



Umm Al-Qura University

Faculty of Applied Sciences

Physics Department

***Academic Guide
Handbook
for
Medical Physics
Program Students***

2017-2018



Preface

Umm Al-Qura University (UQU) is one of the most effective governmental institutes concerned with teaching and scientific research in the Kingdom of Saudi Arabia (KSA). The site responsible for introducing the Degree Program in both Physics, and Medical Physics is the Physics Department. The Physics Department belongs to the Faculty of Applied Science in University of Umm Al-Qura. The faculty brings together all the basic natural sciences concerning teaching and scientific research. The Faculty of Applied Science coordinates seven program degrees; Mathematics, Physics, Medical physics, Chemistry, Industrial chemistry, Biology and Microbiology. The campus belongs to the institute is divided into two main locations as; Al-'Abdiah for boys and El-Zaher for girls. Both the Physics and Medical Physics programs are displayed in the campus.



Umm Al-Qura University
Faculty of Applied Science
Physics Department
Medical Physics Program
Student Handbook



Dear Students,

Welcome to our distinct department. Department of physics was one of the first departments in Umm Al-Qura University and one of its ambitious departments, which participates in developing human resources qualified to construct our nation. The range of our undergraduate programs covers all areas of physics and medical physics. The department focuses on teaching both the fundamentals and sophisticated modules for both physics and medical physics. This will help in improving the society and contributes to the prosperity and welfare of human life. This takes place in compliance with Islamic sciences regarding all physics and medical physics advanced aspects.

The department of physics has a commitment to provide our undergraduates best knowledge. Therefore, they are guided throughout their courses by personal tutors and are taught by experienced and dedicated staffs.

The department of physics first mission is to always prepare and improve our undergraduate program. The department is fast growing, with a plan to apply for accreditation of our Bachelor degree program by ASIIN. We are dedicated to providing a truly outstanding educational opportunity through a proper balance of high quality undergraduate, postgraduate and research programs.

Hopefully this handbook will achieve the benefit contemplated for all. With my best wishes,

Dr. Saleh M. Alluqmani

Head of the Physics Department



Umm Al-Qura University

The University of Umm Al-Qura was established in 1981 by the royal decree number 39 on 30/7/1981. During the first decade of the fifteenth Hijri century the Colleges of Da'wa (Call to Islam), Arabic Language, Applied Sciences, Social Sciences, Engineering and Islamic Architecture were established, beside the College of Education. By the establishment of the College of Medicine and Medical Sciences in 1997 in Makkah. The University offers the Bachelors, Graduate Diplomas, Masters and Ph.D degrees in Islamic Studies, Arabic Language, Education, Social Sciences, Applied Sciences, Medicine and Engineering. In 1986 the Custodian of the Two Holy Mosques laid the foundation stone of Al-'Abdiyah campus to continue the university's educational progress in Makkah and meet the rising demand of the increasing numbers of students. In 1995 the College of Shari'a and Islamic studies, the College of Applied Science, the College of Arabic Language and the College of Engineering and Islamic Architecture began the gradual move to the new campus of Al-'Abdiyah campus, followed by the College of Medicine and Medical Studies which was established by a royal decree in 1997. Currently, there are three campuses in Makkah (In Aziziyah, In Al-Zahir, housing the Deanship of Girls Undergraduate Studies and In Al-'Abdiyah). Umm Al-Qura university gives a special attention to research and publication and community service. The University is playing a significant role in these fields.

The College of Applied Sciences

College of Applied Sciences is the first scientific college at Umm Al-Qura University. The college was established in 1401 A.H. and includes four departments (Physics, Mathematics, Chemistry and Biology). The college departments award Bachelor's and Master's degrees and also the departments of Chemistry and Biology award the Ph.D. degree. The College of Applied Sciences has taken further steps to enhance its scientific programs and lab as well as research facilities. It now has over 60 laboratories as well as an interactive training centre that is concerned with giving students the opportunity to train at governmental sectors and private sector establishments. Amplifying scientific programs, particularly those dedicated to serve the society as well as introducing new Ph.D. programs in the departments of Mathematics and Physics; and Starting new departments (e.g. the Department of Environmental Studies) and



centres of distinction as well as creating different academic posts of specialization in tandem with a number of international research centres.

Department of Physics

The physics department is one of the oldest departments in the Faculty of Science and has been established with a number of other departments (Mathematics, Chemistry and Biology) in 1401 A.H. Department of physics developed a comprehensive and includes research groups enriched research and contributed to the Renaissance of this country. Many factories and companies contribute to the faculty member as advisers. The department requires a student's successful fulfillment of 142 credit hours in eight levels, each ranging from 9 to 22 credit hours, for four years of study. The vision of the department is to be a pioneer in physics, medical physics and their application at the local and international. Highly distinguished education and creative research to serve society and contribute toward knowledge based economy, creativity and scientific research. The message of the department is to be a creative and discrimination in higher education and scientific research in physics and medical physics and graduate students with high scientific and technical skills and contribute to the development of society. The objectives of the department are achieving leadership in higher education, scientific research and community service. Raise the level of graduates through total quality standards. Preparation of development and innovative educational programs that qualify graduates to keep up with the demands of the knowledge society and the work market. Provide students with the basic knowledge and skills in the field of physics and medical physics. Enhance scientific research and professional skills of the researchers to contribute the scientific research and its applications. Serving society through effective partnership. Partnerships with research centers and universities in the world. Attract distinguished scientific and administrative



MISSION, GOALS AND OBJECTIVES

Vision

Achieving pioneering in physics and medical physics at a local and international level, and creating active partnerships with community organizations.

