	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Calculation the position and velocity of satellites.	Orbital Parameters	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Calculation the Orbital elements of satellites.	Orbital Parameters	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	-	Seasonal exam		
13th	**2**	Orbital Perturbation	Orbital Perturbation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Orbital Perturbation and methods of solution	Orbital Perturbation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	**2**	Lagrange Points (L-points)	Orbital Parameters	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: for theoretical) (End-of-semester exam score = 60, including 60 for theory)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, any)	SATELLITE TECHNOLOGY PRINCIPLES AND APPLICATIONS Second Edition Anil K. Maini .Varsha Agrawal,2011.
Main references (sources)	Satellite Orbits models methods and applications. 3 th ed Montenbruck OL, Gill EB.. Springer Verlag Berlin Heidelberg. Germany, 2001.
Recommended books and references (scientific journals, reports...)	Orbital Mechanics for Engineering StudentsCurtis HD. (2014).,3rd ed. New York: Elsevier. ISBN -
Electronic References, Websites	https://www.nasa.gov. https://www.esa.int/

Course Description Form

1. Course Name:
Satellites II
2. Course Code:
AS 412
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. 2nd semester / 2023-2024
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = 30 hours Number of units = 2 units (theoretical 2)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Fouad Mahmood Abdullah **Email: fouad.abdulla@sc.uobaghdad.edu.iq**
8. Course Objectives
The aim of teaching Satellite II is to give students an open curriculum that prepares stude to learn the components. Artificial satellites include the most important scientific applicati of satellites, and enable the student to gain an understanding of modern and advanced scien topics in the specialty of astronomy and space.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by providing "advis assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introducti to Satellit Hardware	Satellite Hardwar	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Mechanic Structure	Satellite Hardwar	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Satellite launch	Launch Sequence	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Acquiring the Desire Orbit	Launch Sequence	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Satellite Stabilizati	Orbital Perturbations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	--	Seasonal Exam		
7th	2	Earth Station's Azimuth a Elevation Angles	Look Angles of a Satellite	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Computin the Slant Range	Look Angles of a Satellite	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	Computin the line-of Sight Distance between Two Satellites	Look Angles of a Satellite	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Satellite Altitude a the Earth Coverage Area	Earth Coverage a Ground Tracks	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Satellite Ground Tracks	Look Angles of Satellite	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	-	Seasonal exam		
13th	**2**	Satellite Applicatic	Satellite Applications	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Applicatic of Remote Sensing Satellites	Satellite Applications	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	**2**	Global Positionin System (GPS)	Satellite Applications	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation	
Overall score out of 100 (Semester grade = 40, including: for theoretical) (End-of-semester exam score = 60, including 60 for theory)	
12. Learning and Teaching Resources	
Required textbooks (curricular books any)	SATELLITE TECHNOLOGY PRINCIPLES AND APPLICATIONS Second Edition Anil K. Maini .Varsha Agrawal,2011.
Main references (sources)	Satellite Orbits models methods and applications. 3 th ed Montenbruck OL, Gill EB.. Springer Verlag Ber Heidelberg. Germany, 2001.
Recommended books and references (scientific journals, reports...)	Orbital Mechanics for Engineering StudentsCur i HD. (2014).,3rd ed. New York: Elsevier. ISBN
Electronic References, Websites	/https://www.nasa.gov. وhttps://www.esa.int/

Course Description Form

1. Course Name:

Quantum Mechanics

2. Course Code:

AS 304

3. Semester / Year:

2nd semester / 2023-2024

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
Total number of hours per section = 30 hours
Number of units = 2 units (theoretical 2)

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Amaal A. Al-hussian
Email: amaal_2016@sc.uobaghdad.edu.iq

8. Course Objectives

This course aims to study quantum mechanics and the theory of relativity, which are the basis understanding any system in the universe, whether macro or micro-systems. In addition, it covers all differences between quantum mechanics (Q.M.). And classical mechanics Q.C. It also gives a detai introduction and explanation of the basics and concepts of quantum mechanics and the theory of relativ starting from the efforts, hypotheses and theories proposed by the scientists who founded these mod mechanics to quantum applications on real systems by taking advantage of all the basic quantum conce to help bring the picture of what is going on inside and around every system in the world. The unive consists of interactions and transfers between energy levels within the system, which result in the loss a gain of energies by the various particles in our cosmic systems.

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introduction to Q.M.	Introduction, Wave properties	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Introduction to Q.M.	De Broglie wave, Atoms	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Q.M. success	Photoelectric effect, Einstein's quantum theory of photoelectric effect	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Q.M. success	Compton scattering, The uncertainty principle	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Wave equation simplification	introduction to wave equation, Linear superposition of sinusoidal waves	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	**2**	--	Seasonal Exam		
7th	2	Q.M. concepts	Operators, Operators 'properties	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	2	Q.M. concepts	Expectation value, Variance	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Q.M. equations	Schrodinger equations	Paper lectures, Electronic screen,	Daily, semester, final exams,

				Video lectures via electronic classes	reports, and assignments
10th	2	Q.M. concepts	Eigen value& Eigen function, Orthonormalize condition	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Q.M. concepts	Parity	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	--	Seasonal Exam		
13th	2	Q.M. concepts	Degeneracy, Dirac notation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Q.M. concepts + Q.M. applications	Wave function properties, Potential Step case	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	Q.M. applications	ID-potential box with rigid walls	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, any)	الميكانيك الكمي ,د.جاسم الحسيني مقدمة في ميكانيك الكم، د. هاشم عبود قاسم، د. ضياء احمد حسين
Main references (sources)	1-Philips A.C., "INTRODUCTION TO QUANTUM MECHANICS)", 2003. 2-Griffiths D.,"INTRODUCTION TO QUANTUM MECHANICS)", 2005.
Recommended books and referen (scientific journals, reports...)	Quantum Mechanics By David McMahon 101 Quantum Questions By Kenneth W. Ford
Electronic References, Websites	

Course Description Form

1. Course Name:

Stellar Physics lab

2. Course Code:

AS 213

3. Semester / Year:

First semester / 2023-2024

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

1 Theoretical hours /week, one section * 15 weeks = 15 hours
2 Practical hours/week per section * 15 weeks = 30 hours
Total number of hours per section = 45 hours
Number of units = 2 units (theoretical 1 + practical 1)

7. Course administrator's name (mention all, if more than one name)

Name: Ahmed H. Abdullah
Email: ahmed.abdullah@sc.uobaghdad.edu.iq

8. Course Objectives

The laboratory aims to study the stars, the phenomena associated with them, and the various stages of th development, with the subject's connections to the previous nebular movements of the stars. It also inclu the creation, development, and death of stars. They use various tools to study different objects at all availa wavelengths, and then use the information they obtain to create physical models of stars. It is also concer with the distribution of the movement of stars in terms of number, classification and distribution. As wel explaining and studying the conditions and processes that lead to the formation of stars. It also inclu studying the physical properties of stars, including brightness, density, and chemical composition, as wel their interactions

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year

6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
		Introduction		Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2	4	You should also able to f determine the a of differ clusters of st and seco compare the age different cluster	1 : Determining the Age of Open Star Clusters_	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3	4	To display the Hertzsprung–Russell (H–R) diagrams of star clusters	2: Hertzsprung - Russell Diagram and the Stellar Evolution.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4	4	The main goal this experimen to learn how to a simula photometer measure apparent U magnitudes stars in a cluste calculate the co index of the clus	3 : Photometry o Star Cluster	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

5	4	This experim demonstrates how informat about stars can directly observed by changing th orbit on a li curve	4 : Eclipsing Bin Stars	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6	4	The main goal of this experiment is to measure: 1. The sidereal rotation period of the sun. 2. The synodic period of rotation of the Sun.	5 : Solar Rotation		
7	4	The main goal to determine mass of Jup using Keple third law.	6 : Calculating the Mass Jupiter Using Kepler's T Law		
8	4	Your goal in this Exp. Is to study the spectral classification of stars	7 : Spectral Classification of Stars		
9	4	The main goal this Exp. is study the birth dying of star.	8 : Dying Stars and the Birth of the Elements		
-10			Solve Problems		

11+12			Final Exam. I Semester.		

