Tafila Technical University

College of Science

Department of Applied Physics

| Study Plan Approval Date | Applied Physics Study Plan | Study Plan Code |
|---|---|---|
| 06/11 / 2024 | | SCI._PHYS._0202 |

This study plan is applied to the students admitted into the Bachelor's program in Applied Physics for the academic year 2024/2025

# Study Plan for B.SC. in Applied Physics

Offered Degree: B.SC. in Applied Physics

# Tafila Technical University

## College of Science

## Department of Applied Physics

| Department | Program | Official Stamp |
|---|---|---|
| Department of Applied Physics | B.SC. in Applied Physics | |
| **The applied physics** study plan was approved by the **dean's council** on 06/11/ 2024 / Decision Number (281/2024) | | |

## TTU Applied Physics Program

Welcome to the department of applied physics at Tafila Technical University TTU. It is one of the most important academic departments in the college of science at TTU. It was established at the beginning of the academic year 2006/2007 and offers **B.Sc. in Applied Physics**. This stemmed from TTU's keen interest in the basic sciences as essential to the development of other fields of science. The department has 16 faculty members who hold Ph.D. degrees in various experimental and theoretical fields that cover the essential aspects of physics. The supporting staff consists of 10 members working as laboratory instructors and technicians. TTU has been keen to prepare advanced educational laboratories that are equipped with up-to-date experiments for all stages of the bachelor's degree, covering subjects such as mechanics, electricity and magnetism, geometrical optics, waves and light, vibrations, thermodynamics, electronics, solid-state physics, atomic and nuclear physics, and computer applications in physics. The bachelor's degree study plan is designed to link physics with technology, industry, and other sciences, so that the program graduates are well equipped for any line of work they choose to pursue.

Physics has often emerged and intersected with many interdisciplinary fields of science such as biomedical physics, quantum chemistry, physics at the nanoscale and other areas such as engineering, modern technology, etc. The department of applied Physics also offers **B.Sc. in Biomedical Physics**, which aims to fulfil the needs of the labour market and keep pace with scientific and technological developments. The biomedical physics program was established at the beginning of the academic year 2024/2025. It provides students with integrated knowledge about the functions of the human body, radiation, radioactivity, dosimetry, medical devices, radiation protection, and full knowledge of the physics of therapeutic and diagnostic radiation, medical imaging, and related devices. The department has been designing the study plan of the educational and research laboratories that suits the biomedical physics program. The state-of-the-art biomedical physics program is committed to applying the fundamental concepts of physics to the foremost scientific problems; educating the next generation of biomedical physicists; promoting the public understanding of the importance of biomedical physics; and achieving local and international quality standards and labor market requirements.

| Vision and Mission | |
|---|---|
| **Vision** | **Preparing** distinguished scientific and professional competencies in the field of applied physics to meet the needs of the labor market. |
| **Mission** | **Qualifying** specialized scientific, professional and research capabilities in applied physics by offering a distinguished scientific program in physics that achieves local and international quality standards and labor market requirements. |

| Program Objectives (POs) | |
|---|---|
| **PO_1** | **Provide** students with basic knowledge and skills in applied physics by a distinguished level of learning and teaching at the bachelor's level. |
| **PO_2** | **Qualify** physics students to meet the requirements of the labor market with specializations needed by governmental institutions and private sector companies. |
| **PO_3** | **Train** physics students on scientific research methods, critical thinking, and problem solving to provide the community with consulting and training services in various physics applications. |
| **PO_4** | **Prepare** distinguished graduates in applied physics to complete their postgraduate studies to serve and develop the society. |
| **PO_5** | **Attract** distinguished scientific and administrative competencies in applied physics. |

| Program Educational Outcomes (PEOs) | |
|---|---|
| **PEO_1** | **Apply** specialized theoretical and practical knowledge in all areas of applied physics. |
| **PEO_2** | **Apply** advanced theoretical and technical skills in gathering information, analyzing outputs, and evaluating quality assurance procedures in applied physics. |
| **PEO_3** | **Justify**, **interpret**, and **communicate** specialized knowledge on applied physics issues through written, visual, and oral communication methods to specialist and non-specialist audiences. |
| **PEO_4** | **Demonstrate** a spirit of initiative and a high degree of independence to work effectively and responsibly in an individual context and within a collaborative teamwork environment. |

| Student Learning Outcomes (SLOs) | |
|---|---|
| **SLO_1** | **Identify**, **formulate**, and **solve** broadly defined technical or scientific problems by applying knowledge of mathematics, science, and technical subjects in areas related to applied physics. |
| **SLO_2** | **Formulate** or **design** a system, process, procedure, or program to meet desired needs. |
| **SLO_3** | **Develop** and **conduct** experiments or test hypotheses, analyze and interpret data, and use scientific judgment to draw conclusions. |
| **SLO_4** | **Communicate** effectively with a wide range of audiences. |
| **SLO_5** | **Understand** ethical and professional responsibilities and the impact of technical and scientific solutions in global, economic, environmental and societal contexts. |
| **SLO_6** | **Work** effectively in teams that set goals, plan tasks, meet deadlines, and analyze risks. |

| Cognitive Domains for Applied Physics Program | |
|---|---|
| **Domain** | Fundamental Cognitive Domains |
| **Theoretical Cognitive Domains** | |
| **1** | Classical Physics |
| **2** | Electricity and Magnetism |
| **3** | Modern Physics |
| **4** | Thermal and Statistical Physics |
| **5** | Mathematical and Computational Applications |
| **Experimental Cognitive Domains** | |
| **6** | Advanced Experimental Applications |
| **Supporting Cognitive Domains** | |
| Courses support the applied physics program that are offered by other programs in the college of science or by other colleges | |

| Numbering System for Applied Physics Program | | | | |
|---|---|---|---|---|
| College NO. | Program NO. | Course Level | Domain NO. | Course order within the cognitive Domain |
| 02 | 02 | From 1 to 4 | From 1 to 6 | From 1 to 9 |

| Credit Hours Distribution for B.SC. in Applied Physics | | | |
|---|---|---|---|
| **Classification** | **Credit Hours** | | |
| | **Obligatory** | **Elective** | **Total** |
| University Requirements | 21 | 6 | 27 |
| College Requirements | 21 | 0 | 21 |
| Specialization Requirements | 68 | 18 | 86 |
| | **110** | **24** | **134** |

## Classification of the Requirements for the B.SC. Degree in Applied Physics According to Teaching Mode (Online – Blended – Face to Face)

| Requirements Classification | Specialization Requirements | | College Requirements | | | Elective University Requirements | | | Obligatory University Requirements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Obligatory | Elective | | | | | | | | | |
| Credit Hours | 68 | 18 | 21 | | | 6 | | | 21 | | |
| % Credit Hours | 50.8 % | 13.4 % | 15.7 % | | | 4.4 % | | | 15.7 % | | |
| **% 100** | **64.2 %** | | **15.7 %** | | | **20.1 %** | | | | | |
| Teaching Mode | F-to-F Courses | Blended Courses | F-to-F Courses | Blended Courses | Online | F-to-F | Blended | Online | F-to-F | Blended | Online |
| **%** | 65 Hrs. | 24 Hrs. | 3 Hrs. | 18 Hrs. | | 0 | 0 | 6 Hrs. | 0 | 0 | 21 Hrs. |
| | 48.5 % | 17.9 % | 2.3 % | 13.4 % | 0 % | 0 % | 0 % | 4.4 % | 0 % | 0 % | 15.7 % |