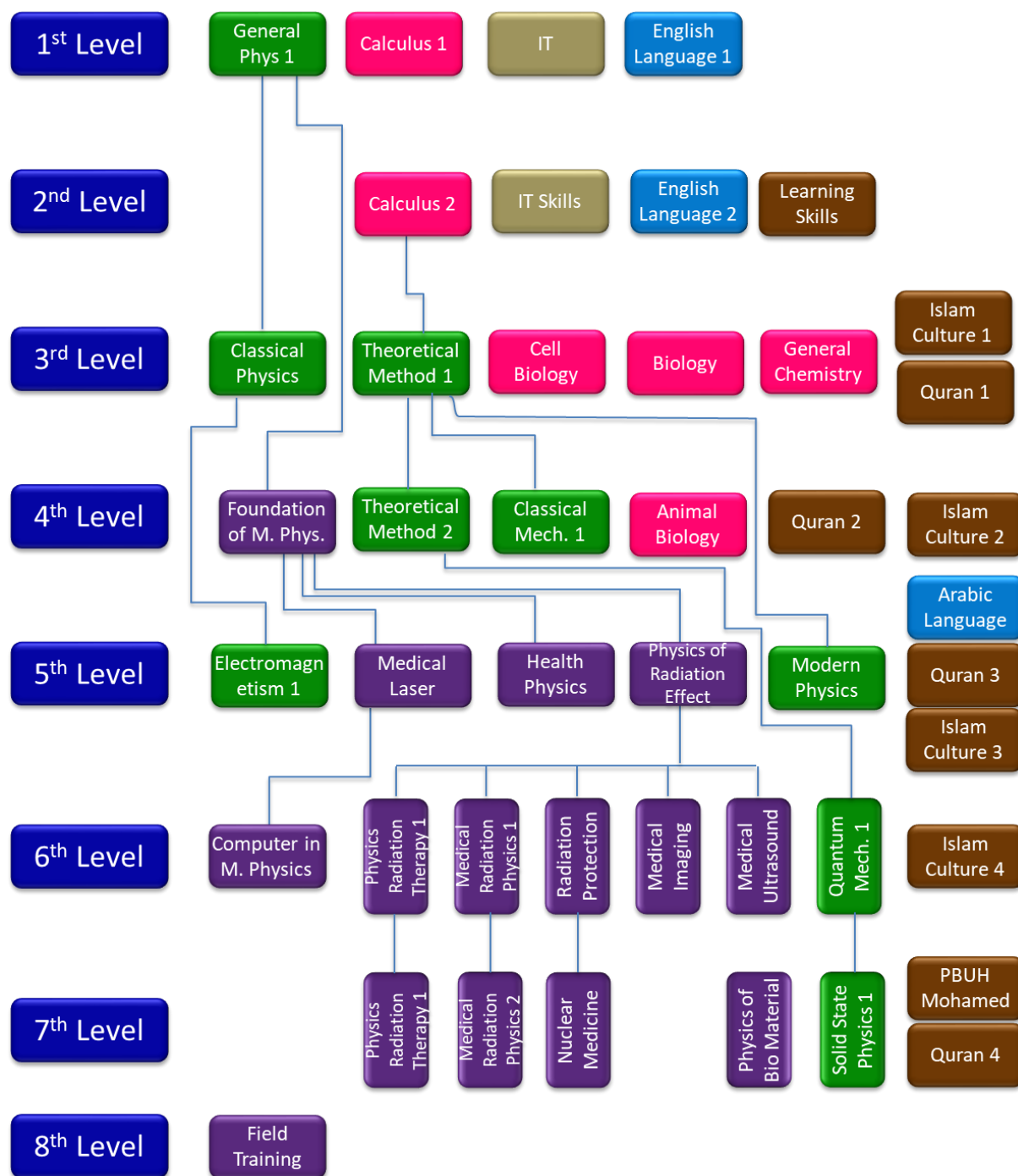
Mission

Realizing creativity and distinction in higher education and scientific research in the field of pure and medical physics. The mission is to prepare graduates with high scientific and technical skills who are capable of serving and developing the community.

Objectives

- 1- Achieving pioneering in higher education, scientific research and community services.
- 2- Upgrading graduates' standard through application of total quality measures.
- 3- Preparation of innovative educational programs that qualify graduates who can adequately respond to the community needs and the labor market.
- 4- Providing students with essential knowledge and skills in the field of pure and medical physics.
- 5- Promoting scientific research and qualifying professional researchers to participate in conducting distinguished scientific research.
- 6- Serving community organization through establishing smart partnerships.
- 7- Establishing smart partnership with research centers and distinguished international universities.
- 8- Attracting highly qualified scientific Cadre and distinguished administrative caliber.

Curriculum Scheme for Medical Physics Program Plan (33)



Design by: Dr. S. M. Attia

List the courses that are granted into the program.

The description of the Medical Physics curriculum 1433 A.H

(Credit hours 135 h)

Course code	Course name	Credit hours	College or Department
First year (the foundation year)			
Level 1 (Semester 1)			
4800170	English (1)	6	Foundation year deanship
4800140	[Mathematics (1)] Introduction to Mathematics	4	Foundation year deanship
4800130	General Physics	4	Foundation year deanship
4800150	Computer skills (1)	2	Foundation year deanship
Level 2 (Semester 2)			
4800153	Basic Computer programming skills (2)	3	Foundation year deanship
4800104	Learning and studying skills	3	Foundation year deanship
4800171	English (2) Technical English skills	4	Foundation year deanship
4800141	[Mathematics (2)] Introduction to Mathematics	4	Foundation year deanship
Total		30	
Second year			
Level 3 (Semester 3)			
Course code	Course name	Credit hours	College or Department

403200	General Physics (2)	4	Faculty of Applied Science / Dept of Physics
403243	Method in Theatrical Physics (1)	2	Faculty of Applied Science / Dept of Physics
401211	Cell Biology	4	Faculty of Applied Science / Dept of Biology
401102	Biology (1): zoology	2	Faculty of Applied Science / Dept of Biology
402101	General Chemistry	4	Faculty of Applied Science / Dept of Chemistry
601101	Islamic Culture (1)	2	Faculty of Shari'a
605101	Holly Quran (1)	2	Faculty of Shari'a
Total		20	
Level 4 (Semester 4)			
Course code	Course name	Credit hours	College or Department
403280	Fundamental of Medical Physics	4	Faculty of Applied Science / Dept of Physics
403220	Classical Mechanics (1)	3	Faculty of Applied Science / Dept of Physics
403244	Method in Theatrical Physics (2)	3	Faculty of Applied Science / Dept of Physics
401364	Animal Biology	3	Faculty of Applied Science / Dept of Biology
601201	Islamic Culture (2)	2	Faculty of Arabic Language
605201	Holly Quran (2)	2	Faculty of Shari'a
Total		17	
Third year			
Level 5 (Semester 5)			
Course code	Course name	Credit hours	College or Department
403381	Laser in Medicine	2	Faculty of Applied Science / Dept of Physics
403383	Health Physics	3	Faculty of Applied Science / Dept of Physics

