كلية العلوم التطبيقية / قسم الفيزياء　　رقم التخصص ٤٠٣٠٠　　الخطة الدراسية لبكالوريوس الفيزياء (البحتة)　　١٤٣٧ هـ　　رقم التوصية ٣٧　　ساعات الخطة ١٣٠

السنة الأولى

الفصل الدراسي الأول (المستوى الأول)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٤١١٠١-٤	تفاضل و تكامل Calculus	٤	-		٤	-
٤٠٢١١٠١-٤	الكيمياء العامة General Chemistry	٣	١		٣	٢
٧٠٠٤١٠١-٤	اللغة الانجليزية English language	٤	-		٤	-
٦٠٥١٠١-٢	القرآن الكريم ١ The Holy Qura'an (1)	٢	-		٢	-
٦٠١١٠١-٢	الثقافة الاسلامية ١ Islamic Culture (1)	٢	-		٢	-
	المجموع	١٦ ساعة				

الفصل الدراسي الثاني (المستوى الثاني)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠١١١٠١-٤	الاحياء العامة General Biology	٣	١		٣	٣
٤٠٣١١٠١-٤	الفيزياء العامة General Physics	٣	١		٣	٣
٧٠٠٤١٠٢-٤	اللغة الانجليزية للعلوم التطبيقية	٤	-	٧٠٠٤١٠١-٤	٤	-
٥٠١١٠١-٢	اللغة العربية Arabic Language	٢	-		٢	-
١٠٢١٠١-٢	السيرة النبوية Biography of prophet Mohamed (PBUH)	٢	-		٢	-
	المجموع	١٦ ساعة				

كلية العلوم التطبيقية / قسم الفيزياء | رقم التخصص ٤٠٣٠٠ | الخطة الدراسية لبكالوريوس الفيزياء (البحتة) | ١٤٣٧ هـ | رقم التوصية ٣٧ | ساعات الخطة ١٣٠

السنة الثانية

الفصل الدراسي الأول (المستوى الثالث)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٤٢٥٠١-٤	التفاضل والتكامل (٢) Differentiation and Integration (2)	٤	-	٤٠٤١٠١١-٤	٤	-
٤٠٤٢٤٠٢-٤	الجبر الخطى (١) Linear Algebra (1)	٤	-	٤٠٤١٠١١-٤	٤	-
٤٠٣٢١٠٢-٤	فيزياء عامة (٢) General Physics (2)	٣	١	٤٠٣١١٠١-٤	٣	٣
٤٠٣٢١٢١-٤	كهربية ومغناطيسية Electricity and magnetism	٣	١	٤٠٣١١٠١-٤	٣	٣
	المجموع	١٦ ساعة				

عدد المقررات: تخصصية (٢ مقرر) + مقرر مساند (٢ مقرر)

الفصل الدراسي الثاني (المستوى الرابع)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٣٢١٤١-٤	طرق نظرية فى الفيزياء (١) Theoretical Methods in Physics (1)	٤	-	٤٠٤٢٥٠١-٤	٤	-
٤٠٣٢١٣١-٤	بصريات Optics	٣	١	٤٠٣٢١٠٢-٤	٣	٣
٤٠٣٢١٥٠-٤	فيزياء حديثة Modern Physics	٣	١	٤٠٣٢١٠٢-٤	٣	٣
٤٠٣٢١٢٢-٣	فيزياء عامة (٣) General Physics(3)	٢	١	٤٠٣٢١٢١-٤	٢	٣
٦٠١٢٠١-٢	الثقافة الاسلامية (٢) Islamic Culture (2)	٢	-	٦٠١١٠١-٢	٢	-
	المجموع	١٧ ساعة				

عدد المقررات: تخصصية (٤ مقررات) + متطلب جامعة (١ مقرر)

كلية العلوم التطبيقية / قسم الفيزياء   رقم التخصص ٤٠٣٠٠   الخطة الدراسية لبكالوريوس الفيزياء (البحتة)   ١٤٣٧ هـ   رقم التوصية ٣٧   ساعات الخطة ١٣٠

السنة الثالثة

الفصل الدراسي الأول (المستوى الخامس)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٣٣١٤٢-٤	طرق نظرية فى الفيزياء (٢) Theoretical Methods in Physics (2)	٤	-	٤٠٣٢١٤١-٤	٤	-
٤٠٣٣١٤٣-٤	ميكانيكا كلاسيكية (١) Classical Mechanics(1)	٤	-	٤٠٣٢١٠٢-٤	٤	-
٤٠٣٣١٤٥-٤	ميكانيكا الكم (١) Quantum Mechanics (1)	٤	-	٤٠٣٢١٤١-٤	٤	-
٤٠٣٣١١٠-٣	حرارة وديناميكا حرارية Heat and Thermodynamics	٣	-	٤٠٣٢١٠٢-٤	٣	-
٦٠٥٢٠١-٢	القرآن الكريم (٢) The Holy Qura'an (2)	٢	-	٦٠٥١٠١-٢	٢	-
	المجموع	١٧ ساعة				
عدد المقررات: تخصصية (٤ مقررات)+ متطلب جامعة (١ مقرر)						

الفصل الدراسي الثاني (المستوى السادس)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٣٣١٣٢-٣	كهرومغناطيسية (١) Electromagnetism (1)	٣	-	٤٠٣٢١٤١-٤	٣	-
٤٠٣٣١٤٦-٣	ميكانيكا الكم (٢) Quantum Mechanics (2)	٣	-	٤٠٣٣١٤٥-٤	٣	-
٤٠٣٣١١١-٣	ديناميكا حرارية احصائية Statistical Thermodynamics	٣	-	٤٠٣٣١١٠-٣	٣	-
٤٠٣٣١٤٤-٢	ميكانيكا كلاسيكية (٢) Classical Mechanics (2)	٢	-	٤٠٣٣١٤٣-٤	٢	-
٦٠٥٣٠١-٢	القرآن الكريم (٣) The Holy Qura'an (3)	٢	-	٦٠٥٢٠١-٢	٢	-
٦٠١٣٠١-٣	الثقافة الإسلامية (٣) Islamic Culture (3)	٣	-	٦٠١٢٠١-٢	٣	-
	المجموع	١٦ ساعة				
عدد المقررات: تخصصية (٤ مقررات) + متطلب جامعة (٢ مقرر)						

كلية العلوم التطبيقية / قسم الفيزياء   رقم التخصص ٤٠٣٠٠   الخطة الدراسية لبكالوريوس الفيزياء (البحتة)   ١٤٣٧ هـ   رقم التوصية ٣٧   **ساعات الخطة ١٣٠**

السنة الرابعة

الفصل الدراسي الأول (المستوى السابع)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٣٤١٣٣-٣	كهرومغناطيسية (٢) Electromagnetism (2)	٣	-	٤٠٣٣١٣٢-٣	٣	-
٤٠٣٤١٦٠-٤	فيزياء نووية Nuclear Physics	٣	١	٤٠٣٣١٤٥-٤	٣	٣
٤٠٣٤١٧٠-٤	فيزياء الجوامد (١) Solid State Physics	٤	-	٤٠٣٣١٤٥-٤	٤	-
٤٠٣٤١٨٠-٣	مقدمة فى الفيزياء الحاسوبية Computational Physics	٢	١	٤٠٣٣١٤٢-٤	٢	٢
٦٠٥٤٠١-٢	القرآن الكريم (٤) The Holy Qura'an (4)	٢	-	٦٠٥٣٠١-٢	٢	-
	المجموع	١٦ ساعة				

عدد المقررات: تخصصية (٤ مقررات) + متطلب جامعة (١ مقرر)

الفصل الدراسي الثاني (المستوى الثامن)

رقم المقرر	اسم المقرر	الساعات الدراسية		المتطلب السابق	الساعات الفعلية	
		نظري	عملي		نظري	عملي
٤٠٣٤١٦٢-٣	فيزياء إشعاعية Radiation Physics	٣	-	٤٠٣٤١٦٠-٤	٣	-
٤٠٣٤١٧٢-٤	فيزياء جوامد (٢) Solid State Physics (2)	٣	١	٤٠٣٤١٧٠-٤	٣	٢
٤٠٣٤١٧٣-٤	إلكترونيات Electronics	٣	١	٤٠٣٤١٧٠-٤	٣	٣
٤٠٣٤١٩٩-٣	مشروع تخرج Graduated Project	٣	-	موافقة القسم	-	-
٦٠١٤٠١-٢	الثقافة الاسلامية (٤) Islamic Culture (4)	٢	-	٦٠١٣٠١-٣	٢	-
	المجموع	١٦ ساعة				

عدد المقررات: تخصصية (٣ مقررات) + مشروع تخرج + متطلب جامعة (١ مقرر)

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **General Physics**

Course code: **4031101-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

1. Course title General Physics 2. Course code: 4031101-4
2. Credit hours: 4hrs
3. Program(s) in which the course is offered. : BSc Physics
4. Name of faculty member responsible for the course: One of the academic staff member
5. Level/year at which this course is offered: 1st Year / Level 2
6. Pre-requisites for this course (if any):
7. Co-requisites for this course (if any): ---
8. Location if not on main campus: Main campus and Alzaher.
9. Mode of Instruction (mark all that apply) a. traditional classroom ✓ What percentage? 100% b. blended (traditional and online) ☐ What percentage? ☐ ☐ ☐

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

1. Define the concepts of the measurements.
2. Define the concepts measuring length.
3. Define the concepts of measuring time.
4. Define the concepts of measuring weight.
5. Differentiate between the distance, the position, and the displacement.
6. Differentiate between the speed and the velocity.
7. Differentiate between the average velocity and the instantaneous velocity.
8. Define the concepts of the acceleration.
9. Differentiate between the average acceleration and the instantaneous acceleration.
10. Differentiate between the linear acceleration and the free fall acceleration.
11. Differentiate between the vectors and the scalars
12. Analyze the vectors into their components.
13. Calculate the multiplication of the vectors.
14. Define the concepts of the force.
15. Define the relation between the force and the acceleration.
16. Apply Newton's laws of motion.
17. Differentiate between the Work and the Energy.
18. Differentiate between the Energy and the power.
19. Define the Kinetic energy of the body.
20. Define the concept of the density of the body.
21. Define the concept of the pressure within the fluid.
22. Define the concept of Pascal principle.
23. Define the concept of Archimedes' principle.
24. Define the concept of Bernoulli's Equation.
25. Define the concept of the temperature
26. Differentiate between the Celsius Scale and Fahrenheit scale of temperature.
27. Define the laws of reflection through plane mirrors and spherical mirrors.
28. Define the laws of refraction through thin lenses.
29. Apply the laws of thin lenses.

In addition to these items, the students should gain practical skills through performance some experimental class.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

The course will cover the principle of physics, such as measurements, work and energy, Newton's laws, heat, fluid mechanics, and light. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

1 Topics to be Covered

Topics	No of Weeks	Contact hours
❖ **Measurement** 1- The physical quantities, standards, and Units. 2- The international system of units. 3- The Standard of time 4- The Standard of length 5- The Standard of Mass 6- Precision and significant figures. 7- Dimensional analysis.	1	3
❖ **Vectors** 1- Vectors and Scalars. 2- Adding vectors : graphical methods 3- Components of vectors. 4- Adding vector: component method. 5- Multiplications of vectors. 6- Vector laws in physics.	2	6
❖ **Motion in one dimension** 1- Particles kinematics. 2- Description of motion 3- Average velocity 4- Instantaneous velocity. 5- Accelerated motion. 6- Motion with Constant Acceleration 7- Freely falling Bodies. 8- Measuring free fall acceleration.	1	3

❖ **Motion in two and three dimensions** 1- Position, velocity, and acceleration. 2- Motion with constant acceleration 3- Projectile motion 4- Uniform circular motion 5- Velocity and acceleration vectors in circular motion	**1**	**3**
❖ **Force and motion** 1- Position, velocity, and accelerations 2- Motion with constant acceleration. . 3- Newtons first and second laws. 4- Forces. 5- Newtons second law 6- Newton's third law. 7- Units of force 8- Weight and mass 9- Measuring forces 10- Applying Newton's laws.	**2**	**6**
❖ **Work and Energy** 1. Work done by constant force. 2. Work done by a variable force: one dimensional case. 3. Work done by a variable force: two dimensional case. 4. Kinetic energy and work-energy theory. 5. Power.	**1**	**3**
❖ **Fluids Statics** 1. Fluids and Solids 2. Density and pressure. 3. Variation of density in a fluid at rest. 4. Pascal Principle. 5. Archimedes' Principle. 6. Surface tension.	**1**	**3**
❖ **Fluid dynamics** 1. General concepts of fluid flow 2. Streamlines and the equation of continuity. 3. Bernoulli's Equation 4. Application of Bernoulli's Equation 5. Viscosity.	**1**	**3**

❖ **Temperature, Heat and the first law of Thermodynamics.** 1. Heat: Energy in transit 2. Heat capacity and specific heat. 3. Heat capacity of solids 4. Temperature. 5. The Celsius and Fahrenheit Scales. 6. Heat transfer.	**2**	**6**
❖ **Reflection and refraction of light at plane surface** 1. Reflection and Refraction 2. Deriving the law of refrlection 3. Image formation by plane mirrors. 4. Deriving the law of refraction. 5. Total internal reflection.	**1**	**3**
❖ **Reflection and refraction of light at plane surface** 1. Spherical mirrors 2. Spherical refracting surfaces. 3. Thin lenses 4. Compound optical systems 5. Optical instruments	**1**	**3**
❖ **Exercises and Solved problems**	**1**	**3**
	15 weeks	**45hrs**

2 Course components (total contact hours per semester):			
Lecture : 45	Tutorial:	Practical: 42	Other:

Practical part:

1. Safety and Security at the lab.
1. Introduction.
2. Precise measurements.
3. Vectors.
4. Determination of specific gravity.