## First: Obligatory University Requirements (21 Credit Hours)

| Course NO. | Course Name | Number Of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|
| | | Theoretical | Experimental | Total | | |
| 0501100 | Communication Skills in Arabic Language | 3 | 0 | 3 | (1) | Online |
| 0502100 | Communication Skills in English Language | 3 | 0 | 3 | (2) | Online |
| 0603099 | Computer complementary course (3) | 3 | 0 | 0 | ------ | Online |
| 0302100 | Life skills | 3 | 0 | 3 | None | Online |
| 0301199 | Leadership and Social Responsibility | 3 | 0 | 3 | None | Online |
| 0404199 | Entrepreneurship and innovation | 3 | 0 | 3 | None | Online |
| 0503101 | National Education (4) | 3 | 0 | 3 | None | Online |
| 0503112 | Military Science (4) | 3 | 0 | 3 | None | Online |

(1) "Arabic Placement Test" or Prerequisite Arabic Language 0501099.
(2) "English Placement Test" or Prerequisite English Language 0502099.
(3) " Computer skill placement test" 0602098 , If the student passes in placement test, the grade will record "pass".
(4) Obligatory course for Jordanian students and optional for non-Jordanians. Non-Jordanian students, who do not choose this course, must study another course from the elective university requirements and the grade for this course will not be included in the student's GPA, but will be counted as **pass** or **fail**.

## Second: Elective University Requirements (6 Credit Hours)

The student can choose one course from each of the following **groups**:

| Course NO. | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|
| | | Theoretical | Experimental | Total | | |
| **Humanities Group**<br>Offered by College of Arts, College of Education and College of Business | | | | | | |
| 0302099 | Islamic Culture | 3 | 0 | 3 | None | Online |
| 0503108 | Human Rights | 3 | 0 | 3 | None | Online |
| 0503110 | Introduction to Domestic Violence | 3 | 0 | 3 | None | Online |
| 0301102 | Principles of Thinking | 3 | 0 | 3 | None | Online |
| 0301105 | Family Counseling | 3 | 0 | 3 | None | Online |
| 0404100 | Work Ethics | 3 | 0 | 3 | None | Online |
| 0403099 | Development and Environment | 3 | 0 | 3 | None | Online |
| **Applied Sciences Group**<br>Offered by College of Engineering, College of Science and College of Information Technology and Telecommunications | | | | | | |
| 0105103 | Mineral Resources in Jordan | 3 | 0 | 3 | None | Online |
| 0601104 | E-Learning | 3 | 0 | 3 | None | Online |
| 0602100 | Digital Culture | 3 | 0 | 3 | None | Online |
| 0106140 | Traffic Safety | 3 | 0 | 3 | None | Online |
| 0105102 | Sustainable Development | 3 | 0 | 3 | None | Online |
| 0202103 | Physics and Society (5) | 3 | 0 | 3 | None | Online |
| 0212111 | Radiation Sources and its Applications (5) | 3 | 0 | 3 | None | Online |

**(5)** Can be chosen by all university students except students of Applied Physics Department.

## Third: Obligatory College Requirements (21 Credit Hours)

| Course NO. | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|
| | | Theoretical | Experimental | Total | | |
| 0213105 | Calculus 1 | 3 | 0 | 3 | (6) | Blended |
| 0213106 | Calculus 2 | 3 | 0 | 3 | 0213105 | Blended |
| 0213101 | General Physics 1 | 3 | 0 | 3 | (7) | Blended |
| 0213107 | General Chemistry 1 | 3 | 0 | 3 | (8) | Blended |
| 0213109 | General Biology 1 | 3 | 0 | 3 | None | Blended |
| 0213115 | Principles of Statistics 1 | 3 | 0 | 3 | None | Blended |
| 0213103 | General Physics Lab. 1 | 0 | 3 | 1 | 0213101 (9) | F-to- F |
| 0213108 | General Chemistry Lab. 1 | 0 | 3 | 1 | 0213107 (9) | F-to- F |
| 0213116 | Principles of Statistics Lab. 1 | 0 | 3 | 1 | 0213115 (9) | F-to- F |

(6) "High School Mathematics " or Prerequisite Calculus 0213098.
(7) "High School Physics " or Prerequisite Physics 0213097.
(8) "High School Chemistry" or Prerequisite Chemistry 0213099.

## Fourth: Obligatory Specialization Requirements (68 Credit Hours)

| **Course NO.** | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|
| | | Theoretical | Experimental | Total | | |
| 0213102 | General Physics 2 | 3 | 0 | 3 | 0213101 | Blended |
| 0213104 | General Physics Lab. 2 | 0 | 3 | 1 | 0213102 (8) | F-to-F |
| 0202211 | Waves and Light | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202212 | Geometrical Optics | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202221 | Electronics 1 | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202233 | Modern Physics | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202242 | General Physics 3 | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202251 | Mathematical Physics 1 | 3 | 0 | 3 | 0213106 | F-to-F |
| 0202264 | Waves and Vibrations Lab. | 0 | 3 | 1 | 0202211 | F-to-F |
| 0202262 | Optics Lab. | 0 | 3 | 1 | 0202212 | F-to-F |
| 0202263 | Electronics Lab. | 0 | 3 | 1 | 0213104 & 0202221 | F-to-F |
| 0202314 | Classical Mechanics | 3 | 0 | 3 | 0202251 | F-to-F |
| 0202325 | Theory of Electromagnetism 1 | 3 | 0 | 3 | 0202251 | F-to-F |
| 0202335 | Quantum Mechanics 1 | 3 | 0 | 3 | 0202233 & 0202251 | F-to-F |
| 0202346 | Thermal and Statistical Physics | 3 | 0 | 3 | 0202242 | F-to-F |
| 0202352 | Mathematical Physics 2 | 3 | 0 | 3 | 0202251 | F-to-F |
| 0202354 | Computer Applications in Physics 1 | 1 | 4 | 3 | 0202251 | F-to-F |
| 0202357 | Applications of Artificial Intelligence in Physics | 2 | 3 | 3 | 0202354 | Blended |

(8) or Concurrent

| | | | | | | |
|---|---|---|---|---|---|---|
| 0202364 | Intermediate Physics Lab. | 0 | 6 | 2 | 0202233 & 0202242 | F-to-F |
| 0202425 | Theory of Electromagnetism 2 | 3 | 0 | 3 | 0202325 | F-to-F |
| 0202436 | Atomic and Molecular Physics | 3 | 0 | 3 | 0202335 | F-to-F |
| 0202437 | Nuclear Physics | 3 | 0 | 3 | 0202335 | F-to-F |
| 0202438 | Solid State Physics 1 | 3 | 0 | 3 | 0202335 | F-to-F |
| 0202456 | Research Project | 2 | 0 | 2 | 0202469 | F-to-F |
| 0202465 | Solid State Physics Lab. | 0 | 6 | 2 | 0202438 | F-to-F |
| 0202466 | Atomic and Nuclear Physics Lab. | 0 | 6 | 2 | 0202436 & 0202437 | F-to-F |
| 0202469 | Training for Applied Physics Students (9) | 2 | 9 | 2 | None | F-to-F |

(9) 9 field training hours per week to fulfill the training course (0202469) requirements (100 training hours).