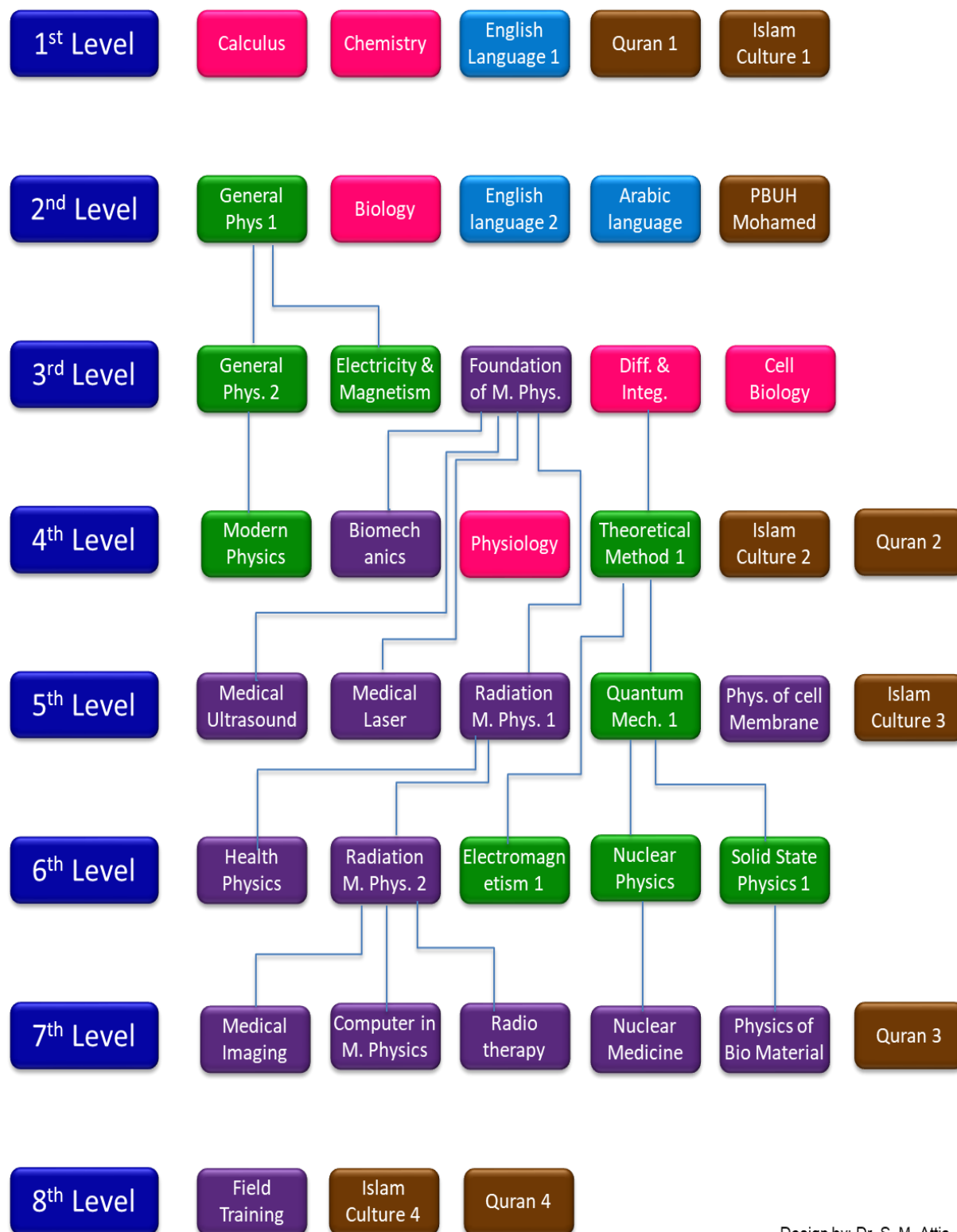


403384	Physics of Radiation effects	2	Faculty of Applied Science / Dept of
403350	Modern Physics	4	Faculty of Applied Science / Dept of
403201	Electromagnetism (1)	3	Faculty of Applied Science / Dept of Physics
601301	Islamic culture (3)	3	Faculty of Shari'a
605301	Holly Quran (3)	2	Faculty of Shari'a
501101	Arabic language	2	Faculty of Arabic Language
Total		21	
Level 6 (Semester 6)			
Course code	Course name	Credit hours	College or Department
403385	Medical radiation Physics (1)	4	Faculty of Applied Science / Dept of Physics
403386	Physics of Radiation Therapy (1)	4	Faculty of Applied Science / Dept of Physics
403388	Radiation Protection	2	Faculty of Applied Science / Dept of Physics
403389	Physics of Medical Imaging	3	Faculty of Applied Science / Dept of Physics
403390	Physics of Ultrasound in Medicine	2	Faculty of Applied Science / Dept of Physics
403391	Computing in Medicine	1	Faculty of Applied Science / Dept of Physics
403344	Quantum Mechanics (1)	3	Faculty of Applied Science / Dept of Physics
601401	Islamic Culture (4)	2	Faculty of Shari'a
Total		21	
Fourth year			
Level 7 (Semester 7)			



Course code	Course name	Credit hours	College or Department
403492	Medical Radiation Physics (2)	4	Faculty of Applied Science / Dept of Physics
403493	Physics of Radiation Therapy (2)	3	Faculty of Applied Science / Dept of Physics
403495	Nuclear Medicine	4	Faculty of Applied Science / Dept of Physics
403496	Physic of Bio-material	3	Faculty of Applied Science / Dept of Physics
403370	Solid State Physics (1)	3	Faculty of Applied Science / Dept of Physics
102101	Profit History	2	Faculty of Shari'a
605401	Holly Quran (4)	2	Faculty of Shari'a
Total		21	
Level 8 (Semester 8)			
Course Code	Prerequisite	Course name	Credit hours
403498	Dept. acceptance	Training project	5 Hr
Total		5	

Curriculum Scheme for Medical Physics Program Plan (37)



Design by: Dr. S. M. Attia



The description of the Medical Physics Curriculum 1437 A.H

(Credit hours 136 h)