5. Determination of Surface tension of a liquid.
6. Determination of viscosity of a liquid.
7. Determination of refractive index of a Prism.
8. Determination of the melting point of wax.
9. Verification of lens formula.
10. Verification of mirrors formula.
11. Determination of specific heat.

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): **6 Office hours to help students for solving assigned problems**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

a. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

1- **Understanding the principle and concepts of physics.**
2- **Applying the physics law to different environmental situation.**
3- **Improving logical thinking.**
4- **Using mathematical formulation to describe the physical principle or phenomena**
5- **Ability to explain how things are working.**
6- **Teaching strategies to be used to develop that knowledge**
7- Demonstrating the basic information and principles through lectures and the achieved applications
8- Discussing phenomena with illustrating pictures and diagrams
9- Lecturing method:

a. Blackboard
b. Power point
c. e-learning

10- Tutorials
11- Revisit concepts
12- Discussions
13- Brain storming sessions
14- **Start each chapter by general idea and the benefit of it;**
15- **Learn the student background of the subject;**
16- **Show the best ways to deal with problem;**
17- **Keep the question "why" or "how" to explain always there**

Build a strategy to solve problem.

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important physics law in different applications.
- At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using images and movies
- Encouraging students to collect the new information about what the new in Physics.
- Enable the reference books and scientific sites concerning Physics in internet.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Exams:
  - Quizzes
  - Short exams (mid term exams)
  - Long exams (final)
  - Homework.
  - Activities.
- Discussions with the students.
- Ask the student to clear the misunderstanding of some physical principle.
- **Ask quality question.**

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

1- **Define the physical phenomena.**
2- **Apply the laws of physics.**
3- **Analyse the physical phenomena.**
4- **Express the physical phenomena mathematically.**
5- **Doing small researches**

(ii) Teaching strategies to be used to develop these cognitive skills:

1- Preparing main outlines for teaching
2- Following some proofs
3- **Define duties for each chapter**
4- Home work assignments
5- **Encourage the student to look for the information in different references**
6- **Ask the student to attend lectures for practice solving problem**

(iii) Methods of assessment of students cognitive skills

1- Midterm's exam. Exams, short quizzes
2- Asking about physical laws previously taught
3- Writing reports on selected parts of the course
4- **Discussions of how to simplify or analyze some phenomena**

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Work independently.
- The students learn independently and take up responsibility.

(i) Teaching strategies to be used to develop these skills and abilities

1- Search through the internet and use the library.
2- Lab work.
3- Case Study.
4- Small group discussion.
5- Enhance educational skills.
6- Develop their interest in Science through :(lab work, field trips, visits to

scientific and research.

7- Encourage the student to attend lectures regularly

8- Give students tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

1. Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

1. Enhancing the ability of students to use computers and internet.
2. Interpret Physical phenomena.
3. Present Physical phenomena orally.
4. Know how to write a report.
5. Computation
6. Problem solving
7. Data analysis and interpretation.
8. Feeling physical reality of results

2. Teaching strategies to be used to develop these skills

1. **Homework (preparing a report on some topics related to the course depending on web sites).**
2. **Seminars presentation**
3. **Field visits**

(iii) Methods of assessment of students numerical and communication skills

1. **Evaluation of presentations**
2. **Evaluation of reports**
3. **Practical exam**
4. Homework.
5. Final exams.
6. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

1. Perform the experiments with high accuracy.
2. Operate instruments safely.
3. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

4. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Written Test (1)	6th week	10%
4	Written Test (2)	11th week	10%
5	Final Exam (Practical)	15th week	20%
6	Final Exam (theoretical)	16th week	40%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week) Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s): - Physics, 4th edition , By: Halliday, Resnick, and Krane, Wiley (1992) **Recommended Reading List** University Physics with modern Physics, 13th edition, by: Hugh D. Young and Roger A. Freedman, Addison-Wesley, (2012). **Electronic Materials, Web Sites** (eg. www.youtube.com.) **Other learning material such as computer-based programs/CD, professional standards/regulations**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
- Library
- Laboratory for fundamental of physics

2. Computing resources

- Computer room
- Scientific calculator.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- .

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **General Physics (2)**

Course code: **4032102-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

3. Course title General Physics (2) 4. Course code: 4032102			
2. Credit hours: 4hrs			
3. Program(s) in which the course is offered. : BSc Physics			
5. Name of faculty member responsible for the course: One of the academic staff member			
5. Level/year at which this course is offered: 1st Year / Level 2			
6. Pre-requisites for this course (if any): General physics 4031101-4			
7. Co-requisites for this course (if any): ---			
8. Location if not on main campus: Main campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	

c. e-learning	What percentage?
d. correspondence	What percentage?
f. other	What percentage?
	Comments:

B Objectives

After completing this course student should be able to:

1- Identify that a force is a vector quantity and thus has both magnitude and direction and also components.
2- Given two or more forces acting on the same particle, add the forces as vectors to get the net force.
3- Identify Newton's first and second laws of motion.
4- Identify inertial reference frames.
5- Sketch a free-body diagram for an object, showing the object as a particle and drawing the forces acting on it as vectors with their tails anchored on the particle.
6- Apply the relationship (Newton's second law) between the net force on an object, the mass of the object, and the acceleration produced by the net force.
7- Distinguish between friction in a static situation and a kinetic situation.
8- Determine direction and magnitude of a frictional force for objects on horizontal, vertical, or inclined planes in situations involving friction, draw free-body diagrams and apply Newton's second law.
9- Distinguish a conservative force from a nonconservative force.
10- For a particle moving between two points, identify that the work done by a conservative force does not depend on which path the particle takes.
11- Calculate the gravitational potential energy of a particle (or, more properly, a particle–Earth system).
12- Calculate the elastic potential energy of a block–spring system.
13- Locate the center of mass of an extended, symmetric object by using the symmetry.
14- For a two-dimensional or three-dimensional extended object with a uniform distribution of mass, determine the center of mass.
15- Identify that if all parts of a body rotate around a fixed axis locked together, the body is a rigid body. (This chapter is about the motion of such bodies.)
16- Identify that the angular position of a rotating rigid body is the angle that an internal reference line makes with a fixed, external reference line.
17- Identify that counterclockwise motion is in the positive direction and clockwise motion is in the negative direction.
18- Identify instantaneous angular speed as the magnitude of the instantaneous angular velocity
19- Identify that smooth rolling can be considered as a combination of pure translation and pure rotation.
20- Apply the relationship between the center-of-mass speed and the angular speed of a body in smooth rolling.
21- Distinguish between equilibrium and static equilibrium
22- Identify that a uniform spherical shell of matter attracts a particle that is outside the shell as if all the shell's mass were concentrated as a particle at its center.

23- Distinguish fluids from solids.
24- Apply the relationship between hydrostatic pressure, force, and the surface area over which that force acts.
25- Distinguish simple harmonic motion from other types of periodic motion.
26- Identify the phase constant f that corresponds to the starting time being set when a particle in SHM is at an extreme point or passing through the center point.
27- Identify that for a simple harmonic oscillator the acceleration a at any instant is always given by the product of a negative constant and the displacement x just then.
28- Identify the three main types of waves.
29- Distinguish between transverse waves and longitudinal waves.
30- Describe the effect on a transverse wave of changing phase constant.
31- Distinguish between a longitudinal wave and a transverse wave.
32- Explain wave fronts and rays.
33- Apply the relationship between the speed of sound, the distance traveled by a sound wave, and the time requiredto travel that distance.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

The course will cover the principle of physics, such as measurements, work and energy, Newton's laws, heat, fluid mechanics, and light. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

Topics to be Covered :		
Topics	**No of Weeks**	**Contact hours**
❖ Particle dynamics 1- Force laws. 2- Frictional Forces. 3- The Dynamics of uniform Circular motion 4- Equation of motion: constant and non-constant forces. 5- Time-dependent forces; analytical methods 6- Time-dependent forces: numerical methods. 7- Drag forces and the motion of projectiles. 8- Limitation of newton's law.	1	3
❖ Conservation of energy 9- Conservative force. 10- Potential energy. 11- One dimensional conservative systems. 12- Two-and three-dimensional conservative systems. 13- Conservation of energy of a system of particles. 14- Mass and energy. 15- Quantization of energy.	1	3
❖ System of particles 7- Two particle system 8- Many particle system 9- Center of mass of solid objects 10- Linear momentum of system of particles. 11- Conservation of linear momentum 12- Work and energy in system of particles 13- Systems of variable mass.	1	3

❖ Collisions 1- What is collisions? 2- Impulse and momentum. 3- Conservation of momentum during collision. 4- Collisions in one dimension. 5- Two dimensional collisions. 6- Center of mass reference frame. 7- Spontaneous decay process. .	1	3
❖ Rotational Kinematics 1- Rotational motion. 2- Rotation variables. 3- Rotation with constant angular acceleration. 4- Rotational quantities as vectors. 5- Relationship between linear and angular variables: scalar form. 6- Relationship between linear and angular variables: vector form.	1.33	4
❖ Rotational dynamics 6. Rotational dynamics 7. Kinetic energy of rotation and rotational inertia. 8. Rotational inertia of solid bodies 9. Rotational dynamics of rigid body 10. Combined rotational and translational motion.	1	3
❖ Angular momentum 1- Angular momentum of a particle 2- System of particles 3- Angular momentum and angular velocity 4- Conservation of angular momentum 5- The spinning top. 6- Quantization of angular momentum.	1	3
❖ Equilibrium of Rigid bodies 1- Condition of equilibrium. 2- Center of Gravity. 3- Examples of equilibrium. 4- Stable, unstable, and Neutral equilibrium or rigid bodies in a gravitational field. 5- Elasticity.	1	3

❖ Gravitation 7. Gravitation from the Ancients to Kepler. 8. Newton and the law of universal gravitation. 9. The gravitation constant G 10. Gravity near the Earth's surface. 11. Gravitational Effect of a spherical distribution of matter 12. Gravitational potential energy 13. The gravitational field and potentials 14. The motions of planets and satellites 15. Universal gravitation. .	**1.33**	**4**
❖ Oscillations. 7. Oscillating systems. 8. The simple harmonic oscillator. 9. Simple harmonic motion 10. Energy considerations in simple harmonic motion. 11. Applications of simple harmonic motion 12. Simple harmonic motion and uniform circular motion. 13. Combinations of harmonic motions 14. Damped harmonic motions 15. Forced harmonic motions. .	**1.33**	**4**
❖ Wave Motion 6. Mechanical waves. 7. Types of waves. 8. Traveling waves. 9. Wave speed 10. The wave equation 11. Power and intensity in wave motion 12. The principle of superposition 13. Interference of waves 14. Standing wave. 15. Resonance.	**1**	**3**
❖ Sound Wave 1. The speed of sound. 2. Traveling longitudinal waves. 3. Power and intensity of sound waves. 4. Standing longitudinal waves. 5. Vibrating systems and sources of sound. 6. Beats 7. The Doppler effect.	**1**	**3**

❖ Solved problems	2	6
	15 weeks	45hrs

2 Course components (total contact hours per semester):			
Lecture : 45	Tutorial:	Practical: 42	Other:

Practical part:

1. Safety and Security at the lab.
2. Introduction.
3. Simple Pendulum.
4. Torque pendulum
5. Verification of Hook's law.
6. Moment of inertia of rigid body.
7. Projectiles
8. Determination of sound velocity in air.

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): **6 Office hours to help students for solving assigned problems**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

b. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

18- **Understanding the principle and concepts of physics.**
19- **Applying the physics law to different environmental situation.**
20- **Improving logical thinking.**
21- **Using mathematical formulation to describe the physical principle or phenomena**
22- **Ability to explain how things are working.**
23- **Teaching strategies to be used to develop that knowledge**
24- Demonstrating the basic information and principles through lectures and the achieved applications
25- Discussing phenomena with illustrating pictures and diagrams
26- Lecturing method:
   a. Blackboard
   b. Power point
   c. e-learning
27- Tutorials
28- Revisit concepts
29- Discussions
30- Brain storming sessions
31- **Start each chapter by general idea and the benefit of it;**
32- **Learn the student background of the subject;**
33- **Show the best ways to deal with problem;**
34- **Keep the question "why" or "how" to explain always there**

Build a strategy to solve problem.