11. Course Evaluation

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	An Introduction to Modern Astrophysics, Carroll & Ostlie Introductory Astronomy and Astrophysics, Zeilik & Gregory An Introduction to the Theory of Stellar Structure and Evolution, Prialnik "Astrophysics in a Nutshell" (Dan Maoz, Princeton). This is formally the "course text". It is a concise introduction, at a level comparable to or slightly lower than the lectures. If you understand everything in this book by the end of the class, you'll be in good shape! • "Advanced Astrophysics" (Neb Duric, Cambridge). This is a good text, which focuses on the basic physics of astrophysics. The level is generally higher than that of the class. I recommend this text if you would like to understand more deeply topics we discuss in class. • "An Introduction to Modern Astrophysics" (Bradley Carroll and Dale Ostlie, Addison Wesley). Unlike the other books, this is a comprehensive text that goes into much more astronomi detail. It's a fine book, if a bit dauntin recommend this if you need more detai explanations of the course topics.
Main references (sources)	• "The formation of Stars", Stahler & Palla (Wiley-VCH) Covers all the topics of this lecture • "Protostars and Planets V", Bo Reipurth, David Jewitt, und Klaus Keil (Univ. of Arizona Press) A collection of review articles on recent progress in star formation research. (many chapters available on astro-ph)

	• “The Origins of Stars and Planetary Systems” , Eds. C.J. Lada & N.D. Kylafis (Kluwer Academic Press) http://www.cfa.harvard.edu/events/1999/crete/ • “Accretion processes in star formation”, L. Hartmann (Cambridge)
Recommended books and references (scientific journals, reports...)	• “The Physics of interstellar dust”, E. Krügel (Series in Astronomy and Astrophysics - Bristol) • “The Physics and Chemistry of the interstellar medium”, A. G. G. M. Tielens (Cambridge Univ. Press) • “Physical processes in the interstellar medium”, L. Spitzer (Wiley-VCH) • “An introduction to star formation”, Wa Thompson & Whitworth (Cambridge Univ. Pres
Electronic References, Websites	- Use reliable electronic references scientific material - NASA's scientific website

Course Description Form

1. Course Name:

Cosmic Plasma

2. Course Code:

AS 315

3. Semester / Year:

Semester

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

15 theoretical hours + 15 discussion hours + 30 practical hours / total = 60 hours
Number of units: theoretical 1 + practical 2= total 3 units

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Ala Fadhil Ahmed
Email: ala.ahmed@sc.uobaghdad.edu.iq

8. Course Objectives

1. Enable students to obtain knowledge and understanding of the principles, scientific foundations and theories of astronomy and space.
2. Enabling students to obtain an understanding of modern and advanced scientific topics in the field of astronomy and space.
3. Enabling students to obtain an understanding of mathematical foundations, calculus and integration exercises, differential equations, advanced mathematics, and equations for the study of astronomy and space.
4. That the student be able to learn about cosmology, the emergence and development of galaxies, stars, interstellar matter, gases, cosmic dust, radio astronomy with high energies, radio astronomy, atomic, modern and nuclear physics, nuclear interactions and cosmic plasma in the basic structure of the universe, knowing and realizing the theories and laws that were developed on this unique scientific basis
5. The study of plasma physics in space and terrestrial and solar magnetism is one of its broadest scientific fields

The student should be able to identify the types of plasma and methods of generating the Plasma constitutes more than 99% of the outer universe

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge

4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	1	Introduction;- What is Plasma A history of lasma)	• Ionization and Recombination • Methods of Ionization Comparison Between Plas and Gas	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	1	Types of plasma	• Types of Plasma Density Degree Ionization	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	1	Saha equation	Saha equat and concept temperature	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	1	Plasma arameters	Deby shieldin	Paper lectures, Electronic screen, Video lectures via electronic	Daily, semester, final exams, reports, and assignments

				classes	
5th	1	Plasma arameters	Criteria plasma	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	1	Corona Discharge	• Positive Corona Negative Coro	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	1	First exam	First exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	1	Motion in plasma	Fast particles Astrophysical plasma	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	1	Cosmic plasma	Stellar winds rotating magnetosphere	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	1	Plasma as Collection of ndividual Particles	• Single Particle Motions • Uniform E and B fields • Gravitational field • Non uniform B Field • Magnetic Mirrors • Non uniform E Field	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11th	1	magneto hydrodynamic – MHD (Fluid Theory)	• Fluid Equation of Motion • The Convection Derivative • The stress Tensor • Collisions the Single – Fl MHD Equatio	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	1	Dusty plasma	• Characteristics of Dusty Plasmas • Macroscopic neutrality Debye shieldir	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	1	Dusty plasma	• Characteristic frequencies • Coulomb coupling parameter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	1	Dusty Plasmas n Space	• Interplanetary space • Comets • Planetary rings • The earth's magnetosphere • Earth’s atmosphere Aurora	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	1	Second exam	Second exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1-"Introduction to plasma physics and controlled fusion " Francis F. Chen ,1984 2-Astronomy By: seeds
Main references (sources)	1-"Introduction to Cosmology "" Barbara Ryden ,2006
Recommended books and references (scientific journals, reports...)	1-Plasma Physics" Richared Fitzpatrick 2-The Electric universe" David Talbot
Electronic References, Websites	Electronic references were us for the theoretical and practi parts

Course Description Form

1. Course Name:

Astronomical Imaging

2. Course Code:

AS 214

3. Semester / Year:

Semester

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

15 theoretical hours + 15 discussion hours + 30 practical hours / total = 60 hours
Number of units: theoretical 1 + practical 2= total 3 units

7. Course administrator's name (mention all, if more than one name)

Name: Dr. Ala Fadhil Ahmed
Email: ala.ahmed@sc.uobaghdad.edu.iq

8. Course Objectives

1. Enabling students to obtain knowledge and understanding of the principles, scientific foundations and theories of astronomy and space.
2. Enabling students to obtain an understanding of modern and advanced scientific topics in the field of astronomy and space.
3. Enabling students to obtain an understanding of the basic principles of the work of astronomical telescopes of various types and image construction
4. From our universe out of the earth to the solar system to the galaxy to cosmology.
5. Enabling students to obtain an understanding of how to use optical and radio astronomical telescopes for the purposes of astronomical observation.
6. Enabling students to obtain an understanding of mathematical foundations, calculus and integration exercises, differential equations, advanced mathematics, and equations for the study of astronomy and space.
7. Giving students a solid scientific curriculum that qualifies students for practical, professional astrophotography and monitoring the movement and orbits of satellites.
8. Introducing students to the processing of satellite images, space and frequency imaging systems, the method of representing digital images, remote sensing techniques, geographic information system and remote sensing.
9. Introducing the student to how to find the coordinates of the celestial body and determine its distance, speed and momentum, as well as converting the known celestial coordinates between them

Enabling the student to find many important astronomical values in determining prayer times and new moc observing the movement of planets, dwarf planets, asteroids, comets, the moon and stars, and drawing sc maps in this regard.