Course Code	Course Title	Required or Elective	Credit Hours	College or Department
First year				
Level 1 (Semester 1)				
4041101	Calculus	R	4	Faculty of Applied Science / Dept. of Mathematics
4021101	General Chemistry	R	4	Faculty of Applied Science / Dept. of Chemistry
7004101	English Language - General	R	4	English Language Institute
605101	Holy Quran I	R	2	
601101	Islamic Culture I	R	2	
Total			16	
Level 2 (Semester 2)				
4031101	General Physics	R	4	Faculty of Applied Science / Dept. of Physics
4011101	General Biology	R	4	Faculty of Applied Science / Dept. of Biology
7004102	English for Science	R	4	English Language Institute
501101	Arabic Language	R	2	Faculty of Arabic Language
102101	The Biography of the Prophet Mohammad (PBUH)	R	2	
Total			16	
Second year				
Level 3 (Semester 3)				
4032280	Fundamentals of Medical physics	R	4	Faculty of Applied Science / Dept. of Physics
4032102	General physics (2)	R	4	Faculty of Applied Science / Dept. of Physics
4032121	Electricity and magnetism	R	4	Faculty of Applied

				Science / Dept. of Physics
4041502	Differentiation and Integration (2)	R	4	Faculty of Applied Science / Dept. of Mathematics
4012312	Cell Biology	R	2	Faculty of Applied Science / Dept. of Biology
Total			18	
Level 4 (Semester 4)				
4032293	Biomechanics	R	3	Faculty of Applied Science / Dept. of Physics
4032141	Theoretical Methods in Physics(1)	R	4	Faculty of Applied Science / Dept. of Physics
4032150	Modern Physics	R	4	Faculty of Applied Science / Dept. of Physics
4013331	Biology-Physiology	R	3	Faculty of Applied Science / Dept. of Biology
605201	Holy Quran II	R	2	
601201	Islamic Culture II	R	2	
Total			18	
Third year				
Level 5 (Semester 5)				
4033290	Physics of Medical Ultrasound	R	2	Faculty of Applied Science / Dept. of Physics
4033281	Physics of medical laser	R	2	Faculty of Applied Science / Dept. of Physics
4033285	Radiation Medical physics(1)	R	4	Faculty of Applied Science / Dept. of Physics
4033298	Physics of cell membrane & Macromolecules	R	2	Faculty of Applied Science / Dept. of Physics
4033145	Quantum Mechanics (1)	R	4	Faculty of Applied Science / Dept. of Physics
601301	Islamic Culture III	R	3	
Total			17	

Level 6 (Semester 6)				
4033283	Health Physics	R	3	Faculty of Applied Science / Dept. of Physics
4033292	Radiation Medical physics(2)	R	4	Faculty of Applied Science / Dept. of Physics
4034170	Solid State Physics(1)	R	4	Faculty of Applied Science / Dept. of Physics
4033132	Electromagnetism (1)	R	3	Faculty of Applied Science / Dept. of Physics
4034160	Nuclear Physics	R	4	Faculty of Applied Science / Dept. of Physics
Total			18	
Fourth year				
Level 7 (Semester 7)				
4034291	Computer Applications in Medical physics	R	2	Faculty of Applied Science / Dept. of Physics
4034289	Physics of Medical Imaging	R	3	Faculty of Applied Science / Dept. of Physics
4034286	Physics of radiotherapy	R	4	Faculty of Applied Science / Dept. of Physics
4034295	Physics of Nuclear Medicine	R	4	Faculty of Applied Science / Dept. of Physics
4034296	Physic of Bio-Material	R	3	Faculty of Applied Science / Dept. of Physics
605301	Holy Quran III	R	2	
Total			18	
Level 8 (Semester 8)				
4034998	Hospital Training	R	11	
605401	Holy Quran IV	R	2	
601401	Islamic Culture IV	R	2	
Total			15	



Medical Physics Study Plan (33) Course Description

Methods in theoretical physics (1) Code: 403460 Pre-requisite: 403345

Objectives, at the end of this course, the student should acquire the following items: Vector analysis, Curvilinear, Infinite series, Power series, Partial differentiation, Ordinary differential equations of the first order, Second order linear differential equations.

General physics102 Code: 403460 Pre-requisite: 403345

Objectives, at the end of this course, the student should acquire the following items: Linear momentum and collision, rotational kinematics, rotational dynamics and static equilibrium, oscillations about equilibrium, electric charges, forces, and fields, electric potential, and electric potential energy, electric current and direct current circuits, magnetism: magnetic field, magnetic force on moving charges, current –carrying wire, amperes' law, magnetic flux and faraday's law of induction.

Methods in theoretical physics (2) Code: 403244 Pre-requisite: 403241

Objectives, at the end of this course, the student should acquire the following items: Gamma, Beta and Error functions: The factorial function, Definition of Gamma function, Definition of Beta function, The relation between the Beta and Gamma functions, The error function. Differential equations of the special functions: Lagendre functions, Bessel functions, Hermite functions, Laguerre functions. Fourier series: Simple harmonic motion and periodic functions, Average value of a function, Fourier coefficients, Complex form of Fourier series, Even and odd Fourier functions, Applications of Fourier series. Fourier transforms: Dirac Delta function: Delta sequences, the Delta calculus, representations of Delta functions, applications of the Delta calculus.

Classical Mechanics (1) Code: 403460 Pre-requisite: 403345

Objectives, at the end of this course, the student should acquire the following items: Fundamental concepts of dynamics, Newtonian Mechanics, Rectilinear motion of a particle, the General motion of a particle in three dimensions, Noninertial reference systems, central forces and celestial mechanics.

Fundamentals of medical Physics Code: 403280 Pre-requisite: 4800130

Objectives, at the end of this course, the student should acquire the following items: In this subject the student will be studying the motions of the living bodies as; Static Forces - Friction -Translational Motion- Angular Motion. - Elasticity and Strength of Materials – Fluids- The Motion of Fluids-Heat and Kinetic Theory- Thermodynamics -Heat and Life -Waves and Sound- Electricity - Electrical Technology – Optics- Atomic Physics. Forces on bones and muscles; body fluid flow; electrodynamics of nerve impulses; electrocardiograms; magnetocardiograms and magnetoencephalograms; diffusion processes, membrane transport, kidney function; biological effects in magnetic resonance and ultra-low frequency electromagnetic radiation; laser applications. Radiation therapy, imaging.

Electromagnetism (1) Code: 403460 Pre-requisite: 403345

Objectives, at the end of this course, the student should acquire the following items: Electric multipoles, Electrostatics in the presence of matter, Special methods in electrostatics, Magnetic energy, Magnetic multipoles, The magnetism in the presence of matter.