## Fifth: Elective Specialization Requirements (18 Credit Hours)

The student can choose any **SIX** courses from the following list:

| Course NO. | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|
| | | Theoretical | Experimental | Total | | |
| 0202313 | Physics of Waves and Vibrations | 3 | 0 | 3 | 0202211& 0202251 | F-to-F |
| 0202315 | Introduction to Astronomy | 3 | 0 | 3 | 0213101 | Blended |
| 0202322 | Electronics 2 (digital electronics) | 3 | 0 | 3 | 0202221 | F-to-F |
| 0202321 | Electrical Circuits | 3 | 0 | 3 | 0213102 | F-to-F |
| 0202333 | Material Science | 3 | 0 | 3 | 0202233 | Blended |
| 0202334 | Soft Matter Physics | 3 | 0 | 3 | 0202233 | Blended |
| 0202345 | Environmental Physics | 3 | 0 | 3 | 0202242 | Blended |
| 0212313 | Radiation Physics | 3 | 0 | 3 | 0202233 | F-to-F |
| 0212324 | Introduction to Biomedical Physics | 3 | 0 | 3 | 0202242 | F-to-F |
| 0212328 | Health Physics | 3 | 0 | 3 | 0212313 | F-to-F |
| 0212343 | Fundamentals of Biophysics | 3 | 0 | 3 | 0212324 | F-to-F |
| 0202426 | Semiconductor Physics | 3 | 0 | 3 | 0202438 | Blended |
| 0212431 | Medical Imaging | 3 | 0 | 3 | 0212328 | F-to-F |
| 0202435 | Quantum Mechanics 2 | 3 | 0 | 3 | 0202335 | F-to-F |
| 0202439 | Solid State Physics 2 | 3 | 0 | 3 | 0202438 | F-to-F |
| 0202441 | Special Topics in Physics | 3 | 0 | 3 | Dept. Approval | Blended |
| 0202453 | Mathematical Physics 3 | 3 | 0 | 3 | 0202352 | F-to-F |
| 0202455 | Computer Applications in Physics 2 | 1 | 4 | 3 | 0202354 | F-to-F |
| 0202467 | Physics of Spectroscopy | 3 | 0 | 3 | 0202335 | F-to-F |
| 0202468 | Laser Physics | 3 | 0 | 3 | 0202211 & 0202335 | F-to-F |

# Advisory Plan for B.SC. Degree in Applied Physics

## First Academic Year_ Applied Physics Program

### The First Semester

| Course Number | Course Name | NO. of Credit Hours | Pre-requisite |
|---|---|---|---|
| 0213105 | Calculus 1 | 3 | (1) |
| 0213101 | General Physics 1 | 3 | (2) |
| 0213107 | General Chemistry 1 | 3 | (3) |
| 0213115 | Principles of Statistics 1 | 3 | None |
| 0213116 | Principles of Statistics Lab. 1 | 1 | 0203131 (4) |
| | Obligatory University Requirement | 3 | |
| | | | |
| **Total** | | **16** | |

### The Second Semester

| Course Number | Course Name | NO. of Credit Hours | Pre-requisite |
|---|---|---|---|
| 0213106 | Calculus 2 | 3 | 0213105 |
| 0213102 | General Physics 2 | 3 | 0213101 |
| 0213109 | General Biology 1 | 3 | None |
| 0205108 | General Chemistry Lab. 1 | 1 | 0213107 (4) |
| 0213103 | General Physics Lab. 1 | 1 | 0213101 (4) |
| | Elective University Requirement | 3 | |
| | Obligatory University Requirement | 3 | |
| **Total** | | **17** | |

(1) “High School Mathematics ” or Prerequisite Calculus 0213098.

(2) “High School Physics” or Prerequisite Physics 0213097.

(3) “High School Chemistry” or Prerequisite Chemistry 0213099.

(4) or concurrent.

## Second Academic Year_ Applied Physics Program

| The First Semester | | | | The Second Semester | | | |
|---|---|---|---|---|---|---|---|
| Course Number | Course Name | NO. of Credit Hours | Pre-requisite | Course Number | Course Name | NO. of Credit Hours | Pre-requisite |
| 0213104 | General Physics Lab. 2 | 1 | 0213102 (5) | 0202233 | Modern Physics | 3 | 0213102 |
| 0202242 | General Physics 3 | 3 | 0213102 | 0202251 | Mathematical Physics 1 | 3 | 0213106 |
| 0202211 | Waves and Light | 3 | 0213102 | 0202264 | Waves and Vibrations Lab. | 1 | 0202211 |
| 0212212 | Geometrical Optics | 3 | 0213102 | 0202262 | Geometrical Optics Lab. | 1 | 0212212 |
| 0202221 | Electronics 1 | 3 | 0213102 | 0202263 | Electronics Lab. | 1 | 0213104 & 0202221 |
| | Obligatory University Requirement | 3 | | | Elective University Requirement | 3 | |
| | | | | | Obligatory University Requirement | 3 | |
| | | | | | Obligatory University Requirement | 3 | |
| **Total** | | **16** | | **Total** | | **18** | |

(5) or concurrent.

## Third Academic Year_ Applied Physics Program

| The First Semester | | | | The Second Semester | | | |
|---|---|---|---|---|---|---|---|
| Course Number | Course Name | NO. of Credit Hours | Pre-requisite | Course Number | Course Name | NO. of Credit Hours | Pre-requisite |
| 0202364 | Intermediate Physics Lab. | 2 | 0202233 & 0202242 | 0202325 | Theory of Electromagnetism 1 | 3 | 0202251 |
| 0202314 | Classical Mechanics | 3 | 0202251 | 0202346 | Thermal and Statistical Physics | 3 | 0202242 |
| 0202352 | Mathematical Physics 2 | 3 | 0202251 | 0202335 | Quantum Mechanics 1 | 3 | 0202251 |
| 0202354 | Computer Applications in Physics 1 | 3 | 0202251 | 0202357 | Applications of Artificial Intelligence in Physics | 3 | 0202354 |
| | Elective Specialization Requirement | 3 | | | Elective Specialization Requirement | 3 | |
| | Elective Specialization Requirement | 3 | | | Obligatory University Requirement | 3 | |
| **Total** | | **17** | | **Total** | | **18** | |

| Fourth Academic Year_ Applied Physics Program | | | | | | | |
|---|---|---|---|---|---|---|---|
| **The First Semester** | | | | **The Second Semester** | | | |
| Course Number | Course Name | NO. of Credit Hours | Pre-requisite | Course Number | Course Name | NO. of Credit Hours | Pre-requisite |
| 0202469 | Training for Applied Physics Students (6) | 2 | None | 0202456 | Research Project | 2 | 0202469 |
| 0202438 | Solid State Physics 1 | 3 | 0202335 | 0202465 | Solid State Physics Lab. | 2 | 0202438 |
| 0202436 | Atomic and Molecular Physics | 3 | 0202335 | 0202466 | Atomic and Nuclear Physics Lab. | 2 | 0202436 & 0202437 |
| 0202437 | Nuclear Physics | 3 | 0202335 | 0202425 | Theory of Electromagnetism 2 | 3 | 0202325 |
| | Elective Specialization Requirement | | | | Elective Specialization Requirement | 3 | |
| | Obligatory University Requirement | 3 | | | Elective Specialization Requirement | 3 | |
| **Total** | | **17** | | **Total** | | **15** | |

(6) 9 field training hours per week to fulfill the training course (0202469) requirements (100 training hours).

