Kingdom of Saudi Arabia
Ministry of Higher Education
Majmaah University
College of Science
Department of Physics

بسم الله الرحمن الرحيم

جامعة المجمعة
Majmaah University

المملكة العربية السعودية
وزارة التعليم العالي
جامعة المجمعة
كلية العلوم
قسم الفيزياء

Physics Program Handbook

PHYSICS
Department

College of Science AlZulfi

Department of Physics

1436هـ -2015م

Contents

WELCOME MESSAGE

Welcome to Physics Department-Al Zulfi Collage of Science Majmaah University. This handbook provides most of the information needed by new graduate students, so that they can rapidly orient themselves to the departmental environment. It will also be useful as a reference document to pursue your graduate studies here .

There are several other documents that you might find useful:

- Student Handbook.
- Study plan
- Accademic Council Handbook.

We would appreciate your comments about the usefulness of this booklet and how it can be improve in future. We would also like to thank everyone who has contributed to this handbook so far.

Best wishes for a productive and enjoyable journey through your studies here!

Rector's Message

Peace, mercy and blessings of Allah ..... And after

On my own behalf and on behalf of employees of the Majmaah University, I am pleased to welcome you, in the gate of the university on the Internet. It is no secret that Higher Education institutions are beacons of science and knowledge, which is the gate that from there we go to the world of research and development, as it is a sign of the state's interest in its sons, has made the state – Protected by Allah - under the leadership of the Custodian of the Two Holy Mosques and his Crown Prince, all the possible facilities and support to enable the sons and daughters of this nation to get science and knowledge, so precious directions were issued to all state leaders to overcome what may face the cognitive educational process of the obstacles and difficulties.

And we all hope that the Majmaah University may be one of the science beacons, and spot of light that graduates our students, girls and boys, armed with science and knowledge, are able to participate in building the society and its progress and development in various fields of life. The achievements of the University , thanks to Allah, was not to be achieved, without the cooperation and concerted efforts of the good people of the Kingdom's citizens, who realized the importance of education in the United march towards progress, development and prosperity.

The decision to establish the University as an expression of the attention of the Custodian of the Two Holy Mosques King Abdullah bin Abdulaziz Al Saud to the march of science in this blessed country, and parental caring gesture – may Allah preserve him for his sons and daughters in this province. From this, comes the approval of the establishment of educational buildings in the university city in Majmaah province, and the premises of colleges in the provinces, equipped with all the technical, official and human potentials, to confirm the interest and attention of the State – may Allah honor- with all what would overcome the obstacles faced by students of hardship for the sake of access to science and knowledge.

We ask Allah to help and guide you and us to what He loves and which pleases Him.

Rector

Dr. Khalid bin Saad Al Muqrin

Dean Message:

All praise is to Allah. Allah's Peace and Blessings be upon Prophet Muhammad and his companions.

My dear student,

It is not new to your knowledge that we are living in a highly developed educational environment these days. For that, we should be very grateful to Allah, then to our wise government. Surely, you realize that these efforts have been exerted for you to increase and improve your capabilities, so be keen on gaining knowledge and utilizing everything you have.

My dear student, you should be aware that there are crucial elements to achieve great success. First and foremost, the obligatory prayers are very immensely important as they make you feel psychologically comfortable and closer to Allah. Second, Making prayers and sleeping early in order to be able to attend lectures with full concentration. Finally, communicating with teaching staff during office hours.

My dear student, recall that how quickly the previous academic years passed, and excellent students found the fruit of their hard labor, but less hardworking students found sorrow and bad feelings.

Dear Student, we highly appreciate your opinions, and we listen to you. We strive to serve you with all the potential available to us. To meet all your needs, we work as a team hoping to have you attend every academic, cultural and sports activities.

Dear Student, we are always keen to develop the educational environment in order to shift from teaching to learning to enable you improve your academic skills and elevate your knowledge.

Dear student, you are the main partner in the application of quality standards altogether so that we can get the academic accreditation. You must recognize the vision and mission of the college, its goals and career opportunities for graduates.

Dean of Faculty of Sciences in Alzulfi
Dr. Mohammad Saleh Aloboudi

Head of Department Message

All Praise is due to Allah, the Lord of the worlds, and blessings and peace be upon our Prophet Muhammad and his Family and Companions.

It is my pleasure and good fortune to contribute to the website of the Physics Department with these humble words and to shed some light on its Faculty of Science at Majmaah University. I thank The Almighty God for His grace and gratitude that has placed me here to serve the religion, the nation, society in general and the university and this college in particular. My thanks go to their Excellencies the Rector and the vice deans of the University, the Dean of the College of Science in Zulfi and my colleagues for the facilities and guidance they have provided in order to serve the university. They have ensured the development and upgrading of their department to its best levels.

Physics is the science that studies everything related to material, its movement and energy; it tries to understand natural phenomena and the forces affecting the functioning of material and formulates knowledge of the laws that do not only explain the processes above, but also the prediction of the natural processes with models that slowly and gradually approach reality.

Physics is at the same also interested in accurately measuring and inventing new ways of increasing a basis of reaching a proper interpretation of natural phenomena. Physics provides the art of measurement methods for use in all the vital and natural sciences like Chemistry, Medicine, Engineering, Biology and other sciences. The progress of civilization is due to the impressive progress of the science of physics. All the devices that we use in our daily lives are based on physics, such as radar, wireless, radio, color TV, phones, laptop computers, cell phones and diagnostic devices in medicine, such as X-rays, magnetic resonance imaging, radiotherapy, glasses, telescopes and space probes, microwave ovens, power transistors, the microphone and electricity.

Head of the Physics Department

Dr. Thamir Shelih Al.Harbi

Contact information:

Program Management : t.alharbi@mu.edu.sa
Program Co-ordinator : h.hanafy@mu.edu.sa

Postal Address:

P.O.Box 1712, Majmaaha University,

Zulfi College of Science, Zulfi 11932,

Saudi Arabia.

For more information and to view the sites faculty members visit the site the department through the portal link

www.mu.edu.sa

http://mu.edu.sa/en/colleges/college-science-al-zulfi/physics-department-0

About Al- Zulfi Faculty of Science

Higher education Ministry approved establishment of Faculty of Sciences-Zulfi on 5 July 2005 to be another building block in "higher education and part of the City University system in Al-Qassim, and started studying at the Faculty of science in the academic year 2006/2007 the Faculty has four departments, Department of mathematics, Department of computer and information sciences, Department of physics and Department of medical laboratories in addition to the preparatory year for the departments of medical laboratories and computer and information science Department and year of preparation science of mathematics and physics , And are taught basic science for students of the Faculty of dentistry in faculty.

This college accepts new students in the preparatory program for medical laboratory, computer Science, physics and mathematics departments for a period of one year as following details:

Preparatory year

A preparatory stage for students who wish to specialize in medical laboratories, departments of computer and information sciences, mathematics and physics designed to provide students with an academic education, English skills and train students in the skills of thinking and learning.

Natural sciences program

This year a preparatory stage for students wishing to major in mathematics or physics, and calculated an average cumulative rate where in theme six levels of study in mathematics or physics, aims to create students receiving academic education in spades and train students in methods of teaching, learning and thinking skills.

The values of Faculty of Science – AL-Zulfi Campus

1- Quality and Excellence
2- Teamwork
3- Development and Continuing Education
4- Community Service.

University Mission

Majmaah University provides educational and research services via an academic system that is capable of competing with an eye on the market demands and the society partnership

College Mission

College of Science - AlZulfi provides graduates who have scientific excellence through effective plans and developed program with the skills needed to compete in the labor market.

About the Department:

Department of Physics was founded with the establishment of the College of Science in Zulfi in 1427 (2006) as one of the four departments of the College (mathematics, physics, medical laboratories, computer). Department started its first year with eight students, were the number of students was growing gradually at a rate of 15 students each year until it reached 83 students in the academic year 1431-1432 AH. The Department of Physics teaches physics courses and gives its graduates Bachelor of Science degree in physics after the student passes the 136 study units successfully according to the new academic plan of the department that have been followed since the academic year 1429-1430 AH. In the future, the M.Sc. and the Ph.D. degrees are will establish, which are awarded separated

Physics Department Mission

“Program of physics is promoting an excellence in physics education through building knowledge, creating skills, conducting research and collaborating with society.”

Objectives

G1:	Graduates should have the standing for further education, teaching, and research in physics.	
	1.1	Foundations and contemporary knowledge in Physics

	1.2	Skills of handling problems on the basis of physics principles
G2:	Skilled graduates that have the capability to conduct studies and research individually as well as in group for the solution of physics based problems.	
	2.1	Foundation for basic scientific research in Physics.
	2.2	Ability to cooperate as individuals or in groups with the society to solve Physics related problems.

Professions or occupations for which students are prepared.

(If there is an early exit point from the program (e.g. diploma or associate degree) include professions or occupations at each exit point)

1) Continue higher educations in physics and obtain their Ph.D.
2) Work in research centers and universities.
   a. King Abdulaziz City for Science and Technology (**http://www.kacst.edu.sa**).
   b. King Abdullah City and Renewable Energy (**http://www.kacare.gov.sa**)
3) Work in the public and private sectors of education.
4) Work in the industry sector.
   a. SABIC is the Saudi Basic Industries Corporation, one of the world's leading manufacturers of

chemicals, fertilizers, plastics and metals. **(http://www.sabic.com)**

b.

5) Work in power stations.

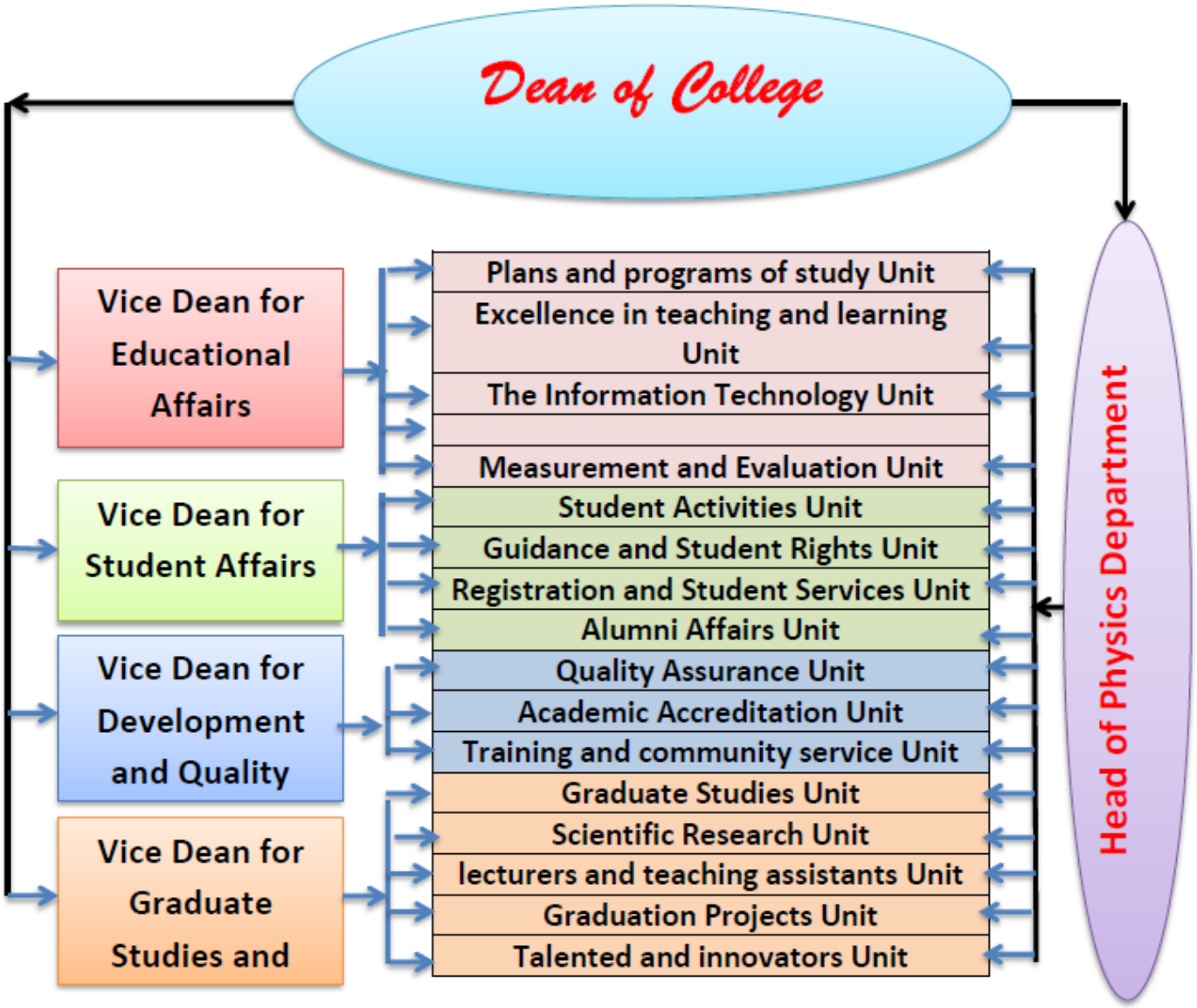
plant	Ghazlan	Rabigh 2 IPP	Shuqaiq 2 IWPP	Ha'il-2	Jubail Marafiq	Ras Tanura	Shedqum	Uthmaniya	Riyadh	Rabigh-2	Qurayyah IPP
Community	Ras Tanura	Makkah Province	Jizan	Ha'il	Ash Sharqiyah	Ash Sharqiyah	Ash Sharqiyah	Ash Sharqiyah	Ar Riyad	Ar Riyad	Abqaiq

6) Work at water stations, petrol ministry.

7) Work in specialized research centres, quality control labs. and standards and measurements bureau.

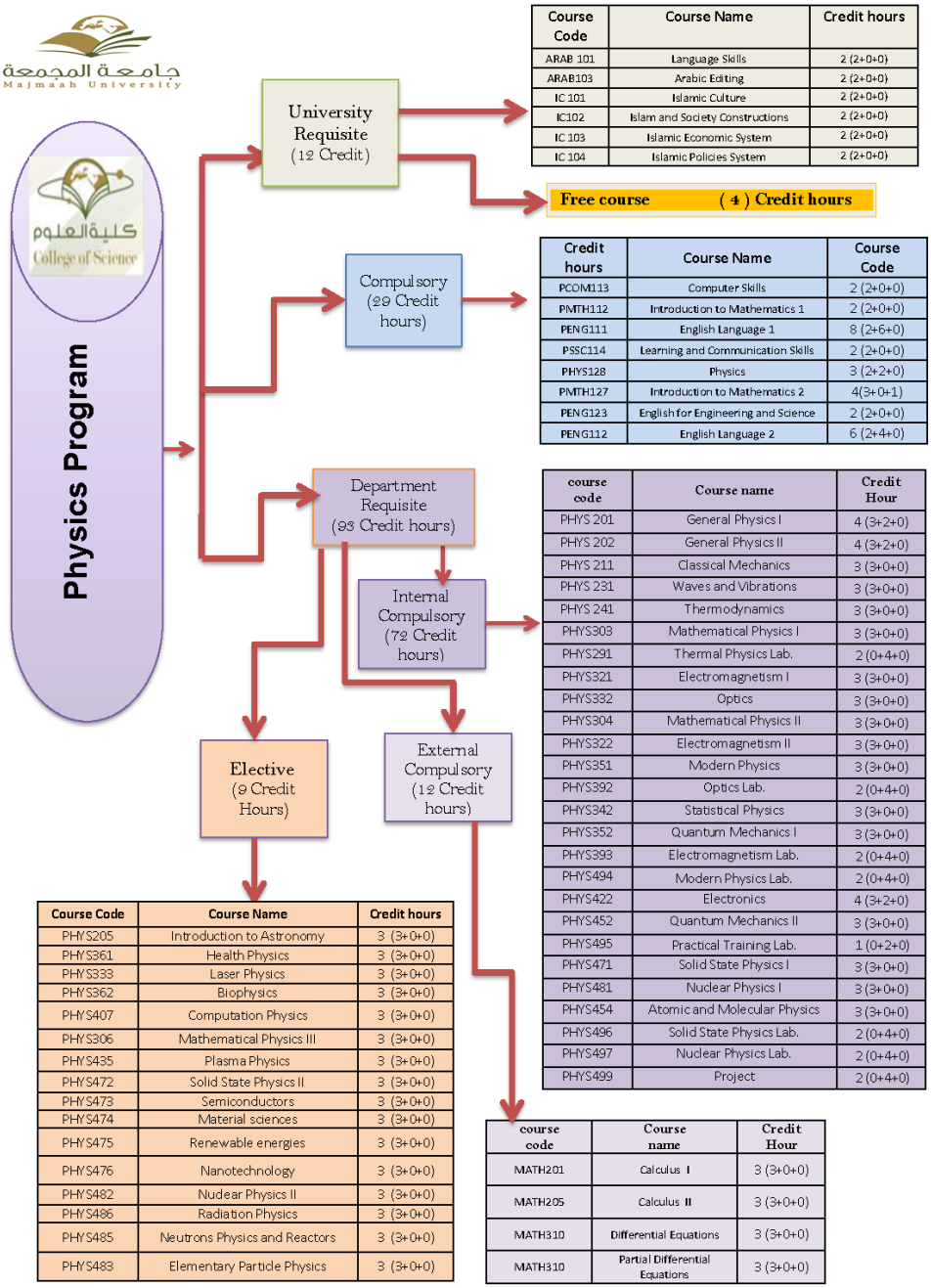
Program a dministrative flow chart

.



Program Curriculum study plan

New Currecuulium



Course Code	Course Name	Credit hours
ARAB 101	Language Skills	2 (2+0+0)
ARAB103	Arabic Editing	2 (2+0+0)
IC 101	Islamic Culture	2 (2+0+0)
IC102	Islam and Society Constructions	2 (2+0+0)
IC 103	Islamic Economic System	2 (2+0+0)
IC 104	Islamic Policies System	2 (2+0+0)

Free course (4) Credit hours

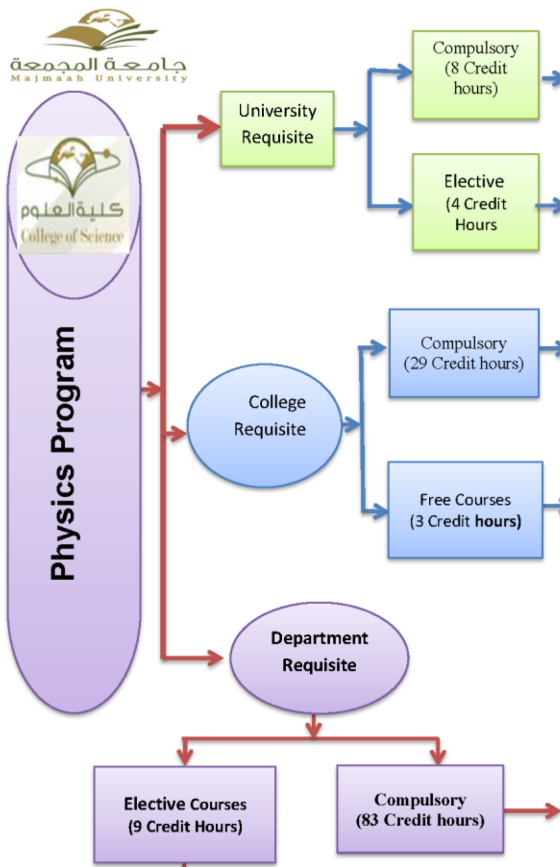
Credit hours	Course Name	Course Code
PCOM113	Computer Skills	2 (2+0+0)
PMTH112	Introduction to Mathematics 1	2 (2+0+0)
PENG111	English Language 1	8 (2+6+0)
PSSC114	Learning and Communication Skills	2 (2+0+0)
PHYS128	Physics	3 (2+2+0)
PMTH127	Introduction to Mathematics 2	4(3+0+1)
PENG123	English for Engineering and Science	2 (2+0+0)
PENG112	English Language 2	6 (2+4+0)

course code	Course name	Credit Hour
PHYS 201	General Physics I	4 (3+2+0)
PHYS 202	General Physics II	4 (3+2+0)
PHYS 211	Classical Mechanics	3 (3+0+0)
PHYS 231	Waves and Vibrations	3 (3+0+0)
PHYS 241	Thermodynamics	3 (3+0+0)
PHYS303	Mathematical Physics I	3 (3+0+0)
PHYS291	Thermal Physics Lab.	2 (0+4+0)
PHYS321	Electromagnetism I	3 (3+0+0)
PHYS332	Optics	3 (3+0+0)
PHYS304	Mathematical Physics II	3 (3+0+0)
PHYS322	Electromagnetism II	3 (3+0+0)
PHYS351	Modern Physics	3 (3+0+0)
PHYS392	Optics Lab.	2 (0+4+0)
PHYS342	Statistical Physics	3 (3+0+0)
PHYS352	Quantum Mechanics I	3 (3+0+0)
PHYS393	Electromagnetism Lab.	2 (0+4+0)
PHYS494	Modern Physics Lab.	2 (0+4+0)
PHYS422	Electronics	4 (3+2+0)
PHYS452	Quantum Mechanics II	3 (3+0+0)
PHYS495	Practical Training Lab.	1 (0+2+0)
PHYS471	Solid State Physics I	3 (3+0+0)
PHYS481	Nuclear Physics I	3 (3+0+0)
PHYS454	Atomic and Molecular Physics	3 (3+0+0)
PHYS496	Solid State Physics Lab.	2 (0+4+0)
PHYS497	Nuclear Physics Lab.	2 (0+4+0)
PHYS499	Project	2 (0+4+0)