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	1	Observation	Types observation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	1	Astrophotograph	Types Astrophotograp	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	1	Telescope	1-Telescope size 2-Telescope speed 3-Telescope type	Paper lectures, Electronic screen,	Daily, semester, final exams, reports, and

				Video lectures via electronic classes	assignments
4th	1	Definitions	1-The depth of field The pupil2 Field of view 3 4-F-ratio	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	1	Imaging errors	Imaging errors	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	1	the primary berrations	1 Spherical aberration 2 Coma aberration 3 Astigmatism aberration 4 Distortion aberration 5 Chromatic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	1	الامتحان الاول	الامتحان الاول	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	1	Some Methods of ptical testing	Power of lens P 1 Focal length F 2 3 Bessel's method Knife-edge method 4 5 Star Testing telescope	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	1	Telescope Mount ypes	1 Polar Mount or Alt-Azimuth al Mount 2 Equatorial Mount 3 Alt-Azimuth Mount Setup 4 Equatorial Mount Setup	Paper lectures, Electronic screen, Video lectures via electronic	Daily, semester, final exams, reports, and assignments

				classes	
10th	1	Telescope Mount Types	3 Alt-Azimuth Mount Setup 4 Equatorial Mount Setup	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	1	Imaging Devices and Charged coupled device CCD	Imaging Devices and Charged coupled device CCD	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	1	CCD definition and work	1 CCD definition and work 2 CCD Wavelength absorption 3 CCD structure 4 CCD Types	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	1	الامتحان الثاني	امتحان الثاني	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	1	Charged coupled evice	1 Signal to noise ratio 2 Quantum efficiency of CCD	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	1	CCD types in optical Sensors	1 Counts Number 2 Exposure time 3 Shutter type 4 Read noise 5 Final data reduction	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11. Course Evaluation					

Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1- Astronomy By: seeds
Main references (sources)	1-"The Electric universe" David Talbot 2-"Introduction to Cosmology "" Barbara Ryden ,2006 Tatarewicz ،3 Joseph (1998). "The Hubble Spa Telescope Servicing Missio In Mack ،Pamela E. *Fro Engineering Science to F Science*. NASA.
Recommended books and references (scientific journals, reports...)	1-"The Electric universe" David Talbot 2-"Introduction to Cosmology "" Barbara Ryden ,2006 ،Lyman S. (March 199 "History of the Spa Telescope".
Electronic References, Websites	Electronic references were us for the theoretical and practi parts

Course Description Form

1. Course Name:
Radiation Astronomy I
2. Course Code:
AS 405
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
(2)Theoretical hours/week, one section * 15 weeks = 30 hours Number of units = 2 units
7. Course administrator's name (mention all, if more than one name)
Name: *Assist.Prof.Dr. Mohammed Naji Abdul-Hussien* **Email:** mohalnajm@uobaghdad.edu.iq
8. Course Objectives
The course aims to study the objects or celestial bodies in the universe that radiate (or refle energy across the electromagnetic spectrum by focusing on the radiation from all objects in universe while taking an in-depth look at the forms of radiation that exist there in order to fu understand the universe by studying the entire electromagnetic spectrum, which includes Hig energy particles such as cosmic rays and other radiation that are completely invisible at cert wavelengths but visible within the optical spectrum. And understanding the radiation transmit between active particles or energetic waves across the universe or outer space, as well explaining the importance of these radiations in studying the most important astronomi phenomena and mysteries, including the radiation of black holes and stars, energy and dark mat in the universe, the origin of the universe and its future, and applying mathematical equatic related to radiation energies in this field.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.

7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	2	**High energy Radiation astrophysics**	1.1The sky in different astronomical radiation wavebands 1.2Electromagnetic Radiation astrophysic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2	2	High energy Radiation astrophysics	1.3 Optical Radiation 1.4 Infrared Radiation 1.5 Millimeter and sub-millimeter Radiation 1.6 Radiofrequency Radiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3	2	High energy Radiation astrophysics	1.7 Radiation of Atoms and Molecules 1.7.1. Line emission of neutral hydrogen (HI) 1.7.2. Molecular line emission 1.8 Ultraviolet Radiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4	2	High energy Radiation astrophysics	1.9 X-ray Radiation 1.10 γ -ray Radiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5	2	High energy Radiation astrophysics	1.11 Observing the Universe without Using Electromagnetic Radiation 1.11.1 Cosmic rays radiation	Paper lectures, Electronic screen, Video lectures	Daily, semester, final exams, reports, and assignments

			1.11.2 Gravitational waves radiation	via electronic classes	
6	**2**	**High energy Radiation astrophysics**	**First Exam.**		
7	**2**	The Radiation Properties of Star	2.1 Continuous radiation flux from Stars 2.2 The Colour temperature(T_c) and Planck's function of astronomical objects	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8	**2**	**The Radiation Properties of Sta**	2.3 Stellar radiation Hydrostatic Equilibrium 2.4 Radiation of Stellar Energy Sources 2.4.1 Thermal Radiation Stellar Energy 2.4.2 Gravitational potential energy radiation of a sphere 2.4.3 Nuclear Stellar Energy	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9	**2**	The Radiation Properties of Star	2.5 The Radiation mechanisms of stellar old age	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10	**2**	The Radiation Properties of Star	2.6 Infrared Radiation of Planetary Nebulae 2.6.1. The Structure of the Infrared Spectrum 2.6.2. Infrared Emission Lines of Nebulae 2.6.3 IRAS: Infrared Spectra of Planetary Nebulae 2.6.4 Parameters of D Particles	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11	**2**	The Radiation Properties of Star	2.7 Radiation mechanisms of Cepheid Variables, Variable stars	Paper lectures, Electronic screen, Video lectures via	Daily, semester, final exams, reports, and assignments

				electronic classes	
12	**2**	The Radiation Properties of Star	2.8 Radiation processes of substellar (White Dwarfs)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13	**2**	The Radiation Properties of Star	2.9 The Radiation mechanisms of High –Mass Stars	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14	**2**	The Radiation Properties of Star	2.10 Stellar Radiation Transport in the Fraunhofer Lines	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15	**2**	**--**	**Final Exam.**		

11. Course Evaluation

Overall score out of 100 %
Semester grade = 40 %
End-of-semester exam score = 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Karttunen, H., Kroger, P., Oia, H., Poutanen, M., Donner, K.J. "**Fundamental Astronomy**", Springer-Verlag, Germany, 2007. 2-Bradley W. Carroll and Dale A. 0stlie ," **An Introduction to Modern Astrophysics**", Second Edition, Pearson Education, Inc., publishing as Addison-Wesley, United States, 2007
Main references (sources)	**1-** Kutner M. L., "**Astronomy A Physical Perspective**", J.Wiley & Sons Inc., New York, 1987.