## Courses that Cover Fundamental Cognitive Domains (Theoritical and Experimental) for the Applied Physics Program

| Cognitive Domain | Course Number | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|---|
| | | | Theoretical | Experimental | Total | | |
| **(1) Classical Physics** | 0202211 | Waves and Light | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202212 | Geometrical Optics | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202313 | Physics of Waves & Vibrations | 3 | 0 | 3 | 0202211 & 0202251 | F-to-F |
| | 0202314 | Classical Mechanics | 3 | 0 | 3 | 0202251 | F-to-F |
| | 0202315 | Introduction to Astronomy | 3 | 0 | 3 | 0213101 | Blended |
| | | | | | | | |
| **(2) Electricity and Magmetism** | 0213102 | General Physics 2 | 3 | 0 | 3 | 0213101 | Blended |
| | 0202221 | Electronics 1 | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202322 | Electronics 2 (digital electronics) | 3 | 0 | 3 | 0202221 | F-to-F |
| | 0202321 | Electrical Circuits | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202325 | Theory of Electromagnetism 1 | 3 | 0 | 3 | 0202251 | F-to-F |
| | 0202425 | Theory of Electromagnetism 2 | 3 | 0 | 3 | 0202325 | F-to-F |
| | 0202426 | Semiconductor Physics | 3 | 0 | 3 | 0202438 | Blended |
| | | | | | | | |
| **(3) Modern Physics** | 0202233 | Modern Physics | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202335 | Quantum Mechanics 1 | 3 | 0 | 3 | 0202233 & 0202251 | F-to-F |
| | 0202333 | Material Science | 3 | 0 | 3 | 0202233 | Blended |
| | 0202334 | Soft Matter Physics | 3 | 0 | 3 | 0202233 | Blended |
| | 0202435 | Quantum Mechanics 2 | 3 | 0 | 3 | 0202335 | F-to-F |
| | 0202436 | Atomic and Molecular Physics | 3 | 0 | 3 | 0202335 | F-to-F |
| | 0202437 | Nuclear Physics | 3 | 0 | 3 | 0202335 | F-to-F |
| | 0202438 | Solid State Physics 1 | 3 | 0 | 3 | 0202335 | F-to-F |
| | 0202439 | Solid State Physics 2 | 3 | 0 | 3 | 0202438 | Blended |
| | 0212324 | Introduction to Biomedical Physics | 3 | 0 | 3 | 0202242 | F-to-F |
| | 0212313 | Radiation Physics | 3 | 0 | 3 | 0202233 | F-to-F |
| | 0212328 | Health Physics | 3 | 0 | 3 | 0212313 | F-to-F |
| | 0212343 | Fundamentals of Biophysics | 3 | 0 | 3 | 0212324 | F-to-F |
| | 0212431 | Medical Imaging | 3 | 0 | 3 | 0212328 | F-to-F |

| Cognitive Domain | Course Number | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|---|
| | | | Theoretical | Experimental | Total | | |
| **(4) Thermal and Statistical Physics** | 0202242 | General Physics 3 | 3 | 0 | 3 | 0213102 | F-to-F |
| | 0202346 | Thermal and Statistical Physics | 3 | 0 | 3 | 0202242 | F-to-F |
| | 0202345 | Environmental Physics | 3 | 0 | 3 | 0202242 | Blended |
| | 0202441 | Special Topics in Physics | 3 | 0 | 3 | Dept. Approval | Blended |
| | | | | | | | |
| **(5) Mathematical and Computational Physics Applications** | 0202251 | Mathematical Physics 1 | 3 | 0 | 3 | 0213106 | F-to-F |
| | 0202352 | Mathematical Physics 2 | 3 | 0 | 3 | 0202251 | F-to-F |
| | 0202453 | Mathematical Physics 3 | 3 | 0 | 3 | 0202352 | F-to-F |
| | 0202354 | Computer Applications in Physics 1 | 1 | 4 | 3 | 0202251 | F-to-F |
| | 0202357 | Applications of Artificial Intelligence in Physics | 2 | 3 | 3 | 0202354 | Blended |
| | 0202455 | Computer Applications in Physics 2 | 1 | 4 | 3 | 0202354 | F-to-F |
| | 0202456 | Research Project | 2 | 0 | 2 | 0202469 | F-to-F |
| | | | | | | | |
| **(6) Advanced Experimental Applications** | 0213104 | General Physics Lab. 2 | 0 | 3 | 1 | 0213102 (1) | F-to-F |
| | 0202264 | Waves and Vibrations Lab. | 0 | 3 | 1 | 0202211 | F-to-F |
| | 0202262 | Optics Lab. | 0 | 3 | 1 | 0202212 | F-to-F |
| | 0202263 | Electronics Lab. | 0 | 3 | 1 | 0213104 & 0202221 | F-to-F |
| | 0202364 | Intermediate Physics Lab. | 0 | 6 | 2 | 0202233 & 0202242 | F-to-F |
| | 0202465 | Solid State Physics Lab. | 0 | 6 | 2 | 0202438 | F-to-F |
| | 0202466 | Atomic and Nuclear Physics Lab. | 0 | 6 | 2 | 0202436 & 0202437 | F-to-F |
| | 0202467 | Physics of Spectroscopy | 3 | 0 | 3 | 0202335 | F-to-F |
| | 0202468 | Laser Physics | 3 | 0 | 3 | 0202211 & 0202335 | F-to-F |
| | 0202469 | Training for Applied Physics Students (2) | 2 | 9 | 2 | None | F-to-F |

(1) or cocurrent

(2) 9 field training hours per week to fulfill the training course (0202469) requirements (100 training hours).

## Courses Offered by the Basic Sciences Department and Cover Supporting Domains of the Applied Physics Program

| Cognitive Domain | Course Number | Course Name | Number of Credit Hours | | | Pre-requisite | Teaching Mode |
|---|---|---|---|---|---|---|---|
| | | | Theoretical | Experimental | Total | | |
| **Supporting Domains** | 0213101 | General Physics1 | 3 | 0 | 3 | (3) | Blended |
| | 0213103 | General Physics Lab. 1 | 0 | 3 | 1 | 0213101 (6) | F-to-F |
| | 0213107 | General Chemistry 1 | 3 | 0 | 3 | (4) | Blended |
| | 0213108 | General Chemistry Lab. 1 | 0 | 3 | 1 | 0213107 (6) | F-to-F |
| | 0213105 | Calculus 1 | 3 | 0 | 3 | (5) | Blended |
| | 0213106 | Calculus 2 | 3 | 0 | 3 | 0213105 | Blended |
| | 0213115 | Principles of Statistics 1 | 3 | 0 | 3 | None | Blended |
| | 0213116 | Principles of Statistics Lab. 1 | 0 | 3 | 1 | 0213115 (6) | F-to-F |
| | 0213109 | General Biology 1 | 3 | 0 | 3 | None | Blended |
| | 0213097 | Prerequisite Physics (7) | 3 | 0 | 0 | None | Blended |
| | 0213098 | Prerequisite Calculus (7) | 3 | 0 | 0 | None | Blended |
| | 0213099 | Prerequisite Chemistry (7) | 3 | 0 | 0 | None | Blended |

(3) "High School Physics " or Prerequisite Physics 0213097.
(4) "High School Chemistry" or Prerequisite Chemistry 0213099.
(5) "High School Mathematics " or Prerequisite Calculus 0213098.
(6) or cocurrent
(7) This course is marked **PASS** or **FAIL**.