Course Code	Course Name	Credit hours
PHYS205	Introduction to Astronomy	3 (3+0+0)
PHYS361	Health Physics	3 (3+0+0)
PHYS333	Laser Physics	3 (3+0+0)
PHYS362	Biophysics	3 (3+0+0)
PHYS407	Computation Physics	3 (3+0+0)
PHYS306	Mathematical Physics III	3 (3+0+0)
PHYS435	Plasma Physics	3 (3+0+0)
PHYS472	Solid State Physics II	3 (3+0+0)
PHYS473	Semiconductors	3 (3+0+0)
PHYS474	Material sciences	3 (3+0+0)
PHYS475	Renewable energies	3 (3+0+0)
PHYS476	Nanotechnology	3 (3+0+0)
PHYS482	Nuclear Physics II	3 (3+0+0)
PHYS486	Radiation Physics	3 (3+0+0)
PHYS485	Neutrons Physics and Reactors	3 (3+0+0)
PHYS483	Elementary Particle Physics	3 (3+0+0)

course code	Course name	Credit Hour
MATH201	Calculus I	3 (3+0+0)
MATH205	Calculus II	3 (3+0+0)
MATH310	Differential Equations	3 (3+0+0)
MATH310	Partial Differential Equations	3 (3+0+0)

Old Curriculium



Course Name	Code	Credit hours
Linguistic Skills	(ARAB 101)	2
Introduction to Islamic Culture	(SALM 101)	2
Islam and building society	(SALM 102)	2
Economical system in Islam	(SALM 103)	2

Course Name	Code	Credit hours
Linguistic Skills	(ARAB 101)	2
Introduction to Islamic Culture	(SALM 101)	2
Islam and building society	(SALM 102)	2
Economical system in Islam	(SALM 103)	2

Course Name	Code	Credit hours
Linguistic Skills	(ARAB 101)	2
Introduction to Islamic Culture	(SALM 101)	2
Islam and building society	(SALM 102)	2
Economical system in Islam	(SALM 103)	2

Course Name	Code	Credit hours
Linguistic Skills	(ARAB 101)	2
Introduction to Islamic Culture	(SALM 101)	2
Islam and building society	(SALM 102)	2
Economical system in Islam	(SALM 103)	2

Course Name	Code	Credit hours
Calculus 1	MATH 201	3
General Physics 1	PHYS 201	3
General Physics 2	PHYS 202	3
Calculus 2	MATH 202	3
Classical Mechanics	PHYS 211	3
Waves and Vibrations	PHYS 231	3
Thermodynamics	PHYS 241	3
Thermal Physics Lab.	PHYS 291	3
Mathematical Physics 1	PHYS 301	3
Differential Equations	MATH 310	3
Electromagnetism 1	PHYS 321	3
Optics	PHYS 332	3
Modern Physics	PHYS 351	3
Partial Differential Equations	MATH 324	3
Mathematical Physics 2	PHYS 302	3
Optics Lab.	PHYS 393	3
Statistical Physics	PHYS 342	3
Electromagnetism Lab.	PHYS 392	3
Quantum Mechanics 1	PHYS 352	3
Electromagnetism 2	PHYS 322	3
Electronics	PHYS 422	3
Quantum Mechanics 2	PHYS 452	3
Modern Physics Lab.	PHYS 495	3
Nuclear Physics 1	PHYS 481	3
Solid state physics 1	PHYS 471	3
Atomic and molecular physics	PHYS 455	3
Solid state physics lab.	PHYS 497	3
Nuclear Physics lab.	PHYS 498	3
Project	PHYS 499	3

Course Name	Code	Credit hours
Introduction to astronomy	PHYS 213	3
Health Physics	PHYS 334	3
Laser Physics	PHYS 333	3
Biophysics	PHYS 361	3
Computational physics	PHYS 405	3
Plasma Physics	PHYS 435	3
Medical Physics	PHYS 462	3
Solid state physics 2	PHYS 472	3
Mathematical physics 3	PHYS 403	3
Semiconductors	PHYS 473	3
Materials Science	PHYS 474	3
Renewable energy	PHYS 476	3
Nuclear physics 2	PHYS 482	3
Radiation Physics	PHYS 485	3
Neutron Physics and Reactors	PHYS 487	3
Elementary particle physics	PHYS 484	3
Nanotechnology	PHYS 476	3
Practical training	PHYS 496	3

Credit point system

- Study system is on the basis of levels.
- The program consists of 8 levels (4 years).
- One level lasts for one semester.
- Total credit hours are 136 hour.
- One credit hour equivalent t one hour lecture or two tutorial/lab hours per week.

Students Workload

Student Workload

College of Sciences -Al Zulfi	Department of Physics	Physics Program

Courses code	Course name	Lecture	Ex./ Lab	Self Study	Work-load	NCAAA	ECTs
PMTH112	Introduction to mathematics I	45		55	100	3	5
PSSC114	Learning and communication skills	30		40	70	2	3
PENG111	English 1 for prep. Year	30	90	125	225	8	11
PCOM113	Computer Skills	30		40	70	2	3
Level 1					465		
PENG 123	English for engineering and science	30		40	70	2	3
PMTH 127	Introduction to mathematics II	45	15	77	137	3	5
PPHS 128	Physics	45		83	128	3	5
PENG 121	English 2 for prep. Year	30	60	100	190	6	10
Level 2					525		
IC101	Introduction to Islamic culture	30		45	75	2	3
MATH201	Calculus I	45		65	110	3	5
PHYS 201	General Physics I	45	26	76	147	3	5
ARAB101	Linguistic Skills	30		50	80	4	7
---	Free course	45		69	114	2	3
ZPSY	Thinking skills and learning methods.	30		50	85	3	5
---	University elective course	30		55	85	2	3
Level 3					696		
PHYS202	General Physics II	45	26	98	169	3	5
MATH202	Calculus II	45		70	115	3	5
PHYS211	Classical Mechanics	45	0	81	126	3	5
PHYS231	Waves and Vibrations	45	0	75	120	3	5
PHYS241	Thermodynamics	45	0	80	125	3	5
PHYS291	Thermal Physics Lab	0	52	39	91	2	3
Level 4					746		
PHYS303	Mathematical Physics I	45	-	78	132	3	5
MATH310	Differential Equations	45		78	132	3	5
PHYS321	Electromagnetism I	45	0	71	125	3	5
PHYS332	Optics	45	0	71	125	3	5
MATH324	Partial Differential Equations	45		67	121	3	5
PHYS351	Modern Physics	45	0	71	125	2	3
Level 5					673		
PHYS304	Mathematical Physics II	45	0	65	120	3	5
IC102	Islam and building society	30		74	87	2	3
PHYS393	Optics Lab.	0	52	39	91	2	3
PHYS342	Statistical Physics	45	-	87	132	3	5
PHYS392	Electromagnetism Lab.	0	52	39	91	2	3
PHYS352	Quantum Mechanics 1	45	0	71	125	3	5
PHYS322	Electromagnetism II	45	0	72	126	3	5
Level 6					772		

Student Workload

College of Sciences -Al Zulfi	Department of Physics	Physics Program					
PHYS422	Electronics	45	26	84	155	4	7
PHYS452	Quantum Mechanics II	45	0	80	125	2	
PHYS494	Modern Physics Lab.	0	52	35	86	3	5
PHYS481	Nuclear Physics I	45	0	80	125	3	5
PHYS471	Solid state physics II	45	-	87	132	3	5
IC103	Economic system in Islam	30		59	89	2	3
PHYS495	Practical Training		26	50	76	1	2
Level 7					712		
PHYS454	Atomic and molecular physics	45	0	81	126	3	5
PHYS496	Solid state physics lab.	0	52	37	89	2	3
PHYS499	project	0	52	73	125	2	3
PHYS497	Nuclear Physics Lab.	-	52	36	88	2	3
PHYS474	Materials Science	45	0	81	126	3	5
PHYS406	Mathematical Physics III	45	0	80	125	3	5
PHYS473	Semiconductor Physics	45	-	87	132	3	5
Level 8					811		
PHYS362	biophysics	45	0	85	120		
PHYS472	Solid state physics II	45	0	83	128		
PHYS361	Health Physics	30	0	102	132		
					5400	137	240

Student Skills

In keeping with the overall objectives of the university and its active scientific development adopted currently, the physics department aspires to achieve scientific leadership in the fields of physics providing the graduate with a vital sense of responsibility and a high level of learning skills putting him at a bar with international students of prestiaious institutions. The main required skills are; Knowledge, Cognitive skills, Interpersonal skills, Responsibility, Communication skills, IT skills, Numerical skills, and English language skills.

1- Knowledge

Obtaining knowledge comes from gathering information, for each course, from several sources. These sources include textbooks, scientific references from the University Library, and the Internet, in addition to the course instructor. It is expected that the graduate should have acceptable basic information upon which the fields of physics and astronomy depend. In particular, he should have a reasonable degree of deep knowledge in classical mechanics, quantum mechanics, materials physics, nuclear physics, astrophysics, electromagnetism, energy physics, optics, biophysics, and theoretical physics. It is also expected that the graduate should have a clear information about many of the applications of those areas in our lives and the general themes of modern research.

2- Cognitive skills

Through the student's studies, he should learn how to understand and think about the physical phenomena and how to simulate it. Also, he should learn how to address the physical issues and problems, and how to use the appropriate mathematical tools to describe the physical phenomena. The student should practice the planning, implementation, and reporting in his laboratory experiments or during the handling of a physical problem. He should learn how to simplify the problem to be solved, to structure the information, and to develop devices to increase the accuracy desired to understand or study a physical phenomenon. The student should be trained on the operations of derivation and deduction that face him during his studies. The development of the student's intellectual skills comes from a review of those points during his practice in the educational process, whether by the instructor or the student's personal efforts. Also, it emanates from the student’s interest in the experimental study, as well as during the periods of solving problems and while discussing how to address the phenomenon during the lecture or by searching on the Internet. The use of computers and computer programs to understand and analyze the laboratory results or to track experimental details in the computer simulation programs. All of those activities are means of helping the student in the formation of a high-level knowledge.

Furthermore, interest in the experimental laboratory work, their consequent results, and comparing them with the physical theories previously learnt by the student play an important role in building a cognitive ability in a practical way.

3- Interpersonal skills and responsibilities

One of the main objectives of the educational process is the development of personal skills and the ability to undertake responsibility through pursuing some of the following strategies:

- Training students to search in the internet and the library.
- Educating them on how to compensate the lectures, from which they were absent, by getting the help from other colleagues.
- Learning how to collect the scientific material for any course being studied, to compile and re-arrange it in a simplified manner. This is one of the means of increasing the personal capacity of learning.
- Discussing how to overcome learning difficulties and solving scientific problems.
- Using the laboratory experiments and the computer to simulate the practical aspects of the scientific topic.
- Attending seminars and general scientific lectures.
- Visiting the institutes, research institutions, and industrial foundations related to the specialization to experience the practical reality in the community.

The achievement of these skills can be facilitated by requesting guidance from the course instructor.

4- Communication Skills

Communication skills can be divided into three skills:

a) ***Communication with colleagues*** that can be practiced through teamwork to solve problems, searching in the internet, or studying a particular idea or a specific topic. Of help in this regard is the raising of the level of cooperation in solving the educational problems and furthering the communication with the student's colleagues and peers. It must be emphasized that the process of communication with peers is the way to perform in a spirit of teamwork, which is important to achieve success in research activities.

b) ***The student's communication with the course instructor:*** Communicating with the instructor is important for solving the student's problems in learning, developing his skills, and overcoming educational difficulties.

c) ***The student's communication with the community:*** This can be achieved through undertaking field visits to factories, companies, research institutions, hospitals, and astronomical observatories. This ability can also be enhanced through communicating with various groups of the society in which the student lives. Furthermore, the student should have the ability and courage to explain physical phenomena to members of his

family, relatives, and his neighbourhood. In addition, he should have the desire and zeal to communicate with the activities of the scientific community either within, or outside, the University. Hence, the importance of the graduate's skills, characterized by social and scientific networking, cannot be over-emphasized.

5- Information Technology Skills:

These skills can be grasp by exploring through the information network, the use of computers in writing reports, performing drawings and calculations, learning languages, and applying different software that increases in depth in accordance with the course level.

6- Numerical Skills:

These skills can be acquire through solving problems, performing numerical analysis for the outputs, the ability to estimate numbers in terms of their numeric value, and the ability to use statistical and analytical software.

7- English Language

The student needs to pay attention to the English language as a skill that can be used in the scientific areas, especially in the fields of research and learning physics. A research physicist requires the English language since both research work and scientific references are often Written in English. Hence, the researcher must master the English language for reading, and in the case of traveling abroad, he needs to conduct his conversations through the medium of the English language. Furthermore, the student needs the skill of writing in English when writing his graduation projects, and submitting a report or research work resulting from his study.

Program Structure and Organization:

Program Study Plan

1- Compulsory and Elective Requisites

Requisite	Type of requisite	Total credit hours	Percentage of credit hours	Observations
University	Compulsory	--	--	
	Elective	12	8.76%	
College	Compulsory	29	21.17%	
	Elective	--	--	
Department	Compulsory	84	61.31%	12 hours from Mathematics from the Department
	Elective	9	6.57%	
Free courses		3	2.19%	
Total hours and percentage		137	100%	

2- University Requisites

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations
ARAB	101	Linguistic skills	2(2+0+0)	--	Compulsory
SALM	101	Introduction to Islamic Culture	2(2+0+0)	--	Compulsory
SALM	102	Islam and building society	2(2+0+0)	--	Compulsory
SALM	103	Economical system in Islam	2(2+0+0)	--	Compulsory
--	--	University Elective	2(2+0+0)	--	Elective
--	--	University Elective	2(2+0+0)	--	Elective

3- Compulsory College Requisites

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations
PCOM	113	Computer Skills	2(2+0+0)	--	
PMTH	112	Introduction to Mathematics 1	2(2+0+0)	--	
PENG	111	English Language 1	8(2+6+0)	--	
PSSC	114	Learning and Communication	2(2+0+0)	--	

		Skills			
PMTH	127	Introduction to Mathematics 2	4(3+0+1)	--	
PENG	123	English for engineering and science	2(2+0+0)	--	
PPHS	128	Physics	3(2+2+0)	--	
PENG	112	English Language 2	6(2+4+0)	--	

4- Elective College Courses

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations

5- Compulsory Department Requisites

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations
MATH	201	Calculus I	3(3+0+0)	--	
PHYS	201	General Physics I	4(3+2+0)	--	
PHYS	202	General Physics II	4(3+2+0)	PHYS 201	
MATH	202	Calculus II	3(3+0+0)	MATH 201	
PHYS	211	Classical Mechanics	3(3+0+0)	PHYS 201 MATH 201	
PHYS	231	Waves and Vibrations	3(3+0+0)	PHYS 201 MATH 201	
PHYS	241	Thermodynamics	3(3+0+0)	PHYS 201	
PHYS	291	Thermal Physics Lab.	2(0+4+0)	PHYS 201	
PHYS	303	Mathematical Physics I	3(3+0+0)	MATH 202	
MATH	310	Differential Equations	3(3+0+0)	MATH 202	
PHYS	321	Electromagnetism I	3(3+0+0)	PHYS 202	
PHYS	332	Optics	3(3+0+0)	PHYS 231	
PHYS	351	Modern Physics	3(3+0+0)	PHYS 231	
MATH	324	Partial Differential Equations	3(3+0+0)	MATH 310	

PHYS	304	Mathematical Physics II	3(3+0+0)	PHYS 301	
PHYS	393	Optics Lab.	3(3+0+0)	PHYS 332	
PHYS	342	Statistical Physics	3(3+0+0)	PHYS 241	
PHYS	393	Electromagnetism Lab.	2(0+4+0)	PHYS 321	
PHYS	352	Quantum Mechanics I	3(3+0+0)	PHYS 351 PHYS 324	
PHYS	322	Electromagnetism II	3(3+0+0)	PHYS 321	
PHYS	423	Electronics	3(3+2+0)	PHYS 202	
PHYS	453	Quantum Mechanics II	3(3+0+0)	PHYS 352	
PHYS	494	Modern Physics Lab.	2(0+4+0)	PHYS 351	
PHYS	481	Nuclear Physics I	3(3+0+0)	PHYS 351	
PHYS	471	Solid state physics I	3(3+0+0)	PHYS 352	
PHYS	454	Atomic and molecular physics	3(3+0+0)	PHYS 352	
PHYS	495	Practical Training	1(0+2+0)	PHYS 392 PHYS 393	- Co-requisite
PHYS	496	Solid state physics lab.	2(0+4+0)	PHYS 471	
PHYS	497	Nuclear Physics lab.	2(0+4+0)	PHYS 481	
PHYS	499	Project	2(0+4+0)	PHYS 497 PHYS 498	

6- Elective Department Requisites

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations
PHYS	205	Introduction to Astronomy	3(3+0+0)	--	
PHYS	361	Health Physics	3(3+0+0)	PHYS 202	
PHYS	355	Laser Physics	3(3+0+0)	PHYS 351	
PHYS	362	Biophysics	3(3+0+0)	PHYS 202	
PHYS	407	Computational Physics	3(3+0+0)	PHYS 302	
PHYS	456	Plasma Physics	3(3+0+0)	PHYS 322	
PHYS	472	Solid state physics II	3(3+0+0)	PHYS 471	
PHYS	406	Mathematical	3(3+0+0)	PHYS 304	

		Physics III			
PHYS	473	Semiconductors	3(3+0+0)	PHYS 471	
PHYS	474	Materials Science	3(3+0+0)	PHYS 471	
PHYS	475	Renewable Energy	3(3+0+0)	PHYS 471	
PHYS	482	Nuclear physics II	3(3+0+0)	PHYS 481	
PHYS	484	Radiation Physics	3(3+0+0)	PHYS 481	
PHYS	485	Neutron Physics and Reactors	3(3+0+0)	PHYS 481	
PHYS	483	Elementary Particle Physics	3(3+0+0)	PHYS 481	
PHYS	476	Nanotechnology	3(3+0+0)	PHYS 471	

7- Training Requisites

Course Code	Course Number	Course	Credit Hours	Pre-requisite	Observations

Suggested distribution of courses on semesters

Year	Course Code	Course Title	Required or Elective	Credit Hours	College or Department
Prep Year					
1st semester	PCOM113	Computer Skills	Required	2(2+0+0)	Computer Science
	PMTH112	Introduction to Mathematics 1		2(2+0+0)	Mathematics
	PENG111	English Language 1		8(2+6+0)	
	PSSC114	Learning and Communication Skills		2(2+0+0)	
2nd semester	PMTH127	Introduction to Mathematics 2	Required	3(3+0+0)	Mathematics
	PENG123	English for Engineering and Science		2(2+0+0)	
	PPHS128	Physics		3(2+2+0)	Physics

	PENG112	English Language 2		6(2+4+0)	
Year	**Course Code**	**Course Title**	**Required or Elective**	**Credit Hours**	**College or Department**
Second Year					
1st Semester	IC101	General Elective	Free	2(2+0+0)	
	MATH201	Calculus 1	Required	3(3+0+0)	Mathematics
	PHYS201	General Physics 1		4(3+2+0)	Physics
	ARAB101	Linguistic Skills		2(2+0+0)	
	ZPSY101	Thinking skills and learning methods.		2(2+0+0)	
	-----	Free course	Free	3(3+0+0)	
	-----	University elective course	elective	2(2+0+0)	
2nd Semester	PHYS202	General Physics II	**Required**	4(3+2+0)	Physics
	MATH202	Calculus II		3(3+0+0)	Mathematic
	PHYS211	Classical Mechanics		3(3+0+0)	Physics
	PHYS231	Waves and Vibrations		3(3+0+0)	
	PHYS241	Thermodynamics		3(3+0+0)	
	PHYS291	Thermal Physics Lab		2(0+4+0)	
Year	**Course Code**	**Course Title**	**Required or Elective**	**Credit Hours**	**College or Department**
Third Year					
1st Semester	PHYS303	Mathematical Physics I	Required	3(3+0+0)	Physics
	MATH310	Differential Equations		3(3+0+0)	Mathematic
	PHYS321	Electromagnetism I		3(3+0+0)	Physics
	PHYS332	Optics		3(3+0+0)	
	MATH324	Partial Differential Equations		3(3+0+0)	Mathematic
	PHYS351	Modern Physics		3(3+0+0)	Physics

2nd Semester	PHYS304	Mathematical Physics II	Required	3(3+0+0)	Physics
	IC102	Islam and building society		2(2+0+0)	
	PHYS393	Optics Lab.		2(0+4+0)	Physics
	PHYS342	Statistical Physics		3(3+0+0)	
	PHYS392	Electromagnetism Lab.		2(0+4+0)	
	PHYS352	Quantum Mechanics I		3(3+0+0)	
	PHYS322	Electromagnetism II		3(3+0+0)	
Year	**Course Code**	**Course Title**	**Required or Elective**	**Credit Hours**	**College or Department**
Fourth Year					
1st Semester	PHYS422	Electronics	Required	4(3+2+0)	Physics
	PHYS452	Quantum Mechanics II		3(3+0+0)	
	PHYS494	Modern Physics Lab.		2(0+4+0)	
	PHYS481	Nuclear Physics I		3(3+0+0)	
	PHYS471	Solid state physics I		3(3+0+0)	
	IC103	Economic system in Islam		2(3+0+0)	
	PHYS495	Practical Training		1(0+2+0)	
2nd Semester	PHYS454	Atomic and molecular physics	Required	3(3+0+0)	Physics
	PHYS496	Solid state physics lab.		2(0+4+0)	
	PHYS497	Nuclear Physics lab		2(0+4+0)	
	PHYS499	Project		2(0+4+0)	
		Department elective	Elective	3(3+0+0)	
		Department elective		3(3+0+0)	
		Department elective		3(3+0+0)	

Physics Courses Description

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
General Physics I	PHYS201	3	2	0	4	Third level	----

Contents:

Theoretical part:

Physics and measurements, Units and dimensions, Dynamics of particle in one dimension (displacement, average velocity, instantaneous velocity, acceleration, free fall), vector algebra and geometry, Motion in two dimensions, Projectile motion, Uniform circular motion, Tangential and radial accelerations, Newton's first law and inertial frames, Mass and weight, Newton's second law, Newton's third law, Friction, Work and energy, Vector scalar products, Work of variable forces, Kinetic energy and work-energy theorem, Conservative and non-conservative forces and potential energy, Power, Conservation of mechanical energy, The conservation law of linear momentum, Impulse, Collisions, Collision in one and two dimensions, Rotational motion with constant angular acceleration, Angular quantities, Moment of inertia, Torque and angular momentum, Work of rotational motion, Properties of matter: Elasticity, Stress, Strain, Modulus's, Strain energy, Fluid mechanics: Density and relative density, the concept of pressure, Pascal law, Archimedes principle, Fluid flow, Bernoulli's equation and its applications, Viscosity, Surface tension.

