# TEMPLATE FOR COURSE SPECIFICATION

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| HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW |

**COURSE SPECIFICATION**

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| This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification. |

**Dr. Salam E Hammeed**

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| 1. Teaching Institution | Al-Nahrain University - College of Science |
| 2. University Department/Centre | Department of Physics |
| 3. Course title/code | Astrophysics |
| 4. Modes of Attendance offered | Compulsory (compulsory attendance) |
| 5. Semester/Year | First Semester 2022-2023 (Second Stage) |
| 6. Number of hours tuition (total) | 2 hours a week - total 30 hours |
| 7. Date of production/revision of this specification | 10-20-2022 |
| 8. **Aims of the Course** | |
| 1. Develop a physical understanding of objects and astrophysical processes. | |
| 2. Develop quantitative solving skills for problems related to objects and astrophysical processes. | |
| 3. Preparation for postgraduate coursework and/or research experiences in astronomy and astrophysics. | |

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| 9· **Learning Outcomes, Teaching, Learning and Assessment Methods** |
| 1. **Cognitive goals**.   A1. Enable students to understand the range of important physical processes that operate in astrophysical environments and how these structures govern across a wide range of scales, from planets to supergroups to the cosmos.  A2. Enable students to gain an understanding of modern and advanced scientific topics in astronomy and space.  A3. Enable students to obtain knowledge and understanding of the principles, scientific foundations and theories of astronomy and space.  A4. Include relevant current active research areas in each category in astrophysics, with a particular focus on the research connection to the department.  A5. Enable students to gain an understanding of the basic principles of the work of astronomical telescopes of all kinds.  A6. To enable students to gain an understanding of how astronomical telescopes are used for astronomical observations.  A7. Enable students to gain an understanding of the mathematical foundations and equations for the study of astronomy and space.  A8. Giving students a solid scientific curriculum that qualifies students for practical and professional astrophotography.  A9. That the student be able to identify the cosmology, the emergence and development of galaxies and stars, interstellar matter, gases, cosmic and radioactive soils, nuclear interactions in the basic structure of the universe, and knowledge and understanding of the theories and laws that were developed on this unique scientific basis.  A10. Introducing the student to how to find the events of the celestial body and determine its distance, speed and momentum, as well as converting the known celestial coordinates between them. |
| B. **The skills goals special to the course:**  B1. Giving students specialized theoretical and practical scientific skills.  B2. Giving students the skills of thinking and analysis from the theoretical and practical side.  B3. Giving students skills related to developing the programming aspect and specialized mathematical calculations.  B4. Enable students to obtain theoretical experiences and develop teaching skills in the field of astronomy and space.  B5. Training students on the skills of arithmetic operations for calculating some of the astronomical and physical parameters and parameters needed for study.  B6. Teaching the student to present lectures and seminars in a simple, clear and fruitful manner. |
| **Teaching and Learning Methods:** |
| 1- Clarification and explanation of the study materials through the whiteboard and the use of (Point Power) via Data Show and LCD screens.  2- Providing students with knowledge through homework related to the theoretical and practical curriculum.  3- Asking the student to visit scientific libraries to obtain academic knowledge.  4- Improving, directing and supporting the scientific knowledge of students by encouraging them to visit various websites.  5- Simplified and sequential explanation of the topic in theory and the topics of difficulty and their application in practice to communicate the idea clearly, including, for example, making appropriate videos for this purpose. |
| **Assessment methods:** |
| 1. Ask direct oral questions.  2. Scientific reports and daily duties.  3. Short daily exams (Quiz) on the theoretical and practical side.  4. Assigning students to make reports of the completed experiment, discuss the results, and set grades for homework and scientific reports.  5. Putting 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 subject.  6. Monthly exams (with various questions and multiple options) on the theoretical and practical side.  7. Final semester exams. |
| C. **Affective and value goals**:  C1- Urging students to commit, persevere, and make possible efforts to obtain academic knowledge.  C2 - Positive and constructive interaction with students for the purpose of motivating them to accept the scientific material.  C3 - Encouraging students to develop thinking and purposeful scientific research and to move away from the traditional memorization approach.  C4 - Develop Internet search skills to broaden the students' knowledge horizon.  C5 - Develop the creative ideas of gifted students through the use of brainstorming.  C6 - Refining the student's personality on acquiring university values ​​and exemplary good behavior.  C7 - Developing the student's ability and his relations with his colleagues for the better so that he always acts "with honesty and ethics in all his dealings during and after being at the university.  C8 - Introducing the student to the importance of the scientific material given to him during the study in relation to his specialization and the extent to which he can benefit from it for the post-graduation stage. |
| **Teaching and Learning Methods:** |
| 1. Students’ participation during the lecture or laboratory to solve mathematical scientific problems.  2. Asking a set of intellectually verbal questions during the lecture to encourage students to think and analyze scientifically.  3. Giving students various homework, theoretical and laboratory aspects, that require subjective explanations by scientific methods.  4. Giving illustrative examples to encourage students to adhere to the spirit of brotherhood, to appreciate the blessing of science, or to enhance the spirit of cooperation.  5. Giving the student an opportunity to explain a small part of the assignment to his colleagues to enhance his self-confidence. |
| **Assessment methods:** |
| 1. Daily short written exams (Quiz) through multiple-choice questions that require scientific skill.  2. Daily oral exams with various scientific questions.  3. Evaluate and give grades to students' homework and daily activities.  4. Evaluation and giving grades to students through the completion of specialized scientific reports, both theoretical and practical.  5. Evaluating students by assigning them to do and discussing specialized scientific seminars.  6. Evaluating students by taking monthly and quarterly exams.  7. Have the students review the library to see the scientific sources and references related to the subjects of the article. |