## Description of the Courses that Cover Fundamental Cognitive Domains of the Applied Physics Program

| | | |
|---|---|---|
| Course Name: **General Physics 2** | Course number: **0213102** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213101** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers the electric force, the electric field, Coulomb's law, Gauss's law, electric potential, electric potential energy, capacitance and dielectric materials, current and resistance, Ohm's law, electromotive force, electric circuits and Kirchhoff laws, the magnetic field, magnetic force acting on an electric charge, Lorentz law, sources of magnetic field, Biot-Savart law, Ampère's law, electromagnetic induction, Faraday's law, and Lenz's law. | |
| Course Name: **General Physics Lab. 2** | Course number: **0213104** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0213102 *** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | This experimental course covers experiments on electricity and magnetism: specific charge of the copper ion, electric field mapping and equipotential surfaces, Coulomb potential and Coulomb field of metal spheres, Wheatstone bridge, potentiometer, Ohm's law, power transfer, conversion of galvanometer to an ammeter and a voltmeter, charging and discharging of a capacitor, magnetic field of a straight conductor, Magnetic field of single coil / Biot-Savart's law with a teslameter, and the horizontal component of the Earth's magnetic field. | |
| Course Name: **Waves and Light** | Course number: **0202211** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers mechanical oscillations: simple harmonic motion, simple pendulum, spring. Waves: traveling, longitudinal waves, waves in stretched rope sound waves. Electromagnetic oscillations and its comparison with mechanical oscillations. Electromagnetic waves: transverse and longitudinal nature of electromagnetic waves. Light: light as electromagnetic wave, interference, diffraction, and polarization. | |
| Course Name: **Geometrical Optics** | Course number: **0202212** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers nature of light, speed of light, index of refraction, concept of a ray, reflection and refraction on surfaces, total reflection, Huygens' principle, Fermat's principle, prism, the dispersion of light. Plane and spherical mirrors and image formation, lenses: convex and concave lenses, thin lenses, thick lenses, and lens defects, optical devices: camera, eye, simple microscope, compound microscope, telescope, fibre optics and communications. | |
| Course Name: **Electronics 1** | Course number: **0202221** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course part covers AC and DC circuits, semiconductors, semiconductor diodes and applications, bipolar transistor, transistor fundamentals and transistor biasing, field effect transistors, voltage amplifiers, power amplifiers, and operational amplifiers. | |

* or concurrent

| | | |
|---|---|---|
| Course Name: **Modern Physics** | Course number: **0202233** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers development stages of modern physics, special theory of relativity: time dilation and length contraction, mass–energy equivalence, and Lorentz transformations, atomic structure and atomic models, Planck's law of radiation, Compton scattering, wave nature of matter, X-ray diffraction, particle diffraction, de Broglie's hypothesis. Introduction to quantum mechanics: Schrödinger's equation and applications. | |
| Course Name: **General Physics 3** | Course number: **0202242** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers applications of Faraday's law and Lenz's law, self-induction & mutual induction, resistance, capacitance, inductance, alternating current, electric transformers, gravity: Newton's law of universal gravitation, gravitational field and potential energy, satellites, fluids: pressure in fluids, Archimedes' principle, Bernoulli's equation, Poiseuille' Law, thermodynamics: temperature, thermal expansion of solids, thermal energy and internal energy, heat capacity, first law of thermodynamics, ideal gas, thermal energy and second law of thermodynamics, heat pumps and refrigerators, and third law of thermodynamics. | |
| Course Name: **Mathematical Physics 1** | Course number: **0202251** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213106** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers complex numbers, linear equations, vectors, matrices and determinants, straight-line equation and plane equation, partial differentiation, multiple integrals, vector analysis, Stoke's theorem and Divergence theorem, first-order differential equations, Fourier series of functions, and periodic functions. | |
| Course Name: **Waves and Vibrations Lab.** | Course number: **0202264** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0202211** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Wave and vibrations lab. equipment familiarization; Mathematical pendulum; Harmonic oscillations of spiral springs; The propagation of a transverse wave; Vibration of strings; Velocity of sound in an air; Optical determination of velocity of sound in liquids; Ultrasonic Michelson-Interferometer; Phase shift and power in AC circuits; The series RLC Circuit; The parallel RLC Circuit. | |
| Course Name: **Optics Lab.** | Course number: **0202262** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0202212** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Optics lab. equipment familiarization; Reflection and Refraction; Total internal reflection and deviation of parallel rays; Plane and spherical mirrors; Thin lenses; Newton's rings, prism, Interference: Michelson interferometer; Diffraction: single and double slit; Polarization; Fiber optics. | |

| | | |
|---|---|---|
| Course Name: **Electronics Lab.** | Course number: **0202263** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0213104 & 0202221** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Electronics lab equipment familiarization; Oscilloscope and measurement of voltage amplitude and frequency; Diode characteristics; Zener diode characteristics and applications; Diode clipping and clamping; Bridge rectifier: Half-wave and Full-wave rectifier; The photo diode; Transistor characteristic curve; Transistor as a switch; Transistor biasing; The solar cell. | |
| Course Name: **Classical Mechanics** | Course number: **0202314** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers kinematics in different coordinate systems, Newtonian mechanics, oscillations, gravitation, central force motion, Lagrangian mechanics, Hamiltonian mechanics, dynamics of systems of particles, mechanics of rigid bodies. | |
| Course Name: **Theory of Electromagnetism 1** | Course number: **0202325** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers coordinate systems; Vectors analysis; Stoke's theorem and divergence theorem; Electric forces; Electric fields; electric potential; applications of Gauss law, Special methods for calculating potential: Laplace equation, image method, and multipole expansion; Electrostatic fields in matter: dipole moment and electrical displacement; Magnetism: Lorentz's law, Biot-Savart's law, and Ampere's law; magnetic fields in matter: linear and nonlinear media. | |
| Course Name: **Quantum Mechanics 1** | Course number: **0202335** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202233 & 0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers wave function and statistical interpretation, time-Independent Schrödinger equation, one-dimensional problems: infinite square well, harmonic oscillator (operator method), free particle, Dirac delta-function and finite well, Hilbert space, Hermitian operators, Dirac notation, Schrödinger equation in spherical coordinates, Hydrogen atom, quantum theory of angular momentum, and spin-1/2 particle. | |
| Course Name: **Thermal and Statistical Physics** | Course number: **0202346** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202242** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers fundamental concepts of Thermal and Statistical Physics: state equations, the first law of thermodynamics, entropy and the second law of thermodynamics, applications of thermodynamics in simple systems, Maxwell-Boltzmann statistics, Bose-Einstein statistics, Fermi-Dirac statistics, statistical concepts of temperature and entropy, and applications of Thermal and Statistical Physics. | |