Practical part:

Error and measurements, Force table, Hook's Law, Free fall, Projectile motion, Inclined planes, Verifying the equations of motion and collisions using air track, Young's Modulus.

Course Objectives:	Course Learning Outcomes (CLOs)
Provide a clear understanding of the basic concepts and integrating their knowledge in the disciplines of mechanics, dynamics, energy, and momentum.	To know and describe the basic principles of mechanics, dynamics, energy, and momentum.
	To apply the formulas learned to solve the different applications of the related topics.
	To distinguish between the one and two dimensional mechanics, kinetic and potential energies, elastic and inelastic collisions, and to analyze the schematics and diagrams related to it.
	To write laboratory reports. Relate the experiments to the theories related. To explain and justify the results obtained from the experiment
Develop learning skills using. Experimental tools in physics lab.	To participates in class discussion. Practice the safety and organizing rules of the laboratories.
	To act with self-reliance when working independently. Displays teamwork and shows professional commitment to ethical practice.
Develop positive attitudes towards seeking facts and scientific research.	To communicate with the teacher and students using communications technology.
	To use software programs in writing, inserting and analyzing data, and plotting graphs.
Provide a foundation for most of other physics laboratories and the skill of using different devices.	To assemble the experiment correctly. To operate the experiment and any attached computer quickly and accurately.
	To measure the different physical parameters in the laboratory professionally and accurately.

References

1. Physics for scientists and engineers; *Raymond A. Serway and John W. Jewett*, Cengage Learning, 9th Ed. 2013.
2. Physics; *John D. Cutnell and Kenneth W. Johnson*; John Wiley & Sons; 9th Ed. 2012
3. College Physics; *Raymond A. Serway, Chris Vuille*; Cengage Learning; 9th Ed. 2011

4. الفيزياء للعلميين والمهندسين: ريموند أ سيروای، روبرت ج. بكتر، جون و. جيويت؛ترجمة محمد محمود عمار،طه زكى سكر، صلاح كامل اللبنى؛مراجعة أحمد أمين حمزة، محمد محمودعمار، محمد عبد الفتاح مبروك، دار المريخ للنشر ج1.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
General Physics II	PHYS202	3	2	0	4	Fourth level	PHYS201

Contents:

Theoretical part:

Electric Charge, Insulators and conductors, Coulomb's law, Point charge, The electric field, Electric field of multiple point charges, The electric field of continuous charge distribution, examples of various shapes (disks, rings, spheres, planes), The parallel plate capacitor, Electric dipole, motion of point charge and electric dipole in electric field, Electric flux, Gauss's law, Applications of Gauss's law, Conductor in electrostatic equilibrium, The electric current, Batteries, current density, Conductivity and resistivity, Electric potential, The potential of point charges, The potential of dipole, The electric potential of many charges, Capacitance and capacitors, Energy stored in a capacitor, Fundamental circuits, Ohm's law, Series resistors, Parallel resistors, Kirchhoff's laws, RC circuits, Magnetism and magnetic force, source of magnetic fields, Magnetic field of a current, Magnetic dipoles, Ampere's law and solenoids, The magnetic force on a moving charge, The magnetic force on a current-carrying wire, Forces and torques on current loops, Induced current, Motional emf, Magnetic flux, Lenz's law, Faraday's law, Induced fields and EM waves, Inductors, LC circuits, LR circuits, AC circuits and phasor, Capacitors in AC circuits, RC filter circuits, Inductor circuits, The RLC circuits, Power in AC circuits, Wave phenomena, Longitudinal and transverse waves, Sound, The nature of light and the laws of geometric optics, Image formation, Interference of light waves, Diffraction patterns and polarization.

Practical part:

Verification of Ohm's Law, Metric bridge, Charge and discharge of capacitors, Inductive Reactance, Capacitive Reactance, RCL circuits, Transformers, Speed of sound in air, Refractive Index of a Prism, Focal length of Lenses, Focal Length of Mirrors, Jouls equivalence.

Course Objectives:	Course Learning Outcomes (CLOs)
Provide a clear understanding of the basic concepts and integrating their knowledge in the disciplines of mechanics, dynamics, energy, and momentum.	To know and describe the basic principles of mechanics, dynamics, energy, and momentum.
	To apply the formulas learned to solve the different applications of the related topics.
	To distinguish between the one and two dimensional mechanics, kinetic and potential energies, elastic and inelastic collisions, and to analyze the schematics and diagrams related to it.
	To write laboratory reports. Relate the experiments to the theories related. To explain and justify the results obtained from the experiment
Develop learning skills using. Experimental tools in physics lab.	To participates in class discussion. Practice the safety and organizing rules of the laboratories.
	To act with self-reliance when working independently. Displays teamwork and shows professional commitment to ethical practice.
Develop positive attitudes towards seeking facts and scientific research.	To communicate with the teacher and students using communications technology.
	To use software programs in writing, inserting and analyzing data, and plotting graphs.
Provide a foundation for most of other physics laboratories and the skill of using different devices.	To assemble the experiment correctly. To operate the experiment and any attached computer quickly and accurately.
	To measure the different physical parameters in the laboratory professionally and accurately.

References

5. Physics for scientists and engineers; *Raymond A. Serway and John W. Jewett*, Cengage Learning, 9th Ed. 2013.

6. Physics; *John D. Cutnell and Kenneth W. Johnson*; John Wiley & Sons; 9th Ed. 2012
7. College Physics; *Raymond A. Serway, Chris Vuille*; Cengage Learning; 9th Ed. 2011
1. الفيزياء للعلميين والمهندسين: ريموند أ سيروای، روبرت ج . بكتر، جون و . جيويت؛ترجمة محمد محمود عمار،طه زكى سكر، صلاح كامل اللبنى؛مراجعة أحمد أمين حمزة، محمد محمودعمار، محمد عبد الفتاح مبروك، دار المريخ للنشر ج2 و ج3.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Classical Mechanics	**PHYS211**	**3**	**2**	**0**	**4**	**Fourth level**	**PHYS201 + MATH 201**

Contents

Integration of Newton's equations of motion, motion under a constant force, motion under a force that is a function of time, velocity and position, time varying mass system. **The Lagrangian Formulation of Mechanics,** Generalized Coordinates and constraints, D'Alembert's Principles and Lagrange's Equations, Hamilton's Principle, Integrals of motion, Nonconservative systems,……etc.**Hamiltonian Dynamics,** the Hamiltonian of a dynamical system, Hamilton's Canonical equation, integrals of Hamilton's, phase space and liouville's theorem, the passage from the Hamiltonian. **General force motion,** The two body problem, general properties of central force motion, effective potential and classification of orbits, general solutions of the problem of motion, Galilean references, Non Galilean references, inverse square law, kepler's law, application of general force, Newton's law of gravity, stability of circular orbits, the upsides and the advance of perihelion, hyperbolic orbits and Rutherford scattering. **Collisions Between Particles,** Direct impact of two particles, centre of mass coordinate system, scattering cross section in the L and C systems, Scattering by a central force field. **Linear Oscillations,** the simple harmonic oscillator, and harmonic oscillation in two and three dimensions, Damped Oscillations, relaxation time phenomena…… etc. **Nonlinear Oscillation,** Qualitative analysis - energy and phase diagrams, Elliptic integrals and Nonlinear oscillations, Fourier series, the method of perturbation, Ritz method, Methods of successive approximation, chaotic oscillations.

Course Objectives:	Course Learning Outcomes (CLOs)
To understand basic knowledge of the Newton's laws To understand basic knowledge of the Newton's laws	List of laws of Newton their derivation.
	Describe the examples of Newtons laws of motion
	Newtons laws in daily life

	List of laws of Newton their derivation.
	Memorize mathematical solutions of these laws
Learn the mathematical techniques to solve langrangian equations.	Collect general information about some about some techniques.
	Apply the techniques to solve the problems
	Work in a group and learn time management.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for langrangian equations.

References

1. Classical Mechanics, *Tai L. Chow*, CRC press, 2nd Ed. 2013; ISBN: 1466569980
2. Classical Mechanics; *John R. Taylor*; University Science Books, 2005, ISBN 189138922X (1-891389-22-X).
3. Classical Mechanics; Tom W. B. Kibble and Frank H. Berkshire; World Scientific Publishing Company; 5th Ed. 2004; ISBN 1860944353.
4. Introduction to Electrodynamics;*David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Vibration and Waves	**PHYS231**	**3**	**0**	**0**	**3**	**Fourth level**	**PHYS201 + Math 201**

Contents

Motion of an Object Attached to a Spring, Mathematical Representation of Simple Harmonic Motion, Energy of the Simple Harmonic Oscillator, Comparing Simple Harmonic Motion with Uniform Circular Motion, The Pendulum, Damped Oscillations, Forced Oscillations, Application of damped and forced oscillations - Superposition of simple harmonic oscillations- Traveling waves, Propagation of a Disturbance, Sinusoidal Waves, transverse wave, longitudinal wave, The Speed of Waves on Strings, amplitude, wavelength, the angular wave number, angular frequency. Period, frequency, Reflection and Transmission, Rate of Energy Transfer by Sinusoidal Waves on Strings, The Linear Wave Equation, Speed of Sound Waves - Periodic Sound Waves, Intensity of Periodic Sound Waves, The Doppler Effect, Digital Sound Recording, Motion Picture Sound, Superposition and Interference , Constructive interference, Destructive interference,

Standing Waves, nodes, antinodes Standing Waves in a String Fixed at Both Ends, Resonance, Standing Waves in Air Columns, Standing Waves in Rods and Membranes, Beats: Interference in Time,

Course Objectives:	Course Learning Outcomes (CLOs)
The study of Simple harmonic oscillation.	The student knowledge of the simple harmonic oscillations
	Learning the fundamental concepts in all physics applied and theoretical
	Distinguish between S.H oscillation and Damped oscillation
	Memorize different technique used in
Develop learning skills using. Experimental tools in physics lab.	To participates in class discussion. Practice the safety and organizing rules of the laboratories.
	To act with self-reliance when working independently. Displays teamwork and shows professional commitment to ethical practice.
Develop positive attitudes towards seeking facts and scientific research.	To communicate with the teacher and students using communications technology.
	To use software programs in writing, inserting and analyzing data, and plotting graphs.
Provide a foundation for most of other physics laboratories and the skill of using different devices.	To assemble the experiment correctly. To operate the experiment and any attached computer quickly and accurately.
	To measure the different physical parameters in the laboratory professionally and accurately.

References

1) Vibrations and waves in Physics, *Iain G. Main*, Cambridge Univ.Press; 3rd Ed. (1993); ISBN 0521447011

2) Vibrations and waves; *George C. King*; Wiley; 1st Ed. (2009); ISBN 0470011890

3) Almost All About Waves; *John R. Pierce*; Dover Publications; 2006; ISBN-13: 978-0486453026

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Thermodynamics	**PHYS241**	**3**	**0**	**0**	**3**	**Fourth level**	**PHYS201**

Contents

Fundamental concept in heat and thermodynamics, Thermal Equilibrium and zeroth law of thermodynamics, Ideal gases, First law of thermodynamic, Application of first law of thermodynamic- isothermic and adiabatic processes. Irreveriable process- reversible processes. Carrnot cycle- otto cycle- cleapeyronlattent heat equation-Second law of thermodynamic, Entropy, Thermodynamic functions, Maxwell relation, Third law of thermodynamic, Phase change, Applications on thermodynamic laws.

Course Objectives:	Course Learning Outcomes (CLOs)
The student knowledge of the basics of science thermodynamics	THE STUDENT LEARN systems, properties, state, changing the state of a system, units systems, property units, converting units, problem solving in thermodynamics.
	The student will know the energy within system boundary, energy transfer.
	state principle, intensive and extensive properties, pure substances, liquid-vapour tables, saturation and quality, compressed liquids, superheated vapour, gases, ideal gas law,……other thermodynamics properties
	The student will have knowledge of closed system, open system, steady state and flow processes, transient.
Learn the basic thermodynamics concepts and principles,	The student will learn the effect of friction, the effect of a finite temperature…..
	Entropy will be studied to deal with the universe equations
	Second law of thermodynamics
	Thermodynamics cycles will be studied first and second laws for cycles, power cycles, refrigeration and heat pump cycles, and second law statements revisited.
The development of students' mental abilities. The student knowledge of the basics of science thermodynamics	

References

1- Fundamentals of Thermodynamics, *C. Borgnakke and R. E. Sonntag*; 8th Ed. (2012); Wiley; ISBN 1118131991.

2- Equilibrium Thermodynamics;*C. J. Adkins*; 3rd ed, (1984), Cambridge University Press; ISBN 0521274567

3- Thermodynamics; *Philip S. Schmidt, Ofodike A. Ezekoye, John R.Howelland, Derek K. Baker*; 1st Ed. (2004); Wiley; ISBN 047114343X.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		

Thermal physics Lab.	**PHYS291**	**0**	**4**	**0**	**2**	**Fourth level**	**PHYS201**

Contents

Temperature and zeroth law of thermodynamics, thermal Equilibrium, Absolute temperature, Entropy, triplet point of water, thermometer, thermocouple, The Celsius, Fahrenheit, and Kelvin Temperature Scales and their conversations, Thermal expansion, thermal expansion of solid, liquid and gases, Linear expansion and volumetric expansion, Mathematical derivation of co-efficient of linear and volumetric expansion, Ideal gas law, Mole, Avogadro's number, Heat and its units, Heat Capacity and specific heat, Internal Energy, Latent Heat, Latent heat of fusion, Latent Heat of vaporization, Specific Heat and calorimeter, work and heat in thermodynamics process, First Law of thermodynamics, adiabatic process, isobaric process, isovolumetric process, isotherma process, Energy transfer mechanisms, thermal conduction, convection, Radiation, Black body, second law of thermodynamic, , Boyles and Charles Law, Newton's law of cooling, viscosity, Surface tension, Bouncy force and Archimedes principle, Pressure and variation of pressure with depth, Determination of the Paraffin wax fusion temperature, resistivity dependence on temperature.

Course Objectives:	Course Outcomes:
To understand basic knowledge of the Newton's laws	List of laws of Newton their derivation.
	Describe the examples of Newtons laws of motion
	Newtons laws in daily life
	Memorize mathematical solutions of these laws
Learn the mathematical techniques to solve langrangian equations.	Collect general information about some about some techniques.
	Apply the techniques to solve the problems
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for langrangian equations.

References:

1- Staff notebook
2- Physics for scientists and engineers; *Raymond A. Serway and John W. Jewett*, Cengage Learning, 9th Ed. 2012

3- Physics, Volume 1, David Halliday, Robert Resnick and Kenneth S. Krane, 5th Ed. 2001
4- Fundamentals of Thermodynamics, *C. Borgnakke and R. E. Sonntag*; 8th Ed. (2012); Wiley; ISBN 1118131991.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Mathematical Physics I	**PHYS303**	**3**	**0**	**0**	**3**	**Fifth level**	**MATH 202**

Contents

Determinants, Matrices, Solving linear equations and differential equations by matrices, Application on the motion of the rotation of the rigid body, Vector Algebra: Vector products, Position, Displacement, Vector transformation, Gradient, The Divergence, The Curl, Laplace operator, Line, Surface, and Volume Integrals, Gauss theorem, Stock's theorem, Green's theorem, Spherical polar coordinates, Cylindrical coordinates, The Dirac delta function.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Mathematical Methods of Physics.	Easily understand about the Matrix and Determinants
	Check and apply the different properties of Matrix.
	Use the Gauss elimination , Cremer rules for the solving of Matrix
	Understand different techniques use for the determination variables in liner eqautions.
Learn, understand and get concepts of Vector algebra.	Collect general information about some Vector algebra with respect to some related topics.
	Apply the gained mathematical tools to solve the linear equations problems
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' intellectual abilities.	Present a short report in a written form and orally on given topics.
	Understand Line, Surface, and Volume Integrals, Gauss theorem, Stock's theorem, Green's theorem and their applications

References:

1- Advanced Engineering Mathematics; *Erwin Kreyszing*;10th (2011); Wiely;ISBN 0470458364
2- Introduction to Electrodynamics;*David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562
3- Mathematical methods in the physical sciences; *Mary L. Boas*; 3rd (2005); Wiley; ISBN 0471198269

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Electromagnetism I	**PHYS221**	**3**	**0**	**0**	**3**	**Fifth level**	**PHYS202**

Contents

Review of vector Operations and algebra, Linear and rotational transformation of vectors, Vector field, Review of vector differential calculus: (gradient, the divergence, the curl, product rules, Second Derivatives), Review of integral Calculus: (linear, surface, and volume integrals), The fundamental theorem for: (calculus, gradient, divergence, curl), Curvilinear Coordinates: (spherical polar and cylindrical coordinates), The divergence of reciprocal square of radial distance, Coulomb's law, The electric field, Continuous charge distributions, Divergence and curl of electrostatic fields, Field lines and flux, Gauss's law and its applications, Electric potential, The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution, Properties of conductors and induced charges, Surface charge and the force on a conductor, Capacitors, Poisson's equation, Laplace's equation in one, two and three dimensions, Boundary conditions and uniqueness theorems, Conductors and the second uniqueness theorem, The monopole and dipole terms, The electric field of a dipole, Gauss's law in the presence of dielectrics, Boundary conditions, Linear Dielectrics: (susceptibility, permittivity, dielectric constant), Boundary value problems with linear dielectrics, Magnetostatics and the Lorentz law, Magnetic fields and magnetic forces, The Biot-Savart law, The divergence and curl of the magnetic field, Ampere's law and its applications, Magnetic vector potential, Magnetostatic boundary conditions, Multipole expansion of the vector potential, magnetization, Magnetic materials: (diamagnets, paramagnets, ferromagnets), Torques and forces on magnetic dipoles, Effect of magnetic field on atomic orbits, The field of a magnetized object, Bound currents, Ampere's law in magnetized materials, Boundary Conditions, Linear and nonlinear media, Magnetic susceptibility and permeability, Ferromagnetism.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Electromagnetism I.	calculate gradient, the divergence, the curl, product rules, Second Derivatives,)
	Remember Coulomb's law, and definite Continuous charge distributions ,linear, on surface and in volume .
	Apply Gauss law to calculate electric field and potential .
	Remember Coulomb s law
Learn the basic of Electromagnetism I	Calculate potential energy of charge distributions.
	Know the conductors properties in equilibrium electrostatics and induced charges.
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for Electromagnetism I

References:

1- Introduction to Electrodynamics;*David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562

2- Elements of Electromagnetics; *Matthew N. O. Sadiku*; 5th (2009); Oxford University Press; ISBN 0195387759

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Exercise	experiment	Credit		
Optics	**PHYS332**	**3**	**0**	**0**	**3**	**Fifth level**	**PHYS231**

Contents

Electromagnetic Phenomena, Gauss' Law, Gauss' Law for Magnetic Fields,, Faraday's Law, Ampere's Law , Maxwell's Adjustment to Ampere's Law, Polarization of Materials, The Wave Equation, Plane Wave Solutions to the Wave Equation, Index of Refraction, Poynting's Theorem, Irradiance of a Plane Wave, Energy Density of Electric Fields, Energy Density of Magnetic Fields, The nature of light, The superposition of waves, Interference of two-beams of light (division of the wave front & division of amplitude) Interferometers (Young's, Fresnel's biprism, loyed mirror, Fresnel's double mirrors, wedge interferometer, Newton rings, Michelson interferometer), Interference of multiple beams, Fabry-Perot interferometer, Applications of interferometry. Diffraction, Huygens' Principle as Formulated by Fresnel, Scalar Diffraction Theory, Fresnel Approximation, Fraunhofer Approximation

Fraunhofer diffraction (single slit, two slits, multiple slits) - diffraction grating - Fresnel diffraction (circular aperture & circular Obstacle). Polarization of Light, Linear, Circular, and Elliptical Polarization, Polarization Effects of Reflection and Transmission Polarization - polarization by absorption, reflection, refraction & double refraction - Optical active materials & polarometer. Interference of polarized light, Analysis of polarized light, Electro-optics (Kerr effect & Pockels effect), Magneto - optics (Faraday effect)

Course Objectives:	Course Outcomes:
The student knowledge of the basics of optics as interference, diffraction and polarisation	List different types of interference and related instrumentation.
	Describe theories explaining the diffraction, interference and polarization
	Identify the light spectra and it use in the optical measurement
	Memorize different technique used interferometry and applications.
Learn the basic light concepts and principles, and the basics of interference and diffraction with a highlight on its practical and scientific significance.	Collect general information about light spectra topics.
	Apply the gained mathematical and experimental tools to solve the wave equation of electromagnetic radiation
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for bright and dark fringe based on wave theories.