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| D. **General and rehabilitative transferred skills (other skills relevant to employability and personal development):**  D1 - Motivating students to work together and serve the community.  D2- Valuing the role of other scientists and thus supporting and developing the scientific personality of students.  D3 - Encouraging students to commit and persevere in scientific research, whether in theoretical or practical aspects, no matter how harsh, difficult and difficult conditions are.  D4 - Develop the students' personality in terms of pushing them towards sober and creative thinking to contribute to serving and building the country.  D5 - Distribute specific topics for each group of students to prepare reports by searching in the Internet, sources or the library and formulating it according to the foundations of the approved research formulation.  D6 - Giving leadership to manage the discussion in the hands of a single work team and enabling them to lead, manage dialogue, exchange opinions, intellectual and personal knowledge, and refine the necessary information.  D 7- The ability to manage and divide time, programs and data related to the subject.  D8 - Training the student on how to benefit from his knowledge and understanding of the curriculum in the process of improving, developing and rehabilitating the student's information for the purposes of personal development after graduation within his scientific specialization.  D 9 - Alert students to errors in their oral answers and discuss them to develop their scientific potential.  D10- Encouraging self-skills to prepare students for employment purposes. |

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| 10. Course Structure | | | | | |
| Week | Hours | ILOs | Unit/Module or Topic Title | Teaching Method | Assessment Method |
| 1 | 2 | Make the student able to know the astronomical distance measurements. | Distance in Astronomy | Blackboard+Data Show screen | Oral and written exams |
| 2 | 2 | To make the student able to know the flow, astronomical illumination, apparent and absolute destiny, and the relationship between them. | Brightness, Flux and Luminosity + order-of-magnitude problems | Blackboard+Data Show screen | Oral and written exams |
| 3 | 2 | Make the student able to measure astronomical coordinates. | astronomical coordinates | Blackboard+Data Show screen | Oral and written exams |
| 4 | 2 | To make the student able to identify astronomical spectra. | Spectra and temperatures | Blackboard+Data Show screen | Oral and written exams |
| 5 | 2 | Make the student able to recognize the stars' colors and extinction. | Colours and extinction | Blackboard+Data Show screen | Oral and written exams |
| 6 | 2 | Make the student able to identify the stars and their life cycle. | Life cycles of stars | Blackboard+Data Show screen | Oral and written exams |
| 7 | 2 | Make the student able to identify the structures of planets. | Planetary structure | Blackboard+Data Show screen | Oral and written exams |
| 8 | 2 | To make the student able to identify telescopes and their types. | Astronomical telescopes | Blackboard+Data Show screen | Oral and written exams |
| 9 | 1 | First monthly exam. | Exam 1 | - | - |
| 10 | 2 | Make the student able to identify our star the Sun. | The Sun: a typical star | Blackboard+Data Show screen | Oral and written exams |
| 11 | 2 | Make the student able to identify the solar activity. | Solar activity | Blackboard+Data Show screen | Oral and written exams |
| 12 | 2 | Make the student able to learn about our galaxy. | The Milky Way – our galaxy | Blackboard+Data Show screen | Oral and written exams |
| 13 | 2 | Make the student able to identify active galaxies. | Active galaxies | Blackboard+Data Show screen | Oral and written exams |
| 14 | 2 | Make the student able to learn about the universe. | The structure of the Universe | Blackboard+Data Show screen | Oral and written exams |
| 15 | 1 | The second monthly exam | Exam 2 | - | - |

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| 11. Infrastructure | | | |
| 1. Books Required reading: | | 1. An Introduction to Astronomy and Astrophysics By: Pankaj Jain.  2. Astrophysics for Physicists By: Arnab Rai Choudhuri.  3. Fundamental Astronomy By: H. Karttunen, P. Kröger, H. Oja, M. Poutanen. and K. J.  Donner.  4. Astronomy: A Physical Perspective, 2nd Edition (Kutner). | |
| 2. Main references (sources) | | An Introduction to Modern Astrophysics, 2nd Edition (Carroll & Ostlie): This is the ultimate reference if you want to learn about certain topics in more depth | |
| A- Recommended books and references (scientific journals, reports…). | |  | |
| B-Electronic references, Internet sites… | |  | |
| 12. The development of the curriculum plan | | | |
| 1. Participation in scientific conferences inside and outside Iraq.  2. Participation in training courses, seminars, scientific workshops and cultural circles inside and outside Iraq.  3. Participation in field visits to other universities.  4. Follow up on scientific development through contacting international universities via the Internet.  5. Conducting an annual evaluation for the purpose of increasing the level of performance for the better.  6. Describe how the department monitors the progress and qualification of students, their achievements and grades.  7. Active participation in internal and external scientific conferences.  8. Raising the level of learning and teaching and upgrading it by finding new mechanisms and tools to facilitate the education process and deliver it with high quality to the largest possible segment of students. | | | |
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