Modern physics

Code: 403344

Pre-requisite: 403242

Objectives, at the end of this course, the student should acquire the following items: the spatial theory of the relativity, the black body radiation, the particle properties of waves, the wave properties of particles, and the atomic structure.

Principles of Quantum Mechanics (1) Code: 403344 Pre-requisite: 403242

Objectives, at the end of this course, the student should acquire the following items: wave-particle duality and uncertainty, the schrödinger equation, unbound particles, bound particles, operator methods, quantum mechanics in three dimensions, spin.

Physics of Laser in medicine

Code: 403382

Pre-requisite: 403280

Objectives, at the end of this course, the student should acquire the following items: The purpose of this subject, with chapters from a group of new references, was to try to set down the physical basics of laser and its interaction with tissue and describe how these basics have been applied in some of the medical specialties. The student need to know the basic principles of physical science to understand the construction and types of laser, opportunities and limitations of lasers, there are many areas in medical science where lasers or modern optics might have application if physical scientists knew about them and could transfer their knowledge of the medical area. The topics also include the optical and thermal response of tissue to laser radiation, Tissue Diagnostics Using Lasers, Therapeutic and Diagnostic Application of Lasers in Ophthalmology, Cardiovascular Applications of Lasers, and Lasers in Photodynamic Therapy.

Health Physics

Code: 403383

Pre-requisite: 403280

Objectives, at the end of this course, the student should acquire the following items: Concepts of medical instrumentation, transducers, and medical electronics design. Various types of sensors and measurement apparatus used for the calibration of medical imaging and therapy systems will receive particular attention. Physical and biological aspects of the use of ionizing radiation in industrial and academic institutions; physical principles underlying shielding instrumentation, waste disposal; biological effects of low levels of ionizing radiation Nuclear Tests & Accident (Chernobyl Accident, The Goiania Radiation Incident).

Physics of radiation effects

Code: 403384

Pre-requisite: 403280

Objectives, at the end of this course, the student should acquire the following items: effects of ionizing radiations on living cells and organisms, including physical, chemical, and physiological bases of radiation cytotoxicity, mutagenicity, and carcinogenesis, biological basis for radiation safety, dose-response characteristics, the physiological basis for internal dosimetry, radiation effects: deterministic, stochastic, radiation-weighted dose units: the Sievert and the REM, radiation chemistry of water, primary products of radiolysis, further radical chemistry, direct and indirect action, macromolecular target in the cell, evidence for DNA as the target molecule, modification of the radiation response, radiation biology of normal and neoplastic tissue systems, radiation carcinogenesis.

Radiation Physics (1) Medical

Code: 403385

Pre-requisite: 403384

Objectives, at the end of this course, the student should acquire the following items: interactions and energy deposition by ionizing radiation in matter; concepts, quantities and units in radiological physics. The use of radioactive sources for radiotherapy including: materials used, source construction dosimetry theory and practical application, dosimetric systems, localization and reconstruction. The course covers low dose rate, high dose rate and permanently placed applications, production of x rays : accelerated charged particle, synchrotron radiation, linear accelerator, radiation sources; radioactivity, transformation mechanisms , transformation kinetics, activity; naturally occurring radiation, serial transformation, interaction of radiation with matter; beta particles, alpha particles, gamma rays, neutrons, general aspects of radioactive decay processes; beta decay, alpha decay, and electron capture,.....



Physics of Radiotherapy (1) Code: 403386 Pre-requisite: 403384

Objectives, at the end of this course, the student should acquire the following items: Ionizing radiation use in radiation therapy to cause controlled biological effects in cancer patients. Physics of the interaction of the various radiation modalities with body-equivalent materials, and physical aspects of clinical applications; lecture and lab. Physics of ionizing radiation therapy with emphasis on external beam dosimetry and treatment planning. Radiation in the treatment of cancer, Kilovoltage X-Ray Units, Linear Accelerators, Cobalt Machines, Simulators., Dose Distribution and Scatter Analysis, Patient Dose Computation Methods, A System of Dosimetric Calculations, Treatment Planning I: Isodose Distributions, Treatment Planning: Patient Data, Corrections, and Set-up, Treatment Planning: Field Shaping, Skin Dose, and Field Separation, Electron Beam Therapy, Dose Fractionation in Radiotherapy, and Quality Assurance.

Radiation protection Code: 403388 Pre-requisite: 403384

Objectives, at the end of this course, the student should acquire the following items: Radiological quantities and units; Dose quantities in radiation protection, Concept of radiation protection quantities, Radioactivity quantities, Activity, specific activity, activity concentration, activity per area, Specific quantities for radon, Radiation Safety Guides, External Radiation Safety, Internal Radiation Safety; Quantities for internal dosimetry, Limits, constraints, action level, Criticality, Evaluation of Radiation Safety Measures, Shielding against ionizing radiation, Stopping power and range, Penetration depths of charged particles, Electrons and positrons, Photons, Basic shielding concept Attenuation data of radioactive sources in shielding materials, Neutrons Basic shielding concepts, Attenuation data of various neutron sources in shielding materials, Nonionizing Radiation Safety.

Physics of Medical Imaging Code: 403389 Pre-requisite: 403384

Objectives, at the end of this course, the student should acquire the following items: The subject includes the physics of x-ray diagnostic procedures and equipment, general imaging considerations; Physics and technology of magnetic resonance imaging (MRI), emphasizing techniques employed in medical diagnostic imaging, and, pulse sequences, hardware, imaging techniques, artifacts, and spectroscopic localization. The conceptual, mathematical and statistical aspects of imaging science and a survey from this formal viewpoint of various medical imaging modalities, including film-screen radiography, positron and x-ray computed tomography, and magnetic resonance imaging.

Ultrasound in Medicine Code: 403390 Pre-requisite: 403383

Objectives, at the end of this course, the student should acquire the following items: Propagation of ultrasonic waves in biological tissues; principles of ultrasonic measuring and imaging instrumentation; design and use of currently available tools for performance evaluation of diagnostic instrumentation; biological effects of ultrasound.