References:

1- Fundamentals of optics;*Jenkins F. A. and H. E. White*;4th Ed. (1976); McGraw-Hill College; ISBN 0070323305
2- HANDBOOK OF OPTICS Volume II Devices , Measurements, and Properties **McGRAW-HILL , INC** ISBN 0-07-047974-7

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Modern Physics	**PHYS351**	**3**	**0**	**0**	**3**	**Fifth level**	**PHYS231**

Contents

Special Theory of Relativity: wave propagation- Michelson Morley experiment- Galilean transformation – Lorentz transformations – Relative velocity - Lorentz contraction – Time Dilation – relativity of mass – Mass and energy – Applications. *The particle like*

properties of Electromagnetic radiation: Electromagnetic waves– The photoelectric effect – black body radiation - The Compton Effect - X-rays. *Wavelike properties of particles:* De-Broglie hypothesis – Electron diffraction experiment of Davison and Germer – Electron microscope – Uncertainty principle, quantum theory. *Atomic Structure:* atomic properties- The Thomson model- Rutherford Model for atomic nuclei - alpha particle scattering- Atomic Spectra – Bohr theory of the hydrogen atom – Sommerfeld's Model – Failure of the Bohr theory Frank-Hertz experiment – The basic ideas of the Quantum Mechanics

Course Objectives:	Course Outcomes:
The student knowledge of the basics of science thermodynamics	THE STUDENT LEARN the relativity and relation with universe
	The student will know the properties of waves
	Wave properties of particle will be studied
	The student will have knowledge of atomic structure
Learn the basic thermodynamics concepts and principles,	The student will learn the basic of quantum mechanics
	H atoms will be studied to deal with the atomic stability
	Many electron atoms will be studied to deal with atoms having more than two electrons
	Elementary particles and basic from heavy ion collisions
The development of students' mental abilities.	

References:

1- Modern Physics; *K. Krane*;3rd (2012); Wiley;ISBN 1118061144

2-Concepts of Modern Physis; *Beiser A.*; 6th (2002); McGraw- Hill Science/Engineering/ Math; ISBN 0072448482.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Mathematical Physics II	**PHYS304**	**3**	**0**	**0**	**3**	**Sixth level**	**PHYS303**

Contents

Complex numbers, Properties of Complex Numbers, Arithmetic Operations, Complex Conjugate, Geometric Interpretation, Powers and Roots, Multiplication and Division, Powers of z, Polar From of a Complex number, Demoivre's Formula, Roots, Sets in the

Complex Plane, Functions of a Complex Variable, Analytic functions - Limits and Continuity – Rules of differentiation, Analyticity - Analyticity at a Point, Criterion for Analyticity, The Cauchy-Riemann Equations, Harmonic Functions, Conjugate Harmonic Functions, Elementary Functions, Exponential and Logarithmic Functions, Principal Value, Trigonometric and Hyperbolic Functions, Hyperbolic Sine and Cosine, Inverse Trigonometric and Hyperbolic Functions, Complex Integration – Contours - Independence of path - Cauchy integral theorem - Bounds for analytic Functions, Series representations for analytic functions, Power Series, Taylor Series, Laurent series, Uniform Convergence, Convergence of power series, Residue Theory. Conformal Mapping- Invariance of Laplace's Equation - Geometric Considerations - Bilinear Transformations - The Schwartz-Christoffel Transformations.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Mathematical Methods of Physics.	Easily understand about Complex numbers , analytic function – limits and continuity – analyticity – the Cauchy –Riemann Equation
	Check and apply the different properties of Series representations for analytic functions , Residue theory.
	Use the Elementary Function , complex integration – contours – Cauchy integral theorem –Bounds for analytic functions
	Understand Conformal Mapping –invariance of Laplaces Equation – Geometric considerations –Bilinear Transformations –the Schwartz-Christofffel Transformations.
Learn, understand and get concepts of complex integral.	Collect general information about complex integral with respect to some related topics.
	Apply the gained mathematical tools to solve complex integral problems
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' intellectual abilities.	Present a short report in a written form and orally on given topics.
	Understand Line integral, and series representations for analytic function and their applications

References:

1- Advanced Engineering Mathematics; *Erwin Kreyszing*;10th (2011); Wiely;ISBN 0470458364

2- Introduction to Electrodynamics;*David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562

3- Mathematical methods in the physical sciences; *Mary L. Boas*; 3rd (2005); Wiley; ISBN 0471198269

4- Fundamentals of Complex Analysis with applications to Engineering, Science, and Mathematics; *E.B. Saff and A.D. Snider*; 3rd (2003); Pearson; ISBN 0139078746.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Electromagnetism II	**PHYS322**	**3**	**0**	**0**	**3**	**Sixth level**	**PHYS321**

Contents

Electromotive force, Ohm's law, Motional electromotive force, Electromagnetic induction, Faraday's law, The induced electric field, Inductance, Energy stored in magnetic fields, The modified Ampere's law, Maxwell's equations in vacuum, Maxwell's equations in matter, Boundary conditions, Conservation laws and the continuity equation, Poynting's theorem, Newton's third law in electrodynamics and momentum, Maxwell's stress tensor, Conservation of momentum, Angular momentum, Electromagnetic waves in one dimension, The wave equation, Sinusoidal waves, Boundary conditions: reflection and transmission, Polarization, Electromagnetic waves in vacuum, Monochromatic plane waves, Energy and momentum in electromagnetic waves, Electromagnetic waves in matter, Propagation in linear media, Reflection and transmission at normal incidence, Reflection and transmission at oblique incidence, Absorption and dispersion, Electromagnetic waves in conductors, Reflection at a conducting surface, The frequency dependence of permittivity, Guided waves and wave guides, TE waves in a rectangular wave guide, The coaxial transmission lines, Electric dipole radiation, Magnetic dipole radiation, Radiation from an arbitrary source, Power radiated by a point charge, Radiation reaction with matter.

Course Objectives:	Course Outcomes:
The study of Electric and Magnetic Fields	To Know and describe the Magnetic and Electric field
	Learning the fundamental Concepts for Electric and Magnetic field
	Ability to solve problems
	Memorize different technique used in
The study of Electromagnetic wave s	Collect general information about some about some atomic spectra related topics.
	Apply the gained mathematical and experimental tools to solve the spectra problems
	Work in a group and learn time management.
	Lear n how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for Electromagnetic wave

References:

1- Introduction to Electrodynamics;*David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562
2- Elements of Electromagnetics; *Matthew N. O. Sadiku*; 5th (2009); Oxford University Press; ISBN 0195387759
3- Electromagnetic field , Roald K. wangsuess ,2nd edition ,
2- Elements of Enginering Electromagnetics , Nannopaneni . N. R , 6 th Edition (2004)
3- Electromagnetic field and wave , Magdy F . Iskander , (2000)

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Optics Lab.	**PHYS392**	**0**	**4**	**0**	**2**	**Sixth level**	**PHYS332**

Contents

Prism spectrometer(refractive index and dispersion), Grating spectrometer, Fresnel's biprism with He-Ne laser, Fresnel's double mirrors with He-Ne laser (generate two virtual, coherent light sources through reflection of a point-shaped light source at a Fresnel's mirror. observe the interference of the two virtual light sources. measure the distance d of the interference lines. generate projected images of the virtual light sources. measure the distance A of the projected images. determine the wavelength of the light of an He-Ne laser from the distance d of the interference lines), Newton's rings, Michelson interferometer, Mach-Zehnder-interferometer, Diffraction at a single slit, Diffraction at double slits, (Investigating diffraction at a slit at different slit widths and determining the slit width. Investigating diffraction at a post and confirming Babinet's principle. Investigating diffraction at a circular iris diaphragm at different hole diameters and determining the diameter of a hole, Investigating the diffraction phenomena at groove gratings and crossed gratings. Determining the wavelength. Determining the grating constant). Diffraction at one-and two-dimensional gratings, ,Polarimter and optical activity, Abbe's refractometer, Inverse square law of light radiation and absorption coefficient of glass or plastic materials, Polarization of light.

References:

1- Fundamentals of optics;*Jenkins F. A. and H. E. White*;4th Ed. (1976); McGraw-Hill College; ISBN 0070323305

2- HANDBOOK OF OPTICS Volume II Devices , Measurements, and Properties McGRAW-HILL **, INC** ISBN 0-07-047974-7

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Statistical Physics	**PHYS342**	**3**	**0**	**0**	**3**	**Sixth level**	**PHYS241**

Contents

Probability, One random variable, Some important probability distributions, Many random variables, Sums of random variables and the central limit theorem, Rules for large numbers, entropy, Kinetic theory of gases, Maxwell's distribution of the velocities of gas molecules and its applications, Distribution function of the energy of molecules, Liouville's theorem, Equilibrium properties, The Microcanonical ensemble, Two-level systems, The ideal gas, Mixing entropy and the Gibbs paradox, The canonical ensemble, Canonical examples, The Gibbs canonical ensemble, The grand canonical ensemble, Quantum statistical mechanics, Maxwell-Boltzmann distribution, Bose Einstein distribution, Fermi-Dirac distribution, Vibrations of a solid, Black-body radiation, Quantum microstates, Quantum macrostates, Ideal quantum gases, Hilbert space of identical particles, Canonical formulation, Grand canonical formulation, The degenerate Fermi gas, The degenerate Bose gas, Maxwell-Boltzmann Statistics, Applications of Maxwell-Boltzmann Statistics, Bose-Einstein Statistics, Fermi-Dirac Statistics, Temperature and Entropy, The Thermodynamics of Gases, Statistical Thermodynamics, The Canonical Ensemble, The Grand Canonical Ensemble.

Course Objectives:	**Course Outcomes:**
Students are expected to learn about the scope of statistical physics.	Compare between boson and fermion particles.
	Describe classical statistical physics.
	Apply Maxwell-Boltzmann statistic to find the weight of classical gas.
Students are expected to apply Maxwell-Boltzmann statistics to find physics properties of different systems.	Find mean and most probable velocities.
	Identify the specific heats of gases.
	Apply Equipartition of energy theory to find energy and specific heat of diatomic gas.
Students are expected to familiar with quantum statistics physics.	Classify particles with quantum statistics.
	Compare between Bose-Einstein and Fermi-Dirac Statistics.

	Learn how to search for information through library and internet.
Students will lean to acknowledge of the canonical and grand canonical ensembles.	Evaluation of the grand partition function.
	Classify fluctuations of the assembly energy in a canonical ensemble.
	Describe thermodynamic properties of the canonical ensemble.

References:

1- Statistical Physics, F. Mandl, John Wiley and Sons, 2000

2- Fundamentals of Statistical & Thermal Phys, F. Reif McGraw-Hill, 1985.

3- Statistical Mechanics, R.K. Pathria, 3ed edition, MPG Books Ltd, 2013.

4- Introduction to statistical physics, A. J. Pointon,2nd edition, Pergamon press, 1980.

5- Statistical Physics;*F. Mandl*; 2nd Ed. (1988); Wiley; ISBN 0471915335.

6- Statistical Physics; *L. D. Landau and E. M. Lifshitz*; 3rd Ed. (1980); Butterworth-Heinmann; ISBN 0750633727

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Quantum Mechanics I	**PHYS352**	**3**	**0**	**0**	**3**	**Sixth level**	**PHYS351 + MATH324**

Contents

Reviews of the fundamental experiments in modern physics, the need for quantum mechanics. Photoelectric effect, Compton effect, Interference Phenomena, Louis De Broglie Laws. Wave packet and uncertainty principle, Schrödinger equation for free particle, Continuity relation, The dynamical variables and calculating the expectation values, Schrödinger equation with a potential in one dimension, Dynamical variables and calculating the expectation values in momentum space, Commutation relations. Hermitian operators, Linear operators, Completeness relation and orthonormality. Schrödinger equation in three dimensions, The fundamental postulates of quantum mechanics, Particle in an infinite well, Spectral expansion theory, The parity, Constants of motion and conservation laws, Momentum eigenfunctions and free body, One-dimensional potentials: The potential step, The finite potential well at scattering and bound states, The potential barrier, The delta-function potential at Scattering and Bound states, Simple harmonic oscillator, Oscillator eigenfunctions and eigenvalues, Annihilation an creation operators, Hermite polynomials. Ladder operators and dynamical variables, Schrödinger equation in three dimensions in Cartesian coordinates, Schrödinger equation in three dimension curvilinear coordinate

system, Angular momentum and its eigenfunctions and eigenvlaues, The addition of angular momentum, The central potentials.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Quantum Mechanics I.	Determine the energy of the potential well of infinite levels and concluded that the energy levels are quantized.
	Verify Heisenberg uncertainty principle on few examples.
	Write Schrodinger in three dimension and resolve Harmonic Oscillator.
	Find the three components of angular momentum.
Learn the basic Quantum Mechanics I concepts and principles.	Write operators and dynamical variables, Schrödinger equation in three dimensions
	Give and represent wave waves packet and apply Heisenberg principle uncertainty.
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for Quantum Mechanics I

References:

1. Quantum Physics; *Stephen Gasiorowicz*; 3rd Ed.(2003); Wiley; ISBN 0471057002.
2. Introduction to Quantum Mechanics; *David J. Griffiths*;2nd Ed.(2004); Pearson Prentice Hall; ISBN 0131118927.
3. Quantum Mechanics: Concepts and Applications; *NouredineZettili*;2nd Ed.(2009); Wiley; ISBN 0470026790.

4- Quantum Mechanics (1 vol. set)
Claude Cohen-Tannoudji , Bernard Diu , Frank Laloe ISBN 047116433

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Electromagnetism Lab.	**PHYS393**	**0**	**4**	**0**	**2**	**Sixth level**	**PHYS321**

Contents

Measurement of the electric charge by Millikan oil drop method, measurement of e/m of the electron, Verification of Biot - Savart law,

Verification of Faraday's law, Transformers, Measuring the force on current carrying conductors in a homogenous magnetic fields, Voltege and current transformation with a transformer , Voltege transformation with a transformer under load , Measuring the magnetic field for a straight conductor and circular loops ., Measuring the magnetic field of an air coil , , Helmholtz coils, Magnetic induction.

Course Objectives:	Course Outcomes:
Apply conceptual understanding of Electromagnetic Field	The student knowledge of magnetic field
	Work effectively in groups and exercise leadership
	Psychomotor Skills
	.
Measuring the force acting on current carrying conductors in a homogenous magnetic fields	
	Apply the gained mathematical and experimental tools
	Work in a group and learn time management.
	Lear n how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	.

References:

1-Staff notes Hand Book
2- Introduction to Electrodynamics; *David J. Griffiths*;4rded(2012); Addison-Wesley; ISBN 0321856562
3- Elements of Electromagnetics; *Matthew N. O. Sadiku*; 5th (2009); Oxford University Press; ISBN 0195387759
4- Electromagnetic field , Roald . K. wangsuess ,2nd edition ,
5- Elements of Enginering Electromagnetics , Nannopaneni . N. R , 6 th Edition (2004)
4- Physics for scientists and engineers , Serway A. R , 9th Edition , Brooks / cole

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Modern Physics	**PHYS494**	**0**	**4**	**0**	**2**	**Seventh level**	**PHYS351**

Lab.							

Contents:

The Blamer series of hydrogen and determination of Rydberg constant.
Franck- Hertz experiment for Mercury using an oven.
Franck- Hertz experiment for Neon.
Characteristics of microwaves: polarization, reflection, absorption…..
Fabry – Perot interferometer. (if not taken in optics lab.)
Kerr effect.
Faraday effect.
Pockels effect.
Normal Zeeman effect.
Determination of Planck's constant using photoelectric effect.
Studying X-ray spectra:

- As a function of voltage and current.
- The energy spectrum of some metals.
- Mosley's law.

Course Objectives:	Course Outcomes:
Familiarize the student with some of the basic instruments and measurement techniques typically employed in the experimental work of the various fields of modern physics.	To distinguish and analyze the different schematics and graphs related to certain experiment.
	To read, explain and interpret the results of an experiment
	To write laboratory reports. Relate the experiments to the theories related.
To provide the student with opportunities to learn proper data recording, analysis, and reporting techniques, including the use of spreadsheets, graphical displays and curve fitting routines, the application of appropriate error analysis methodologies, and the maintenance of an accurate and complete scientist's notebook.	To participate in class discussion. Practice the safety and organizing rules of the laboratories.
	To act with self-reliance when working independently. Displays teamwork and shows professional commitment to ethical practice.
	To communicate with the teacher and students using communications technology.

Develop positive attitudes towards seeking facts and scientific research, such as developing effective strategies for designing and implementing experimental solutions to problems requiring physical measurements.	To use software programs in writing, inserting and analyzing data, and plotting graphs.
Provide a foundation for most of other physics laboratories and the skill of using different devices.	To assemble the experiment correctly. To operate the experiment and any attached computer quickly and accurately.
	To measure the different physical parameters in the laboratory professionally and accurately.

References:

Staff notes Handbook, and User Manual.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Electronics	**PHYS423**	**3**	**2**	**0**	**4**	**Seventh level**	**PHYS202**

Contents

Theroritical part:

Analog Electronics: Semiconductors and Diode Applications that include N-type and P-type Semiconductors The P-N junction. Forward basing diode and reverse basing diode. Diode applications such as half-wave rectifier and full-wave rectifier. power supply filters and regulators. Diode limiters. Special Purpose Diodes such as Zener diode, zener limiting. Optical diodes or light emitting diode with their applications, Bipolar junction transistor, The Transistor as an Amplifier, The Transistor as a Switch, Transistor Bias Circuits (base biasing circuits and voltage divider biasing). Stability of voltage divider biasing. Field Effect Transistor (FET). JFET Characteristics and Parameters. JFET Biasing. JFET Biasing – Voltage-Divider Bias. Operational Amplifiers, Op-Amp Input Modes and Parameters. Amplifier Frequency Response, Amplifier Frequency Response. Basic Concepts – Effect of Coupling Capacitors. Junction Field effect transistor Differential and Operational Amplifiers, Introduction to Feedback Circuits, Multivibrators and Oscillators.
Digital Electronics: Digital Concepts: Digital and Analog Quantities. Binary Digits, Logic Levels, and Digital Waveforms. Basic Logic Operations. Overview of Basic Logic Functions. Number Systems, Operations, and Codes. Decimal-to-Binary Conversion. Logic

Gates, Exclusive-OR and Exclusive-NOR Gates. Karnaugh Maps Flip Flops, Shift Registers, Counters, Memories.

Practical part:

P-N junction application (half-wave rectifier, full-wave rectifier, clampers and limiters, Zener regulation) - Transistors JFET & BJT amplifiers. Amplifiers with 741(Inverting & Non inverting Amplifiers, Active Filters, Wien Oscillator, AstableMultivibrator). Half and Full Adder (7483), Flip Flop (7474-7476), Shift Register (7495-74194), Counters (7493-74193).

Course Objectives:	Course Outcomes:
Understand the basic principles and abstractions that are used to analyse and design electronic circuits and systems.	Knowledge in basic sciences, mathematics, and electronic principles.
	Knowledge in the fundamentals of electronic principles and practices, including analysis, design, evaluation, and management.
	An understanding of the professional and ethical responsibility of electronic profession.
Understand the language of electrical and electronic and how to formulate and solve basic electrical and electronic problems.	Collect data and information and perform analysis, interpretation and draw inferences or conclusions
	Perform in-depth study and analysis of electronic problems, and find innovative or creative solutions based on economy, feasibility and safety
	Evaluate alternative designs and solutions, with an understanding of the impact of the proposed solution
Understand how electronic circuits and systems fit into the larger context of science careers, ethics, societal needs, and environmental concerns.	The students will have the ability to work constructively in groups.
	Students should be responsible for their own learning that requires using means to find new information data, or techniques of analysis.

References:

1. Electronicsfundamentals: Circuits, Devices and Applications; *Thomas L. Floyd*; 7th Ed. (2006); Prentice Hall; ISBN 013219709X.
2. Fundamentals of Electronic Devices; *R. J. Tocci and M. E. Oliver*;4th Ed. (1991); Merrill Publication Co.; ISBN 0675212596.
3. Digital Fundamentals; *Thomas L. Floyd*; 10th Ed. (2008); Prentice Hall; ISBN 01322359235.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Quantum Mechanics II	PHYS452	3	0	0	3	Seventh level	PHYS352

Contents

Dirac notation, Vector space algebra and Hilbert space, Rephrasing wave mechanics and operator methods in abstract view, , Commutation relations. Hermitian operators, Linear operators, Completeness relation and orthonormalization. Schrödinger equation in three dimensions. Angular momentum commutation relations, Raising and lowering operators for angular momentum, Expansion theory in abstract view, Matrix representation of angular momentum operators, General relations in matrix mechanics, Fermi's golden rule. The Stern-Gerlach experiment and spin, Eigenstates of spin ½, The intrinsic magnetic moment of spin ½ particles, Addition of two spins, Addition of Spin ½ and orbital angular momentum, Time-independent perturbation theory and energy shifts, Degenerate perturbation theory, The Stark effect, The Zeeman effect, Hyperfine splitting, Variational principle and its applications in harmonic oscillatory and central potential, The WKB approximation, Time-dependent perturbation theory, The interaction of charged particle with electromagnetic field, Two level-system, emission and absorption of radiations, spontaneous emission, Transition rate, selection rule, scattering theory, Partial wave analysis, The Born approximation.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Quantum Mechanics I.	Familiarize with Dirac notation, Vector space algebra and Hilbert space Rephrasing wave mechanics and operator methods in abstract view.
	Good use ofnAngular momentum commutation relations, Raising and lowering operators for angular momentum .
	Understand and apply Time-independent perturbation theory and energy shifts, Degenerate perturbation theory, The Stark effect, Hyperfined splitting,
	Calculate and represent the Stark effect, Hyperfined splitting,.
Learn the basic of Quantum MechanicsII	Definite and illustrated variationnel method
	Verify Time-independent perturbation theory and energy shifts in the case of Harmonic oscillator. .
	Work in a group and learn time management.
	Learn how to search for information through library and internet.