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important microorganisms in different applications and human service.
- At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using images and movies
- Encouraging students to collect the new information about what the new in Microbiology
- Enable the reference books and scientific sites concerning bacteriology in internet.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Exams**:**
  - Quizzes
  - Short exams (mid term exams)
  - Long exams (final)
  - Homework.
  - Activities.
- Discussions with the students.
- Ask the student to clear the misunderstanding of some physical principle.
- **Ask quality question.**

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

6- **Define the physical phenomena.**
7- **Apply the laws of physics.**
8- **Analyse the physical phenomena.**
9- **Express the physical phenomena mathematically.**
10- **Doing small researches**

(ii) Teaching strategies to be used to develop these cognitive skills:

- Lectures
-Brain storming
-Discussion

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Work independently.
- The students learn independently and take up responsibility.

(ii) Teaching strategies to be used to develop these skills and abilities

- Lab work
- Case Study
- Active learning
- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

3. Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

9. Enhancing the ability of students to use computers and internet.
10. Interpret Physical phenomena.
11. Present Physical phenomena orally.
12. Know how to write a report.
13. Computation
14. Problem solving
15. Data analysis and interpretation.
16. Feeling physical reality of results

4. Teaching strategies to be used to develop these skills

5. **Homework (preparing a report on some topics related to the course depending on web sites).**

6. **Seminars presentation**

7. **Field visits**

(iii) Methods of assessment of students numerical and communication skills

7. **Evaluation of presentations**

8. **Evaluation of reports**

9. **Practical exam**

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

4. Perform the experiments with high accuracy.
5. Operate instruments safely.
6. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

8. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Written Test (1)	6^{th} week	10%
4	Written Test (2)	11^{th} week	10%
5	Final Exam (Practical)	15^{th} week	20%
6	Final Exam (theoretical)	16^{th} week	40%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

Physics, 4^{th} edition , By: Halliday, Resnick, and Krane, Wiley (1992)

Recommended Reading List

- University Physics with modern Physics, 13th edition, by: Hugh D. Young and Roger A. Freedman, Addison-Wesley, (2012).

Electronic Materials, Web Sites

(eg. www.youtube.com.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
- Library
- Laboratory for fundamental of physics

2. Computing resources

- Computer room
- Scientific calculator.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- .

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching
• Questionaries • Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department
• Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching
• Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)
• After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.
• Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Electricity and Magnetism**

Course code: **4-4032121**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

1. Course title **Electricity and Magnetism** 2. Course code: **4-4032121**	
2. Credit hours: 4hrs	
3. Program(s) in which the course is offered. : BSc Physics	
6. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 2nd Year / Level 3	
6. Pre-requisites for this course (if any): General physics 4031101-4	
7. Co-requisites for this course (if any): ---	
8. Location if not on main campus: Main campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning — What percentage?

d. correspondence — What percentage?

f. other — What percentage?

Comments:

B Objectives

Upon completion of this course the student will be able to:

1. Provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force),
2. Identify that at every point in the space surrounding a charged particle, the particle sets up an electric field , which is a vector quantity and thus has both magnitude and direction.
3. Identify how an electric field can be used to explain how a charged particle can exert an electrostatic force on a second charged particle even though there is no contact between the particles.
4. Explain how a small positive test charge is used (in principle) to measure the electric field at any given point.
5. Define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy.
6. Define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's laws, and RC charging and decay circuits.
7. Calculate the potential difference between any two points in a circuit.
8. Distinguish a real battery from an ideal battery and, in a circuit diagram, replace a real battery with an ideal battery and an explicitly shown resistance.
9. Calculate the net rate of energy transfer in a real battery for current in the direction of the emf and in the opposite direction.
10. Define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole.
11. Calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law, and state the limitations of Ampere's Law.
12. State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.
13. Calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields.

In addition to these items, the students should gain practical skills through performance some experimental class.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

1 Topics to be Covered

Topics	No of Weeks	Contact hours

Electric charge and Coulomb's law 1- Introduction. 2- Electric Charge 3- Conductors and Insulators 4- Coulomb's law 5- Charge is Quantized 6- Charge is Conserved	1	3
The Electric Field 1- Fields. 2- The Electric Field E 3- The Electric Field of a Point Charges and Lines of Force 4- The Electric Field of Continuous Charge Distributions 5- A Point Charge in an Electric Field 6- A Dipole in an Electric Field	1	3
❖ **Gauss Law** 1- IntroductionThe flux of a Vector Field 2- The Flux of the Electric Field 3- Gauss law 4- A Charged Insolated Conductor 5- Applications of Gauss law 6- Experimental Tests of Gauss law and Coulomb law	1	3
❖ **Electric Potential** 1- Electrostatic and Gravitational Forces 2- Electrical Potential Energy 3- Electric Potential 4- Calculating the Potential from the Field 5- Potential due to Point Charge 6- Potential due to a Collection of Point Charges 7- The Electric Potential of Continuous Charge distribution 8- Equipotential Surfaces 9- Calculating the Field from the Potential 10- An Insulated Conductor	2	6

Capacitors and dielectrics 1- Capacitance 2- Calculating the Capacitance 3- Capacitors in Series and Parallel 4- Energy Storage in an Electric Field 5- Capacitor with Dielectric 6- Dielectrics: an Atomic View 7- Dielectrics and Gauss law	1.5	5
Current and Resistance 1. Electric Current 2. Current Denstiy 3. Resistance, Resistivity, and Conductivity 4. Ohm's law 5. Ohm's law: A Microscopic View 6. Energy Transfers in an Electric Circuit	1.5	5
DC Circuits 1. Electromotive Force 2. Calculating the Current in a Single Loop 3. Potential Differences 4. Resistors in Series and Parallel 5. Multiloop Circuits 6. RC Circuits	1.5	5
The Magnetic Field 1. The Magnetic Field B 2. The Magnetic Force on a Moving Charge 3. Circulating Charges 4. The Hall Effect. 5. The Magnetic Force on a Current 6. Torque on a Current LoopThe Magnetic Force on a Current 7. The Magnetic Dipole	2	6
Ampere's Law 1. The Biot-Savart Law. 2. Applications of the Biot-Savart Law 3. Lines of Magnetic Field 4. Two Parallel Conductors 5. Ampere's Law 6. Solenoids and Toroids.	2	6

	14 weeks	**42hrs**

2 Course components (total contact hours per semester):			
Lecture : 42	Tutorial:	Practical: 42	Other:

Practical part:

1. Safety and Security at the lab.
2. Introduction.
3. Determining the capacitance of a capacitor / connecting capacitors in series and in parallel
4. Studying Ohm's Law / connecting two resistors in series and in parallel
5. Determining the time constant of an RC circuit
6. Kirchhoff's Rules (The Junction Rule and The Loop Rule)

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): **6 Office hours to help students for solving assigned problems**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

A brief summary of the knowledge or skill the course is intended to develop;

A description of the teaching strategies to be used in the course to develop that knowledge or skill;

The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

a. **Knowledge :** Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

Understanding the principle and concepts of physics.

Applying the physics law to different environmental situation.

Improving logical thinking.

Using mathematical formulation to describe the physical principle or phenomena

Ability to explain how things are working.

Teaching strategies to be used to develop that knowledge

1- Demonstrating the basic information and principles through lectures and the achieved applications
2- Discussing phenomena with illustrating pictures and diagrams
3- Lecturing method:
   a. Blackboard
   b. Power point
   c. e-learning
4- Tutorials
5- Revisit concepts
6- Discussions
7- Brain storming sessions

Start each chapter by general idea and the benefit of it;

Learn the student background of the subject;

Show the best ways to deal with problem;

Keep the question "why" or "how" to explain always there

Build a strategy to solve problem.

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important physics law in different applications.

- At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using images and movies
- Encouraging students to collect the new information about what the new in Physics.
- Enable the reference books and scientific sites concerning Physics in internet.

(iii) Methods of assessment of knowledge acquired:

- Solve some example during the lecture.
- Exams:
  - Quizzes
  - Short exams (mid term exams)
  - Long exams (final)
  - Homework.
  - Activities.
- Discussions with the students.
- Ask the student to clear the misunderstanding of some physical principle.

Ask quality question.

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

Define the physical phenomena.
Apply the laws of physics.
Analyse the physical phenomena.
Express the physical phenomena mathematically.
Doing small researches

(ii) Teaching strategies to be used to develop these cognitive skills:

Preparing main outlines for teaching

Following some proofs

3- Define duties for each chapter

Home work assignments

Encourage the student to look for the information in different references
Ask the student to attend lectures for practice solving problem

(iii) Methods of assessment of students cognitive skills

1- Midterm's exam. Exams, short quizzes
2- Asking about physical laws previously taught
3- Writing reports on selected parts of the course

Discussions of how to simplify or analyze some phenomena

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Work independently.
- The students learn independently and take up responsibility.

Teaching strategies to be used to develop these skills and abilities

1- Search through the internet and use the library.
2- Lab work.
3- Case Study.
4- Small group discussion.
5- Enhance educational skills.
6- Develop their interest in Science through :(lab work, field trips, visits to scientific and research.
7- Encourage the student to attend lectures regularly
8- Give students tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

1. Enhancing the ability of students to use computers and internet.
2. Interpret Physical phenomena.
3. Present Physical phenomena orally.
4. Know how to write a report.
5. Computation

6. Problem solving
7. Data analysis and interpretation.
8. Feeling physical reality of results

Teaching strategies to be used to develop these skills

Homework (preparing a report on some topics related to the course depending on web sites).

Seminars presentation

Field visits

(iii) Methods of assessment of students numerical and communication skills

Evaluation of presentations

Evaluation of reports

Practical exam

1. Homework.
2. Final exams.
3. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

7. Perform the experiments with high accuracy.
8. Operate instruments safely.
9. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

9. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

5. Schedule of Assessment Tasks for Students During the Semester

Assessment task (e.g. essay, test, group project, examination, speech,	Week Due	Proportion of Total Assessment

	oral presentation, etc.)		
1	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Written Test (1)	6th week	10%
4	Written Test (2)	11th week	10%
5	Final Exam (Practical)	15th week	20%
6	Final Exam (theoretical)	16th week	40%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

-

Physics, 4th edition , By: Halliday, Resnick, and Krane, Wiley (1992)

Recommended Reading List

University Physics with modern Physics, 13th edition, by: Hugh D. Young and Roger A. Freedman, Addison-Wesley, (2012).

Electronic Materials, Web Sites

(eg. www.youtube.com.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
- Library
- Laboratory for fundamental of physics

2. Computing resources

- Computer room
- Scientific calculator.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- .

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- After the agreement of Department and Faculty administrations

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Theoretical Methods in Physics (1)**

Course code: **4032141-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

5. Course title Theoretical Methods in Physics (1) 6. Course code: 4032141-4	
2. Credit hours: 4hrs	
3. Program(s) in which the course is offered. : BSc Physics	
7. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 2nd Year / Level 4	
6. Pre-requisites for this course (if any): Differentiation and Integration (2) (4042501-4)	
7. Co-requisites for this course (if any): ---	
8. Location if not on main campus: Main campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

1. Manipulate vectors and perform algebraic operators on them.
2. Deal with infinite series and test convergence.
3. Use Fourier series for expansion of periodic functions in terms of an infinite sum of sines and cosines.
4. Perform partial differentiation and use ordinary differential equations in physics problems.
5. Solve homogeneous and nonhomogeneous second order differential equations.
6. Use Laplace transform and calculate solution of differential equations by Laplace transform.
7. Deal with Fourier transform, Dirac-Delta, and Green's functions and their applications in physics.
8. Develop an intuitive feeling for the precise mathematical formulation of physical problems and for the physical interpretation of the mathematical solutions.
9. Be familiar with the mathematical formulae of this course that frequently appear in physics problems.
10. Use computer to verify the solution of some physical problems.
11. Use computer to construct graphs of some functions.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

The course provides a direct preparation for an advanced study in theoretical physics and is also an interesting element in the education of an experimental physicist. The physical principles behind the mathematical models are stressed so that insight and problem solving ability become primary. This course together with phys 403342-4 will cover the basic mathematical tools used in physical science and engineering: Vector analysis, partial differentiation, power and series, differential equations, special functions, integral transforms, and complex analysis. The course is designed to supply students for a variety of mathematical methods that need for advanced undergraduate and beginning graduate study in physical science and to develop a solid background for those who will continue into the mathematics of advanced theoretical physics.