	2- Longair M.S. ,"**High Energy Astrophysics",** Third Edition, University of Cambridge, Cambridge, 2011. **3-** Grigor A. Gurzadyan, "**The Phys and Dynamics of Planet Nebulae",** Springer-Verlag Be Heidelberg, New York, 1997.
Recommended books and references (scientific journals, reports...)	**1-** J. Bennett, M. Donahue, N. Schneider and M. Voit, **"The Cosmic Perspective"**, Eight Edition, PEARSON, United States of America, 2017. 2-SAO/NASA Astrophysics Data System 3- Astrophysical Journal, Astronomy & Astrophysics (A&A) journal ,The Astrophysical Journal Supplement Series and The Astronomical Journal
Electronic References, Websites	استخدام المراجع الالكترونية الموثوقة بها للجزء للمادة العلمية من ضمنها الموقع العلمي النظري الكبير التابع لوكالة ناسا الفضائية (NED.) **https://ned.ipac.caltech.edu** https://ui.adsabs.harvard.edu https://astronomy.fas.harvard.edu

Course Description Form

1. Course Name:
Radiation Astronomy II
2. Course Code:
AS 406
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
(2)Theoretical hours/week, one section * 15 weeks = 30 hours Number of units = 2 units
7. Course administrator's name (mention all, if more than one name)
Name: *Assist.Prof.Dr. Mohammed Naji Abdul-Hussien* **Email:** mohalnajm@uobaghdad.edu.iq
8. Course Objectives
This course describes the radiation energies of elementary particles, nuclei, and electromagne waves as they propagate through outer space and the universe by applying the laws astrophysics with high and low energies, including the laws of thermal, non-thermal, ionizi and non-ionizing radiation, and the mechanism of their radiation in various celestial bodi including, for example, galaxies, stars, and planetary nebulae, etc.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	2	3- **Radiation Mechanisms of Electromagnetic Emissions**	3.1 Thermal Radiation Mechanisms 3.1.1 Blackbody Radiation Characteristics 3.1.2 Properties of the Planck radiation Law 3.1.2 Bremsstrahlung (Free-free Emissions) 3.1.3 Photoionization and Recombination (Free-Bound) Radiation 3.1.4 Continuum Emissions from Ionized Gas.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2	2		3.2 Non-thermal Radiation Mechanis	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3	2		3.3 Synchrotron radiation and Interactions of high energy photons 3.3.1 Theory of Extended radiation sources (synchrotron radiation) 3.3.2 Neutrino Bremsstrahlung and Neutrino Synchrotron Radiation 3.3.3 The total energy loss rate 3.3.4The polarization of synchrotron radiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4	2		3.4 Other Radiation Mechanisms 3.4.1 Inverse Compton scattering radiation 3.4.2 Masers radiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

5	**2**		3.5 Monochromatic (Line) Radiation 3.6 Line Radiation from Molecules	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6	**2**	**–––**	**First Exam.**		
7	**2**	**The Radiation Properties of galaxies**	4.1 The Radiation Mechanisms of our Galaxy (Milky Way) 4.1.1 The gaseous content of the disc in the Milky Way 4.1.2 Milky Way in the different radiation wavebands 4.1.3 The Nuclear Region of the Galactic Bulge (R ≤ 300 pc)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8	**2**		4.2 The Radiation processes of Normal Galaxies 4.2.1 The Non-thermal Radiofrequency Emissions of Normal Galaxies 4.2.2 The radiation law of elliptical galaxies The radiation law of Spiral galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9	**2**		4.3 The radiation mechanisms properties of distant galaxies 4.3.1 The spectra emission of Normal galaxies *I*-Broadband spectrum radiation II-Optical spectra radiation of Normal galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

10	**2**		4.4 The radiation mechanisms properties of Active Galaxies (AGN) 4.4.1 The luminosity of Active Galaxies 4.4.2 The spectra emission of Active galaxies 4.4.3 Broadband radiation spectra of Active galaxies 4.4.4 Spectral energy distribution (or SED) of galaxies I. (SED) of Normal galaxies. II. (SED) of Active galaxies. 4.4.5 Spectral optical radiation of Active galaxies 4.4.6 Dust sublimation radius for an AGN	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11	**2**		4.5 High energy Radiation of Extragalactic 4.6 Radiation processes of Starburst Galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12	**2**		4.7 Unified Model of Radiation Active Galactic Nuclei	Paper lectures, Electronic screen, Video lectures	Daily, semester, final exams, reports, and assignments

					via electronic classes	
13	**2**		4.8	Radiation properties of Luminous Infrared and Megamaser Galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14	**2**		4.9 4.10	X-ray emission in the normal and active galaxies The Intergalactic Medium radiation and Lyman α Systems	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15	**2**			**Final Exam.**		

11. Course Evaluation

Overall score out of 100 %
Semester grade = 40 %
End-of-semester exam score = 60 %

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Karttunen, H., Kroger, P., Oia, H., Poutanen, M., Donner, K.J. "**Fundamental Astronomy**", Springer-Verlag, Germany, 2007. 2-Bradley W. Carroll and Dale A. 0stlie ,“ **An Introduction to Modern Astrophysics**”, Second Edition, Pearson Education, Inc., publishing as Addison-Wesley, United States, 2007
Main references (sources)	**1-** Kutner M. L., "**Astronomy A Physical Perspective**", J.Wiley & Sons Inc., New York, 1987. **2-** Longair M.S. ,“**High Energy Astrophysics”,** Third Edition, University of Cambridge, Cambridge, 2011. **3-** Grigor A. Gurzadyan, “**The Phys and Dynamics of Planet Nebulae”,** Springer-Verlag Be Heidelberg, New York, 1997.
Recommended books and references (scientific journals, reports...)	**1-** J. Bennett, M. Donahue, N. Schneider and M. Voit, **“The Cosmic Perspective”**,

	Eight Edition, PEARSON, United States of America, 2017. 2-SAO/NASA Astrophysics Data System 3- Astrophysical Journal, Astronomy & Astrophysics (A&A) journal ,The Astrophysical Journal Supplement Series and The Astronomical Journal
Electronic References, Websites	استخدام المراجع الالكترونية الموثوقة بها للجزء النظري للمادة العلمية من ضمنها الموقع العلمي الكبير التابع لوكالة ناسا الفضائية (NED.) **https://ned.ipac.caltech.edu** https://ui.adsabs.harvard.edu https://astronomy.fas.harvard.edu

Course Description Form

1. Course Name:
Galaxies-I
2. Course Code:
AS303
3. Semester / Year:
1st semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = 30 hours Number of units = 2 units (theoretical 2)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Yasir Ezzuldeen Rashed **Email: yassir.e@sc.uobaghdad.edu.iq**
8. Course Objectives
1. Training specialized graduates in the field of astronomy and space sciences who possess both theoretical and practical scientific skills to meet the needs of ministries and other scientific institutions with highly competent personnel contributing to serving and building the country. 2. Conducting specialized scientific research either within the department or through collaboration with ministries and other scientific institutions to contribute to enriching astronomy and space sciences and keeping pace with scientific advancements in this field. 3. Encouraging outstanding students in this field to become teaching assistants in the department and faculty members in the future. 4. Working to achieve educational quality and academic accreditation by developing and updating curricula to match modern scientific advancements. 5. Providing all available facilities and resources for academic study to the student, which in turn encourages the student to persevere and compete. 6. Preparing qualified scientific cadres capable of developing comprehensive plans for the organizations they oversee, assisting in making the right decisions.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year

6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introduction: History, Cosmology	General Introduction, Cosmological Constant	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Galaxies Morphology	Spiral galaxies Elliptical Galaxies Irregular Galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Active Galaxies Type and Structure (1)	Seyfert Galaxies QSO Radio Galaxies Blazas Liner Galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Active Galaxies Type and Structure (2)	Broad Line Region Narrow Line region Dusty tours Jet Accretion Disk Supermassive Black hole	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Variability and Diagnostic Diagrams	Variability Scheme Diagnostic Diagrams	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Morphology and structure of the Milky Way	Galactic Hole Galactic Bulge Galactic Disk	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