The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for Quantum MechanicsII

References:

1. Quantum Physics;*Stephen Gasiorowicz*; 3rd Ed.(2003); Wiley; ISBN 0471057002.
2. Introduction to Quantum Mechanics; *David J. Griffiths*;2nd Ed.(2004); Pearson Prentice Hall; ISBN 0131118927.
3. Quantum Mechanics: Concepts and Applications; *NouredineZettili*;2nd Ed.(2009); Wiley; ISBN 0470026790

4- Quantum Mechanics (2 vol. set)
Claude Cohen-Tannoudji , Bernard Diu , Frank Laloe ISBN 047116433

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Solid State Physics I	**PHYS471**	**3**	**0**	**0**	**3**	**Seventh**	**PHYS352**

Contents

CRYSTAL STRUCTURE:
Lattices (Bravais and non-Bravais lattices), Primitive and non primitive unit cell, Wigner-Seitz unit cell, Symmetry and symmetry operations, Miller indices and planes, Classification of lattices, 2-dimensional and 3-dimensional lattices, (NaCl, CsCl, ZnS and diamond lattices), Reciprocal lattice.
CRYSTAL DIFFRACTION :
Bragg's law, Von-Laue equation, Experimental techniques of X-ray diffraction (Laue method, Rotating crystal method, Powder method), Electron diffraction., Neutron diffraction.
CRYSTAL BINDING:
Covalent bonding, Metallic bonding, Hydrogen bonding, Ionic bonding, Cohesive energy of ionic crystals, Van-der-Waals bonding, Van-der-Waals London interaction.
LATTICE VIBRATIONS AND THERMAL PROPERTIES OF SOLID:
Dispersion relation of phonons for one-dimensional Mono-atomic and Diatomic linear lattices, Physical difference between optical and acoustic branches, Excitation of optical branch, Quantization of Elastic Waves Phonons, -Phonon Momentum. Lattice heat

capacity, Dulong and Petit Law for specific heat of solids, Einstein Model of specific heat of solids, Debye model of specific heat of solids with high and low temperature limitations.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Solid State Physics and their properties	Easily differentiate the materials from each other on the basis of their crystal structure.
	Understand diffraction formula and its co-relation with crystal diffraction.
	Differentiate Physical and chemical nature of crystal binding energy e.g weak and strong bindingenergy
	Understand different crystal structure techniques use for the determination of Crystal structures.
Learn, understand and get concepts of theories related to the basic properties of Solids and their correlation with experimental techniques.	Collect general information about some properties of solids with respect to some related topics.
	Apply the gained mathematical and experimental tools to solve the spectra problems
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' intellectual abilities.	Present a short report in a written form and orally on given topics.
	Derive equations of Einstein and Debye theories and check how specific heat of solids behave at low and high temperature regions with experimental finings

References:

1. Introduction to Solid State Physics (7th edition), C. Kittel; John Wiley and sons.
2. An Introduction to Solid State Physics and its Applications, R. J Elliot and A. F. Gibson; ELBS and Macmillan.
3. Elementary Solid State Physics, Ali Omar; Addison wesley.
4. Solid State Physics, Neil W. Ashcroft & N David Marmin; Holt-Saunders international.
5. Solid State Physics, J. S. Blackmore; W. B. Saunders.
6. Principle of Solid State Physics, Ziman; Cambridge University.
7. Solid State Physics, H. E. Hall John; ELBS and John Wiley & Son.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Nuclear Physics I	**PHYS481**	**3**	**0**	**0**	**3**	**Seventh**	**PHYS351**

Contents

Properties of the nucleus: Constituents – determination of nuclear charge, radius and mass – Nuclear binding energy, Semi-empirical mass formula. *Natural Radioactivity:* Decay law – Nuclear stability – Radioactivity and theory of transformation – Alpha Decay: Basic α decay processes, Theory of α emission – Beta Decay: Energy release in β decay, Fermi Theory of β decay, Angular momentum and parity selection rules – Gamma Decay: Energetics of γ decay, classical electromagnetic radiation, transition to quantum mechanics, angular momentum and parity selection rules – *Artificial Radioactivity:* Discovery of artificial radionuclides – Transuranium elements – Interaction of radiation with matter: Interaction of heavy elements – interaction of light electrons – interaction of gamma rays with matter – interaction of neutrons with matter. Radiation Detectors: Gas detectors – Scintillation detectors – solid state detectors. Nuclear Reactions: Types of reactions and conservation laws, Energetics of nuclear reactions, Reaction cross sections, Compound nucleus reactions, Direct Reactions, Heavy ion reactions, Reactions of matter by gamma-rays- reactions by alpha particles- reactions by protons- reactions by neutrons. *Nuclear fission:* Discovery of Nuclear fission – theory of nuclear fission. *Nuclear fusion:* Energy production in stars – control of thermonuclear reactions. Nuclear accelerators

Course Objectives:	**Course Outcomes:**
Develop a clear understanding of the basic concepts in nuclear physics	Recognize the constituents of the nucleus
	Describe basic nuclear properties such as the nuclear charge, nuclear radius, nuclear mass, angular momentum and parity.
Explain the physical principles underlying the liquid drop model of the nucleus and use it to explain nuclear masses and binding energies.	Identify the nuclear binding energy and semi-empirical mass formula.
	Apply the liquid drop model to calculate the nuclear binding energy.
	Learn how to search for information through library and internet.
Acquire knowledge of natural radioactivity and various decay modes.	Describe natural radioactivity and the differences between various decay modes.
	Derive expression for the Q-value for different radioactive decay processes.
	Apply the selection rules of various decay modes to determine the allowed and forbidden transitions
Be familiar with the different types of nuclear reactions, nuclear detectors and nuclear accelerators.	Recognize the different types of nuclear reactions.
	Identify nuclear radiation detectors. .

	List different types of nuclear accelerators.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Construct the mathematical formulation suitable for the theoretical analysis of various decay modes.

References:

1- Concepts of Modern Physis;*Beiser A.*;6th (2002); McGraw- Hill Science/Engineering/ Math; ISBN 0072448482.
2- Introductory Nuclear Physics; *K. S. Krane*; 3rd Ed. (1987); Wiley; 047180553X.
3- Nuclear Physics; *Wong S. M. Samuel*; (2013); Prentice-Hall of India Pvt.Ltd; 8120309901
4- Elements of Nuclear Physics;*W. E. Burcham*; (1979); Longman; 0582460271
5- Introduction to Nuclear Science;*J. C. Bryan*; 2nd Ed. (2013); CRC Press; ISBN: 1439898928

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Practical Training	**PHYS495**	**0**	**2**	**0**	**1**	**Seventh**	**PHYS392 + PHYS393**

Contents

The student carries out a research under the supervision of one of the Staff members in one of the following branches:

- Theoretical Physics.
- Nuclear Physics.
- Solid State Physics.
- Fiber Optics.
- Laser.
- Plasma.

The student learns how to write a report and trains on how to use research equipments or any necessary software as a preparation to the project course.

References:

To be decided by the instructor.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Atomic and Molecular Physics	PHYS454	3	0	0	3	Eighth	PHYS352

Contents

Introduction: Comparing between atomic emission spectroscopy and atomic absorption spectroscopy; Optical spectroscopy, Atomic spectrum, Atomic emission / absorption spectrophotometry Molecular spectroscopy, Spectroscopy of inner electrons.Zeemen's effect, Sodium spectrum, Effect of magnetic field on the energy levels of atom. Theory of magnetic energy, Anomalous Zeeman's effect and Lande splitting factor. Molecular Spectra of diatomic moleculesVibrational energy levels in both classical mechanics and quantum mechanics. Rotational spectra of diatomic molecule in gaseous state and rotational energy levels. Molecular spectra; AnharmonicOscillato- Non Rigid Rotator - Infrared Vibration-Rotation spectra;visible spectrum, IR spectrum, RBS spectra, XRD spectrum - measurements of Absorbance, Transmitting and Reflecting using double beam Spectrophotometers in all ranges of wavelengths (UV-VIS-NIR-IR), Normal modes of vibrations; Natural of infrared absorption, Basic Laser principles, Laser behavior, Properties of laser radiations, Different types of lasers, Laser spectroscopy, The total losses of the laser system, Transmission at the mirrors. Absorption and scattering by the mirrors, Absorption in the laser medium. Diffraction losses at the mirrors, The Ruby Laser - Three Level Laser (Helium-Neon Laser) - Four Level Laser (Carbon dioxide Laser), Laser applications.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of science atom and molecules	List different types of atomic and molecular spectra and related instrumentation.
	Describe theories explaining the structure of atoms and the origin of the observed spectra
	Identify atomic effect such as space quantization and Zeeman Effect.
	Memorize different technique used in laser and applications.
Learn the basic atomic concepts and principles, and the basics of emission spectroscopy with a highlight on its practical and scientific significance.	Collect general information about some about some atomic spectra related topics.
	Apply the gained mathematical and experimental tools to solve the spectra problems

	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive expression for atomic spectra based on Bohr-Summerfield theories.

References:

1- The Physics of Atoms and Quanta: Introduction to Experiments and Theory ; *H. Haken, H. C. Wolf and W. D. Brewer*; 6th Ed. (2000); Springer; ISBN 3540672745
2- Concepts of Modern Physis; *Beiser A.*; 6th (2002); McGraw- Hill Science/ Engineering/ Math; ISBN 0072448482.
3- Atomic and Molecular Spectroscopy: Basic Aspects and Practical Applications;SuneSvanberg;4th Ed. (2003); Springer; ISBN 3540203826

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Solid State Lab.	**PHYS496**	**0**	**4**	**0**	**2**	**Eighth**	**PHYS471**

Contents

Studying the characteristics of the solar cell- electron diffraction experiments- characteristics curves of an optical (photo) resistor- the electron spin resonance (ESR)- Calculation of the energy gap of germanium by an electrical method- determination of the thermal coefficient of a noble metal (platinum) by computer- the magnetic susceptibility of some materials and its classification – X-ray spectroscopy and calculation of Planck's constant and Miller indices of crystal planes in NaCl single crystal- Thermoelectric effect in semiconductors (calculation of Seebeck, Peltier and Thomson coefficients)- Superconductivity and determination of the transformation temperature of YBCO specimen by computer – Determination of the absorption coefficient of Aluminum for X-ray, Hall effect, Studying the crystline structure by using the field effect microscope.

Course Objective	Course Learning Outcomes (CLOs)
1. Supporting the experimental and application experiences for students and	Assurance of the basic knowledge of the main physical phenomenon for solid state courses.

improvements of their skills. 2. Supporting the courses PHIS-271 and PHIS-472 with experiments.	
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
1- Preparing students for future research and developments. 2- Describing plans to be developed. 3- Seeking for recent search works related with the course. 4- Experimental correlations between the mathematical basics and physical applications.	5- Choose to work in a group and learn time management. 6- Demonstrate how to search for information through library and internet. 7- Justify a short report in a written form and orally using appropriate scientific language. 8- Discussions for the sources of errors.

References

1 – تجارب متقدمة في فيزياء الجوامد: د. عبد الرحمن علي العقل ود. زياد حسين المصري، الخريجي للنشر، 1426هـ - 2005م.

2- فيزياء الجوامد: محمد أمين سليمان، أحمد فؤاد باشا وشريف أحمد خيري، دار الفكر العربي، القاهرة 1426 هـ - 2005 م.

3 - Introduction to Solid State Physics; *C. Kittel*; 8th Ed. (2004) John Wiley;ISBN 047141526X.

4 –Experiment manuals.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Nuclear Physics Lab.	**PHYS497**	**0**	**4**	**0**	**2**	**Eighth**	**PHYS481**

Contents

Statistical nature of Radioactive decay law –Determination of the half-life of Thoronisotope Rn^{220} - Rutherford Scattering - Attenuation of gamma radiation - Absorption of beta radiation passing through different materials – Inverse square law in case of gamma-rays - Velocity of alpha particle - Backscattering of beta particles- Alpha spectroscopy of radioactive elements - Determining the energy loss of alpha particles in aluminum and in gold - Recording a beta spectrum with a scintillation counter - Effect of a

magnetic field on beta particles motion - Rutherford Scattering- Determining the half-life of a 137Ba sample - Counting statistics - Attenuation of gamma radiation - Absorption of beta radiation - Compton effect - Velocity of alpha particle- Gamma spectroscopy using NaI(Tl) detector and multichannel analyser (MCA) -Deflection of beta rays in the magnetic field - Law of distance and absorption of gamma or beta rays by Geiger counter - Determining the energy loss of alpha particles in Al and Au - Recording a beta spectrum with a scintillation counter, Nuclear magnetic resonance.

Course Objectives:	Course Outcomes:
Students will learn to do the nuclear physics experiments.	List nuclear detectors.
	Describe Rutherford experiment.
	Do the half-life of a ^{137}Ba sample by computer and digital counter experiment.
Students are expected to use nuclear lab. to get different experimental techniques.	Find attenuation coefficient of Al.
	Identify gamma spectrum by scintillation detector.
	Apply nuclear magnetic resonances to find g factor.
Students are expected to familiar with different types of nuclear radiations.	Classify nuclear radiations.
	Compare between alpha and gamma sources.
	Learn how to search for information through library and internet.
Students are expected to classify nuclear detectors.	Compare among scintillation, semiconductor and gas detectors.
	Classify nuclear detectors.
	Describe scintillation counter.

References:

1. Introductory Nuclear Physics, K.S. Krane,2nd edition, John Wiley and Sons, 1988.
2. Radiation Detection and Measurement, G.F. Knoll, 4th Edition, 2010.
3. دليل المعمل في العلوم النووية، مريم عتيق و محمد الدغمة، منشورات جامعة الفاتح، الطبعة الاولى، 1992.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Project	**PHYS498**	**0**	**4**	**0**	**2**	**Eighth**	**PHYS495**

Contents

The student carries out a research under the supervision of one of the Staff members in one of the following branches:

- Theoretical Physics.
- Nuclear Physics.
- Solid State Physics.
- Fiber Optics.
- Laser.
- Plasma.

The student should submit a report about his work, and is evaluated by a committee selected by the department.

References:

To be decided by the instructor depending on the topic of the project.

Elective Course names

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Mathematical Physics III	PHYS406	3	0	0	3	Elective	PHYS304

Contents

Series Method for solving linear differential equations, Singular Points of Differential Equations and their Importance. Series Methods (Frobenius). Legendre, Bessel, Hermite and Laguerre Differential Equations. Legendre polynomials, Hermite polynomials, Lagurre polynomials, Bessel Functions, Series Expansion of a Function in terms of a Complete Set of Legendre Functions. Bessel Functions: First and Second Kind, Zeros of Bessel Functions and Orthogonality, Fourier transformation and its application, Laplace transformation and its application, Solution of First and Second Order ODEs, Solution of Simultaneous First Order ODEs, Solution of One-Dimensional PDEs : Wave and Diffusion Equations, Evaluation of Definite Integrals, Eigenvalue problem, Differential equations of Boundary value problem.

References:

1. Mathematical methods for physicists; *George B. Arfken, Hans J. Weber and Frank E. Harris*;7th Ed. (2012); Academic press; ISBN 0123846544.
2. Methods of Mathematical Physics: Partial Differential Equations by R.Courant&D.Hilbert.(New Delhi: Wiley India, 2008).
3. Complex Variables: Introduction and Applications, 2ed By Mark J. Ablowitz, A. S.Fokas (Cambridge University Press, 2003) 27
4. Special Functions By George E. Andrews, Richard Askey, Ranjan Roy (Cambridge University Press, 2000)
5. Schaum's Outline of Complex Variables By Murray R. Spiegel (McGraw-Hill, 1999)
6. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Limited,1985)
7. Introduction to Mathematical Physics by Charlie Harper. (P.H.I., 1995).

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Health Physics	PHYS361	3	0	0	3	Elective	PHYS202

Contents

Review of the sources of radiation, basic dosimetry, and hazards of ionizing radiation, Radiation safety guides and codes in the environment, industry, medical and nuclear facilities.Radioactivity and transformation mechanisms, Alpha emission, Beta emission, Positron emission, Orbital electron capture, Gamma rays, Internal conversion. Transformation kinetics, Half-life, Average life. Activity, The Becquerel, The Curie, Specific activity. Interaction of radiation with matter, Beta rays (Range-Energy relationship), mechanisms of energy loss (Ionization and excitation, Bremsstrahlung), Alpha rays (Range-Energy relationship), Gamma rays (Exponential absorption), interaction mechanisms (Pair production, Compton scattering Photoelectric absorption, Photodisintegration), Neutrons (Production, Interaction, Scattering and Absorption). Radiation dosimetry, Absorbed dose (Gray and Rad), Exposure (Roentgen), Exposure-dose relationship.

Course Objective	Course Learning Outcomes (CLOs)
Principles of Health physics.	Radioactive materials
	Basic scientific and experimental background on radiation protection.
	Transformation kinetics, Half life, Average life. Activity, The Becquerel, The Curie, Specific activity.
	Interaction of radiation with matter
Basic applications.	Know the different types of protection from radioactive materials.
	Interaction of radiation with matter
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.

References:

1. مبادئ الاشعاعات المؤينة والوقاية منها، د.محمد فاروق أحمدود.أحمد السريع.
2. Introduction to Health Physics; *Herman Cember and Thomas Johnson*; 4th Ed. (2008); McGraw-Hill Medical; ISBN 0071423087.
3. Basic Health Physics: Problems and Solutions; Joseph John Bevelacqua;1st Ed. (1999); Wiley-Interscience; ISBN 0471297119.

Course	Code and	Contact hours	Level	Pre-

name	number	Lecture	Experiment	Exercise	Credit	study	requisite
BioPhysics	**PHYS362**	**3**	**0**	**0**	**3**	**Elective**	**PHYS202**

Contents

Biomechanics Forces affects on our bodies. Vector analysis. Levers and equilibrium of rigid bodies. Stress-strain curve. Young's and Shear modulus for materials and biological tissues. Stress-Strain Curve- Young's and Shear Modulus for materials and applications. Definition of Fluid, Properties of Fluid. Viscosity and Surface tension. Compressibility, Continuity Density, Dynamic Viscosity, kinematic viscosity, Ideal Fluid, Real fluid, Newton's Law of Viscosity, Pressure in Fluids, Atmospheric Pressure, , Measurement of Pressure; Gauges and the Barometer, Pascal's Principle, Buoyancy and Archimedes' Principle, Fluids in Motion; Flow Rate and the Equation of Continuity, Bernoulli's Equation and its applications. Poiseuille equation, Navier–Stokes equations-Effect of gravity and acceleration on blood pressure. Nature of sound and sound intensity level. Ultra-sound, production and its applications in diagnostic and treatment. Nervous system. And electricity within the body. Equilibrium potential and Nernst equation. Factors affecting the propagation of action potential. Action potential measurements of some organs; EGG,EEG and ERG. Nonionizing Radiation, Physical and biological effects.

Course Objective	**Course Learning Outcomes (CLOs)**
Principles of Biophysics	Biological materials
	Basic scientific and experimental background on Biomechanics.
	Modulation of biological systems in a physically reasonable and tractable fashion.
	Interaction of cell and tissue with each other
Basic applications.	Utilize the formal and mathematical techniques learnt in the course to predict various properties of the biological system at hand.
	Know the different types of electric body signals
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of	Present a short report in a written form and orally using

students' mental abilities.	appropriate scientific language.

References:

1) Biophysics: An Introduction; Rodney Cotterill; 1st Ed. (2002); Wiley;ISBN 0471485381
2) Physics of the Body (Medical Physics Series); John R. Cameron, James G. Skofronick and Roderick M. Grant; 2nd Ed. (1999); Medical Physics Pub Corp; ISBN 094483891X
3) Introduction to Health Physics; Herman Cember and Thomas Johnson; 4th Ed. (2008); McGraw-Hill Medical; ISBN 0071423087.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Laser Physics	**PHYS333**	**3**	**0**	**0**	**3**	**Elective**	**PHYS351**

Contents

Absorption and Emission of light, Einstein Relations, Population inversion, Gain coefficient, Optical resonator, Laser Modes, solid *state lasers*, semiconductor lasers, Gas lasers, Dye lasers, Free electron laser and some new lasers. Laser beam properties, Line width, Divergence, coherence, Brightness, Focusing properties of laser, *Q*- switching, Frequency doubling, Phase conjugation. Applications: medical, industrial, Military, Scientific, Holography and compunctions.

Course Objectives:	Course Outcomes:
Understand basic laser physics, Describe the concept of stimulated emission and what is an active medium.	Knowledge in basic sciences, mathematics, and electronic principles.
	Knowledge in the fundamentals of electronic principles and practices, including analysis, design, evaluation, and management.
	An understanding of the professional and ethical responsibility of electronic profession.
Differentiate between the concepts of energy versus power. Describe the difference between average	Collect data and information and perform analysis, interpretation and draw inferences or conclusions

power and peak power	Perform in-depth study and analysis of electronic problems, and find innovative or creative solutions based on economy, feasibility and safety
	Evaluate alternative designs and solutions, with an understanding of the impact of the proposed solution
Understand the three different laser emission modes and their role in peak power and thermal effects on target tissue. Understand the impact of pulse duration on peak power and thermal effects on target tissue.	The students will have the ability to work constructively in groups.
	Students should be responsible for their own learning that requires using means to find new information data, or techniques of analysis.