Computing in Medicine Code: 403391 Pre-requisite: 403382

Objectives, at the end of this course, the student should acquire the following items: Computers are the excellent means for storage of patient related data. Big hospitals employ computer systems to maintain patient records. It is often necessary to maintain detailed records of the medical history of patients. Many of the modern-day medical equipment have small, programmed computers. Many of the medical appliances of today works on pre-programmed instructions. The circuitry and logic in most of the medical equipment is basically a computer. The functioning of hospital-bed beeping systems, emergency alarm systems, X-ray machines and several such medical appliances is based on computer logic. Computer software is used for diagnosis of diseases. It can be used for the examination of internal organs of the body. Advanced computer-based systems are used to examine delicate organs of the body. Some of the complex surgeries can be performed with the aid of computers. Medical imaging is a vast field that deals with the techniques to create images of the human body for medical purposes. Many of the modern methods of scanning and imaging are largely based on the computer technology. Magnetic resonance imaging employs computer software. Computed tomography makes use of digital geometry processing techniques to obtain 3-D images. Sophisticated computers and infrared cameras are used for obtaining high-resolution images. Computers are widely used for the generation of 3-D images in medicine. Computer networking enables quicker communication. We can exchange images and messages in seconds and derive conclusions speedily. They can seek advice and share knowledge in a convenient manner over the Internet.



Medical Radiation Physics (2) Code: 403492 Pre-requisite: 403385

Objectives, at the end of this course, the student should acquire the following items: Exposures from natural and man-made radiation sources, External dosimetry, Internal dosimetry of radionuclides, and Decontamination.

Physics of Radiotherapy (2) Code: 403494 Pre-requisite: 403386

Objectives, at the end of this course, the student should acquire the following items: 3D Imaging for Radiotherapy. Clinical X-Ray Computed Tomography, 3D Imaging and Treatment Planning, Magnetic Resonance Imaging for Radiotherapy Planning, Potential of Magnetic Resonance Spectroscopy for Radiotherapy Planning, PET and PET/CT for Radiotherapy Planning, 3D Treatment Planning for Conformal Radiotherapy, Advanced External Radiation Oncology, and Advanced Brachytherapy Physics.

Nuclear Medicine Code: 403494 Pre-requisite: 403386

Objectives, at the end of this course, the student should acquire the following items: Basic Nuclear Medicine Physics, Formation of Radionuclides, Nonscintillation Detectors, Nonimaging Scintillation Detectors, Imaging Instrumentation, Single-Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Combined PET/CT Imaging, Quality Control, Daily Quality Control Tests, Weekly Quality Control Tests, Acceptance Tests, Spatial Resolution, Scatter Fraction, Sensitivity, and Quantitative Analysis in Nuclear Medicine Imaging.

Solid State Physics (1) Code: 403370 Pre-requisite: 403344

Objectives, at the end of this course, the student should acquire the following items: crystal structure, crystal binding, crystal diffraction, defects in crystals, lattice vibrations and some thermal properties, free electrons in metals, and band theory of solids.

Physics of Biomaterials Code: 403497 Pre-requisite: 403389

Objectives, at the end of this course, the student should acquire the following items: Introduction to Medical Biomaterials: Type of Bio materials, Properties of biomaterials: Physical, thermal, electrical and optical properties of bio-materials and their application for processing. Novel Biomaterials Uses in medicine: Biodegradable materials, Hydrogels, self-assembling peptides, Implant materials, Metallic implant materials, stainless steels, co-based alloys, Ti based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite, glass, ceramics, and carbons. Polymers for Medical applications: Polymeric implant, Polymers for drug delivery: types of polymer, pharmaceutical polymers. Physicochemical properties of polymers and relationship with structure, properties, kinetics, mechanisms and applications and Materials Nanostructure Devices (DNA-templated and nanowires).

Hospital Training Code: 403498 Pre-requisite: the departmental agreement.

Objectives, at the end of this course, the student should acquire the following items: The course consists of a 16-week hospital-based rotation in: diagnostic imaging (x-rays, CT, fluoroscopy, and diagnostic ultrasound), MRI, nuclear medicine, radiation therapy, mammography, radiation protection, and health physics. The student will write a final progress report about the procedures that he learned and performed. Performing acceptance and quality assurance tests for diagnostic scanners. Operating with equipment independently.



Preparation of Graduates

- Graduation of outstanding physicist who is knowledgeable, skilled, professional and who demonstrate excellence in creative thinking, prevention and management of handicap.
- The preparation of graduates for not only perform their professional role in patient care, but also to provide leadership for the profession, contribute to the growth of the profession, and contribute to the health care needs of society.
 - Engage in lifelong academic and professional development through self-assessment, reflection, education, and feedback from others.

Rules and Regulation

- Rules and regulation governing the responsibilities and rights of the student and followers are clearly defined in the university rules and regulation booklets (available to all online on UQU official site or printed) <https://uqu.edu.sa>

The Medical Physics program

- 1- The medical physics program is regarded as an integral package of courses (theoretical, experimental and project) in the field of physics leading to a qualification titled bachelor of physics
- 2- The medical physics program is a program that is designed to provide students with higher levels of knowledge and skill required for professional occupations.
- 3- It is also necessary to point out that while learning outcomes-setting, student special attributes and characteristics established by program, faculty and university were included such as:-
 - ✓ Excellence in learning, practice, research and continuous improvement of performance in these areas.
 - ✓ The ability to recall and apply their knowledge in their personal and professional lives for many years after they graduate, not just being passed tests and assignments.
 - ✓ Recognize the provisional nature of knowledge field and take this into account in investigating and proposing solutions to academic or professional issues



- ✓ The ability to behave sensitively, transparency responsibly, and ethically in difficult situations
 - ✓ The ability to work in a spirit of teamwork and appreciation of differences.
 - ✓ The ability to take initiative in identifying and resolving problems and issues both at the individual and group levels, exercising leadership in pursuit of innovative and practical solutions.
 - ✓ The ability to apply the theoretical insights and methods of inquiry from their field of study in considering the issues and problems in other contexts.
 - ✓ The continuity to extend their knowledge through habits of lifelong learning
 - ✓ Considering honesty, justice, Caring, Compassion, credibility, empathy and mutual respect in providing services to patients.
- 4- Teaching staff is available at sufficient times for consultation and advice to student through a declared scheduled for office hours adopted in department councils. This matter has proved by the minutes of the frequent meetings of staff members with students and also in accompanied attendance sheets for these meetings
- 5- Teaching resources are sufficient to large extent to ensure achievement of the intended learning outcomes. This evidence by:
- ✓ The availability of classrooms, staffing, seat, lighting, aeration and air conditioning and timetable for their maintenance.
 - ✓ The availability of learning laboratories in the department, which already equipped with teaching and learning audio-visual aids.
 - ✓ The labs are also equipped with assessment equipment in sufficient number for student training.
 - ✓ The availability of teaching and learning aids such as and /or visual equipment, models, educational media and CDs and simulation tools.
 - ✓ The availability of the special field in the project.
 - ✓ The presence of the King Abdallah university library, Faculty of Science library and Physics department's library.
 - ✓ The university's subscription in many of well-known universal information bases and in many well reputed scientific sites and magazines in the field of specialization to provide



an opportunity for students to see and use what is new in the physics field in their learning activities.