7th	2	Stars	Type Star Binary Stars Properties of Stras	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	First Exam				
9th	2	Structure and Properties of The Elliptical Galaxie	Structure of Elliptical Properties of Elliptical	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Structure Properties of Spiral Galaxie	Structure of spiral Properties of spiral	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Galaxy Mass and Luminosity Functions	Galaxy Mass Luminosity Functic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Properties of t AGN Populati	Properties of the AGN Population	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Galaxy Cent and Black Holes	Galaxy Centers and Black Holes	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Reviewing all topics and ans the questions	Reviewing all the to and answer the questio	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	Second Exam				

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books any)	/
Main references (sources)	Galaxies in The Universe An Introduction Book by (Linda Sparke) Extragalactic Astronomy and Cosmology Book by (Peter Shneider)

Recommended books and references (scientific journals, reports...)	https://ui.adsabs.harvard.edu/classic-form
Electronic References, Websites	https://ned.ipac.caltech.edu/classic/ http://skyserver.sdss.org/dr15/en/tools/chart/navi.aspx

Course Description Form

1. Course Name:
Galaxies-I
2. Course Code:
AS306
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours Total number of hours per section = 30 hours Number of units = 2 units (theoretical 2)
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Yasir Ezzuldeen Rashed **Email: yassir.e@sc.uobaghdad.edu.iq**
8. Course Objectives
1. Training specialized graduates in the field of astronomy and space sciences who possess both theoretical and practical scientific skills to meet the needs of ministries and other scientific institutions with highly competent personnel contributing to serving and building the country. 2. Conducting specialized scientific research either within the department or through collaboration with ministries and other scientific institutions to contribute to enriching astronomy and space sciences and keeping pace with scientific advancements in this field. 3. Encouraging outstanding students in this field to become teaching assistants in the department and faculty members in the future. 4. Working to achieve educational quality and academic accreditation by developing and updating curricula to match modern scientific advancements. 5. Providing all available facilities and resources for academic study to the student, which in turn encourages the student to persevere and compete. 6. Preparing qualified scientific cadres capable of developing comprehensive plans for the organizations they oversee, assisting in making the right decisions.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year

6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "advise assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Galaxy Clusters (Ty and Properties)	Galaxy Clusters (T and Properties)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	The Local and Othe Groups	The Local and Oth Groups	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Rotation Cu and it's properties	Rotation Curve it's properties	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Linear size and Radio loudness and Spectral ind	Linear size and Radio loudness and Spectral index	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Supermassive black hole and Eddington rate	Supermassive bl hole and Edding rate	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Star formation rate and supernova rate	Star formation rate supernova rate	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Scaling Relations ar Dynamics	Scaling Relations Dynamics	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	First Exam				

9th	2	Tully fisher relatio and Faber Jackson relation	Tully fisher relati and Faber Jackso relation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Fundamental Plane Galaxies	Fundamental Pl of Galaxies	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Galaxy Formation & Evolution	Galaxy Formation Evolution	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Collisionless Dynamics	Collisionless Dynamics	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Shock Heating Radiative Cooling	Shock Heating Radiative Cooling	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Reviewing all topic and answer questions	Reviewing all topic and answer questions	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	Second Exam				

11. Course Evaluation

Overall score out of 100
(Semester grade = 40)
(End-of-semester exam score = 60)

12. Learning and Teaching Resources

Required textbooks (curricular books, any)	/
Main references (sources)	Galaxies in The Universe An Introduction Book by (Linda Sparke) Extragalactic Astronomy and Cosmology Book by (Peter Shneider)
Recommended books and references (scientific journals, reports...)	https://ui.adsabs.harvard.edu/classic-form
Electronic References, Websites	https://ned.ipac.caltech.edu/classic/ http://skyserver.sdss.org/dr15/en/tools/chart/navi.aspx

Course Description Form

1. Course Name:
photometry
2. Course Code:
AS 414
3. Semester / Year:
2nd semester/2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Sinan Hasan Ali **Email:** sinan.ali@sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to educate the students to study the celestial objects through to the Energy (light) emitted from them and how to analyze this energy by tools and Equipment's regard to this studies to find out the their brightness and magnitudes.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1	2	Photometry and visible EMR	photometry	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2	2	The magnitude and color system	=	=	=
3	2	Types of telescopes' and image formations	=	=	=
4	2	The atmosphere	=	=	=
5	2	Space astronomy and perfect observing site	=	=	=
6	2	Seeing	=	=	=
7	2	Optical depth and atmospheric Extinction	=	=	=
8	2	Night and bright sky	=	=	=
9	2	Photon data reduction	=	=	=
10	2	An overview doi photometry	=	=	=
11	2	Standard stars	=	=	=
12	2	Measuring instrumen magnitudes	=	=	=
13	2	Uncertainties and signal noise ratio	=	=	=
14	2	Optical Filters	=	=	=

11. Course Evaluation
Semester grade = 40 Final-of-semester exam score = 60

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	H. Karttunen,P. Kröger,H. Oja,M. Poutanen,K. J. Donner (Eds.),Fundamental Astronomy, Fifth Edition With 449 Illustrations Including 34 Color Plates and 75 Exercises with Solutions.

	Jean Kovalesky and P. Kenn Seidelmann, Fundamentals Astronomy, published by the pr syndicate of the university of cambric
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
spectroscopy
2. Course Code:
AS 411
3. Semester / Year:
1st semester/2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Sinan Hasan Ali **Email:** sinan.ali@sc.uobaghdad.edu.iq
8. Course Objectives
This course aims to educate the students to study the celestial objects through to the Energy (light) emitted from them and how to analyze this energy by tools and Equipment's regard to this studies to find out the information's about these celestial objects from where approaching or receding from the Earth, velocities and their atmosphere ingredients.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	2	Kirchhoff's laws for astronomical spectra and black body radiation	spectroscopy	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2	2	Doppler and red shifts with stellar spectra	=	=	=
3	2	Standard spectral lines and reference spectra	=	=	=
4	2	Airy Disk, Rayleigh limi and FWHM, PSF	=	=	=
5	2	Focus, exit pupil and eye relief	=	=	=
6	2	Prisms, Gratings and spectroscopes	=	=	=
7	2	Efficiency of the spectroscope	=	=	=
8	2	Grating theory	=	=	=
9	2	Grisms	=	=	=
10	2	Spectroscopic design and construction	=	=	=
11	2	The prisms as dispersion element	=	=	=
12	2	The grating as dispersion element	=	=	=
13	2	Blazed Grating	=	=	=
14	2	Anamorphic factor	=	=	=

11. Course Evaluation

Semester grade = 40
Final-of-semester exam score = 60

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	Ken M. Harrison ,Astronomical Spectrosco for Amateurs, Springer New York Dordre Heidelberg London
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name: computer 3/second grade/chemistry department

2. Course Code: AS203

3. Semester / Year: second semester study /universal study2023-2024

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Mandatory attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 hours theoretical/weekly one class +15weeks=30 hours

7. Course administrator's name (mention all, if more than one name)

Name: Teacher . Dr.Ahmed Hashim Hussein. Teacher . Dr .Yasser Ezzuldeen
Teacher . Dr .Uday Etewy Lecture. Zainab Fadhil assistance lecture .Hiba Usama
Email: ahmedhashem@pgiafs.uobaghdad.edu.iq

8. Course Objectives

Teaching the student how to deal with Microsoft power point and preparing him to mak presentation during the period of his studies for any subject and possibility of ease of worki on this application and developing future skills.