References:

1- Lasers: principles and applications; *J. Wi1son and J. F. B. Hawkes*; (1987); Prentice Hall College Div.;0135236975

2- Principles of Laser Materials Processing;*Elijah Kannatey-Asibu Jr.*; 1st Ed. (2009);Wiley;ISBN 0470177985.

3- Introduction to modern optics; *G. R. Fowles*; 2nd Ed. (1989);Dover Publications; ISBN0486659577

4- Laser Physics; *S. Hooker and C. Webb*; (2010); Oxford University Press; ISBN 0198506929

5- Laser Fundamentals; *William T. Silfvast*; 2nd Ed. (2008); Cambridge University Press; ISBN 9780521541053.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Semiconductor Physics	**PHYS473**	**3**	**0**	**0**	**3**	**Elective**	**PHYS471**

Contents

Semiconductor Fundamentals:
Basic of crystal structure, Classification of semiconductors, Semiconducting properties of different semiconductors and resistivity techniques of measurements.

Physical properties of Semiconductors

Energy Band Gap, Doping of Semiconductors, concept of Holes, Effective Mass Physical Interpretation of the Effective Mass, Effective Masses in Semiconductors Silicon and Germanium,

Charge Carrier Dynamics

Bohr Model for the Hydrogen Atom, Carrier distribution functions, Carrier densities, Carrier Transport, Carrier recombination and generation, Continuity equation, The drift-diffusion model

P-N Junctions:

Electrostatic analysis of a P-N diode, The P-N diode current, Reverse bias breakdown.

Bipolar Junction Transistors:

Structure and principle of operation, Ideal transistor model, Non-ideal effects, Base and collector transit time effects, BJT circuit models, BJT

MOS Capacitors:

Structure and principle of operation, MOS analysis.

MOS Field-Effect-Transistors:

Structure and principle of operation, MOSFET models, Threshold voltage, MOSFET Circuits and Technology.

Course Objectives:	Course Outcomes:
The student knowledge of the basics of Semiconductor Physics	Easily differentiate the semiconductor materials from other related experiments.
	Understand and can describe different type of semiconductor classification.
	Understand who quantum mechanics works effectively in semiconductors
Learn the basic of semiconductor charge carrier statistics and its scientific significance on device performance.	Collect general information about semiconductor and devices related topics.
	Apply the gained theoretical results and experimental tools to solve the problems.
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally.
	Derive expression for junction device on the basis of basic theories.

References:

1) Semiconductor Physics and Devices: Basic Principles, *Donald A Neamen*, 4th Ed. (2011);McGraw-Hill Higher Education; ISBN:0073529583.
2) Semiconductor Physical Electronics, Sheng S. Li, 2006 Springer Science+Business, ISBN 10: 0-387-28893-7

3) Semiconductors and semimetals; *Robert Willardson and A. C. Beer*; Academic Press; 012752116X

4) Physics Of Semiconductor Devices; *Simon M. Sze,Kwok K. Ng*; 3rd Ed. (2006); Wiley - Interscience; ISBN:0471143235.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Introduction to Astronomy	**PHYS213**	**3**	**0**	**0**	**3**	**Elective**	**----**

Contents

Introduction: modern astrophysics – History of astronomy. Laws of motion: Kepler laws, Gravitational law, newton's modified law, Orbits of planets, speed in the orbit, proceeding velocity. Solar system: planets: 1- Earth-like planets: Mercury, Venus, Earth, Mars. 2 - giant planets (like Jupiter): Jupiter, Saturn, Uranus, Neptune. 3 – satellites, the rings, comets, asteroids. Stars: Stars dimensions, Destiny, Luminosity, spectrum types, HR form, double stars and stars masses. Evolution of stars. Galaxies: Milky Way, types of galaxies, galaxies properties, anomalies galaxies, galaxies crowds, the universe.

Course Objectives:	Course Outcomes:
Upon completion of this course students should be able to describe the Big Bang, explain the age and origin of the Solar System and illustrate differences between Earth and other planets in the Solar System. Importantly, students will have gained the scientific basis to summarize conditions necessary for life and to assess scientific evidence for life on other planets.	• Develop and appreciation of the workings, wonder, and beauty of the •
Learn the basic solar system concepts and principles,	• astronomical universe (G. E. 4, 7)

The development of students' mental abilities.	• Build a foundation for future study in astronomy (G. E. 3, 7)

References:

1- Introductory Astronomy and Astrophysics;*ZeilikMicheal and Stephen A. Gregory*; 4th Ed. (1997); Cengage Learning; ISBN: 0030062284.

2- Exploration and Introduction to Astronomy , *Thomas Arny and Stephen Schneider*; 6th Ed. (2010); McGraw-Hill; ISBN:0077345096

3- Fundamental Astronomy; *HannuKarttunen, PekkaKröger, HeikkiOja, MarkkuPoutanen and Karl Johan Donner*; Springer; 5th Ed. (2007); ISBN: 3540341439

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Materials Science	**PHYS474**	**3**	**0**	**0**	**3**	**Elective**	**PHYS471**

Contents

States of matter (liquid, crystalline and vitreous);crystal structure of metals; Metallography (reflecting optical microscope, transmission electron microscope) specimen preparations; Mechanical testing (hardness & tensile test); Defects in crystals (point defects and dislocations); Diffusion in solids; (phase transformation and phase diagrams)strengthening mechanisms (alloying, cold work, precipitation & fiber strengthening); heat treatment of steel & T TT curves.

Course Objectives:	Course Outcomes:
Provide a clear understanding of the basic concepts and integrating their knowledge	To know and list the basic types of materials.

in the disciplines of science and engineering principles relevant to materials.	Recognizing the different mechanical properties and interpreting them.
	Defining the main terms in phase diagrams.
Student will read and analyze the relationship between macro/microstructure, characterization, phase diagrams, properties and processing and design of materials.	Analyzing the stress-strain diagrams and extracting all necessary information from it.
	Discriminating between the different types of phase diagrams and extracting all necessary information from it.
	To participates in class discussion, and discusses new ideas.
	To act with self-reliance when working independently.
	To communicate with the teacher and students using communications technology.
	To use software programs in writing, inserting and analyzing data, and plotting graphs.

References:

1) Materials Science and Engineering, An Introduction; *William D. Callister Jr. and David G. Rethwisch*; 8th Ed. (2009); John Wiley and Sons Inc.*;* ISBN: 0470419970

2) Foundations of Materials Science and Engineering, *W. F. Smith and J. Hashemi*;5th Ed. (2009); McGraw-Hill Science/Engineering/Math;ISBN:0073529249

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Medical Physics	**PHYS462**	**3**	**0**	**0**	**3**	**Elective**	**PHYS481**

Contents

Introduction toMedical Physics, Electromagnetic Spectrum and Radiation, Basic Interactions ofionizing and non-ionizing Radiation with biological matter. Radiological Imaging: Introduction to Imaging, Conventional X-ray imaging, Computed Tomography,

Diagnostic ultrasound. Radiation therapy: Introduction toRadiotherapy Physics Linear Accelerators, Introduction to External Beam Treatment Planning, Brachytherapy, Machine calibration and quality assurance. Magnetic Resonance Imaging: Introduction, Basic NMR Physics, MR Imaging Principles, Applications. Nuclear medicine: Introduction, Isotopes, PET scan.

References:

1- Medical Imaging Physics; *W. R. Hendee and E. R. Ritnour*; 4th Ed. (2002); Wiley-Liss.; ISBN: 0471382264

2- Physics of Radiology; *A. B. Wolbarst and G. Cook*; 2th Ed. (2005); Medical Physics Pub Corp; ISBN:1930524226

3- The Essential Physics of Medical Imaging;*J. T. Bushberg, J. A. Seibert, E. M. Leidholdt Jr. and J. M. Boone*;3rd Ed. (2011); Lippincott Williams & Wilkins; ISBN: 0781780578

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Computational Physics	**PHYS407**	**3**	**0**	**0**	**3**	**Elective**	**PHYS304**

Contents

Introduction: Computation and Science, The emergence of Modern Computers, Computer Algorithms and Languages: Applications: Newton and Kepler Laws. Numerical linear Algebra: Systems of linear equations, Eigen values and Eigen vectors.Interpolation, Extrapolation and Data Fitting: Polynomial Interpolation, Data fitting, Least squares fitting. Ordinary differential equations: Initial-value problems, The Euler and Picard methods, The Runge-Kutta method, Chaotic dynamics of the driven pendulum, Boundary -value and eigenvalue problem, The one-dimensional Schrödinger equation.

References:

Computational Physics; N. J. Giordano and H.Nakanishi; 2nd Ed. (2005); Addison-Wesley; ISBN: 0131469908

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		

Neutrons Physics and Reactors	**PHYS485**	**3**	**0**	**0**	**3**	**Elective**	**PHYS481**

Contents

Neutron reactions: cross-sections, attenuation, reaction rate, fission cross-section. Nuclear fission, fission yield, Energy distribution among fission neutrons and fragments, regeneration factor. Thermal neutrons: energy distribution, effective cross section, moderation, average energy loss, Average energy logarithmic decrement, SDP,MR and resonance escape probability. The Nuclear chain reaction: neutron cycle, thermal utilization factor and calculating the four factors formula, Neutron Physics, Neutron Interactions, Neutron Diffusion and Moderation, Spatial Diffusion of Neutrons, One-Group Reactor Equation, The Slab Reactor, Other Reactor Shapes, The One-Group Critical Equation, Thennal Reactors, Reflected Reactors, Multigroup Calculations, Nuclear reactors and nuclear power, The Fission Chain Reaction, Nuclear Reactor Fuels, Non-Nuclear Components of Nuclear Power Plants, Components of Nuclear Reactors, Power Reactors and Nuclear Steam Supply Systems, Nuclear Cycles, Isotope Separation, Fuel Reprocessing, Radioactive Waste Disposal, The time-dependent reactor, Classification of Time Problems, Reactor Kinetics, Control Rods and Chemical Shim, Temperature Effects on Reactivity, Fission Product Poisoning, Core Properties during Lifetime. Heat Removal from nuclear reactors, General Thermodynamic Considerations, Heat Generation in Reactors, Heat Flow by Conduction, Heat Transfer to Coolants, Boiling Heat Transfer, Thennal Design of a Reactor

Course Objectives:	**Course Outcomes:**
Students will learn to acknowledge of neutron physics.	List the neutron sources.
	Describe the neutron cycle.
	Apply Fick's law to find the intensity of neutrons.
Students are expected to identify and characterize neutron sources and interaction with matter.	Find energy of neutron after passing through a matter.
	Identify the thermal neutron and moderator.
	Derive the neutron velocity at the maximum of Maxwellian flux distribution.
Students are expected to familiar with different types of nuclear reactors.	Classify nuclear reactors.
	Compare between the heavy and light water reactors.
	Learn how to search for information through library and internet.

Students are expected to learn about heat removal from nuclear reactors	Describe the independently the controlling chain reaction.
	Classify methods that are used to remove heat from reactors.
	Describe the heat removal from nuclear reactors.

References:

1. Introduction to Nuclear Reactor Theory; *John R. Lamars*;1st Ed. (1966); Addison-Wesley ISBN: 0201041200.
2. Introductory Nuclear Physics; *K.S. Krane*; 3rd Ed. (1987), Wiley; ISBN: 047180553X
3. Introduction to Nuclear Engineering; *J. Lamarsh and A. Baratta*;3rd Ed. (2001);Prentice Hall; ISBN: 0201824981.
4. Fundamentals of Nuclear Reactor Physics; *Elmer E. Lewis*; 1st (2008); Academic Press; ISBN: 0123706319
5. Nuclear Reactor Kinetics and Plant Control; *Yoshiaki Oka and Katsuo Suzuki*; 2013; Springer; ISBN: 4431541942

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Radiation Physics	**PHYS485**	**3**	**0**	**0**	**3**	**Elective**	**PHYS481**

Contents

Definition of radiation quantities, doses and their units, instruments for measuring personal doses, radiation monitoring and radioactive contamination,biological effects of radiation, external and internal radiation exposure, radiation protection and shielding, recommendations of IAEC, protection against different radiations sources, decontamination, radioactive waste management

Course Objectives:	**Course Outcomes:**
Develop a clear understanding of different types of ionizing radiation, radiation quantities and their units.	Recognize different types of ionizing radiation.
	Identify radiation doses and their units.
Understand of impacts of ionizing radiation on health	Identify different types of biological effects of radiation
	Describe direct and indirect mechanisms of ionizing radiation effects
	Learn how to search for information through library and internet.

Be familiar with the radiation protection and shielding	Describe radiation shielding for each radiation type
	Derive Mathematical Formulations of the Buildup Factor.
	Calculate proper thickness and type of shield for each radiation type.
Demonstrate the principles of radioactive waste management	Classify the radioactive waste
	List the fundamental principles of radioactive waste management.
	Recognize the proper procedure of radioactive waste management
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Construct the mathematical formulation suitable for the theoretical analysis of various decay modes.

Referances

1- أسس الفيزياء الإشعاعية،أ.د. محمد فاروق أحمد و د. أحمد محمد السريع، جامعة الملك سعود – الرياض (الطبعة الثالثة 1426 هـ)

1- Introductory Nuclear Physics; *K.S. Krane*; 3rd Ed. (1987), Wiley; ISBN: 047180553X

2- Physics for Radiation Protection;*James E. Martin*; 3rd (2013); Wiley-VCH; ISBN-13: 978-3527411764

3- Radiation Physics for Medical Physicists;*Ervin B.Podgoršak,*; 2010; Springer ISBN-13: 978-3642008740

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Renewable Energy	**PHYS475**	**3**	**0**	**0**	**3**	**Elective**	**PHYS471**

Contents

OVERVIEW OF ENERGY USE

Today's energy use, Fossil fuels and environmental impact, Renewable energy source and devices

SOLAR ENERGY

Solar radiation, Solar thermal energy, Photovoltaic (Solar cells)

BIOMASS AND BIO-ENERGY

Synthetic fuels from the biomass, Thermo-chemical, physical-chemical and bio-chemical conversion, Bio-fuel cells

WIND ENERGY AND HYDROELECTRICITY

Availability of wind energy, Wind turbines, wind parks and power control, Water sources and power. Water turbines and hydroelectric plants

THERMOELECTRICITY AND WASTE-HEAT UTILIZATION

Physics of thermoelectricity: Peltier-Seebeck and Thomson effects, Thermoelectric materials, Thermoelectric generators

ENERGY STORAGE

Smart grid systems, Hybrid vehicles, Forms of energy storage, Batteries , Super- capacitor

Course Objectives:	Course Outcomes:
To understand basic knowledge of the renewable energy resources	Solar Radiation.
	Describe the different techniques to convert these radiation to energy
	Alternative sources in our practical life
	Hydrothermal, Wind and Biomass
Learn the different design for getting energy from natural resources.	Literature review about conversion of radiation into energy
	Apply the different designs for getting higher efficiency
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
	Derive different methods to get energy

References:

1- Energy and Environment; *R. A. Ristinan and J. P. Kraushaar*; 2nd Edition (2005); Wiley; ISBN-10:0471739898

2- Energy studies; *William Shepherd, David W. Shepherd, D. W. Shepherd*; 2nd Ed. (2003) World Scientific Publishing Company.; ISBN-10:1860943225

3- Renewable Energy: Power for a Sustainable Future; *Godfrey Boyle*; 3rdEdition (2012); Oxford University Press, USA;ISBN-10:0199545332

4- Fundamentals of Renewable Energy Processes; *Aldo V. da Rosa*; 3rd Edition2012; Academic Press; ISBN-10: 0123972191

Course	Code and	Contact hours	Level	Pre-

name	number	Lecture	Experiment	Exercise	Credit	study	requisite
Plasma Physics	PHYS435	3	0	0	3	Elective	PHYS322

Contents

Introduction (Definition of Plasma, Processing Plasmas, Plasma Physics and Plasma Chemistry). Single Particle Motions (Orbits in direct current electric and magnetic fields, Collisions, Transport Phenomena, Chemical Reactions in Plasmas). Plasma Statistical Mechanics (Ensemble Theory, Liouville's Theorem, Particle Distribution Functions, the Boltzmann and Vlasov Equations). Plasma Magnetohydrodynamics (MHD Equilibrium, Magnetic Confinement, Stability). Waves in Cold Plasmas (Wave Equations, Dispersion Functions, The effects of Magnetic Fields). Waves in Hot Plasmas (Acoustic and Magnetoacoustic waves, Landau Damping, Nonlinear Waves). Kinetic Theory and Radiation (Cyclotron emission, Bremsstrahlung). Applications (Fusion, Plasma-Aided Manufacturing).

References:

1- Introduction to Plasma Physics and Controlled Fusion; *F. F. Chen*;2nd Ed. (2006); Springer;ISBN-10:0306413329

2- Introduction to Plasma Physics: With Space and Laboratory Applications;*D. A. Gurnett and A. Bhattacharjee*; (2005); Cambridge University Press; ISBN-10:0521367301.

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Elementary partical Physics	PHYS484	3	0	0	3	Elective	PHYS481

Contents

Elementary particles: properties, classifications and detections. Fundamental forces between elementary particles. Symmetries and their role in studying elementary particle physics. Strong force. Electromagnetic force. Weak force. Relativistic quantum mechanics. Feynman diagram.

Course Objectives:	Course Outcomes:
The students are given an introduction to elementary particle physics that allows them to prepare for a master or PhD degree in this field. Tools are used to calculate and simulate various high energy processes.	Compare analytical calculations to predictions of simulation programmes such as CompHEPRead publications in the field of particle physics.
	Calculate, using Feynman techniques, cross sections for various processes, as well as decay widths or lifetimes of particle resonances.
	Interpret experimental results within or beyond the Standard Model.
	Write project reports and prepare and hold short presentations.
Learn the basic elementary particle concepts and principles,	Compare analytical calculations to predictions of simulation programmes such as CompHEPRead publications in the field of particle physics.
	Calculate, using Feynman techniques, cross sections for various processes, as well as decay widths or lifetimes of particle resonances.
	Interpret experimental results within or beyond the Standard Model.
	Write project reports and prepare and hold short presentations.
The development of students' mental abilities.	Write project reports and prepare and hold short presentations.

References:

1- Introduction to High Energy Physics;*D.Perkins*; 4th Ed.(2000); Cambridge University Press;ISBN-10:0521621968

2- Quarks & Leptons; *F. Halzen and A. D. Martin*; 1st ed.(1984); Wiley; ISBN-10:0471887412

3- Elementary Particles; *I. S. Hughes*; 3rd Ed. (1991); Cambridge University Press; ISBN-10: 0521407397

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Solid State Physics II	**PHYS472**	**3**	**0**	**0**	**3**	**Elective**	**PHYS471**

Contents

Semiconductors and its applications (semiconductor materials- Band theory in semiconductor- energy gap in semiconductors– holes- Fermi level in semiconductor- effect of impurities on semiconductors – applications) Magnetism in solid state (magnetic moments- origin of magnetism– diamagnetism–paramagnetism–Ferromagnetism-

molecular field theory- exchange energy–Antiferromagnetism– Ferrimagnetism- hystresis loop- magnetic domains- magnetic resonance) Superconductivity Electrical properties of Superconductors-magnetic properties of superconductors-thermodynamic properties of superconductor-electrodynamic properties of superconductor(London theory- Ginzeberg Landau theory) type I and type II superconductors- cooper pair- microscopic theory of superconductors (BCS theory) Dielectric properties of solids (polarization and dielectric constants, electric damage for insulators- Ferroelectric) Optical properties of solids (Reflection, absorption and emission- optical conductivity)

Course Objective	Course Learning Outcomes (CLOs)
The student will have the knowledge of the free electron theory (classical model of free electron, Fermi gas of free electrons, Maxwell-oltzmann distribution, Fermi-Dirac distribution function).	Memorize of the free-electron model and further details of the nearly-free electron model of electronic structure; modifications to the Fermi surface near zone boundaries. The tight binding method.
	Describe the microscopic origins of the magnetic and electrical properties of solids and explain some ground-state and finite-temperature properties of ferromagnets.
Learn the statistical view of free electrons.	Describe and understanding of the semi-classical dynamics of electrons in solids
	recognize and understanding of the Fermi surface and how it is modified by the presence of a weak crystal potential
	Work in a group and learn time management.
	Learn how to search for information through library and internet.
The development of students' mental abilities.	Present a short report in a written form and orally using appropriate scientific language.
Understand the Semiconductor materials – Band theory in semiconductors – energy gap in semiconductors – holes – Fermi level in semiconductor – effect of impurities on semiconductors –	Estimate the Semiconductor materials – Band theory in semiconductors – energy gap in semiconductors – holes – Fermi level in semiconductor – effect of impurities on semiconductors – applications)

applications).	
Understand the magnetism in solid state – Superconductivity – Electrical properties of semiconductors – Electrical and thermodynamic properties of semiconductors.	List the physical principles for different types of electric and magnetic phenomena in solid materials (like e.g. paraelectricity, dielectricity, ferroelectricity, superconductivity, paramagnetism, diamagnetism, ferromagnetism, antiferromagnetism etc) and in relevant cases relate this to macroscopically measured physical quantities**.**

References:

1 – تطبيقات فيزياء الجوامد، د. فوزي غالب عوض ود. خضر محمد الشيباني ود. عادل مجذوب حسيب، مطبوعات عمادة شؤو ن المكتبات، جامعة الملك سعود- الرياض 1413هـ- 1992م

2 - Introduction to Solid State Physics; *C. Kittel*; 8th Ed. (2004) John Wiley;ISBN 047141526X.