- 6- Some appropriate preparatory and orientation mechanisms are provided to prepare students for study in a higher education environment as the preparatory year and the involved courses concerned with the education of English language and other learning skills.
- 7- Systems are in place within the program for monitoring and coordinating student workload such as:
 - ✓ Equal distribution of teaching courses in the educational semesters. This matter in order to monitor, equally distribute and coordinate the educational burdens or workload of the students through the different courses and semesters, as shown in the department study curriculum and its compliance with the minimum and maximum teaching units for each semester and each year as defined by the National Qualifications Framework.
 - ✓ The curriculum and course development committee in the program periodically reviewed the taught topics in each course to avoid its duplication and subsequent increase in the student educational burdens (workload).
- 8- Student surveys and their opinions and satisfaction about their workload.
- 9- Student portfolio for each course and the included learning and educational activities and assignments. These activities were continuously revised and evaluated by the department staff who provide students the feedback about their performance
 - ✓ Feedback on performance by students and results of assessments are given promptly to students.
 - ✓ Each student has his own university email address through which guidance and instructions from different university departments such as from department, college and deanship of student affairs have been sent to him.
 - ✓ The final results for all courses and some periodic courses have been declared for all students through their university sites. Students can access easily to know these results by using their passwords.



Processes for Academic Advising for Students

- Teaching staff is available at sufficient times for consultation and advice to students through a declared scheduled for office hours adopted in department councils.
- Teaching resources are sufficient to large extent to ensure achievement of the extended learning outcomes
- The availability of classrooms, staffing, safety of seats, lighting, aeration and air conditioning and timetable for their maintenance.
- The availability of learning laboratories in the department, which are well equipped with teaching and learning audio-visual aids
- The labs are also well equipped with assessments and equipment in a sufficient number for student training. They maintain contracts for their safety and periodic follow up have been signed with a well-known company in this field.
- The availability of teaching and learning aids such as audio and /or visual equipment, models, educational media and CDs and simulation tools.
- The availability of the special field in the project.
- The presence of the King Abdallah university library, Faculty of Science library and Physics department's library.
- The university's subscription in many of well-known universal information bases and in many well reputed scientific sites and magazines in the field of specialization to provide an opportunity for students to see and use what is new in the physics field in their learning activities.
- Each student has his own university email address through which guidance and instructions from different university departments such as from department, college and deanship of student affairs have been sent to him.
- The final results for all courses and some periodic courses have been declared for all students through their university sites. Students can access easily to know these results by using their passwords.
- Deanship of information technology and deanship of E & distance learning (such as active learning — cooperative learning & - E-learning



Qualification and Experience of Teaching Staff.

- All members of the department staff have good moral character and reputation, scientific and practical efficiency and working with the spirit of teamwork evidenced by the appreciation of the faculty board for the department staff and the positive feedback from the student report in course surveys.
- Teaching staff members have appropriate qualifications and experience for the courses they teach.
- Most of teaching staff members are working full-time.
- All members of the department staff have good moral character and reputation, scientific and practical efficiency and working with the spirit of teamwork evidenced by the appreciation of the faculty board for the department staff and the positive feedback from the student report in course surveys.
- Most members of the department staff participate in research activities in the fields of study, they teach and also involve their students in these activities. students and their supervisors
- The teaching staff has the appropriate qualifications and experiences for teaching the courses that they teach.
- All the members' teaching staff are working a full-time.
- All members of the department staff have good moral character and reputation, scientific and practical efficiency and working with the spirit of teamwork. This is evidenced by the appreciation of the faculty board for the department staff and the positive feedback from the student report in course surveys.
- All the members teaching staff are involved on a continuing basis in scholarly activities that ensure they remain up to date with the latest developments in their field and can involve their students in learning that incorporates those developments.
- The academic staff in the department have a high degree of professionalism, experience and highly skilled in the general and specific areas of specialization.



- The ratio of the number of courses taught by staff of the department, who is working full-time, with that taught by members from outside the department, indicates that the percentage is 100%.