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso

assistance or receiving “advisory” assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Power p 2010	Dealing with the PowerPoint sc and main menus, adding slides to program, designing them, and ge information about the program	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2th	2	Power p 2010	Writing within slides and dealing main menus and inserts	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3th	2	Power p 2010	How to put data in an Excel table retrieve it using PowerPoint, crea chart for it, and also insert var graphics	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Power p 2010	How to make a design suitable fo presentation slides, whether it ready-made theme, choosing background, or inserting an image background and controlling lighting in it.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Power p 2010	Practical and theoretical sem exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Power p 2010	Explanation of the Table T menu, which appears only w you insert the table, wh contains two menus, Design Align, which appears only w you insert the table.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	Power p 2010	Explanation of the list of drav tools that appears when you in a drawing, illustration, structural drawing, and all belongings and commands	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	2	Power p 2010	How to place transiti movements between slides detail	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Power p 2010	How to place the animations each paragraph and disting them from others in presentation through its menu detail	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

10th	2	Power 2010	Practical and theoretical seme exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	Power 2010	Practical and theoretical seme exam	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	Power 2010	Making spelling and grammat corrections from special l inserting videos and links slides, while control presentation time in terms of d and presentation.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Power 2010	Explain the presentation and various methods in detail from slide show menu	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Power 2010	Explain the presentation and various methods in detail from slide show menu	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	Power 2010	Explaining a review of all the for the presentation, giving b lectures to all students, assessing their understanding the material from the presentat	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation

Daily, semester and final exams, reports and assignments

12. Learning and Teaching Resources

Required textbooks (curricular books any)	"Computer Basics and its Office Applications," the second part, approved by the Mini of Higher Education and Scientific Research
Main references (sources)	Microsoft Office Professional 2010 step by step 1st Edition ,2011. Computing Fundamantals:IC3 Edition, 2014.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://hr.virginia.edu/sites/default/files/PDFs/Microsoft%20PowerPoint%202010.pdf

Course Description Form

1. Course Name:
Astronomical applications
2. Course Code:
AS 301
3. Semester / Year:
2nd semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours 2 Practical hours/week per section * 15 weeks = 30 hours Total number of hours per section = 60 hours Number of units = 3 units (theoretical 2 + practical 1)
7. Course administrator's name (mention all, if more than one name)
Name: Raaid Nawfee Hassan **Email: raaid.hassan@sc.uobaghdad.edu.iq**
8. Course Objectives
1. Preparing graduates specialized in the field of astronomy and space sciences who possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries an other scientific institutions with highly qualified cadres who contribute to serving and buildir the country. 2. Conducting specialized scientific research, whether in the department or through participation with ministries and other scientific institutions for the purpose of contributing to the advancement of astronomy and space sciences and keeping pace with scientific development in this field. 3. Providing scientific consultations to various scientific departments and institutions, including, for example, the Ministry of Higher Education, Universities, Science, Technology and Environment, the Ministry of Youth, and the Civil and Military Aviation Authority. 4. Encouraging distinguished students in this field to become teaching assistants in the department and faculty members in the future 5. Working to achieve educational quality and academic accreditation by developing and updating curricula to suit modern scientific development 6. Develop the student's transferable personal skills such as oral and written communication, making tables, handling and analyzing data, leading group work, etc. 7. Preparing qualified scientific staff to develop integrated plans for the organizations they supervise, which help in making the right decisions. 8. The student acquires thinking and problem-solving skills by developing systematic skills f dealing with problems, which includes the student's ability to approach the problem, divide i into various parts, recognize the knowledge he has, find the missing knowledge, and apply it solve the problem. 9. Providing all facilities and possibilities available for the student's academic study, which i turn works to encourage the student to persevere and compete.

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Angles modes, Trigonometric functions	A detailed introduction and explanation of what is mea by trigonometric angles an their patterns	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Calendars types	A detailed explanation of calendars	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd-4th	4	Time conversion	Knowledge and detailed explanation of conversion between times	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Time tracing	A detailed explanation of t tracing	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

6th	2	Calculating the Julian day and calendar date Transformation between them	Calculating the Julian days Calculate the current calendar and convert between them	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	2	**First Exam**		Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	2	Day of the year for common year and leap year	A detailed explanation of calculating common and leap year days	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Examples and home works	Illustrative examples and assignments	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Types of Astronomical coordinates	Astronomical coordinates a their types	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th-12th	4	Transformation between the astronomical coordinates	Conversion between equatorial, horizontal, galactic and other astronomical coordinates	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Electromagnetic spectrum	Illustrate and explanation of electromagnetic spectru	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Astronomical observation	Astronomical monitoring o celestial bodies and determining their locations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	**Second Exam**			

11. Course Evaluation
Overall score out of 100 (Semester grade = 40, including: 25 for theoretical + 15 for practical) (End-of-semester exam score = 60, including 40 for theory + 20 for practical)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Astronomy Andrew |Frankno, David Marrison(2016)
Main references (sources)	Introduction to Astronomy Prof. Saul Rappaport (2006)
Recommended books and references (scientific journals, reports...)	Introduction to Astronomy and Cosmology Ian Morison(2008)
Electronic References, Websites	https://www.planetary.org/night-sky/astronomy-for-beginners

Course Description Form

1. Course Name: Digital Image Processing II

2. Course Code: AS410

3. Semester / Year:2024-2023 الثاني

4. Description Preparation Date:

2-4-2024

5. Available Attendance Forms:

Weekly attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

2 Theoretical hours/week, one section * 15 weeks = 30 hours
2 Practical hours/week per section * 15 weeks = 30 hours
Total number of hours per section = 60 hours
Number of units = 3 units (theoretical 2 + practical 1)

7. Course administrator's name (mention all, if more than one name)

Name: Prof,Dr,Bushra Qassim
Email: bushra.qassim@sc.uobaghdad.edu.iq

8. Course Objectives

1-Preparing graduates specialized in the field of astronomy and space sciences who possess theoretical and practical scientific skills for the purpose of meeting the needs of ministries and other scientific institutions with highly qualified cadres who contribute to serving and building the country.

2-.Conducting specialized scientific research, whether in the department or through participation with ministries and other scientific institutions for the purpose of contributing to the advancement of astronomy and space sciences and keeping pace with scientific development in this field.

3- Providing scientific consultations to various scientific departments and institutions, including, for example, the Ministry of Higher Education, Universities, Science, Technology and Environment, the Ministry of Youth, and the Civil and Military Aviation Authority.