| | | |
|---|---|---|
| Course Name: **Mathematical Physics 2** | Course number: **0202352** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers applications of Fourier series; special functions: gamma, beta, error functions, and Dirac delta function; Ordinary differential equations; Series solution of differential equations; Laplace transforms; Sturm-Liouville eigenvalue problem; Bessel functions, Legendre polynomials; Hermite polynomials; Spherical harmonics; Angular momentum; Solving the radial equation of the hydrogen atom; Solving the harmonic oscillator equation. | |
| Course Name: **Computer Applications in Physics 1** | Course number: **0202354** | NO. of credit hours: **3** (**1** Theoretical Hr. & **4** Experimental Hrs.) |
| Pre-requisite: **0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | Matlab software, C++ and Python will be used as computational and programming tools in **basic** physics applications. Students will be trained to solve problems in real and complex algebra, trigonometry, linear algebra, plotting, calculating integrals and derivatives. The four experimental hours are divided into two sessions: each of two experimental hours. | |
| Course Name: **Intermediate Physics Lab.** | Course number: **0202364** | NO. of credit hours: **2** (**6** Experimental Hrs.) |
| Pre-requisite: **0202233 & 0202242** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Intermediate physics lab. equipment familiarization; Stefan-Boltzmann Law; Specific heat of gasses; Measuring the magnetic field of a conductor; Mechanical equivalent of heat; Specific charge of the electron; Balmer series of mercury; Planck's constant; Thermal expansion of liquids; Thermal expansion of solids; Electromagnetic induction. The six experimental hours are divided into two sessions: each of three experimental hours. | |
| Course Name: **Theory of Electromagnetism 2** | Course number: **0202425** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202325** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers the basic principles of electrodynamics: Maxwell's equations, electromagnetic waves, wave equation, wave propagation, reflection and refraction of plane waves, wave vectors, electromagnetic radiation, impedance, dipole radiation, and antennas. | |
| Course Name: **Atomic and Molecular Physics** | Course number: **0202436** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers one-electron atoms, electron spin, addition of angular momenta, fine structure, Hyperfine structure, interaction of one-electron atoms with electromagnetic radiation, interaction of one-electron atoms with external electric and magnetic fields: Stark effect and Zeeman effect, two-electron atoms, molecular structure and spectra of diatomic molecules. | |

| | | |
|---|---|---|
| Course Name: **Nuclear Physics** | Course number: **0202437** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This course covers basic nuclear concepts and properties; nuclear force: deuteron, extended forces, scattering of nucleons, nuclear models: liquid drop model, shell model; unified model; radioactive decays: alpha, beta, and gamma; nuclear reactions: compound nucleus reactions, nuclear fission and fusion. | |
| Course Name: **Solid State Physics 1** | Course number: **0202438** | NO. of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers crystal structure and binding, diffraction in crystals, reciprocal lattice and vibrations, photons and specific heat, free electron model, band theory of solids, metals, semiconductors and insulators. | |
| Course Name**: Applications of Artificial Intelligance in Physics** | Course number: **0202357** | NO. of credit hours: **3** (**2** Theoretical Hr. & **3** Experimental Hrs.) |
| Pre-requisite: **0202354** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This course examines artificial intelligence (AI) impact on physics, covering techniques such as machine learning, neural networks, and data mining. Students will learn to apply these tools to solve complex physical problems in areas such as experimental physics, simulations, quantum mechanics, and materials science. Through projects and case studies, they will gain practical experience with AI algorithms to analyze data, optimize systems, and predict phenomena. This interdisciplinary course combines theoretical and practical learning. | |
| Course Name: **Research Project** | Course number: **0202456** | Number of credit hours: **2** Theoretical Hrs. |
| Pre-requisite: **0202469** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This applied research course aims to develop the student's self-learning, interpersonal skills, critical thinking and problem solving through conducting a scientific review, applied experiment, or computer modelling within the applied physics discipline in coordination with a supervisor assigned by the department council. This course includes a fortnightly two-hours session to follow up on the student's progress in the research and to enable the student demonstrating, discussing and evaluating his/her achievement with peers and the department faculty members. | |
| Course Name: **Solid State Physics Lab.** | Course number: **0202465** | NO. of credit hours: **2** (**6** Experimental Hrs.) |
| Pre-requisite: **0202438** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Solid state physics lab. equipment familiarization; Hall effect in metals; Band gap of Germanium; Diffraction of electron in polycrystalline lattice; Expanding a wire: elastic limit, flow point, and stress-strain diagram; Bragg reflection: determining the lattice constant of monocrystals; Electron spins resonance at DPPH; Hall effect in p-Germanium; Thermal and electrical conductivity of metals; Ferromagnetic hysterics with PC interface system. The six experimental hours are divided into two sessions: each of three experimental hours. | |

| | | |
|---|---|---|
| Course Name: **Atomic and Nuclear Physics Lab.** | Course number: **0202466** | NO. of credit hours: **2** (**6** Experimental Hrs.) |
| Pre-requisite: **0202436 & 0202437** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This experimental course covers experiments on: Atomic and nuclear physics lab. equipment familiarization; Atomic Spectra of two electrons systems: He and Hg; Fine structure: one electron and two electrons spectra; Zeeman effect; Franck-Hertz experiment with Hg; Gamma ray spectroscopy using NaI detector; Attinuation coefficient and absorption of gamma ray; Determining the half-life of $^{137}$Ba; Electron absorption; Attinuation coefficient and absorption of Beta particles. The six experimental hours are divided into two sessions: each of three experimental hours. | |
| Course Name: **Training for Applied Physics Students *** | Course number: **0202469** | NO. of credit hours: **2** (**100** Field Training Hrs. in Applied Physics) |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This field training course is designed to deepen student understanding of the principles, concepts, and real-world physics applications acquired during their study. The student must have finished **90** credit hours to be enrolled in this training course. | |
| Course Name: **Physics of Waves and Vibrations** | Course number: **0202313** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202211 & 0202251** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | This course covers simple harmonic motion, the damped harmonic oscillator, forced oscillations, coupled oscillators, travelling waves, standing waves, interference and diffraction of waves, and the dispersion of waves. | |
| Course Name: **Introduction to Astronomy** | Course number: **0202315** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213101** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers ancient and modern astronomy, astronomical equipments, the earth motions, composition and atmosphere, the movements of the sun and of the moon, lunar and solar eclipse, tides, the solar system, and the universe: creation and development. | |
| Course Name: **Electronics 2 (Digital Electronics)** | Course number: **0202322** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202221** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers fundamentals of digital electronics: Number systems, binary codes, digital arithmetic, logic gates and related devices, logic families, boolean algebra and simplification techniques, arithmetic circuits, multiplexers and demultiplexers, flip-flops and related devices, counters and registers, data conversion circuits – D/A and A/D converters. | |

* 9 field training hours per week to fulfill the training course (0202469) requirements (100 training hours).