Topic	No of Weeks	Contact hours
❖ **Vector Analysis & Curvilinear Coordinates:** Triple (Scalar-Vector) products- Differentiation of vectors- grad, Div, Curl and Laplace's operator, Vector integral- Green's, Gauss' and Stokes theorems, General curvilinear coordinates-vector operators in orthogonal curvilinear coordinates.	**2.5**	**10**
❖ **Infinite series, Power series:** Geometric series, testing series for convergence, Alternating series, interval of convergence- expanding functions in power series, Taylor and Maclaurin expansions, Solving Problems about Series	**2**	**8**
Fist periodic exam		
❖ **Partial Differentiation:** Total differentials- Approximating using differentials, chain rule Implicit differentiation, Application to Maximum and Minimum problems, Lagrange Multipliers, Change of Variables, Differentiation of Integrals.	**2.5**	**10**
❖ **Fourier series and transforms:** Simple Harmonic Motion and Wave Motion; Periodic Functions, Average Value of a Function, Fourier Coefficients, Complex Form of Fourier Series, Even and Odd Functions, Applications of Fourier Series, Fourier Transforms.	**2**	**8**
Second periodic exam		
❖ **Ordinary differential equations:** First order differential equations; separable differential equations, linear 1st order equations, 2^{nt} order differential equations; Homogeneous differential equations, Non-homogeneous differential equations.	**3**	**12**
❖ **Solution of Differential Equations by Laplace Transforms:** The Laplace Transform, Convolution, The Dirac Delta Function, A Brief Introduction to Green Functions.	**2**	**8**
Final periodic exam		

	14	56

2 Course components (total contact hours per semester):			
Lecture : 56	Tutorial:	Practical:	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay)

This actually depends on the student's level, study skills and habits, but in general four hours per week are sufficient.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned;**

c. Knowledge : Description of the knowledge to be acquired

1. Learning fundamentals of Mathematical Physics.
2. Understand how to use mathematics as a tool for physics.
3. Understand how to translate a physical problem in mathematical form.
4. Ability to solve Physical problems analytically in an efficient way.
5. Improving the logical thinking.
6. Developing the learning skills of the students in using computers as an educational tool, problem solving and demonstration.

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions.
- Starting each Chapter by general idea and the benefit of the Mathematical tool.
- Solving examples during the lecture time.
- Show the best ways to deal with the problem.
- Build a problem solving strategy.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using computer simulations.
- Enable reference books and scientific websites concerning Theoretical Methods in Physics.

(iii) Methods of assessment of knowledge acquired:

- Online Quizzes 10%
- Homework 10%
- Interactive discussions 10%
- Mid term exam 1: 20%
- Mid term exam 2: 20%
- Final exam: 30%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

1. Develop analytic skills.
2. Develop problem-solving skills.
3. Develop ability to think creatively.
4. Improve memory skills.
5. Improve mathematical skills.
6. Analyse and explain natural physical problem.

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Develop ability to synthesize and integrate information.
2. Encourage the students to use different learning resources.
3. Writing the final answer in concise form when possible.
4. Writing an equation/physical law in wards.
5. Using shortest way to reach the final answer.
6. Using appropriate symbols that can be easily memorized.
7. Discussions of how to simplify or analyse physical problem.

(iii) Methods of assessment of students cognitive skills

1. Oral questions.
2. Presentations.
3. Term paper.
4. Online Quizzes.
5. Problem solving.

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

1. Develop ability to work independently.
2. Develop ability to work productively with others.
3. Improve self-esteem.
4. Develop leadership skills.

(iii) Teaching strategies to be used to develop these skills and abilities

1. Homework assignment for each group of the students.
2. Homework assignments that should be worked out independently.
3. Cooperative learning.
4. Microteaching.
5. Search through the internet and use the library.
6. Develop their interest in Science through :(lab work, field trips, visits to scientific and research.

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

1. Marking the home works.
2. Working closely with the different groups.
3. Evaluate the efforts of each student in preparing the report.
4. Evaluate the scientific values of reports.
5. Evaluate the work in team
6. Evaluation of the role of each student in lab group assignment
7. Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain At the end of the course, the student will be able to:

1. Enhancing the ability of students to use computers and internet.
2. Present Physical phenomena orally.
3. Know how to write a report.
4. Feeling physical reality of results.
5. Perform effective communication with colleagues and faculty members.
6. Ability to use programs designed for numerical computation.
7. Problem solving and ability to interpret the results.

(ii) Teaching strategies to be used to develop these skills

10. **Homework (preparing a report on some topics related to the course depending on web sites).**
11. **Seminars presentation.**
12. **Field visits to factories.**
13. **Additional lectures on numerical techniques.**
14. **Exposing the students to problems that can only be solved numerically.**

(iii) Methods of assessment of students numerical and communication skills

1. **Give the students homework assignments on problems that can be solved numerically.**
2. **Ask the students to search the internet for the solution of a specific problem.**
3. Using the computer to construct three dimensional graphs.
4. Evaluation of presentations and reports.

e. Psychomotor Skills (if applicable)

(i) Teaching strategies to be used to develop these skills

(iv) Methods of assessment of students psychomotor skills

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	Online quizzes	All weeks	10%
1	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Written Test (1)	6^{th} week	20%
4	Written Test (2)	11^{th} week	20%
5	Final Exam (theoretical)	16^{th} week	30%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and

academic advice. (include amount of time faculty are available each week).

2. Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

1. Mary L. Boas, Mathematical methods in the Physical sciences, third edition, John Wiley and Sons (2006), ISBN-13 978-0-471-19826-0.
2. George B. Arfken, Hans J. Weber and Frank E. Harris, Mathematical Methods for Physicists (Seventh Edition), Elsevier (2012), ISBN: 978-0-12-384654-9.
3. G. Dennis Zill, R. Michael Cullen, Advanced engineering mathematics, Jones and Bartlett Publisher (2006), ISBN 9780763745912.
4. Eugene Butkov, Mathematical Physics, World student series edition (1973).
5. S. Grossman, Elementary Linear Algebra, 6th edition, Wadsworth (2006).

Recommended Reading List

Electronic Materials, Web Sites

(E-learning gate of Umm Al-Qura university, etc.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

9- Class room is already provided with data show
10- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
11- Library
12- Laboratory for fundamental of physics.

2. Computing resources

7. Computer room
8. MATLAB software.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries using e-learning gate of Umm Al-Qura university.
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

COURSE SPECIFICATION

Course title: Optics 4032131-4

Academic Year 1436\1437H

Revised in 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: ***Umm AL-Qura University***
College/Department: ***College of Applied Sciences / Physics Department***

A Course Identification and General Information

1. Course title and code: *Optics 4032131*	
2. Credit hours: *4 cr. Hr (3 contact hrs + Lab)*	
3. Program(s) in which the course is offered. (If general elective available in many programs indicate this rather than list programs) *B.Sc Degree in Physics*	
4. Name of faculty member responsible for the course **One of the academic staff member**	
5. Level/year at which this course is offered: *Second year/ Fourth semester*	
6. Pre-requisites for this course (if any): ***4032102***	
7. Co-requisites for this course (if any)	
8. Location if not on main campus ***Within The University Campus***	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	**What percentage?** 100%
b. blended (traditional and online)	**What percentage?**

c. e-learning ☐	What percentage? ☐
d. correspondence ☐	What percentage? ☐
f. other ☐	What percentage? ☐
	Comments:

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course

The physical optics science considered one of the most important fields in experimental and theoretical physics.

The objectives of this course are to through light on nature of light. And also throw light on different phenomena like interference, diffraction, polarization and their application in life.

The benchmark statement of the main learning outcomes are as follows:

1. To understand basic Fundamentals of physical optics and its relation with basic science and modern technology.

2. The students should be trained on physical and generic skills (knowledge – cognitive – interpersonal – communication – problem solving – information technology)

3. To describe, in words, the ways in which various concepts in optics come into play in particular situations; to represent these optical phenomena and its fields mathematically in those situations; and also to predict outcomes in other similar situations.

4. The day life applications in the domain of this course.

5. To analyze optical systems using a required basics

6- Cooperate with different institution to find how they deal with the subject.

7- Renew the course references frequently.

8- Frequently check for the latest discovery in science

The main goal of this course is to use the scientific methods to understand the individual points of the course and its relation with the applied technology surrounding him.

2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)

1. Explain strategy of the course in the beginning of the semester
2. Outlines of the physical laws, principles and the associated proofs.
3. Highlighting the day life applications whenever exist.
4. Encourage the students to see more details in the international web sites and reference books in the library.
5- Encourage the student to build an example of different experiments related to course and comparing it with experiments in the lab.
6- Cooperate with different institution to find how they deal with the subject.
7- Renew the course references frequently.
8- *Frequently check for the latest discovery in science*

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered

Topic	Contact hours	No of Weeks
Aberrations - Types of aberrations - Correction of aberrations	**6**	**2**
Interference - Young double slit - Double beam experiments - General conditions of interference - Superposition - Michelson interferometer - Plane parallel plates - Fabry - Perot interferometer - Newtons rings	**9**	**3**

Fourier analysis for physical optics - **Fraunhofer diffraction** - Fraunhofer diffraction by a single slit (by integration methods) - Diffraction maxima and half width for single slit - Fraunhofer diffraction by circular slit (by integration methods) - Airy disk - Rayleigh`s criterion - **Fresnel diffraction** - Fresnel integrals (by integration methods) - Cornu spiral - Fresnel diffraction on single slit - Huygens principle	**6**	**2**
Diffraction grating - One dimension gratings - Grating equation - Angular dispersion - Chromatic resolving power - Two dimension grating - X ray diffraction - Braggs law	**6**	**2**
Fourier optics - Basic rules for Fourier transform - Spatial filtering - Diffraction theory of image formation in the microscope - Optical image processing	**6**	**2**
Polarization - Types of polarized light - Production of polarized - Optical active phenomena - Polarization caused by electric and magnetic fields	**6**	**2**

2 Course components (total contact hours per semester):			
Lecture: 39 hr	**Tutorial:** hr	Practical/**Fieldwork/Internship:** 30 hr	Other: Office hours : **39 hr**

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

4. Development of Learning Outcomes in Domains of Learning **For each of the domains of learning shown below indicate:** • A brief summary of the knowledge or skill the course is intended to develop; • A description of the teaching strategies to be used in the course to develop that knowledge or skills • The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.
a. Knowledge
(i) Description of the knowledge to be acquired *Knowledge that students should know and understand when they complete the course is as follow:* * *Learning basic fundamentals in physical optics.* * *Understanding the physics of superposition of waves, interference, diffraction, and polarization* * *Using mathematical formula to describe the physical principle of diffraction and its relation with Fourier transform* * Capable of correcting the different types of lens aberrations. * Classifying the different types of interference techniques.

(ii) Teaching strategies to be used to develop that knowledge

1.Demonstrating the basic information and principles through lectures and the achieved applications
2. Discussing phenomena with illustrating pictures and diagrams
3. Lecturing method:
- *a. board*
- *b. Power point*
- *c. e learning*

4. Tutorials
5. Experimental learning
6. Discussions
7. Brain storming
8. Start each chapter by general idea and the benefit of it
9. To improve the student background of the subject
10. Show the best ways to deal with problem
11. Solving problems
12 Encourage the concept of team work
13- Logical thinking.
14- Active teaching
15- Self learning

(iii) Methods of assessment of knowledge acquired

1. Solve some example during the lecture.
***2.** Exams:*
- *a) Quizzes*
- *b) Short exams (mid- term exams)*
- *c) Long exams (final)*
- *d) Oral exams*
- *f) online quizzes*

3. Discussions during the lectures.
4. Ask the student to clear the misunderstanding of some physical principle and asking about quality question.
5- Home work
6- Writing scientific paper
7- Doing team research or team project
8- Reports

b. Cognitive Skills

(i) Cognitive skills to be developed

1. Flexibility skills
2. Elaborating information skill
3.Accessing information skill
4. Note taking skill
5. Drawing conclusion skill
6. The skill of determining cause- effect relationship
7. The skill of generation and testing hypnoses
8. Inferring skill
9. Evaluating evidence skill
10. Managing attention skill
11. Problem solving skill
12. Prioritizing skill
13. Questioning skill
14. Thinking systematically skill
15. Sequencing skill
16. The skill of presenting information graphically

(ii) Teaching strategies to be used to develop these cognitive skills

1. Preparing main outlines for teaching
2. Following some proofs
3. Define duties for each chapter
4. Home work assignments
5. Encourage the student to look for the information in different references
6. Ask the student to attend lectures for practice solving problem
7. Doing small research
8- Self learning
9-Project based learning
10- Report back sessions
11-Active learning

(iii) Methods of assessment of students cognitive skills *1. Midterm's exam. Exams, short quizzes* *2. Asking about physical laws previously taught* *3. Writing reports on selected parts of the course* *4. team work projects*
c. Interpersonal Skills and Responsibility
(i) Description of the interpersonal skills and capacity to carry responsibility to be developed *1. Responsibility for own learning* *2. Group participation and leader ship* *3. Act responsibly personal and professional situation.* *4. Ethical standards of behaviour* *5. Active communication skill* *6. Self-learning skill* *7. Time management* *8. Respect the view of the others* *9. Encourage the idea of team work* *10- work independent*