4- Working to achieve educational quality and academic accreditation by developing and updating curricula to suit modern scientific development

9. Teaching and Learning Strategies

1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose.
2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum
3. Asking students to visit scientific libraries to obtain academic knowledge
4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites
5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure: Theory

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Transformation	Walsh and Hadamard transformation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Transformation	KL-transformation Discrete cosine transformation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Image enhancement	Image enhancement: histogram equalization method	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

4th	**2**	Image smoothing	Image smoothing in spatial domain by neighbors based methods		Daily, semester, final exams, reports, and assignments
5th	**2**	Image smoothing	Image smoothing in frequency domain: Low pass filter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	**2**	Image sharpening	Image sharpening in spatial domain by differentiation	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
7th	**2**	**First Exam**		Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	**2**	Image sharpening	The Linear difference method	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Image sharpening	Robert gradient method and Sobal operator	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Image sharpening	Image sharpening in spatial domain by Laplacian operator		Daily, semester, final exams,

					reports, and assignments
11th	**2**	Image sharpening in frequency domain	Image sharpening in frequency domain: high pass filter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	Image restoration	Image restoration methods: Inverse filter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	**2**	Image restoration	Types of noise	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Image restoration	Image restoration methods :Winner filter	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	**2**	Second Exam			

11-Course Structure: Practical					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1st	**2**	**Transformation**	Experiment of Discrete cosine Transformation	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
2nd	**2**	**Transformation**	Experiment of Hadamard Transformation	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
3rd	**2**	**Transformation**	Experiment of Walsh Transformation	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
4th	**2**	**Image Enhancement (point processing)**	Experiment of Image enhancement (Histogram)	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
5th	**2**	**Image Enhancement (point processing)**	Experiment of Image enhancement (Histogram equalization)	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
6th	**2**	**Image Enhancement using spatial domain filters**	Experiment of Image enhancement Average filter	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
7th	**2**	**Image Enhancement using spatial domain filters**	Experiment of Image enhancement Median filter	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
8th	**2**	**Image Enhancement using frequency domain filters**	Experiment of Image Smoothing in frequency domain (Low pass filter)	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
9th	**2**	**Image Enhancement using spatial domain filters**	Experiment of Image Smoothing in frequency domain (Sobel Operator)	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams

10th	**2**	**Image Enhancement using spatial domain filters**	Experiment of Image Smoothing in frequency domain (Laplacian Operator)	Application of MATLAB code Electronic screen Video lectures via electronic classes	
11th	**2**	**Image Enhancement using frequency domain filters**	Experiment of Image sharpening in frequency domain (High pass filter)	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
12th	**2**	**Image Restoration**	Inverse filter	Application of MATLAB code Electronic screen Video lectures via electronic classes	
13th	**2**		Pandemic review	Application of MATLAB code Electronic screen Video lectures via electronic classes	Daily, semester and final exams
14th	**2**		Final Exam. First Semester	Application of MATLAB code	Daily, semester and final exams

12-Course Evaluation

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

11. Learning and Teaching Resources

Required textbooks (curricular books, if any)	***Digital image processing by Gonzalez &Woods***
Main references (sources)	***Computer vision and image processing by Scott Umbaugh***
Recommended books and references (scientific journals, reports...)	***John R. Jensen, "Introductiory Digi Image", 3/E, Prentice-Hall, 2005***
Electronic References, Websites	

Course Description Form

1. Course Name:
Astronomical Applications Lab.
2. Course Code:
AS 301
3. Semester / Year:
1 semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours **2 Practical hours/week per section * 15 weeks = 30 hours** **Total number of hours per section = 60 hours** **Number of units = 3 units (theoretical 2 + practical 1)**
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Raaid Nawfee Hassan Email: raaid.hassan@sc.uobaghdad.edu.iq **Name: Dr. Fouad Mahmood Abdullah Email: fouad.abdulla@sc.uobaghdad.edu.iq** **Name : Omar Tareq Ali Email: omar.t@sc.uobaghdad.edu.iq**
8. Course Objectives
The Astronomical Applications Laboratory aims to train the student on modern programs and applications used in astronomy and space science and to develop the student's skills in programming astronomical calculations for celestial bodies such as (the sun, moon, planets, and satellites). Enabling the student to find many important astronomical values in determining prayer times and the new moon.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side

9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Introduction (concepts of programming).	programming	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Calculation of the Julian Day(J.D) from calendar dat	Dates and calendars	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Calculation of the calendar date fror Julian Day(J.D).	Dates and calendars	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Dynamical Time and Universal Time .Part1	Times	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Dynamical Time and Universal Time. Part2	Times	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	--	Seasonal Exam		
7th	2	Sidereal Time at Greenwich	Times	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Transformation o Coordinates Part1 (Horizon to Equatorial)..	The coordinate system	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	Transformation o Coordinates Part2.(Equatorial Ecliptic).	The coordinate system	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Transformation o Coordinates Part3.(Ecliptic to Equatorial).	The coordinate system	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Transformation of Coordinates Part4 . (Galactic to Equatorial).	The coordinate system	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	-	Seasonal exam		
13th	**2**	Rise and Set of a body Part1 (Stars	The celestial sphere	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Rise and Set of body Part2 (Moo	The celestial spher	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	**2**	Rise and S of a body Part3 (Sur	The celestial spher	Paper lectures, Electronic screen,	Daily, semester, final exams, reports, and assignments

				Video lectures via electronic classes	

11. Course Evaluation

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

12. Learning and Teaching Resources

Required textbooks (curricular books, any)	Meeus, J. **(1998)**, "*Astronomical Algorithms*", Second Edition, Willmann-Bell. Inc., Printed in the United States of America
Main references (sources)	Smith, P. **(1995)**, "*Practical Astronomy With Your Calculator*", Third Edition, the Press Syndicate of the University of Cambridge, Printed in Great Britain by Academic Press Ltd.
Recommended books and references (scientific journals, reports...)	The Astronomical Almanac for the Year , (United States Naval Observatory/Nautical Almanac Office,)
Electronic References, Websites	https://www.redshiftsky.com https://www.timeanddate.com// https://www.nasa.gov/

Course Description Form

1. Course Name:
Astronomical techniques Lab.
2. Course Code:
AS 302
3. Semester / Year:
2 semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, one section * 15 weeks = 30 hours **2 Practical hours/week per section * 15 weeks = 30 hours** **Total number of hours per section = 60 hours** **Number of units = 3 units (theoretical 2 + practical 1)**
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Raaid Nawfee Hassan Email: raaid.hassan@sc.uobaghdad.edu.iq **Name: Dr. Fouad Mahmood Abdullah Email: fouad.abdulla@sc.uobaghdad.edu.iq** **Name : Omar Tareq Ali Email: omar.t@sc.uobaghdad.edu.iq**
8. Course Objectives
The Astronomical Technologies Laboratory aims to train the student on modern programs and techniques used in astronomy and space and to enable the student to find many important astronomical values in determining prayer times and the new moon and monitoring the movement of planets, asteroids, comets, the moon and stars.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-person or electronic learning media through blended learning. It is possible to use whiteboard media and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoretical and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them to visit various websites 5. Supporting students' practical laboratory studies by providing astronomical observation evenings throughout the academic year 6. A simplified and sequential explanation of the topic theoretically and detailing the topics in terms of difficulty and applying them practically to convey the idea clearly, including, for example, making appropriate videos for this purpose. 7. Translating topics and theoretical vocabulary related to the department's various educational materials and how some processors can be converted into computer programs of great scientific and educational benefit. 8. Developing the student's programming and analytical mathematical side 9. Discuss the information and concepts covered in the lecture with students by providing "adviso assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Solar Coordinates	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Equation of Time	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Calculate equinox and solstices	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Equation of Kepler .Part1	Orbital mechanics of planets	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Equation of Kepler .Part2	Orbital mechanics of planets	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	--	Seasonal Exam		
7th	2	Calculate the illuminated fracti of the disk of a planet	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

8th	**2**	Eclipses (Sun) Pa 1	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	**2**	Eclipses (Moon) Part 2	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	**2**	Planet in perihelic and aphelion	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	**2**	Planet passages through the nodes	Solar system calculations	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	**2**	-	Seasonal exam		
13th	**2**	Technique of Telescopes . Part 1	Technique of Telescopes	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	**2**	Technique of Telescopes Part	Technique of Telescopes	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	**2**	Astronomic Adaptive Optics technique	Technique of Telescopes	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