| | | |
|---|---|---|
| Course Name: **Electric Circiuts** | Course number: **0202321** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213102** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers circuit elements; Ohm's law; Kirchhoff's laws; series, parallel, and star-delta connections of passive circuit elements; voltage and current dividers; circuit analysis; RL, RC, and RLC circuits with source-free; RL, RC, and RLC circuits with unit-step forcing function; sinusoidal forcing function; phasor diagrams for RLC circuit combinations; impedance/ admittance; average and rms values of sinusoidal functions. | |
| Course Name: **Material Science** | Course number: **0202333** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202233** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers introduction to phases of matter, atomic structure and interatomic bonding, mechanical properties of materials, electrical properties of materials, thermal properties of materials, magnetic properties of materials, and optical properties of materials. | |
| Course Name: **Soft Matter Physics** | Course number: **0202334** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202233** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers intermolecular interactions, structural organization, and experimental techniques for investigating soft matter. Polymers: synthesis, characterization, amorphous and crystalline polymers, plastics, rubber, fibres. Colloids: Forces between colloidal particles, characterization, effect of polymers on colloid stability, sols, gels, clays, foams, and food colloids. Amphiphiles: Types, surface activity, and adsorption at solid interfaces. Liquid crystals: Types, characteristics and identification of liquid crystal phases, and elastic properties. Biological soft matter: Lipid membranes, DNA, and proteins. | |
| Course Name: **Enviromental Physics** | Course number: **0202345** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202242** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers many aspects of physics that pervade environmental processes in our everyday lives and in naturally occurring phenomena. The human environment, noise pollution, atmosphere and radiation, water, wind, physics of ground, green energy, an energy for living. | |
| Course Name: **Radiation Physics** | Course number: **0212313** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202233** | Teaching language: **English** | Offered by: Biomedical Physics Program |
| Course Description | The course covers fundamentals of radiation physics: radioactivity and decay kinetics, sources of ionizing radiation, natural decay series, production and properties of ionizing radiation, interactions of photons, charged particles, and neutrons with matter, radiation detectors; concepts of radiation dosimetry (theoretical and experimental, cavity theory and ionization chambers). | |
| Course Name: **Introduction to Biomedical Physics** | Course number: **0212324** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202242** | Teaching language: **English** | Offered by: Biomedical Physics Program |
| Course Description | The course covers biomechanics, biofluid mechanics, sound and hearing, light and vision, heat and temperature, electricity and magnetism in the human body, biomagnetism, the use of ionizing and non-ionizing radiation in medical diagnosis and treatment, and introduction to radiation protection and nuclear medicine. | |

| | | |
|---|---|---|
| Course Name: **Health Physics** | Course number: **0212328** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0212313** | Teaching language: **English** | Offered by: Biomedical Physics Program |
| Course Description | The course covers Radiation Dosimetry; Biological Basis for Radiation Safety; Radiation Safety Guides; Health Physics Instrumentation: Radiation Detercors, Dose Measurement, Calibration, and Counting Statristics; External Radiation Safety; Internal Radiation Safety; Evaluation of Radiation Safety Measures; Nonionizing Radiation Safety. | |
| Course Name: **Fundamentals of Biophysics** | Course number: **0212343** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0212324** | Teaching language: **English** | Offered by: Biomedical Physics Program |
| Course Description | The course covers molecular structure of biomolecules. properties and function of proteins, nucleic acids, lipids and membranes. Energetics and dynamics of biological systems. Physical aspects of selected systems including: circulatory system, hearing, nerve transmission, vision, photosynthesis, enzyme mechanism, and cellular diffusion. Introduction to spectroscopic methods for monitoring reactions and determining structure including light absorption or scattering, fluorescence, NMR, and x-ray diffraction. | |
| Course Name: **Semiconductor Physics** | Course number: **0202426** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202438** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers elementary properties of semiconductors, energy band theory, semiconductor statistics, transport of carriers in semiconductors, carrier diffusion processes, scattering processes, quantum effects in transport phenomena. | |
| Course Name: **Medical Imaging** | Course number: **0212431** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0212328** | Teaching language: **English** | Offered by: Biomedical Physics Program |
| Course Description | The course covers mathematical and statistical aspects of imaging science, physical description of image quality: resolution, contrast, and signal to noise ratio, X-ray imaging radiography, fluoroscopy, computed tomography (CT), ultrasonography, nuclear imaging: gamma camera, scintigraphy, positron emission tomography (PET), single photon emission computed tomography (SPECT), and magnetic resonance imaging (MRI), evaluation and optimization of imagining systems, Linear system theory in the Fourier domain, image processing and analysis, statistical properties of signals. | |
| Course Name**: Quantum Mechanics 2** | Course number: **0202435** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers time-independent perturbation theory (nondegenerate and degenerate); fine structure of Hydrogen atom; Stark effect; Zeeman effect; time-dependent perturbation theory: emission and absorption of radiation; variational method; matrix quantum mechanics. | |

| | | |
|---|---|---|
| Course Name**: Solid State Physics 2** | Course number: **0202439** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202438** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers Fermi surface and theory of electrical conduction, dielectrics, magnetic properties, optical phenomena in solids, concepts of phase transition in solids, materials and superconductivity, and solid state spectroscopy. | |
| Course Name**:** **Special Topics in Physics** | Course number: **0202441** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **Dept. Approval** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The content of this course is determined by the department council. It includes selected topics in applied physics and within the fundamental cognitive domains for the applied physics program. The student must have finished **100** credit hours to be enrolled in this course. | |
| Course Name**: Mathematical Physics 3** | Course number: **0202453** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202352** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers partial differential equations: Laplace's equation; Steady-state temperature in a rectangular plate; The diffusion or heat flow equation; The Schrodinger equation; The wave equation; The vibrating string; Steady-state temperature in a cylinder; and Poisson's equation. Calculus of variations: The Euler equation; Several dependent variables; and Lagrange's equations. Functions of complex variables: Analytic functions; Contour integrals; The residue theorem. | |
| Course Name: **Computer Applications in Physics 2** | Course number: **0202455** | NO. of credit hours: **3** (**1** Theoretical Hr. & **4** Experimental Hrs.) |
| Pre-requisite: **0202354** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | MATLAB software, C++ and Python programming languages will be used as computational and programming tools in **advanced** physics applications. Students will be trained to model real-world problems using special functions and differential equations. The four experimental hours are divided into two sessions: each of two experimental hours. | |
| Course Name**: Physics of Spectroscopy** | Course number: **0202467** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers characteristics and techniques for measurement of electromagnetic spectra, infrared, visible, ultra-violet and shorter wavelengths, applications to atomic, molecular and solid state physics, spectroscopic methods, two and multi-photon spectroscopy and nonlinear mixing of coherent waves. | |
| Course Name**: Laser Physics** | Course number: **0202468** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0202211 & 0202335** | Teaching language: **English** | Offered by: Applied Physics Program |
| Course Description | The course covers theory of three and four levels lasers. Types of laser: solid state lasers, gas laser, diode lasers. Cavities of laser, stability of laser cavity using matrix optics. Optics of Gaussian beam, theory of pulsed lasers for three and four levels lasers. Selection of wavelength of laser using dispersion elements (Prisms, Fabry-Perot, birefringence plates). Non-linear optics and harmonic generation. Application of lasers. | |