(ii) Teaching strategies to be used to develop these skills and abilities *1. Brain storming* *2. Group discussion* *3. Experimental training* *4. Summarizing lectures or collecting materials of the course.* *5. Try to solve difficulties in learning: solving problems – enhance educational skills.* *6. Encourage the student to attend general lectures.*
(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility *1. Quizzes on the previous lecture* *2. Discussion* *3. Seminars* *4- Home work* *5- Reports*
d. Communication, Information Technology and Numerical Skills
(i) Description of the skills to be developed in this domain. *1. Computation and Problem solving skill* *2. Using technology and programs for solving the difficulties in physics* *3. Data analysis and interpretation* *4- Using technology in presentations* *5-Using technology in communications with others*
(ii) Teaching strategies to be used to develop these skills *1. Know the basic mathematical principles.* *2. Use the web for research.* *3. Computational analysis.* *4. Data representation.* *5. Focusing on some real results and its physical meaning.* *6. Lectures for problem solution.* *7. Experimental training* *9.Exams to measure the mathematical skill.* *10.Clear the weakness point that should be eliminated.* *11.Encourage the student to ask for help if needed.* *12.Encourage the student to ask good question to help solve the*

problem
(iii) Methods of assessment of students numerical and communication skills *1. Their interaction with the lectures and discussions.* *2. The reports using technology.* *3. Homework, Problem solutions assignment and exams* *4. Results of computations and analysis.* *5. doing research using internet*
e. Psychomotor Skills (if applicable)
At the end of the course, the student will be able to: 10. Perform the experiments with high accuracy. 11. Operate instruments safely. 12. Draw the data and curves.
(ii) Teaching strategies to be used to develop these skills - Follow up the students in lab and during carryout all experimental work.
15. Methods of assessment of students psychomotor skills • Practical exam. • Giving additional marks for the results with high and good accuracy

5. Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm exam 1	5th week	10

2	Midterm 2	10^{th} week	10
3	Homework	Every week	5
4	Project	12^{th} week	5
5	Solving problems	Every week	10
6	Experimental exam	End of semester	20
7	Final exam	End of semester	40
8			

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

6 office hours per week

E Learning Resources

1. Required Text(s)

2. Essential References * *Introduction to Classical and Modern Optics, by Jurgen R. Meyer-Arendt, Prentic – Hall international , (1995).* * *Fundamentals of optics , by Francis Jenkins and Harvey White, Mc Graw Education, (2001)*
3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)
4-.Electronic Materials, Web Sites etc *http://www.physicsclassroom.com* *http://www.learnerstv.com/*
5- Other learning material such as computer-based programs/CD, professional standards/regulations *Virtual physics*

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) • *Lecture room organized for face to face learning* * *Library*

• *Laboratory for optics* • *Boards* • *Suitable lightening system* • *Air condition units* • *Fiber optic networks and wireless* • *Computers and data show*
2. Computing resources * *computers with data show* * *Available numbers of computers for students* * *Updating the computer each year*
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) *Checked later if needed*

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching • *Evaluating the instructor by the student using questionnaires* • *Following up the progress of student in the course* • *Evaluating the progress of student by the projects and reports*

• *Evaluating the course by specialized committees*
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department • *Self-evaluation* • *Student evaluation* • *Evaluation by other instructor in the same department or outside it*
3 Processes for Improvement of Teaching • *Course report* • *Program report* • *Program self study* • *Handling the weakness point.* • *By the Accreditation committee in the department*
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • *The instructors of the course are checking together and put a unique process of evaluation.* • *Check marking of a sample of papers by others in the department.* • *Feedback evaluation of teaching from independent organization* • *Independent evaluation by another instructor that give the same course in another faculty or department* • *Evaluation by the Accreditation committee in the university*
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

1- *The following points may help to get the course effectiveness*
   - *Student evaluation*
   - *Course report*
   - *Program report*
2- *According to point 1 the plan of improvement should be given.*
3- *Contact the college to evaluate the course*
4- *Reviewing the course and updating it*

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Modern physics**

Course code: **4033150-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: Umm AL – Qura University
College/Department : College of Applied Sciences – Department of Physics

A Course Identification and General Information

Course title : Modern physics Course code: 4-4033150			
2. Credit hours: 4 . (3 lecturer + 1 practical or lab.)			
3. Program(s) in which the course is offered. : B.Sc Physics			
8. Name of faculty member responsible for the course: One of the academic staff member			
5. Level/year at which this course is offered: 5th level			
6. Pre-requisites for this course (if any): General physics (2) 4032102-4			
7. Co-requisites for this course (if any): ---			
8. Location if not on main campus: Main campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

For students undertaking this course, the aims are to:

1-**acquire** basics of the spatial theory of the relativity.

2-Acquire the basic of the radiation of black body and objects.

3-**Calculate** the phase and group velocities.

5-Describe atom structure (Atomic models, Alpha-particle scattering, The Rutherford scattering formula, Nuclear dimensions, Electron orbits, Atomic spectra, The Bohr atom, Energy levels and spectra, Nuclear Motion, Atomic excitation, The correspondence Principle).

6- acquire information about particles proprieties of waves

7- **List** the différents physics phenomena (The photoelectric effect, The quantum theory of light, X rays X-ray diffraction, The Compton effect, Pair production)

8- **describe** the UV catastrophe.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

. C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached)**

1 Topics to be Covered

List of Topics	No of Weeks	Contact hours
THE SPATIAL THEORY OF THE RELATIVITY (introduction, reference frame, inertial reference frame, Galilean relativity,)	Week ***(week 1)***	3hrs

THE SPATIAL THEORY OF THE RELATIVITY (Einstein's postulate of relativity, relativity of the simultaneity, time dilatation, length contraction, Lorentz transformations, relativistic velocity transformations,)	Week *(week 2)*	3hrs
THE SPATIAL THEORY OF THE RELATIVITY (relativistic mechanics, mass, energy, transformation of energy, momentum and force, Doppler effect, Relativistic collisions)	Week *(week 3)*	3hrs
BLACK BODY RADIATION (radiation of heated objects, thermal radiation, cavity radiation treated with classical physics,)	Week *(week 4)*	3hrs
BLACK BODY RADIATION (UV catastrophe, Planck's solution, quantum of energy)	Week *(week 5)*	3hrs
PARTICLE PROPERTIES OF WAVES (The photoelectric effect, The quantum theory of light,)	Week *(week 6)*	3hrs
First Periodic Exam	Week *(week 7)*	3hrs
PARTICLE PROPERTIES OF WAVES (X rays X-ray diffraction, The Compton effect, Pair production, Gravitational red shift)	Week *(week 8)*	
WAVE PROPERTIES OF PARTICLES (De Broglie waves, Wave function, De Broglie wave velocity, Phase and group velocities,)	Week *(week 9)*	3hrs
WAVE PROPERTIES OF PARTICLES (The diffraction of particles,)	Week *(week 10)*	

Second examination 1	Week *(week 11)*	3hrs
WAVE PROPERTIES OF PARTICLES (The uncertainty principle, Applications of the uncertainty principle, The wave-particle duality)	Week *(week 12)*	
ATOMIC STRUCTRUE (Atomic models, Alpha-particle scattering, The Rutherford scattering formula,)	Week *(week 13)*	3hrs
ATOMIC STRUCTRUE (Nuclear dimensions, Electron orbits, Atomic spectra,)	Week *(week 14)*	3hrs
ATOMIC STRUCTRUE (Energy levels and spectra, Nuclear Motion, Atomic excitation, The correspondence Principle)	Week *(week 15)*	
Final examination	Week *(week 16)*	

2 Course components (total contact hours per semester):			
Lecture 36 (Credit Hrs)	**Tutorial:** ------	**Practical/Fieldwork/Internship:**	**Other:** 12 hrs

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

d. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

- outline the adventages of relativity.

2- list the types of relativities

3- define the inertial reference frame, Galilean relativity.

4- acquire basics of Einstein's postulate of relativity, relativity of the simultaneity, time dilatation, length contraction, Lorentz transformations

5- describe black body and UV catastrophe

6- list different model of atomic structure.

7- describe De Broglie waves, Wave function, De Broglie wave velocity, The diffraction of particles, The uncertainty principle, Applications of the uncertainty principle, The wave-particle duality

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important medical physics in different medical applications and human service.
- At the end of the program, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using images and movies
- Encouraging students to collect the new information about what the new in computer in medicine.
- Enable the reference books and scientific sites concerning bacteriology in internet.

(iii) Methods of assessment of knowledge acquired:

- The assessment of these skills is implicit in all forms of assessment, but is not explicitly measured. The overall degree of success achieved by each student reflects the extent to which these skills have been acquired. The project work and growing in complexity as the student progresses, are assessed to explicitly measure the acquisition of the ability to handle experimental equipment, plan measurements in a logical fashion, analyse the results produced and communicate them through printed and verbal media.

b. Cognitive Skills

b1. estimate The uncertainty principle

b2. Apply different physics idea in experimental Laboratory.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Lectures
-Brain storming
-Discussion

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- work effectively in a group to make a decision.

-Analyse obtained data and how to manage it.

-make a certain decision fast especially during data acquisition.

(v) Teaching strategies to be used to develop these skills and abilities

- Lab work
- Case Study
- Active learning
- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(iii) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

5. Enhancing the ability of students to use computers and internet.
6. Interpret image pre-processing data
7. Use effectively image processing package to enhance the obtained image.
8. Know how to write a report.

9. Teaching strategies to be used to develop these skills

16. **Homework (preparing a report on some topics related to the course depending on web sites).**
17. **Seminars presentation**
18. **Field visits to factories**

(iii) Methods of assessment of students numerical and communication skills

10. Evaluation of presentations
11. Evaluation of reports
12. Practical exam

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

13. Perform the experiments with high accuracy.
14. Operate instruments safely.
15. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

19. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Exercises & Home works+ quizzes	All weeks	5%
	Assay	15th week	5%
2	Laboratory	All weeks	20 %
3	Written Test (1)	6th week	10%
4	Written Test (2)	11th week	10%
6	Final Exam (theoretical)	16th week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and

academic advice. (include amount of time faculty are available each week)

Office hours: 10 hrs

E. Learning Resources

Required Text(s):

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Recommended Reading List

Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

1-Jeremy Bernstein, Paul Fishbane and Stephen Gasiorowicz , Modern Physics, 2-Hardback (2000).

2-Randy Harris, Modern Physics (2nd Edition), International Edition

3-A. Beiser (2003). Concepts of Modern Physics (6th ed.). McGraw-Hill

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Electronic Materials, Web Sites

(eg. Web Sites, Social Media, Blackboard, etc.)

Other learning material such as computer-based programs/CD, professional standards/regulations

- **PPT prepared by Associate prof. Dr. Taha Alfawwal**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.

2. Computing resources

- Providing class rooms with computers and labs with data show.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- Availability of some reference bacterial strains
- Availability different specific media and chemicals used for isolation.

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title: **General Physics (3)**

Course code: 4032122-3

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

7. Course title General Physics (3) 8. Course code: 4032122-3	
2. Credit hours: 2hrs	
3. Program(s) in which the course is offered. :	
9. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 2nd Year / Level 4	
6. Pre-requisites for this course (if any): Electricity and magnetism (4032121-4)	
7. Co-requisites for this course (if any): ---	
8. Location if not on main campus: Main campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

1. Define the main properties of an alternating current
2. Use the complex number
3. Understand the principle of basic components in AC circuit
4. Understand the concept of the electric power
5. Understand the theory of RC, RL, RLC circuits
6. Understand different types of filters (Low pass filter, High pass filter,…)
7. Understand the theory of the resonant circuit

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

1 Topics to be Covered

Topic	No of Weeks	Contact hours
Principles of alternating current: AC waveforms, frequency, Angular frequency, Period, Instantaneous value of the voltage, Maximum or peak value of the voltage, Initial phase, Root-Mean- Square (RMS) Values of Current and Voltage	**1**	**2**
Complex number: Introduction, Vectors and AC waveforms, Simple vector addition, Complex vector addition, Polar and rectangular notation, Complex number arithmetic.	**2**	**4**
Passive components in AC circuit: purely R, C ,L, Voltage, Current, Current leads Voltage	**2**	**4**
Power in AC circuit: Power in resistive and reactive AC circuits, True, Reactive, and Apparent power, Calculating power factor	**1**	**2**
AC circuit analysis: Reactance and impedance, RC circuit, RL circuit and series-parallel RLC circuits .	**2**	**4**
Filters: Filter function , Low-pass filters, High-pass filters, Band-pass filters, Band-stop filters, Decibel, Bode plot,	**2**	**4**
Resonant circuits: LC circuit, series- parallel RLC circuit, Quality factor,	**2**	**4**

AC bridges : **AC bridges**, Maxwell's inductance bridge, Maxwell-Wien Bridge, Anderson Bridge, Hay's Bridge, Owen Bridge, De Sauty Bridge Shering bridge, Wien Series Bridge.	**3**	**6**
	15	**30**

2 Course components (total contact hours per semester):			
Lecture : 30	Tutorial: 12	Practical: 14	Other: 5

Practical's part:

1. Wave AC form
2. Passive components in AC circuit (R, L, C)
3. RL circuit
4. RC circuit
5. RLC circuit
6. RC filter (low and high pass filter)
7. Resonant RLC circuit

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The method of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

e. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

1. Define the main properties of an alternating current
2. Using the complex number
3. Analyse the equations of R-C and R-C-L circuits and calculating the impedance, power factor, root-mean- square values of current and voltage.
4. To use mathematical formulation to describe the physical principle or phenomena.
5. Improving logical thinking.