11. Course Evaluation

Overall score out of 100 **(Semester grade = 40, including: 25 for theoretical + 15 for practical)** **(End-of-semester exam score = 60, including 40 for theory + 20 for practical)**	

12. Learning and Teaching Resources

Required textbooks (curricular books, any)	Meeus, J. **(1998)**, "*Astronomical Algorithms*", Second Edition, Willmann-Bell. Inc., Printed in the United States of America
Main references (sources)	Smith, P. **(1995)**, "*Practical Astronomy With Your Calculator*", Third Edition, the Press Syndicate of the University of Cambridge, Printed in Great Britain by Academic Press Ltd.
Recommended books and references (scientific journals, reports...)	The Astronomical Almanac for the Year , (United States Naval Observatory/Nautical Almanac Office,)
Electronic References, Websites	https://www.redshiftsky.com https://www.timeanddate.com// https://www.nasa.gov/

Course Description Form

1. Course Name:
Atomic Physics
2. Course Code:
AS 209
3. Semester / Year:
1st Semester / 2023-2024
4. Description Preparation Date:
2-4-2024
5. Available Attendance Forms:
Weekly Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Theoretical hours/week, One Section * 15 weeks = 30 hours 2 Practical hours/week per section * 15 weeks = 30 hours Total number of hours per section = 60 hours Number of units = 3 units (2 Theoretical + 1 Practical)
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Khalid Abdull-kareem Hadi **Email:** khalid.hadi@sc.uobaghdad.edu.iq
8. Course Objectives
1. Preparing graduates specialized in the field of astronomy and space sciences who poss theoretical and practical scientific skills for the purpose of meeting the needs of ministries a other scientific institutions with highly qualified cadres who contribute to serving and build the country. 2. Encouraging distinguished students in this field to become teaching assistants in department and faculty members in the future 3. Working to achieve educational quality and academic accreditation by developing a updating curricula to suit modern scientific development 4. Develop the student's transferable personal skills such as oral and written communicati making tables, handling and analyzing data, leading group work, etc. 5. The student acquires thinking and problem-solving skills by developing systematic skills dealing with problems, which includes the student's ability to approach the problem, divid into various parts, recognize the knowledge he has, find the missing knowledge, and appl to solve the problem. 6. Providing all facilities and possibilities available for the student's academic study, which turn encourages the student to persevere and compete.
9. Teaching and Learning Strategies
1. Clarifying and explaining study materials through electronic classes or any approved in-pers or electronic learning media through blended learning. It is possible to use whiteboard me and use Power Point via LCD screens and Data (Show) for this purpose. 2. Providing students with knowledge through homework assignments related to the theoreti and practical curriculum 3. Asking students to visit scientific libraries to obtain academic knowledge 4. Improving, guiding and supporting students' scientific knowledge by encouraging them visit various websites

5. Supporting students' practical laboratory studies by providing astronomical observat evenings throughout the academic year
6. A simplified and sequential explanation of the topic theoretically and detailing the topics terms of difficulty and applying them practically to convey the idea clearly, including, example, making appropriate videos for this purpose.
7. Translating topics and theoretical vocabulary related to the department's various educatio materials and how some processors can be converted into computer programs of gr scientific and educational benefit.
8. Developing the student's programming and analytical mathematical side
9. Discuss the information and concepts covered in the lecture with students by provid "advisory" assistance or receiving "advisory" assistance from these students.

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1st	2	Historical Overview	Introduction: A historical overview of the development of physics science in general and atomic physics in particular.	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Elements of Electricity and Magnetism	Electric Charge, Coulomb Field, Electrostatic Field, Potential Difference"	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Charged Atomic Particles	The Discovery of Natural Radioactivity, Moving Charged Particles, Electric Discharge Through Gases	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Determination of (e/m) for Cathode Rays	Applying Electrostatic Filed, Applying Magnetic Field)	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Electronic Charge (Millikan Oil Drop Experiment	No Electrostatic Field "Falling", Applying Electric Field "Rising", Positive Ray	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	The Atomic Models " Thomson's Model"	Definition and explanation of Thomson's Model,	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

			Alpha Particle Scattering by Thomson's model		
7th	2	The Atomic Models "Rutherford's Mode"	Definition and explanation of Rutherford's Mode	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	2	The Atomic Models "Rutherford's Mode"	Rutherford Scattering	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	The Atomic Models "Bohr's Model"	The Difficulty of Rutherford Model of the Nuclear Atom	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	The Atomic Models "Bohr's Model"	Definition and explanation of Bohr's Model	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	The Atomic Models "Bohr's Model"	Definition and explanation of Bohr's Quantum Theory	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	The Atomic Models "Bohr's Model"	The Hydrogen Atom	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	The Atomic Models "Bohr's Model"	The Energy Levels and the Spectra of hydrogen	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	Quantum Numbers	Definition and explanation of the Four quantum numbers	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
15th	2	Pauli Exclusive Principle and the Spectral Notation	Definition of the Pauli Exclusive	Paper lectures,	Daily, semester, final exams,

			Principle and the Spectral Notation	Electronic screen, Video lectures via electronic classes	reports, and assignments
Course Structure: Practical					
Week	**Hours**	**Unit or subject name**	**Required Learning Outcomes**	**Learning method**	**Evaluation method**
1st	2	Calculating the electron to mass ratio (Shuster method)	Calculating the electron to mass ratio (e/m) applying electric field	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
2nd	2	Calculating the electron to mass ratio (Shuster method)	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
3rd	2	Balmer series Experiment	Determination of Rydberg's constant	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
4th	2	Balmer series Experiment	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
5th	2	Light Absorption Coefficient by Using Photo Cell	Calculating the light absorption coefficient using a photo cell	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
6th	2	Light Absorption Coefficient by Using Photo Cell	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments

7th	2	Photoelectric Effect (high intensity)	Examining the photoelectric effect for high intensity	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
8th	2	Photoelectric Effect (high intensity)	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
9th	2	Photoelectric Effect (low intensity)	Examining the photoelectric effect for low intensity	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
10th	2	Photoelectric Effect (low intensity)	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
11th	2	The Back Scattering of Beta Particles	Calculating the Back Scattering of Beta Particles	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
12th	2	The Back Scattering of Beta Particles	Discuss the experiment, solve questions, and explain derivations related to the topic	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
13th	2	Full review	A comprehensive review of all experiments	Paper lectures, Electronic screen, Video lectures via electronic classes	Daily, semester, final exams, reports, and assignments
14th	2	General Overview	Distribute reports and discuss results related to experiments	Paper lectures, Electronic screen,	Daily, semester, final exams, reports, and assignments

				Video lectures via electronic classes	
15th	2	Final Course Exam			

11. Course Evaluation

Overall score out of 100
(Semester grade = 40, including: 25 for theoretical + 15 for practical)
(End-of-semester exam score = 60, including 40 for theory + 20 for practical)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	- الفـــــــيزياء الذريـــــــة (الجزء الأول) د. طالب ناهي الخفاجي، د. عباس حمادي، د. هرمز موسى - الفـــــــيزياء الذريـــــــة (الجزء الثاني) د. طالب ناهي الخفاجي، د. عباس حمادي، د. هرمز موسى - الفيزياء الحديثة د. محمد أحمد الجبور
Main references (sources)	- Introduction to Atomic and Nuclear Physics Henery Semat & John R.Albert - Physics of the Atom M. Russell Weher & James A.Richard - Introduction to Atomic Physics M. Russell Weher & James A.Richard - Nuclear Physics I. Keplan
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	