## Description of the Courses Offered by the Basic Sciences Department and Cover the Supporting Domains of the Applied Physics Program

| | | |
|---|---|---|
| Course Name**: General Physics 1** | Course number: **0213101** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: * | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers units and measurement, scalar and vector quantities, vectors, motion in one dimension, projectiles, circular motion, laws of motion and their applications, work and energy, linear momentum, collisions, kinematics of rotational motion, center of mass, torque, angular momentum, applications of static and dynamic equilibrium. | |
| Course Name**: General Physics Lab. 1** | Course number: **0213103** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0213101 **** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | This experimental course covers an introduction on measurements, accuracy and precision, collection and analysis of data, measurements and uncertainties, vectors: force table, kinematics of rectilinear motion, projectiles, newton's second law of motion with digital cart, force and displacement on a fixed pully, centripetal force/centrifugal force, coefficients kinetic and static friction, conservation of mechanical energy, conservation of momentum with digital-cart, simple pendulum, spring constant, moment of inertia of rigid object. | |
| Course Name**: General Chemistry 1** | Course number: **0213107** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: ***** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers chemistry and measurement, stoichiometry of atoms and molecules, stoichiometry of chemical reactions, properties of solutions, periodic table and electronic configurations of atoms and ions, molecular structure, chemical bonding, molecular shapes, gases, thermochemistry. | |
| Course Name**: General Chemistry Lab. 1** | Course number: **0213108** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0213107 *** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | This experimental course covers Lab. safety and basic Lab. techniques, formula of hydrate, empirical formula of a compound, limiting reactant, periodic chart and periodic law, spectroscopy and molecular geometry, properties of inorganic compounds and metathesis reactions, molecular weight of a volatile liquid, preparation of an alum, aspirin synthesis, standardization of NaOH solution and equivalent weight of an acid, bleach analysis. | |

* "High School Physics " or Prerequisite Physics 0213097.
** or cocurrent
*** "High School Chemistry" or Prerequisite Chemistry 0213099.

| | | |
|---|---|---|
| Course Name**: Calculus 1** | Course number: **0213105** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: ** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers functions and their properties, types of functions, equation of a straight line, curves of functions, average equations, limits and continuity, derivative, definition of the derivative, trigonometric functions, implicit differentiation, applications to derivatives, Rolle's theorem, mean value theorem, properties of integration, the first and second fundamental theorems, the fundamental theorem of calculus, applications to integration (area, volume, surface area, arc length ). | |
| Course Name**: Calculus 2** | Course number: **0213106** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **0213105** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers exponential and logarithmic functions, Hyperbolic functions, Inverse functions, trigonometric and hyperbolic inverse functions, Integration techniques by parts, Trigonometric substations, fractions, integration of partial trigonometric functions, and improper integrals. Sequences test, series convergence test, ratio test, comparison test, root test conditional convergence, Maclaurin and Taylor series and their convergences, power series, differentiation and integration of power series. | |
| Course Name**: Principles of Statistics 1** | Course number: **0213115** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers data collection, survey, types of data, sampling techniques, data representations, measure of central location, measure of dispersion, probability, random variables and distribution, methods of counting, Independence, conditional probability, Bayes theorem, binomial distribution, normal distribution, expectations, Point estimation, interval estimation for mean, hypothesis testing for mean. | |
| Course Name**: Principles of Statistics Lab. 1** | Course number: **0213116** | NO. of credit hours: **1** (**3** Experimental Hrs.) |
| Pre-requisite: **0213115**** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | This experimental course covers data representation by graphs and tables for ungrouped and grouped data, measures of central location (mean, median, and mode), measures of dispersion (range, variance, and standard deviation), probability distribution curves, binomial distribution, normal distribution, central limit theorem (CLT), Estimations of the confidence interval and hypothesis testing about the mean of one population, and correlation and regression. Statistical packages such as SPSS and Minitab are used for the above calculations. | |
| Course Name**: General Biology 1** | Course number: **0213109** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | This course cover chemical context of life, water and the fitness of the environment, carbon and the molecular diversity of life, the structure and function of large biological molecules, cell structure and function, membrane structure and function, introduction to metabolism, cellular respiration and fermentation, photosynthesis, the cell cycle, mitosis, meiosis and sexual life cycles, Mendel and the gene idea, and the chromosomal basis of inheritance. | |

* or cocurrent

** "High School Mathematics " or Prerequisite Calculus 0213098.

| | | |
|---|---|---|
| Cours Name: **Prerequisite Physics *** | Course number: **0213097** | NO. of credit hours: **0** (**3** Theoretical.) |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers measurement and system of units; Vectors; motion in one and two dimensions; Particle dynamics and Newton's laws of motion; Work and energy; Conservation of energy; Collisions, impulse; Conservation of linear momentum; Electric charge; Coulomb's law; Electric field; Gauss law; Electric potential: electric potential energy and electric potential of point charges; Current and resistance; Ohm's law; Kirchhoff's laws; Magnetic field: Magnetic force and concept of magnetic field. | |
| Cours Name: **Prerequisite Calculus *** | Course number: **0213098** | NO. of credit hours: **0** (**3** Theoretical.) |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers real numbers, Inequalities; Cartesian plane; Distance formula, Straight lines; Parabola; Graph of curves; Composition functions; Polynomials; Rational functions; Long division, Roots of polynomials; Exponents; Logarithms; Trigonometric functions, Limits, Continuity, Limits at infinity, Definition of derivative; Differentiation rules; Applications; chain rule; Implicit differentiation; Derivatives of logarithmic and trigonometric functions; Definite integration; Principles of integration; Fundamental theorem of calculus; Applications of integration; Area between two curves. | |
| Cours Name: **Prerequisite Chemistry *** | Course number: **0213099** | NO. of credit hours: **0** (**3** Theoretical.) |
| Pre-requisite: **None** | Teaching language: **English** | Offered by: Basic Sciences Department |
| Course Description | The course covers basic concepts in chemistry: The study of change; Mass relationships in chemical reactions, Gases, Physical periodic relationship among the elements; Chemical bonding; Physical properties of solutions; Acids, bases and their equilibria. The course emphasizes on developing the student's problem-solving skills by introducing examples on everyday examples whenever possible. | |

## Description of Elective University Course Offered by the Applied Physics Program

| | | |
|---|---|---|
| Course Name**: Physics and Society **** | Course number: **0202111** | Number of credit hours: **3** Theoretical Hrs. |
| Pre-requisite: **None** | Teaching language: **Arabic** | Offered by: Applied Physics Program |
| Course Description | This course aims to enrich the general knowledge of the university students in various specializations on physics of everyday phenomena. Physics and its branches; Definition of fact, theory, hypothesis, and scientific law; Physics research area; The universe: Creation and development; The solar system; The earth motions; Atmospheric physics; The motion of sun and moon; Lunar and solar eclipse; Tides; Timing; Atom and nuclear structure: Electromagnetic spectrum applications, Ozone layer depletion, Nuclear reactions in sun, Radiation doses, Medical imaging, and Nuclear energy. Interactive audiovisual learning material on how different electrical, mechanical, and electronic devices work that enables student to share, to discuss, and to justify his/her ideas with peers through written, visual, and oral communication methods. | |

* This course is marked **PASS** or **FAIL**

** Can be chosen by all university students except students of the Applied Physics Department.