(ii) Teaching strategies to be used to develop that knowledge

1. Demonstrating the basic information and principles through lectures and the achieved applications
2. Discussing phenomena with illustrating pictures and diagrams
3. Lecturing method:
    a. Blackboard
    b. Power point
    c. e-learning
4. Tutorials
5. Revisit concepts
6. Discussions
7. Brain storming sessions
8. **Start each chapter by general idea and the benefit of it;**
9. **Learn the student background of the subject;**
10. **Show the best ways to deal with problem;**
11. **Keep the question "why" or "how" to explain always there;**
12. **Build a strategy to solve problem.**

(iii) Methods of assessment of knowledge acquired:

- Periodical exam and reports 10%
- Mid- term (1 and 2) theoretical exams 30%

- Mid-term practical exam 5%
- Final practical exam 15%
- Final exam 40%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

1. How to use physical laws and principles to understand the subject
2. How to simplify problems and analyze phenomena
3. Analyse and explain natural phenomena.
4. Ability to explain the idea with the student own words.
5. Represent the problems mathematically

(ii) Teaching strategies to be used to develop these cognitive skills:

8. **Preparing main outlines for teaching**
9. Following some proofs
10. Define duties for each chapter
11. Home work assignments
12. Encourage the student to look for the information in different references
13. Ask the student to attend lectures for practice solving problem
14. Ask the student to do small research.

(iii) Methods of assessment of students cognitive skills

6. Midterm's exam. Exams, short quizzes
7. Asking about physical laws previously taught
8. Writing reports on selected parts of the course
9. Discussions of how to simplify or analyze some phenomena.

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

The students should learn independently and take up responsibility through:

1. Write a report
2. Develop his English language
3. Think in solving problems
4. Search on the internet
5. Collect the material of the course
6. Deal with the lost lectures that he missed.
7. The students should know how to do that independently and through discussions with the others

(vi) Teaching strategies to be used to develop these skills and abilities

- Lab work

- Active learning

- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(iv) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

10. Enhancing the ability of students to use computers and internet.
11. Interpret measurement
12. Present the electrical circuit
13. Know how to write a report.

14. Teaching strategies to be used to develop these skills

Know the basic mathematical principles. 1.

Use the web for research. 2.

Discuss with the student. 3.

Clear the weakness point that should be eliminated. 5.

Encourage the student to ask for help if needed. 6.

Computational analysis. 7.

Data representation. 8.

Focusing on some real results and its physical meaning. 9.

Lectures for problem solution. 10.

Encourage the student to ask good question to help solve the problem 11.

(iii) Methods of assessment of students numerical and communication skills

13. **Evaluation of presentations**
14. **Evaluation of reports**
15. **Practical exam**

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

16. Perform the experiments with high accuracy.
17. Operate instruments safely.
18. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

20. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Exercises & Home works	All weeks	5 %
2	Participation	All weeks	5 %
3	Written Test (1)	6th week	15%
4	Written Test (2)	11th week	15%
5	Final Exam (Practical)	15th week	20%
6	Final Exam (theoretical)	17th week	40%

D. Student Support

2. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Office hours: 6 hrs

E. Learning Resources

Required Text(s):

Lessons In Electric Circuits, Volume II – AC. By Tony R. Kuphaldt.6 th Edition, 2007

Fundamental of Physics by Halliday & Resnick

Recommended Reading List

Lessons In Electric Circuits, Volume II – AC. By Tony R. Kuphaldt.6 th Edition, 2007

Fundamental of Physics by Halliday & Resnick

Electronic Materials, Web Sites

(eg. Web Sites, Social Media, Blackboard, etc.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.

2. Computing resources

- Providing class rooms with computers and labs with data show.

3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- After the agreement of Department and Faculty administrations

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

5- The following points may help to get the course effectiveness
  - Student evaluation
  - Course report
  - Program report

- Program Self study

6- According to point 1 the plan of improvement should be given.

7- Contact the college to evaluate the course and the benefit it add to other courses.

8- Add some subject and cut off others depending on the new discoveries in physics.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Theoretical Methods in Physics (2)**

Course code: **4033142-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

9. Course title Theoretical Methods in Physics (2) 10. Course code: 4033142-4	
2. Credit hours: 4hrs	
3. Program(s) in which the course is offered. : BSc Physics	
10. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 3rd Year / Level 5	
6. Pre-requisites for this course (if any): Theoretical Methods in Physics (1) 4032141-4	
7. Co-requisites for this course (if any): ---	
8. Location if not on main campus: Main campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

12. Deal with special functions (factorial, gamma, beta and error functions) that are used extensively in physics problems.
13. Use Legendre function, Bessel equation, and Laguerre function as solutions of some types of differential equations
14. Be familiar with the methods of solving partial differential equations (PDE).
15. Translate a physical problem in mathematical form (PDE, boundary value problem).
16. Deal with Functions of a complex variable, and contour integrals, and use them to find residues and to calculate definite integrals.
17. Develop an intuitive feeling for the precise mathematical formulation of physical problems and for the physical interpretation of the mathematical solutions.
18. Be familiar with the mathematical formulae of this course that frequently appear in physics problems.
19. Use computer to verify the solution of some physical problems.
20. Use computer to construct graphs of some functions.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

The objective of this course is to learn in a practical manner the mathematical techniques and methods useful in physical sciences, not covered by previous courses (Theoretical Methods in Physics (1)**)**. The approach requires a combination of mathematics, skill in making legitimate approximations, and intelligent use of computers to get some motivation and verify the approximations.

The course is designed to supply students for a variety of mathematical methods that need for advanced undergraduate and beginning graduate study in physical science and to develop a solid background for those who will continue into the mathematics of advanced theoretical physics.

Topic	No of Weeks	Contact hours
❖ **Special functions:** Factorial Function, Gamma Function; Recursion Relation, Some Important Formulas Involving Gamma Functions, Beta Functions, Beta Functions in Terms of Gamma Functions, The Error Function, Asymptotic Series, Stirling's Formula, Elliptic Integrals and Functions.	**2**	**8**
❖ **Legendre's functions:** Leibniz' Rule, Rodrigues' Formula, Generating Function, Orthogonality of the Legendre Polynomials, Normalization of the Legendre Polynomials, Legendre Series, Associated Legendre Functions, Generalized Power Series.	**2.5**	**10**
First periodic exam		
❖ **Bessel's functions:** First and Second Solution of Bessel's Equation, Graphs and Zeros of Bessel Functions, Recursion Relations, Other Kinds of Bessel Functions, Orthogonality of Bessel Functions.	**2.5**	**10**
❖ **Hermite - Laguerre Functions:** Ladder operators, Hermite functions, Hermite polynomials, Laguerre functions, Laguerre polynomials, Associated Laguerre polynomials.	**2**	**8**
Second periodic exam		
❖ **Partial Differential Equations:** Laplace's Equation; Steady-State Temperature in a Rectangular Plate, The Diffusion or Heat Flow Equation, The Wave Equation; the Vibrating String, Steady-state Temperature in a Cylinder, Steady-state Temperature in a Sphere, Poisson's Equation Integral Transform Solutions of Partial Differential Equations	**2**	**8**
❖ **Functions of a complex variable:** Analytic functions- Cauchy-Riemann conditions, Contour Integrals, Laurent Series, The residue theorem, Methods of finding the residues, Evaluation of Definite Integrals, Mapping	**3**	**12**
Final Exam		
	14	**56**

2 Course components (total contact hours per semester):			
Lecture : 56	Tutorial:	Practical:	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay) This actually depends on the student's level, study skills and habits, but in general four hours per week are sufficient.

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned;**

f. Knowledge : Description of the knowledge to be acquired

7. Learning fundamentals of Mathematical Physics.
8. Understand how to use mathematics as a tool for physics.
9. Understand how to translate a physical problem in mathematical form.
10. Ability to solve Physical problems analytically in an efficient way.
11. Improving the logical thinking.
12. Developing the learning skills of the students in using computers as an educational tool, problem solving and demonstration.

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions.
- Starting each Chapter by general idea and the benefit of the Mathematical tool.
- Solving examples during the lecture time.
- Show the best ways to deal with the problem.
- Build a problem solving strategy.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using computer simulations.
- Enable reference books and scientific websites concerning Theoretical Methods in Physics.

(iii) Methods of assessment of knowledge acquired:

- Online Quizzes 10%
- Homework 10%
- Interactive discussions 10%
- Mid term exam 1: 20%
- Mid term exam 2: 20%
- Final exam: 30%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

7. Develop analytic skills.
8. Develop problem-solving skills.
9. Develop ability to think creatively.
10. Improve memory skills.
11. Improve mathematical skills.
12. Analyse and explain natural physical problem.

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Develop ability to synthesize and integrate information.
2. Encourage the students to use different learning resources.
3. Writing the final answer in concise form when possible.
4. Writing an equation/physical law in wards.
5. Using shortest way to reach the final answer.
6. Using appropriate symbols that can be easily memorized.
7. Discussions of how to simplify or analyse physical problem.

(iii) Methods of assessment of students cognitive skills

1. Oral questions.
2. Presentations.
3. Term paper.
4. Quizzes.
5. Problem solving.

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

5. Develop ability to work independently.
6. Develop ability to work productively with others.
7. Improve self-esteem.
8. Develop leadership skills.

(vii) Teaching strategies to be used to develop these skills and abilities

7. Homework assignment for each group of the students.
8. Homework assignments that should be worked out independently.
9. Cooperative learning.
10. Microteaching.
11. Search through the internet and use the library.
12. Develop their interest in Science through :(lab work, field trips, visits to scientific and research.

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

8. Marking the home works.
9. Working closely with the different groups.
10. Evaluate the efforts of each student in preparing the report.
11. Evaluate the scientific values of reports.
12. Evaluate the work in team
13. Evaluation of the role of each student in lab group assignment
14. Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(v) Description of the skills to be developed in this domain At the end of the course, the student will be able to:

8. Enhancing the ability of students to use computers and internet.
9. Present Physical phenomena orally.
10. Know how to write a report.
11. Feeling physical reality of results.
12. Perform effective communication with colleagues and faculty members.
13. Ability to use programs designed for numerical computation.
14. Problem solving and ability to interpret the results.

(vi) Teaching strategies to be used to develop these skills

21. **Homework (preparing a report on some topics related to the course depending on web sites).**
22. **Seminars presentation.**
23. **Field visits to factories.**
24. **Additional lectures on numerical techniques.**
25. **Exposing the students to problems that can only be solved numerically.**

(iii) Methods of assessment of students numerical and communication skills

5. **Give the students homework assignments on problems that can be solved numerically.**
6. **Ask the students to search the internet for the solution of a specific problem.**
7. Using the computer to construct three dimensional graphs.
8. Evaluation of presentations and reports.

e. Psychomotor Skills (if applicable)

(i) Teaching strategies to be used to develop these skills
(viii) Methods of assessment of students psychomotor skills

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	Online quizzes	All weeks	10%
1	Exercises & Home works	All weeks	10 %
2	Participation in activities lectures and labs	All weeks	10 %
3	Written Test (1)	6^{th} week	20%
4	Written Test (2)	11^{th} week	20%
5	Final Exam (theoretical)	16^{th} week	30%

D. Student Support

3. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week).
4. Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

6. Mary L. Boas, Mathematical methods in the Physical sciences, third edition, John Wiley and Sons (2006), ISBN-13 978-0-471-19826-0.
7. George B. Arfken, Hans J. Weber and Frank E. Harris, Mathematical Methods for

Physicists (Seventh Edition), Elsevier (2012), ISBN: 978-0-12-384654-9.

8. G. Dennis Zill, R. Michael Cullen, Advanced engineering mathematics, Jones and Bartlett Publisher (2006), ISBN 9780763745912.
9. Eugene Butkov, Mathematical Physics, World student series edition (1973).
10. S. Grossman, Elementary Linear Algebra, 6th edition, Wadsworth (2006).