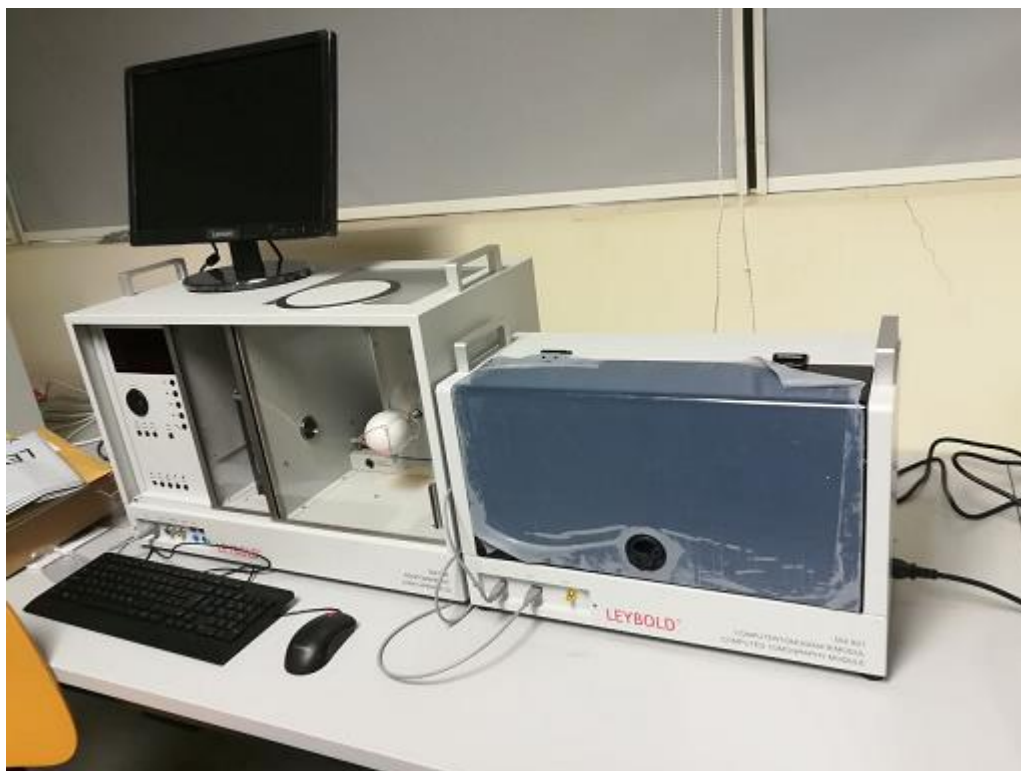
Teaching resources

- Teaching resources are sufficient to large extent to support teaching and learning process and ensure achievement of the intended learning outcomes. This evidenced by:
- The availability of classrooms, staffing, seats, lighting, aeration and air conditioning with a timetable for their maintenance.
- The availability of learning laboratories in the department, which are well equipped with teaching & learning audio-visual aids.
- The labs are also well equipped with assessment equipment in a sufficient number for student training. The maintenance contracts for their safety and periodic follow up have been signed with a well-known company in this field.
- The availability of teaching & learning aids such as audio and /or visual equipment, models, educational media & CDs and simulation tools.
- The subscription in many of well-known universal information bases and in many well reputed scientific sites and magazines in the field of specialization to provide an opportunity for students to see and use what's new in the rehabilitation field in their learning activities
- Ready access to online databases and research and journal.
- King Abdallah library frequently organizes training courses and workshops for ailing teaching staff and students all over the university to keep them informed about library services, regulation of the library controlling the process of borrowing books, different database that university joint and how to access to them and any other changes in services.



Facilities and Equipment

- Facilities at the College of Applied Science including Department of Physics include sufficient space and state of the technology which allow faculty to deliver effective and efficient learning-centered teaching through a variety of instructional methods and approaches in a conducive learning environment, while good use of these facilities and equipment enable students to take responsibility for their own learning. The use of these facilities and equipment are assessed regularly in terms of their suitability for all stakeholders, i.e. students, faculty and staff.
- Several major improvements have been undertaken in terms of the quality and adequacy of the facilities and equipment in the Physics Department, the College and the University as a whole. These enhancements include: the introduction of smart classrooms and the provision of new and upgraded computer laboratories; Internet bandwidth and wireless coverage have also been improved. Furthermore, fully equipped specific labs for each field of physics have been established in the College of Science
- The physics department provides quality of the facilities and equipment from the main users. (Aabdiya campus for male-student and Alzaher campus for female-student) stated that classroom including halls, laboratories are attractive and comfortable. The Medical Physics Laboratories included several and sophisticated types of student experiments.







Academic Mentoring

Academic Mentoring is one of the mainstays of the university education designed to facilitate the process of counselling students and directing them to achieve the best results, and to adapt to the university environment and make use of all opportunities offered to them by providing them with the academic skills necessary to upgrade their academic achievement. To that end, an academic mentoring office has been introduced in the Physics department.

The academic advisor is one of the faculty, staff and the likes, assigned by the academic advising office to perform the functions of academic guidance for a group of students.

Characteristics of an academic advisor:

1. To be aware of curricula system and registration mechanism.
2. To play a vital role in academic guidance
3. To have the ability to conduct meetings concerning academic guidance
4. Must have the practical basic skills of academic guidance process
5. Must dedicate a part of his time to play his role effectively.



Skills an academic advisor must possess

1. Leading skills.
2. Compassion skills.
3. Planning skills.
4. Listening skills.
5. Decision making and problem solving skills.
6. Time management and investment skills.
7. Organization skills.

Academic advisor tasks in general:

The role of the academic advisor is focused on the university student performance since his admission to the university till graduation. It includes the following:

1. Student orientation as regards the elements of the study plan (basic and optional courses), their numbers and cognitive requirements, directing students to the best ways of making use of them, introducing students to the course of each major, the subjects within each major. He must not be biased for a specific major and he must link the major and labor market.
2. Introduce students to the names of buildings and lecture schedules and how to deal with the central library, especially new students.
3. Making sure to provide students with registration times concerning cancelling and adding courses, changing sections, dropping out from one major the right way by following regulations.
4. Teaching students how to calculate their scores manually, in addition to introducing them to subject grades and GPAs.
5. Conducting a study of the student's academic record, including studies courses, his study plan and failure subjects and other data
6. Helping students in the selection and registration of courses in their study plan, based on their GPA.
7. Helping students to complete the form of Adding/ cancelling/Changing courses (so that the reasons for cancellation are discussed with students and they are guided to adding another course to replace the one cancelled). Also, directing them to the best course based on their academic records, capabilities and submitting them on time.
8. Making sure to conduct periodical meetings between the advisor and the student, through the advisor designating specific office hours or communication via email, to enable them to follow up their students and give them support, build a bridge of friendship between them and students, answer their inquiries and find solutions to difficulties and problems that they face in their education.
9. Developing reports and giving recommendations to students with low GPAs and provide the academic guidance office with these reports and recommendations.
10. Making sure to follow up the educational process of students in a good way and help them by introducing new sections according to their needs.



11. Defining the education courses that need to be introduced in the coming semester according to the needs of students and informing the academic guidance office of the same.
12. Follow up the grades of students, encourage students with high grades and motivate them, offer guidance and advice to students with low grades and alert them as regards the followed procedures and holding extensive periodical meetings with them to help and guide them.
13. Motivating students to take part in academic activities and introducing them to how to make use of the King Abdullah University Library, how to manage their time and encourage them to make use of the available summer classes.
14. Maintaining confidentiality and mutual confidence between the advisor and the student as regards any information provided by the student to the advisor.

Participation of Medical Physics Program on International Day of Medical Physics with The Cooperation of Maternity & Children Hospital in Holy Capital







The medical physics program graduates could join both the governal sector and private sector. There are several hospitals in which, the graduates joined and worked at as follows:

- King Feisal Specialist Hospital
- Maternity & Children Hospital in Holy Capital
- Armed Forces Hospital
- King Fahad National
- Specialist Hospital
- Saudi German Hospital
- King Abdullah Medical City
- King Abdul-Aziz
- Medical National Gard
- King Abdullah Medical City
- Al Noor-Specialist Hospital
- King Abdul-Aziz For Medical Therapy Hospital