3 - Elementary SolidState Physics: Principles and Applications; *M. A. Omar*; 4th Ed. (1994); AddisonWesely;ISBN 0201607336.

4 - Solid State Physics;*Neil W. Ashcroft and N. David Mermin*;1st Ed. (1976); Cengage Learning; ISBN 0030839939

Course name	Code and number	Contact hours				Level study	Pre-requisite
		Lecture	Experiment	Exercise	Credit		
Nuclear Physics II	**PHYS482**	**3**	**0**	**0**	**3**	**Elective**	**PHYS481**

Contents

The fundamental forces in nature, quark theory and the origin of nuclear force, inter nucleon force, the deuteron, neutron-proton scattering, general properties of nucleon-nucleon force, exchange forces, meson theory of nuclear forces, many-body forces, nuclear models (liquid drop model, shell model, collective model), Nuclear angular momentum, nuclear magnetic moments, nuclear electric moments, electric quadrupole moment of nuclei, Single particle potentials and center of mass motions, single particle energy levels, spin-orbit potential, single particle shell model, elementary particles, fundamental symmetries and gauge theory, lepton-hadrons interactions, quantum chromo dynamics, electro-weak interactions, physics of modern accelerators, The Force Between Nucleons, Nuclear Models, Accelerators, Nuclear Spin and Moments, Meson Physics,

Cosmic Rays, Particle Physics, Yukawa's theory and mesons, Strange Particles, elements of group theory, Classification of Hadrons, Quarks.

Course Objectives:	Course Outcomes:
Students will learn to acknowledge of the force between nucleons.	List nuclear force properties.
	Describe spin, parity, magnetic dipole moment and electric quadrupole moment.
	Apply the exchange force model to find the range of exchange particle between nucleons.
Students are expected to use nuclear models to find nuclear properties.	Find nuclear spin of ^{17}O by using shell model
	Identify parity of ^{17}N by using shell model
	Apply shell model to find magnetic dipole moment and electric quadrupole moment.
Students are expected to familiar with different types of accelerators.	Classify accelerators with respect to their energies.

References:

1. Introductory Nuclear Physics; *K. S. Krane*; 3rd Ed. (1987); Wiley; 047180553X.
2. Introduction to Nuclear Science; *J. C. Bryan*;
3. Nuclear Physics; *Wong S. M. Samuel*; (2013); Prentice-Hall of India Pvt.Ltd; 8120309901
4. Fundamentals of Nuclear Physics; *B.B. Srivastava*; (2011); Rastogi Publication, ISBN: 81-7133-828-3.
5. Elements of Nuclear Physics;*W. E. Burcham*; (1979); Longman; 0582460271
6. Introduction to Nuclear Science;*J. C. Bryan*; 2nd Ed. (2013); CRC Press; ISBN: 1439898928
7. Concepts of Modern Physics, *Beiser*, McGraw Hill, 6th edition
8. Quantum Mechanics, *S. Gasiorowicz*, 3ed Edition, Wiley, 2003.

Assesment Methods

All study courses are assessment as the following schedual table. The percentage degree for each assessment items are given in the following table:

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	First exam*	6	
2	Second exam*	12	
3	Lab. Exam	14	
4	Presentation	One/ semester	
5	Homework	Every week	
6	quizzes	End topics	
7	Discussions	Every week	
8	Team group	Three time/ semester	
9	Tutorials	Every sub topic	
10	Computer tools used	Every report and presentation	
11	Project**	-	
12	Peer project**	-	
13	Final exam *	End of the semester	40%
	Total		100 %

* First exam, second exam and final exam are written exam

** Project and Peer Project are an independent assessment, the grad point is 100.

Full List of All Department Members

a) Staff Names and Contact

Dr. Thamer Alharbi **Nationality: Saudi Arabian** **Major: Physics** **Specialty: Nuclear Physics** **Scientific Rank: Assistant Professor** **Website: http://faculty.mu.edu.sa/talharbi** **E mail: t.alharbi@mu.edu.sa**		**الاسم: د. ثامر بن شليح الحربي** **الجنسية: سعودي** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء نووية** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044040**
Prof. Abdul Majid **Nationality: Pakistani** **Major: Physics** **Specialty: Nanotechnology and Semiconductors** **Scientific Rank: Professor** **Website: http://faculty.mu.edu.sa/aabdulmajid** **E mail: a.abdulmajid@mu.edu.sa**		**الاسم: أ.د. عبدالماجد** **الجنسية: باكستان** **التخصص العام: الفيزياء** **التخصص: تقنية النانو وأشباه الموصلات** **الرتبة العلمية: أستاذ** **تليفون: 0164044129**

Prof. Mohamed Ali ZAIDI **Nationality: Tunisian** **Major: Physics** **Specialty: Solid Of Physics and Semiconductors** **Scientific Rank: Professor** **http://faculty.mu.edu.sa/mzaidi** **E mail: m.zaidi@mu.edu.sa**		**الاسم: أ. د. محمد علي زائدي** **الجنسية: تونسي** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء الجوامد وشبه الموصلات** **تليفون: 0164044128**
Dr. Mohamed abushayeb **Nationality: Jordanian** **Major: Physics** **Specialty: High Energy Physics** **Scientific Rank: associated Professor** **http://faculty.mu.edu.sa/mabushayeb** **E mail: m.abushayeb@mu.edu.sa**		**الاسم: د. محمد خيري د ابو شايب** **الجنسية: اردني** **التخصص العام: الفيزياء** **التخصص الدقيق: فيزياء الطاقة العالي** **الرتبة العلمية: أستاذ مشارك** **تليفون: 0164044104**
Dr. Mohamed S. Gaafar **Nationality: Egyptian** **Major: Physics** **Specialty: Solid State Physics** **Scientific Rank: Associate Professor** **http://faculty.mu.edu.sa/mgaafar** **E mail: m.gaafar@mu.edu.sa**		**الاسم: د. محمد السيد عوض جعفر** **الجنسية: مصري** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء الجوامد** **الرتبة العلمية: أستاذ مشارك** **تليفون: 0164044099**
Dr. Samir Khalil Al-zobaidi **Nationality: Jordanian** **Major: Physics** **Specialty: Polymer Science** **Scientific Rank: Assistant Professor** **http://faculty.mu.edu.sa/salzobaidi** **E mail: s.alzobaidi@mu.edu.sa**		**الاسم: د. سامر خليل نايف الزبيدي** **الجنسية: أردني** **التخصص العام: فيزياء** **التخصص الدقيق: علم المبلمرات** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044095**
Dr. Abdu Idris Omer **Nationality: Sudanese** **Major: Microelectronics** **Specialty: Electronic systems Engineering** **Scientific Rank: Assistant Professor** **http://faculty.mu.edu.sa/aidris** **E mail: a.idris@mu.edu.sa**		**الاسم: د.عبده إدريس عمر** **الجنسية: سوداني** **التخصص العام: الكترونيات دقيقة** **التخصص الدقيق: هندسة النظم الإلكترونية** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044098**
Name: Dr. Ibrahim Shaarany **Nationality: Egyptian** **Major: Physics** **Specialty: Theoretical Physics** **Scientific Rank: Asst. Professor** **http://faculty.mu.edu.sa/iahaarany** **E mail: i.shaarany@mu.edu.sa**		**الاسم: د. ابراهيم شعراني حجي محمود** **الجنسية: مصري** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء نظرية** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044102**

Dr. Hassan Hanafy **Nationality: Egyptian** **Major: Physics** **Specialty: Atomic Physics** **Scientific Rank: Asst. Professor** **Website: http://faculty.mu.edu.sa/hhanafy** **E mail: h.hanafy@mu.edu.sa**		**الاسم: د. حسن سعد حنفى** **الجنسية: مصري** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء ذرية** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044103**
Name: Khaled Ben Abdessalem **Nationality: tunisienne** **Major: Physics** **Specialty: Biophysics** **Scientific Rank: Assistant Professor** **Website:** **http://faculty.mu.edu.sa/kabdessalem** **E mail: k.abdessalem@mu.edu.sa**		**الاسم: د. خالد بن عبد السلام** **الجنسية: تونسية** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء حيوية** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044133**
Name : Ahmed Adel Ahmed **Nationality: Egyptian** **Major: Physics** **Specialty: Nuclear Physics** **Scientific Rank: Ass. Professor** **Website:** **http://faculty.mu.edu.sa/aaahmed** **E mail: aa.ahmed@mu.edu.sa**		**الاسم: د. احمد عادل احمد** **الجنسية: مصرى** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء نووية** **الرتبة العلمية: أستاذ مساعد** **تليفون:**
Prof. Adam Abdullah **Nationality: Indian** **Major: Physics** **Specialty: Nanotechnology and Semiconductors** **Scientific Rank: Assistant Professor** **Website:** **http://faculty.mu.edu.sa/abahishti** **E mail: a.bahishti@mu.edu.sa**		**الاسم: د. آدم عبد الله** **الجنسية: الهند** **التخصص العام: الفيزياء** **التخصص: تقنية النانو وأشباه الموصلات** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044170**
Name : Mahmoud Mohamed Ahmed **Nationality: Egyptian** **Major: Physics** **Specialty: Laser Physics and Application** **Scientific Rank: Ass. Professor** **Website: http://faculty.mu.edu.sa/ mahmad** **E mail: m.ahmad@mu.edu.sa**		**الاسم: د. محمود محمد احمد** **الجنسية: مصرى** **التخصص العام: فيزياء** **التخصص الدقيق: فيزياء الليزر وتطبيقاته** **الرتبة العلمية: أستاذ مساعد** **تليفون: 0164044101**
Prof. Adam Abdullah **Nationality: Pakistani** **Major: Physics** **Specialty: Nanotechnology and**		**الاسم: د. محمد ارشد كامران** **الجنسية: باكستان** **التخصص العام: الفيزياء** **التخصص: تقنية النانو وأشباه**

Semiconductors Scientific Rank: Assistant Professor Website: http://faculty.mu.edu.sa/mkamran E mail: m.kamaran@mu.edu.sa		الموصلات الرتبة العلمية: أستاذ مساعد تليفون: 0164044146
Prof. Mohamed Shaker Khan Nationality: Indian Major: Physics Specialty: Radiation Physics Scientific Rank: Assistant Professor Website: http://faculty.mu.edu.sa/ mskhan E mail: ms.khan@mu.edu.sa		الاسم: د. آدم عبد الله الجنسية: الهند التخصص العام: الفيزياء التخصص: الفيزياء الاشعاعية الرتبة العلمية: أستاذ مساعد تليفون:0164044125
Name: Elasaad Mustapha JEMII Nationality: Tunisian Major: Physics Specialty: Nuclear Physics Scientific Rank: Assistant Professor Website: http://faculty.mu.edu.sa/ ejemii E mail: e.jemii@mu.edu.sa		الاسم: د. الاسعد مصطفى الجنسية: تونسية التخصص العام: فيزياء التخصص الدقيق: فيزياء نووية الرتبة العلمية: أستاذ مساعد تليفون:
Prof. Mohamed Hamad Nationality: Pakistani Major: Physics Specialty: Medical Physics Scientific Rank: Assistant Professor Website: http://faculty.mu.edu.sa/mhammad E mail: m.hammad@mu.edu.sa		الاسم: د. محمد حماد الجنسية: باكستان التخصص العام: الفيزياء التخصص: فيزياء طبية الرتبة العلمية: أستاذ مساعد تليفون:

b) Abroad Members Names

م	Name	Rink	Field	Position Study	E-mail
1)	Mansour Elhabardi	Lecture	Solid State	England	m.alhabradi@mu.edu.sa
2)	Mohamed Elbadah	Demonstrator	Physics	Canada	@mu.edu.sa
3)	Ahmed Elanzei	Demonstrator	Physics	USA	@mu.edu.sa

c) Demonstrator Names

م	Name	Rink	Field	Position	E-mail

				Study	
1)	Majed Elowaid	Demonstrator	Physics		m.alouaid@mu.edu.sa
2)	Abdulrzag Aldweesh	Demonstrator	Physics		as.aldweesh@mu.edu.sa
3)	Nader Alhabradi	Demonstrator	Physics		n.alhabradi@mu.edu.sa

d) Technation Names

M	Name	Rink	Field	work	E-mail
1)	Ahmed Alwazzan	B. Sc.	Physics	Zulfi College	a.alwazzan@mu.edu.sa

e) Secretary Names

M	Name	=	=	work	E-mail
1)	Abdalla Alsweeket			Zulfi College	a.alsweeket@mu.edu.sa

General Units in the department

1- The unit overseeing the program:

The members of this unit are the entire staff department, whose responsibilities are:

a) Supervise the implementation of the action plan program.
b) Choose a counsel to assist in the rehabilitation Department for accreditation by the accreditation; and in coordination with the Unit on the development and quality assurance.
c) Complete all of the requirements of accreditation in the national body standards section (NCAAA).
d) Follow-up and coordination with the Unit on the development and quality in college and reporting. And-prepare a Visual presentation of the section and the section and guide the program.

2- Quality and Accreditation Unit:

The taskforce of this unit are:

1) Supervision and collection of (program description – report – description of courses - report of decisions).
2) Oversee the follow-up self-study preparation (SSR) for the section.

3) Supervision of the preparation room within the section for academic evaluation and accreditation and program documentation is complete and to visit residents during periods of the calendar program.
4) Report periodically on how complete the requirements of accreditation.
5) Supervise the preparation of exams students and models to answer for decisions. And-supervising provides ways of teaching and learning for students in coordination with the units section.
6) Development, management and quality control processes in the Department.
7) Follow-up to and choose the standard reference for the section.
8) Supervision and follow-up of development plans and future planning.
9) Follow the modern trends in methods and methodology and teaching techniques.
10) Identify training programs section for the development of teaching skills, research and art.
11) Preparation, distribution, and collection of student questionnaires on the usefulness of the training program during the years of study and the appropriateness of the decisions for life process and proposals to expand the utilization and preparation of statistical results tab.

3- Academic advising Unit:

Functions of academic advising unit are:

a) Raising awareness of the importance of accreditation for the section through meetings.
b) Expand the concept of academic advising and academic advisor role in guiding the student to plan for their future education.
c) Preparation of questionnaires for academic accreditation in relation to academic guidance, distribution, collection, analysis and presentation of results recommendation the program accordingly.
d) Deepening trust between students and faculty.
e) Receive and respond to suggestions or complaints from students.
f) Educate students with support services.

4-Safety and Security Unit :

The functions of this unit described as:

a) Ensure all laboratory equipment and student services.
b) Check the availability of maintenance plans of plants, equipment and student services.
c) Report periodically to the Chief of section at the end of each academic year for repairs/adjustments.
d) Overseeing security and safety procedures in the laboratory and classroom before school and provide

Report to the Department Chair.

- Awareness raising and the preparation and distribution of publications to students and safety of various risks (chemical-electrical-radioactive) at the beginning of the school year.
- And-signs and safety procedures in a prominent place in every classroom and laboratory and emergency telephone numbers,

5-Follow-up Unit of alumni and community partnership :

The functions of this unit described as:

a) Personal data collection and the disaggregation of student section and their means of communication.
b) Data collection and the disaggregation of data on employers and their means of communication.
c) A programme to document relevant to graduates employment destinations.
d) Preparation and distribution and collection of questionnaires on satisfaction this category on their course; and preparation of statistical results and recommend accordingly.
e) Creation of effective mechanism for the provision of employment opportunities for graduates in their respective fields (for example, by convening meetings of employment – employers ' views on levels of graduates-exploring the views of employers in the important decisions of the program and the section).
f) Activation of communication graduates (such as the alumni section).
g) Survey of graduates who joined jobs on their assessment of the usefulness of the programme and contents of previous decisions.

6- The training Unit and community service:

The functions of this unit described as:

a) Collection and compilation project carried out by the Department and its members and their contributions in community services and development plans.
b) Promotion and entrepreneurship students to maximize returns on the role service to the community through the tool and publications, in coordination with the units section.
c) Deepen communication between the College and those responsible for development plans in Saudi Arabia.
d) Develop programes to strengthen the relationship between the Department and the community and follow up their implementation.

7- The Commission on graduate studies and scientific research:

The functions of this unit described as:

1. Developing a system for monitoring, documentation and dissemination of research data and participate in conferences.
2. Establishment and updating of a database of research published by the Faculty in the Department.
3. Encourage scientific publication in scientific journals of the world rankings.
4. List of research faculty website section and updated annually.
5. Do the tasks referred to it by the Unit of postgraduate studies and research at the College.
6. Registration of current research projects and ending with the section and their names announced on the website of the section and return to society.
7. A yearly calendar of scientific research projects of the section and of the recommendations of the Commission on graduate studies and research.

5- Schedules Unit:

The functions of this unit described as:

1. Work schedules quarterly section.
2. Distribution of the burden of teaching on the Faculty section.
3. Distribution decisions in agreement with the decisions of the scientific units in the section.
4. Coordination with other colleges on the mathematics courses.

9- Plans implantation Unit:

The functions of this unit described as:

1) Action guide includes decisions and objectives and help on using the latest scientific methods in the teaching process and continuous.
2) Find a link either directly by departments or through community service with public education and the labour market.
3) Audit report of the external auditors to study the development of the section and to develop action plans to remedy the deficiencies.

10. Advertising and publishing Unit:

The functions of this unit described as:

1) Preparation, implementation and supervision of the section University website page on the Web.
2) Prepare and print student guide and academic publications and training packages.
3) Coordination with faculty members to publish their scientific section.

11. Testing and control Unit:

The functions of this unit described as:

a) Coordination with the Unit Chairperson for scheduling tests.
b) Hold training workshops on emerging quality control tests.
c) pickup and delivery of tests and to faculty members
d) Save your answers students for analysis and review.

12. The student activities Unit:

The functions of this unit described as:

a) Preparation and organization of sports and cultural activities for students section.
b) Organizing periodic meetings with the Dean and Department Chair.
c) Field visits Academy.

13. The Education Unit:

The functions of this unit described as:

1) Activate media e-learning campus.
2) Training sessions for faculty to take advantage of e learning.

14. Suggestions and complaints Unit:

The functions of this unit described as:

a) Suggestions and complaints about the section of all relevant actors.
b) Lift Department Council of ideas and suggestions.

Physics Laboratories

The *Laboratory Manual* contains many experiments for the beginning study of physics. The experiments illustrate the concepts found in this introductory course. Both qualitative and quantitative experiments are included, requiring manipulation of apparatus, observation, and collection of data. The experiments are designed to help you utilize the processes of science to interpret data and draw conclusions.

The laboratory report is an important part of the laboratory experience. It helps you learn to communicate observations and conclusions to others. Special laboratory report pages are included with each experiment to allow the most efficient use of lab-report time. Graph paper is necessary for most labs requiring construction of graphs. While accuracy is always desirable, other goals are of equal importance in laboratory work that accompanies early courses in science. A high priority is given to how well laboratory experiments introduce, develop, or make the physics theories learned in the classroom realistic and understandable and to how well laboratory investigations illustrate the methods used by scientists. Student laboratories include:

1) General Physics (1) Lab.
2) General Physics (2) Lab.
3) Thermal Physics Lab.
4) Optics Lab.
5) Electromagnetic Lab.
6) Modern Physics Lab.
7) Solid State Lab.
8) Nuclear Lab.
9) Electronic Lab.

1- General Physics (1) Lab.

This laboratory will help to clarify certain principles, which studied in theoretical parts for science students. It was cover tests for mechanics and properties of matter. The students are doning approximately 12 experience distributed across 14 week course. They will learn to writte a report on all the action and experience these tests are:

(1) Error Analysis and Graph Drawing.
(2) Using the measurement tools in the lab.
(3) Study the transmitted liquid viscosity
(4) Graphity measurements with free
(5) Simple pendulum
(6) Motion law in one dimension.
(7) Study of Joule equivalent
(8) Force-table
(9) Verification of Hook's Law
(10) Measurements of Young Course names
(11) Study the Archimedes' Principle

Force-table

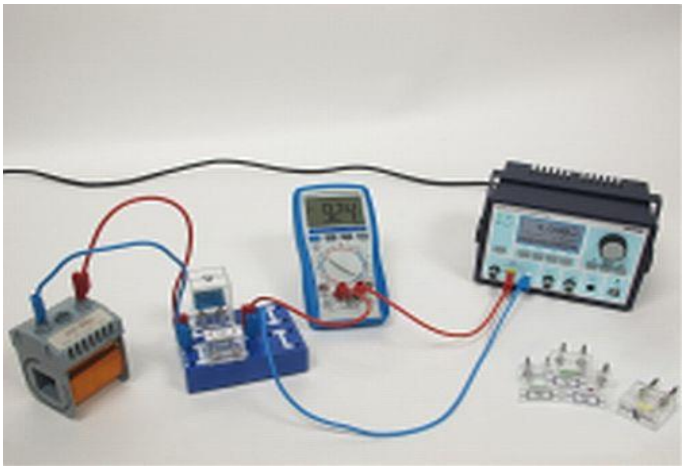
2- General Physics (2)

This Lab. offer an ideal opportunity to learn and strengthen, by means of actual observations, some of the principles and laws of physics that are taught to you in general physics lectures. You will also become familiar with modern measuring equipment and learn the fundamentals of preparing a report of the results. The experiments are covered the electricity and magnetism and the AC and DC circuits. Also they covered some of the geometric light experiments. The experiments are:

2. Introduction
3. Charging and discharging of a capacitor
4. Resonance in LCR circuit
5. Velocity of Sound
6. Ohm's Law
7. Self-inductance and resistance of a coil
8. Measurements of the focal length of the lenses
9. Measurements of the focal length of the mirrors
10. Refractive index of the prism
11. Meter bridge and measure the unknown resistance
12. Weston bridge
13. Transformers

.