Recommended Reading List

Electronic Materials, Web Sites

(eg. Web Sites, Social Media, Blackboard, etc.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

13- Class room is already provided with data show
14- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
15- Library
16- Laboratory for fundamental of physics..

2. Computing resources

9. Computer room
10. MATLAB software.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Questionaries • Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Classical Mechanics (1)**

Course code: **4033143-4**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: Umm Al-Qura University
College/Department: Faculty of Applied Science – Department of Physics

A Course Identification and General Information

11. Course title Classical Mechanics (1) **12. Course code:** 4033143-4	
2. Credit hours: 4 hrs	
3. Program(s) in which the course is offered. : BSc Physics	
11. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 3rd Year / 5th Level	
6. Pre-requisites for this course (if any): General Physics (2) (4032101-4)	
7. Co-requisites for this course (if any): ---	
8. Location if not on main campus: Main campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning ☐ What percentage? ☐

d. correspondence ☐ What percentage? ☐

f. other ☐ What percentage? ☐

Comments:

B Objectives

After completing this course student should be able to:

1. The basic concepts of all the way to valid conclusion and discuss the fundamental concepts in classical mechanics (1) through a broad range of interesting application to the real world.
2. Clearly and logically discuss the scalar, vector, gradient, divergence, curl, application of operator, vector integration, and derivative of a vector.
3. Analyze coordinates systems (curvilinear, differential vector operator, Cartesian, spherical and cylindrical) in physics
4. General motion of the particles in the three dimensions.
5. Discuss the noninertial reference systems.
6. Discuss the gravitation and central forces.
7. Discuss the fundamental concepts of impulse, collision and motion of a body with variable mass.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Fundamental Concepts: Vectors** • Introduction. • Vectors. • The Scalar Product. • The Vector Product. • Triple Products. • Derivative of a Vector. • Position Vector of a Particle: Velocity and Acceleration in Rectangular Coordinates. • Velocity and Acceleration in Plane Polar Coordinates. • Velocity and Acceleration in Cylindrical and Spherical Coordinates.	**2**	**8**

❖ **Newtonian Mechanics: Rectilinear Motion of a Particle** • Newton's Law of Motion. • Rectilinear Motion: Unifor Accerleration Under a Constant Force. • Forces that Depend on Position: The Concepts of Kinetic and Potential Energy. • Velocity-Dependent Forces: Fluid Resistance and Terminal Velocity.	2	8
❖ **Oscillations** • Linear Resoring Force: Harmonic Motion. • Energy Considerations in Harmonic Motion. • Damped Harmonic Motion. • Forced Harmonic Motion: Resonance.	2	8
❖ **General Motion of a Particle in Three Dimensions** • Introduction. • The Potential Energy Function n Three-Dimensional Motion: The Del Operator. • Forces of the Separable Type. • The Harmonic Oscillator in Two and Three Dimensions. • Constrained Motion of a particle.	2	8
❖ **Noninertial Reference Systems** • Accelerated Coordinate Systems and Interial Forces. • Rotating Coordinate Systems. • Dynamics of a Particle in a Rotating Coordinate System. • Effects of Earth's Rotation. • The Foucault Pendulum.	2	8
❖ **Gravitation and Central Forces** • Introduction. • Gravitational Force between a Uniform Sphere and a Particle. • Kepler's Laws of Planetary Motion. • Kepler's Second Law: Equal Areas. • Kepler's Firs Law: The Law of Ellipses. • Kepler's Third Law: The Harmonic Law. • Potential Energy in a Gravitational Field: Gravitational Potential. • Potential Energy in a General Central Field. • Energy Equation of an Orbit in a Central Field. • Orbital Energies in an Inverse-Squar Field.	2	8

❖ **Dynamics of Systems of Particles** • Introduction: Center of Mass and Linear Momentum of a System. • Angular Momentum and Kinetic Energy of a system. • Motion of Two Interacting Bodies: The Reduced Mass. • Collisions. • Oblique Collisions and Scattering: Comparison of Laboratory and Center of Mass Coordinates. • Motion of a Body with Variable Mass: Rocket Motion.	**2**	**8**
	14 **Week**	**56** **Hours**

2 Course components (total contact hours per semester):			
Lecture: 56	Tutorial:	Practical:	Other: 14 hr

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 14 hr (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

g. Knowledge: Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

35- **Define the scalar and vector quantities.**
36- Describe the different types of product of vectors.
37- Describe the position, velocity and acceleration vectors in Cartesian, spherical and cylindrical coordinates.
38- Define the Newton's laws of motion.
39- Describe the motion of a freely falling body.
40- Describe the horizontal motion of a particle moving through a fluid.
41- Define the harmonic motion.
42- Describe the harmonic motion, taking into account frictional force.
43- Determine the maximum amplitude, resonant frequency, phase shift, and quality factor of a forced harmonic oscillator.
44- Define the work principle.
45- Determine the conditions for the existence of a potential function.
46- Describe the motion of a projectile in a uniform gravitational field.
47- Describe the motion of a particle subject to a linear restoring force that is always directed toward a fixed point.
48- Define the inertial forces and the physical meaning of each force.
49- Define the Newton's law of universal gravitation.
50- Determine the gravitational force between a uniform sphere and a particle.
51- List Kepler's laws of planetary motion.
52- Determine the orbital energies in an inverse-square field.

(ii) Teaching strategies to be used to develop that knowledge

1. Demonstrating the basic information and principles through lectures and the achieved applications.
2. Discussing phenomena with illustrating pictures and diagrams.
3. Lecturing method:
    a. Blackboard
    b. Power point
    c. e-learning
4. Tutorials.
5. Revisit concepts.
6. Discussions.
7. Brain storming sessions.
8. **Start each chapter by general idea and the benefit of it.**
9. **Learn the student background of the subject.**
10. **Show the best ways to deal with problem.**
11. **Keep the question "why" or "how" to explain always there.**
12. Build a strategy to solve problem.

(iii) Methods of assessment of knowledge acquired:

- Quizzes and Homeworks 20%
- Short exams (mid term exams) 30%
- Long exams (final) 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

1. **Analyze the Vectors, divergence, Curl, Grad.**
2. **Describe the different coordinate systems.**
3. **Understand the general equation of motion of the particle in three dimensions.**
4. **Understand the noninertial reference systems.**
5. **Knowing the central forces and celestial mechanics.**
6. **Ask the student to do a small research.**

(ii) Teaching strategies to be used to develop these cognitive skills:

15. Preparing main outlines for teaching.
16. Following some proofs.
17. **Define duties for each chapter.**
18. Home work assignments.
19. **Encourage the student to look for the information in different references.**
20. **Ask the student to attend lectures for practice solving problem.**

(iii) Methods of assessment of students cognitive skills

1. **Midterm exam. Exams, short quizzes.**
2. **Asking about physical laws previously taught.**
3. **Writing reports on selected parts of the course.**
4. **Discussions of how to simplify or analyze some phenomena.**

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

1. Work independently.
2. The students learn independently and take up responsibility.

(ix) Teaching strategies to be used to develop these skills and abilities

1. Learn how to search the internet and use the library.
2. Learn how to cover missed lectures.
3. Learn how to summarize lectures or to collect materials of the course.
4. Learn how to solve difficulties in learning: solving problems – enhance educational skills.

5. Develop the interest in Science through :(lab work, field trips, visits to scientific and research.
6. Encourage the student to attend lectures regularly by:
    i. Giving bonus marks for attendance
    ii. Assigning marks for attendance.
7. Give students' tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

1. Quizzes on the previous lecture.
2. Checking report on internet use.
3. Discussion.
4. **The accuracy of the result gained by each group will indicate the good group work.**
5. **Presenting the required research on time and the degree of the quality will show the sense of responsibility.**

d. Communication, Information Technology and Numerical Skills

(vii) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

1. Computation
2. Problem solving
3. Data analysis and interpretation.

15. Teaching strategies to be used to develop these skills

1. **Know the basic mathematical principles.**
2. Use the web for research.
3. **Discuss with the student.**
4. **Exams to measure the mathematical skill.**
5. **Encourage the student to ask for help if needed.**
6. Computational analysis.
7. Data representation.
8. Focusing on some real results and its physical meaning.
9. **Lectures for problem solution.**
10. Encourage the student to ask good questions to help solve the problem.

11. Display the lecture note and homework assignment on the web.

(iii) Methods of assessment of students numerical and communication skills

1. **Their interaction with the lectures and discussions.**
2. The reports of different asked tasks.
3. **Homework, Problem solutions, assignment and exam should focus on the understanding.**
4. Results of computations and analysis.
5. Comments on some resulting numbers.
6. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to: (NA)

(ii) Teaching strategies to be used to develop these skills (NA)

(iii) Methods of assessment of students psychomotor skills **(NA)**

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	Exercises & Home works	All weeks	5 %
2	Participation	All weeks	5 %
3	In-Class Problem Solving	13th,7th week	10%
4	Midterm 1	6th week	15%
5	Midterm 2	10th week	15%

6	Final Exam	16th week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week) Each student will supervise by an academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

1. G. R. Fowles, and G. L. Cassiday, "Analytical Mechanics" (7th ed.), Brooks Cole. (2005).
2. G. R. Fowles, "Analytical Mechanics" (3rd ed.), Holt, Rinehart and Winston (1977).

Recommended Reading List

1. Thornton, Stephen T.; Marion, Jerry B.. Classical Dynamics of Particles and Systems (5th ed.). Brooks Cole. (2003).
2. Kibble, Tom W. B.; Berkshire, Frank H. Classical Mechanics (5th ed.). Imperial College Press. (2004).

Electronic Materials, Web Sites

- http://en.wikipedia.org/wiki/Classical_mechanics
- http://math.ucr.edu/home/baez/classical/

Other learning material such as computer-based programs/CD, professional standards/regulations (NA)

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room for 30 students.
- Library

2. Computing resources

- Computer room.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) (NA)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- 10 minutes Quiz per week.
- Home works.
- Term paper.
- Final Exam.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- At the end of term, Students fill an evaluation Sheet (without names).
- Student Marks are analyzed by considering Standard Deviation.

3. Processes for Improvement of Teaching

- Strategies are modified each term according to the student feedback.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- In case of more than one section taken this course, the instructors are cooperated to give unified Exams and they use the same marks distribution for the answer sheet. Students can see their corrected sheet and compare it with key answer sheet.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

9- The following points may help to get the course effectiveness

- Student evaluation
- Course report
- Program report
- Program Self study

10- According to point 1 the plan of improvement should be given. 11- Contact the college to evaluate the course and the benefit it add to other courses. 12- Add some subject and cut off others depending on the new discoveries in physics.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Quantum Mechanics (1)**

Course code: 4033145-4

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: Umm Al-Qura University
College/Department: Faculty of Applied Science – Department of Physics

A Course Identification and General Information

13. Course title: Quantum Mechanics (1) 14. Course code: 4033145-4			
2. Credit hours: 4 hrs			
3. Program(s) in which the course is offered.: BSc Physics			
4.Name of faculty member responsible for the course: One of the academic staff member			
5. Level/year at which this course is offered: 3^{rd} Year / 5^{th} Level			
6. Pre-requisites for this course (if any): Theoretical Methods in Physics (1) (4032141-4)			
7. Co-requisites for this course (if any): ---			
8. Location if not on main campus: Main campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	

c. e-learning | What percentage?

d. correspondence | What percentage?

f. other | What percentage?