Measurements of the focal length of the lenses



RLC resonant circuits

3-Thermal physics Lab.

In this Lab., the properties of matter were utilized under effect of the temperature. The

1) Specific heat of solid
2) Surface tension and the temperature effect
3) Measurements the viscosity of the transmitted liquid under control the temperature.
4) Latent heat (Wax, Paraffin)
5) Resistivity and temperature effect
6) Newton's law of cooling
7) Thermal extension of solid

Thermal extension of solid

4-Optics Laboratory

The physical properties of light (interference, diffraction and polarization) utilized

This laboratory aims to give the student pilot skill to learn wave phenomena (Interference, Diffraction and Polarization). Also, the student will learn the process to use laser and other sources. This Lab., coverage of trials on interference and diffraction and polarization experiments almost over 14 week. Student, in the experiment lesson, are observed the light phenomena and learn how to write a report. These experiments are:

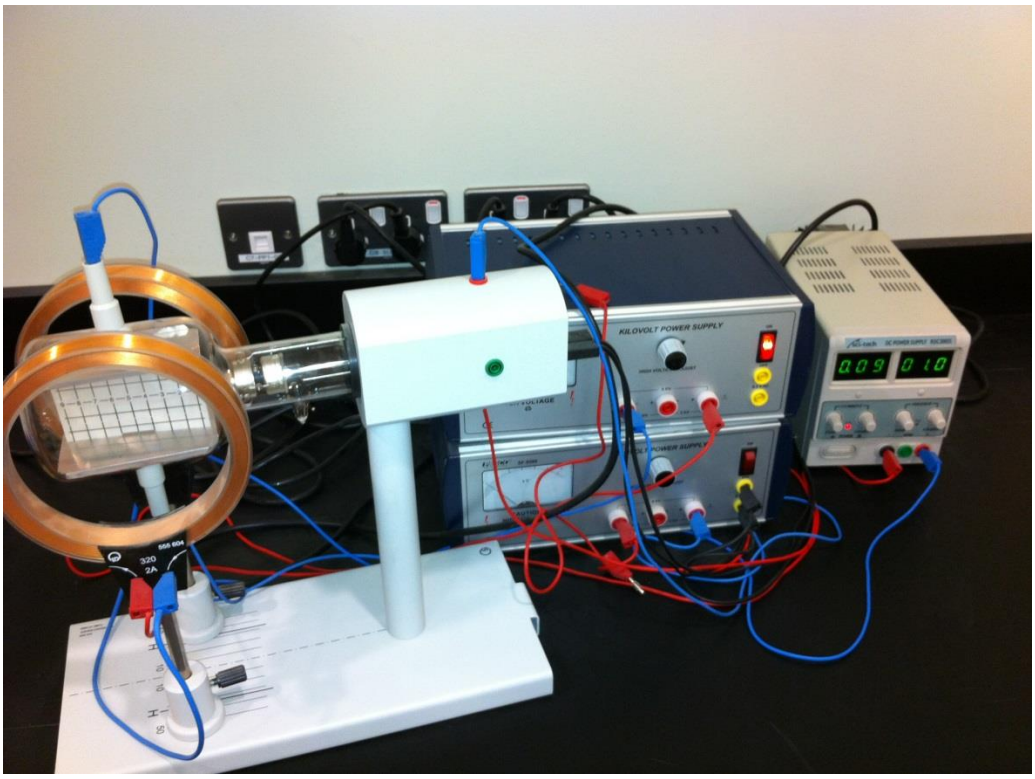
1- Laud's Mirror
2- Newton Rings
3- Michelson Interferometer
4- Fabry-port interferometer
5- Diffraction from single and double slits
6- Diffraction gritting
7- Abby' refract meter
8- Specific Rotation
9- Inverse Square Law
10- Study of the polarization

Michelson Interferometer

5- Electromagnetic Lab.

The experimental skill in the theoretical and experiments of the electromagnetic theories are studied in the lab. The experiments lesions are:

1- The specific electron charge
2- Study the magnetic force from current
3- Verification of the Biot-Sufrt law
4- Transformers' laws
5- RLC circuits studies
6- Magnetic moment
7- Helmholtz Coils
8- Magnetic Inductions
9- Farady Law

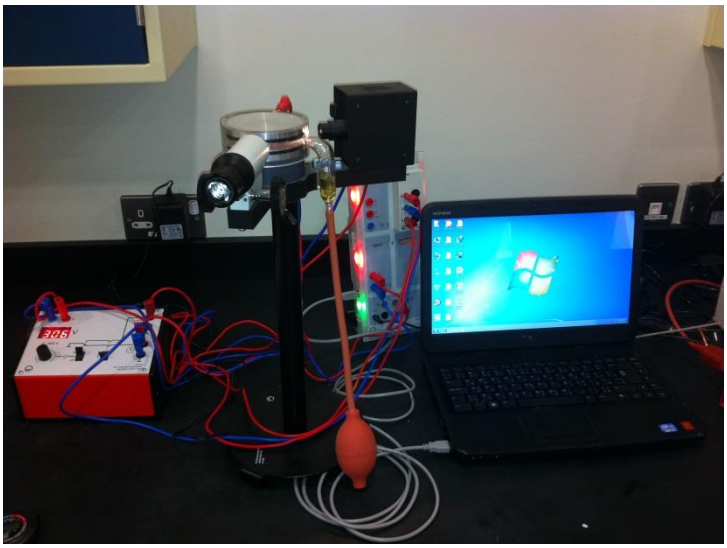


6- Modern Physics

The essential mean of the modern physics laboratory is enabiling students the basic concepts of physics and application of laws and theories of modern Physics. The experiments are:

1. Photoelectric effect experiment.
2. Millikan oil drop experiment.
3. Balmer series, and Rydberg's constant determination.
4. Normal Zeeman effect.
5. e/m determination experiment.
6. Moseley's law using x-ray
7. Energy spectrum of a crystal using x-ray
8. Effect of voltage and current on the x-ray spectrum.
9. Frank – Hertz experiment.

Millikan Experiment



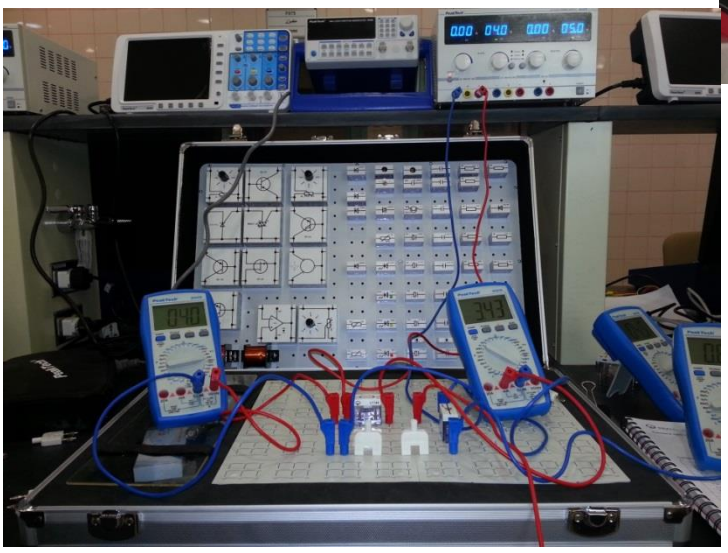
7- Electronic Laboratory

The construction of the electronic circuits are discuded and explaining in the electronic lab. In addition, it is compared with the simultaneous Digital circuits.

The experiments of this lab. are:

1- Study the properties of the PN junction
2- Study the properties of the Zener diode
3- Half and full waves rectifiers
4- Voltage regulator
5- Clipping and clamping
6- Study the transistor characteristic
7- Study the FET characteristic
8- Operation amplifier
9- Integrated circuits
10- Digital Counters Digital counters

Electronic Board system

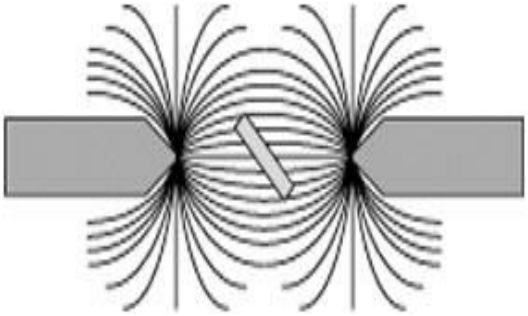


Transistor experiments

8- Solid State Physics Laboratory

Solid-state lab. was constructed in order to study the physical properties of the matter. The advanced theories in solid state physics will be explained by the experiments.
The experiments are listed as:

1- Study the electroheating phenomena (Seebeck effect, Thomson effect, and Paltier effect).
2- Thermal coefficient of metal
3- X-rays diffraction
4- X-ray ionization
5- Hall effect of metal
6- Hall effect of Semeconductor
7- Tunneling microscope
8- Electron Spin Resonance
9- Diamagnetism and Paramagnetism
10- Solar Cell



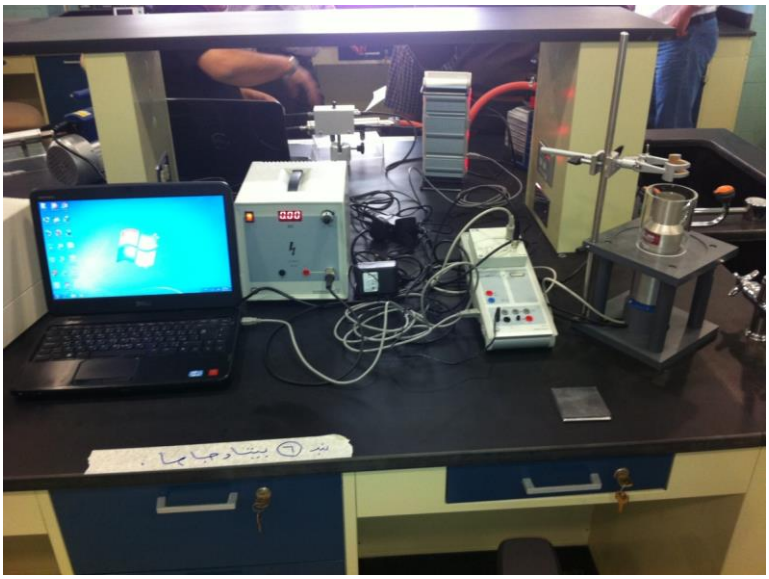
Diamagnetism and Paramagnetism

X-ray Diffraction

9- Nuclear Physics Laboratory

Nuclear physics laboratory will help to accepte students a certain skill for nuclear sources. It was cover tests for the radioactive elements. In deeping, how to protect the inverimentals, and analysis the result. The students are doning and learning to writte a report on all the action and experience, these tests lessons are:

1- Compoton effect
2- Nuclear magnetic resonance
3- Alpha spectroscopy
4- Beta spectroscopy
5- Law of distance and absorption
6- Gamma spectroscopy
7- Counting statistics
8- Determining the Half-Life of



Gamma spectroscopy

Future improve project in the Program

- Constracte a Nano Technology Unit
- Constracte a Laser Research unit
- High Eduction Research
- Laser Physics Research

The study system at the college of science

Teaching at the collage of science is subject to the following scheme:

- The Academic year consists mainly of two regular semesters and summer session, if available.
- The duration of the level is a full semester without including the periods of registration and final exams (not less than 15 weeks).
- The summer semester duration time is not less than eight weeks, which the teaching time for each course is doubled.
- The stage of academic progress is indicated by the academic level, where the number of levels is at least eight levels according to the approval study plan.
- Students have to complete 136 credit hours to obtain a Bachelor's Degree as follows:
  a. The student studies a number of 35 credit hours during the preparatory year (two semesters in one academic year).
  b. The student studies 97 credit hours {compulsory(72)+ electively(9)}in the program of specialization in the various collage departments throught the six semesters following the preparatory year (beginning with the third semester).
  c. University requirements: the student selects 8 credit hours of the requirements of the university of 22 optional credit hours during the period of study at the collage.

Rules for Registrationof Courses

- The course is a Course name that meets the needs of the level specified in the approved study plan in each specialty (program). The course has a number, a code , a title, and a description depending on the different departments .
- The course is divided into a set of theoretical lectures and practical lessons (study units) taught weekly during the academic level.
- The credit hour is a weekly theoretical lecture that is not less than fifty minutes, or a practical lesson which is not less than one hundred minuts.
- The registration of the courses for all students is done automatically through the website: http://edugate.mu.edu.sa
- The academic levels vary in the number of the units ofstudy, from 12 units to 20 units, for each term.
- The courses are registered automatically at the beginning of the following semester according the study plan for the student's convenience. Then, after fixed time the student can modify the course schedule by adding or dropping.

- The following table shows the student's study load corresponding to the cumulative average:

GPA	2	2.5	3	3.5	4	4.5	5
Hours allowed forregistration	14	15	16	17	18	19	20

- The Processes of dropping and adding are performed by the student electronically in the first week of the semester through accessing the gate of the academic system of the University Deanship of Admission and Registration (http://edugate.mu.edu.sa).
- No student has the right to register a course without passing its pre- requisite course.
- Students, who pass all courses without failures, are registered in the courses of the level beginning gradually with the lower levels according to the study plans approved.
- Students, who fail in some courses, are registered in courses that ensure their minimum study load in each semester taking into account the following points: - No conflict in the course study schedule. - Satisfying the previous requirements of the course or courses to be registered.

Calculating the Average and Cumulative GPA

The Average and cumulative GPA are calculated every semester for the student automatically by the system. To know how to calculate the averages, you should follow the following steps: Calculating the Semester Average: The GPA is calculated considering the following points:

1. Knowing the number of hours of the courses.
2. knowing the mark obtained in each course.
3. Knowing the corresponding grade of each mark.
4. Knowing the value of each grade.
5. Knowing the points = number of hours of the course × value of the grade.
6. Determining the total points obtained in all courses of the semester.
7. Determining the total number of hours registered in the semester.
8. The average is calculated every semester according to the following equation :

The following table shows the percentage of marks, grade and value obtained by the student in each course, which is used to calculate the points:

Mark	Grade	Letter	Value
95 – 100	Excellent +	A+	5
90 to < 95	Excellent	A	4.75
85 to < 90	Verygood+	B+	4.5
80 to < 85	Verygood	B	4
75 to < 80	Good +	C+	3.5
70 to < 75	Good	C	3
65 to < 70	Pass+	D+	2.5
60 to < 65	Pass	D	2
< 60	Failure	E	1
Absent	debarred	H	1

Calculating the Average Cumulative:

The GPA semester average is calculated as follows:
The grand total of points (for all semesters that have been studied). The grand total of credit hours (for all semesters that have been Studie). The cumulative average is calculated according to the following equation:

$$GPA = \frac{Grand\ Total\ of\ Point}{Grand\ Total\ of\ Credit\ hours}$$

Here is an example of how to calculate the grades above:
Calculating the grade of the first semester:

Course	Credits	Mark	Grade	Grade value	Point
PHYS101	4	67	D+	2.5	4x2.5=10
Chem 101	4	73	C	3	4x3=12
Eng 121	3	77	C+	3.5	3x3.5=10.5
Arab 101	2	81	B	4	2x4=8
Total	13				40.5

$$GPA = \frac{Grand\ Total\ of\ Point}{Grand\ Total\ of\ Credit\ hours} = \frac{40.5}{13} = 3.12$$

Calculating the grade of the second semester:

Course	Credits	Mark	Grade	Value Grade	Points
Math 101	3	6	D	2	3 × 2 = 6
Stat 101	3	7	C	3	3 × 3 = 9
C.S. 206	3	8	B	4	3 × 4 = 12
Arab 103	3	8	B+	4.5	3 × 4.5 =
Islam 101	2	9	A	4.75	2 × 4.75 =
Eng 122	3	9	A+	5	3 × 5 = 15
	17				65

$$GPA = \frac{Grand\ Total\ of\ Point}{Grand\ Total\ of\ Credit\ hours} = \frac{65}{17} = 3.82$$

To Calculate the average cumulative:

$$CGPA = \frac{Total\ of\ Point}{Total\ hours\ of\ semesters} = \frac{105.5}{30} = 3.52$$

Dropping and adding of a course:

- The process of dropping and adding is performed through portal (http://edugate.mu.edu.sa) during the first week of the semester only; but the number of credit hours registered has to be at least 12 hours.
- The student may drop only one course due to an excuse acceptable to the Dean of the College. This procedure should occur at least five weeks before the final exams begin. The student has the right to apply for such a procedure at a maximum of four courses during the whole period of study at the College.

Attendance, postponing and dropping out of College:

- The student must be regular in attendance attending at least 75% of the lectures and the practical classes.
- If any student has a percentage of absence of 25% , or more, in any course, he is denied access to the final exam of this course and his result is F.
- A student may apply for postponement of the study before the beginning of the semester for an excuse accepted by the College Board. The postponement should not exceed two consecutive semesters or three intermittent semesters as a maximum limit while studying at the College.
- The University Council may, in case of necessity, exempt the applicant from the previous provision.

- If a student drops out of College for one semester without requesting the postponement of his registration, the University has the right to dismiss his registration. The University Council has the right to do this for a lesser period of time.
- The student is not considered as dropping out of College if he is a visiting student at another university.

Visiting Student:

Visiting Student means a student who studies some courses at another university, or at a branch of the university to which he belongs without being transferred. The courses he studied are accredited according to the following regulations:

- The student has to have a transcript (including a grade point average) for, at least, two semesters at his college before he applies as a visiting student.
- The student must obtain a prior approval from his college permitting him to study as a visiting student while specifying the courses that will be studied. The College has the right to require a specific grade to be achieved by the student to offset the course. The student should obtain an official letter from the Deanship of Admission and Registration directing him to study as a visiting student.
- The student has to join a college or a university officially recognized.
- The courses, under consideration by the student to be studied outside the University, must be equivalent in their description to the University courses, and their course units should be no less than the units of any of the courses contained in the graduation requirements.
- The maximum of the total units of study that can be calculated from outside the University is twenty percent (20%) of the total units
- required for graduation at Majaamaha University.
- The courses that are studied by the visiting student are not included in the cumulative average. These courses are recorded in his academic record.
- The student must provide the Deanship of Admission and Registration with the results he obtained during the first two weeks of study in the semester following the period of study as a visitor. If not reported within that period, the student is considered as dropping out of College during those semesters.

Dismissal from the University:

The student is dismissed from the University in the following cases:

- If he receives three consecutive warnings due to a cumulative average below a minimum of 2.

- The student may be given a fourth opportunity by the Council of the University based upon the recommendation of the College Council to raise his cumulative GPA by studying the available courses.
- The University Council may give the dismissed students, due to warnings, an opportunity that does not exceed two semesters as a maximum.
- If the student does not fulfill his graduation requirements at the College in a period of up to half of the period prescribed for graduation in addition to the duration of the Program.
- The student is given an exceptional opportunity by the University
- Council to meet the graduation requirements during a maximum period not exceeding twice the original term specified for graduation.
- The University Council may allow dismissed students, due to the exhaustion of failure times, to attend twice the duration of the Program. This extension should not exceed a maximum of two semesters.

Examinations and Grades:

- Based on a proposal from the Department Council, the College Council specifies a mark for the student's semester work, varying from 40% to 60% of the final grade of the course.
- The mark of the course's semester work is calculated by one of the following two methods:
    1. Oral, practical tests, research, or other forms of classroom activity, or from all the above or some of them, in addition to at least one written exam.
    2. Two written exams at least.
- Based on the recommendation of the course instructor, it is permissible for the Department Council, that teaches the course, to allow the student to complete the requirements of any course in the following semester and to give the student a grade of I (incomplete) in his academic record. Only the grades achieved by the student are included in the GPA or cumulative after the completion of the requirements of that course.
- If one semester passes without changing the grade incomplete (I), the student is given an F which is calculated in the GPA and cumulative.
- The grades obtained by the student in each course are calculated according to the schedule mentioned above.

Restrictions of the Final Examination:

- No student may be tested in more than two courses in one day.
- The student is not allowed to enter the final exam after half an hour of its beginning, and is not allowed to leave the exam room before half an hour after its beginning.

- Based on a recommendation from the relevant department council, the College Council specifies the duration of the final written exam to be within a period not less than one hour, and not more than three hours.
- Cheating in the exam, initiating it, or violating the instructions and rules of examination procedures are actions punishable in accordance with the Regulat Council.
- In cases of necessity, the college council, in change of teaching a course, has the right to approve re-marking of the answer sheets in a period of time not later than the beginning of the following semester in accordance with the following rules:
  a) A student may apply for re-marking the answer sheets of only one course per semester.
  b) The student, who wishes to re-mark his answer sheets, may apply for one month after taking the final exam.
  c) The student, who has already applied for re-marking and proved the invalidity of his application, should never appy for re-marking his answer sheets in any exame in future.

Transferring

1) Transferring from one college to another within the University:

a) It is permissible, with the consent of the respective deans of the colleges, to transfer from one college to another in according with the conditions approved by college council to which the student wishes to transfer.
b) The student's college academic record has to show all courses previously studied, inclouding grades, semester and cumulative averages throughout the study at the college from which he is transferred.

2) Transferreing from one major to another within the college:

a) By approval of the Dean the student may transfer to another specialty within the college according to the guidelines established by the college council.
b) The student's college academic record has to show all courses previously studied, including grades, semester and cumulative averages throughout the study at the college from which he is transferred.