Comments:

B Objectives

After completing this course student should be able to:

The quantum mechanics (1) start with the reasons and natural phenomena that have led to the emergence of quantum mechanics; this is done by highlighting the difficulty of the classic mechanics to explain many phenomena that indicate duality of the particle and wave. In order for the student to understand these phenomena we discussed

8. Radiation- Planck's law, photoelectric effect, Compton effect, Wave Nature of matter, De Broglie waves, diffraction of matter waves.
9. Expectation values, principle of superposition; Quantum mechanical operators: Three important quantum mechanical operators, eigenfunctions and eigenvalues, properties of operators, measurability of different observables at equal times, Heisenberg's uncertainty principle, angular momentum operator.
10. Kinetic energy, total energy, bra and ket notation, Schrodinger equation, Postulates, formulation, properties of stationary states.
11. Solution of Schrodinger Equation, free particle, harmonic oscillator, particle in a box, constants of motion, conservation laws, Hydrogen atom, Wavefunctions, hydrogen atom spectrum.
12. The eigenstates of Spin 1/2, addition of two spins, the addition of spin 1/2 and orbital angular momentum, and general rules for addition of angular momenta.
13. Matrix representation of angular momentum operators, and general relations in matrix mechanics.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Wave Particle Duality, Probability, and the Schrodinger Equation** • Radiation as Particles, Electrons as Waves. • Plane Waves and Wavepackets. • The Probability Interpretation of the Wavefunction. • The Schrodinger Equation. • The Heisenberg Uncertainty Relations. • The Probability Current. • Expectation Values and the Momentum in Wave Mechanics; The Momentum in Wave Mechanics, Wavefunction in Momentum Space.	**2**	**8**
❖ **Eigenvalues, Eigenfunctions, and the Expansion Postulate** • The Time-Independent Schrodinger Equation. • Eigenvalue Equations. • The Eigenvalue Problem for a Particle in a Box. • The Expansion Postulate and Its Physical Interpretation. • Momentum Eigenfunctions and the Free Particle; Normalization of the Free Particle Wave Function, Degeneracy. • Parity.	**2**	**8**
❖ **One-Dimensional Potentials** • The Potential Step. • The Potential Well. • The Potential Barrier. • An Example of Tunneling. • Bound States in a Potential Well. • The Harmonic Oscillator.	**2**	**8**

❖ **The General Structure of Wave Mechanics** • Eigenfunctions and Eigenvalues; The Hamiltonian Operator. • Other Observables. • Vector Spaces and Operators. • Degeneracy and Simultaneous Observables. • Time Dependence and the Classical Limit.	2	8
❖ **Angular Momentum** • The Angular Momentum Commutation Relations. • Raising and Lowering Operators for Angular Momentum. • Representation of $\left\|\ell, \mathbf{m}\right\rangle$ States in Spherical Coordinates.	1	4
❖ **The Schrodinger Equation in Three Dimensions and the Hydrogen Atom** • The Central Potential. • The Hydrogen Atom. • The Energy Spectrum. • The Free Particle.	2	8
❖ **Spin** • Eigenstates of Spin 1/2. • The Intrinsic Magnetic Moment of Spin 1/2 Particles. • Addition of Two Spins. • The Addition of Spin 1/2 and Orbital Angular Momentum. • General Rules for Addition of Angular Momenta.	1.5	6

❖ **Matrix Representation of Operators** • Matrices in Quantum Mechanics. • Matrix Representation of Angular Momentum Operators. • General Relations in Marix Mechanics. • Matrix Representation of Spin 1/2.	**1.5**	**6**
	14 **Week**	**56** **Hours**

2 Course components (total contact hours per semester):			
Lecture: 56 hr	Tutorial:	Practical:	Other: 14 hr

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): **14 hr**

4. Development of Learning Outcomes in Domains of Learning **For each of the domains of learning shown below indicate:** 1- **A brief summary of the knowledge or skill the course is intended to develop.** 2- **A description of the teaching strategies to be used in the course to develop that knowledge or skill.** 3- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**
h. **Knowledge:** Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

53- **Learn to be acquainted with the historical background of quantum mechanics, wave-particle description-the uncertainty principle and Schrodinger equation.**

54- **Understand the physics of quantum mechanics and their applications mentioned in the text.**

55- **Use mathematical formulation to describe the physical principle or phenomena.**

56- **Explain how things are working.**

(ii) Teaching strategies to be used to develop that knowledge

13. Demonstrating the basic information and principles through lectures and the achieved applications.
14. Discussing phenomena with illustrating pictures and diagrams.
15. Lecturing method:
    a. Blackboard
    b. Power point
    c. e-learning
16. Tutorials.
17. Revisit concepts.
18. Discussions.
19. Brain storming sessions.
20. **Start each chapter by general idea and the benefit of it.**
21. **Learn the student background of the subject.**
22. **Show the best ways to deal with the problem.**
23. **Keep the question "why" or "how" to explain always there.**
24. Build a strategy to solve the problem.

(iii) Methods of assessment of knowledge acquired:

- Quizzes and Homeworks 20%
- Short exams (mid term exams) 30%
- Long exams (final) 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

- **Acquired a firm background in the foundations of quantum mechanics and have the students' desire kindled to discover more in the second part of the course.**

2- Analyse the observed of the particles by solving the Schrodinger equation.

3- Understand the theoretical treatments of quantum mechanics problems.

4- Do a small research.

(ii) Teaching strategies to be used to develop these cognitive skills:

21. Preparing main outlines for teaching.

22. Following some proofs.

23. Define duties for each chapter.

24. Home work assignments.

25. Encourage the student to look for the information in different references.

26. Ask the student to attend lectures for practice solving problem.

(iii) Methods of assessment of students cognitive skills

5. **Midterm exam. Exams, short quizzes.**
6. **Asking about physical laws previously taught.**
7. **Writing reports on selected parts of the course.**
8. **Discussions of how to simplify or analyze some phenomena.**

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

3. Work independently.
4. The students learn independently and take up responsibility.

(x) Teaching strategies to be used to develop these skills and abilities

8. Learn how to search the internet and use the library.
9. Learn how to cover missed lectures.
10. Learn how to summarize lectures or to collect materials of the course.

11. Learn how to solve difficulties in learning: solving problems – enhance educational skills.
12. Develop the interest in Science through :(lab work, field trips, ...).
13. Encourage the student to attend lectures regularly by:
    i. Giving bonus marks for attendance
    ii. Assigning marks for attendance.
14. Give students' tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

6. Quizzes on the previous lecture.
7. Discussion.
8. **The accuracy of the result gained by each group will indicate the good group work.**
9. **Presenting the required research on time and the degree of the quality will show the sense of responsibility.**

d. Communication, Information Technology and Numerical Skills

(viii) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

4. Computation
5. Problem solving
6. Data analysis and interpretation.

16. Teaching strategies to be used to develop these skills

12. **Know the basic mathematical principles.**
13. Use the web for research.
14. **Discuss with the student.**
15. **Exams to measure the mathematical skill.**
16. **Encourage the student to ask for help if needed.**
17. Computational analysis.
18. Data representation.
19. Focusing on some real results and its physical meaning.
20. **Lectures for problem solution.**
21. Encourage the student to ask good questions to help solve the problem.
22. Display the lecture note and homework assignment on the web.

(iii) Methods of assessment of students numerical and communication skills

7. **Their interaction with the lectures and discussions.**
8. The reports of different asked tasks.
9. **Homework, Problem solutions, assignment and exam should focus on the understanding.**
10. Results of computations and analysis.
11. Comments on some resulting numbers.
12. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to: (NA)

(ii) Teaching strategies to be used to develop these skills (NA)

(iii) Methods of assessment of students psychomotor skills **(NA)**

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	Exercises & Home works	All weeks	5 %
2	Participation	All weeks	5 %
3	In-Class Problem Solving	13th,7th week	10%
4	Midterm 1	6th week	15%
5	Midterm 2	10th week	15%
6	Final Exam	16th week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Each student will supervise by an academic adviser in the physics department and the time table for academic advice were given to the student each semester. (4 hrs office hours).

E. Learning Resources

Required Text(s):

3. S. Gasiorowicz, "Quantum Mechanics", John Wiley & Sons, Inc., 3rd Ed. (2003).

Recommended Reading List

1- David J. Griffiths ”Introduction to Quantum Mechanics”, Pearson Prentice Hall, New York, USA, (2005).
2- Nouredine Zettili, "Quantum Mechanics: Concepts and Applications", John Wiley & Sons, Inc. (2001).

Electronic Materials, Web Sites

- http://en.wikipedia.org/wiki/Quantum Mechanics/
- http://www.dmoz.org/Science/Physics/Quantum Mechanics/

Other learning material such as computer-based programs/CD, professional standards/regulations (NA)

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room for 30 students.
- Library.

2. Computing resources

- Computer room.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) (NA)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- 10 minutes Quiz per week.
- Home works.
- Term paper.
- Final Exam.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- At the end of term, Students fill an evaluation Sheet (without names).
- Student Marks are analyzed by considering Standard Deviation.

3. Processes for Improvement of Teaching

- Strategies are modified each term according to the student feedback.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- In case of more than one section taken this course, the instructors are cooperated to give unified Exams and they use the same marks distribution for the answer sheet. Students can see their corrected sheet and compare it with key answer sheet.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

13- The following points may help to get the course effectiveness
  - Student evaluation
  - Course report
  - Program report
  - Program Self study

14- According to point 1 the plan of improvement should be given.

15- Contact the college to evaluate the course and the benefit it add to other courses.

16- Add some subject and cut off others depending on the new discoveries in physics.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Heat and Thermodynamics**

Course code: **4033110-3**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of physics

A Course Identification and General Information

15. Course title Heat and Thermodynamic **16. Course code:** 4033110-3
2. Credit hours: 3hrs
3. Program(s) in which the course is offered. : BSc physics
12. Name of faculty member responsible for the course: One of the academic staff member
5. Level/year at which this course is offered: 3rd Year / Level 5
6. Pre-requisites for this course (if any): General Physics 4032101-4
7. Co-requisites for this course (if any): ---
8. Location if not on main campus: Main campus

B Objectives

After completing this course student should be able to:

1. Learn about thermodynamic systems and boundaries
2. Study the basic laws of thermodynamics including
   - conservation of mass
   - conservation of energy or first law
   - second law
3. Understand various forms of energy including heat transfer and work
4. Identify various type of properties (e.g., extensive and intensive properties)
5. Use tables, equations, and charts, in evaluation of thermodynamic properties
6. Apply conservation of mass, first law, and second law in thermodynamic analysis of systems (e.g., turbines, pumps, compressors, heat exchangers, etc.)

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

This course primarily contributes to physics program outcomes:

(a) an ability to apply knowledge of mathematics, and , science

(b) an ability to identify, formulate, and solve physics problems (l) apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyse, design, and realize physical systems, components or processes; and work professionally in both thermal and mechanical systems areas.

Topics covered:

1. Thermodynamic systems
2. Property, state, process, and equilibrium, system of units
3. Energy and the first law of thermodynamics
4. Energy of a system
5. Energy transfer by work of heat
6. Energy balance for systems and cycles

7. Properties of pure, simple compressible substance

8. Tables of thermodynamic properties

9. Generalized compressibility chart and ideal gas model

10. Conservation of mass and energy for a control volume

11. Irreversible and reversible processes

12. Ideal performance for power, refrigeration, & heat pump cycles

13. Second law of thermodynamics and definition of entropy change

14. Entropy of pure, simple compressible substance

15. Control volume analyses for steady state and transient processes

16. Isentropic efficiencies of turbines, nozzles, compressors, and pumps

17. Introduction to vapor power cycles

18. Introduction to air-standard power cycles

19. Introduction to vapor compression refrigeration and heat pump cycles

1 Topics to be Covered		
Topic	No of Weeks	Contact hours

CHAPTER 1. **Thermal properties of matter (1 week)** 1.1 Define Thermodynamics 1.2 Temperature, Heat, Temperature scales, Type of thermometer, , 1.3 Two Measurable Properties : Specific Volume and Pressure 1.4 Zero law of Thermodynamic 1.5 Thermal transfers, thermal expansion.	2	6
CHAPTER 2. **Thermodynamics properties** 2.1 Equation of ideal gas, kinetic theory, Van der Waal equation for real gas. 2.2 Deduction of the critical constant of a real gas of Van der Waal 2.3 Virial equation of state, Reduced equation of state. 2.4 Adiabatic compressibility 2.5 P-V-T relationship of real gases, Phase Diagram	3	9

CHAPTER 3. **First law of thermodynamics, Heat and Energy** 3.1 First law of thermodynamics, Heat and Energy 3.2 Defining Systems and Their Behavior 3.3 The processing in thermodynamics 3.4 The definition of heat capacity and specific heat capacity, latent heat 3.5 Apply the first law of thermodynamics to evaluate the temperature and work and the internal energy and energy conversion. 3.6 Explain the enthalpy 3.7 The relationship between specific heat for gas, the work done in adiabatic process.	2	6
First Mid-term Examination	1	3
CHAPTER 4. **Second law of thermodynamics** 4.1. Heat engines, refrigerators, heat pumps and reversible processes 4.2 statements of Kelvin - Planck and Clausius. 4.3 Carnot machine and its efficiency. 4.4 Otto cycle and diesel fuel and gasoline and its efficiency.	3	9

CHAPTER 5. **Thermodynamics potentials** 5.1 thermodynamics potentials, internal energy U, enthalpy (H), free energy of Gibbs (G) and Helmholtz free energy (A), Maxwell relations and their the application, Tds equations 5.2 Clausiuos Claperyron equation.	**2**	**6**
Second Mid-term Examination	**1**	**3**
	14 weeks	**42 hrs**

2 Course components (total contact hours per semester):			
Lecture : 42	Tutorial: 12	Practical: 0	Other: Office hours 12

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

i. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

- Demonstrating the basic information and principles through lectures and the achieved applications
- Discussing phenomena with illustrating pictures and diagrams
- Lecturing method:
- Projector
- Power point
- e-learning
- Discussions
- Start each chapter by general idea and the benefit of it
- Learn the student background of the subject;
- Show the best ways to deal with problem;

Keep the question "why" or "how" to explain always there

(ii) Teaching strategies to be used to develop that knowledge

- Theoretical teaching is supported by problem solving.
- Give the students the summary of course after the end of each chapter.
- Recommended text books, data show, internet.

(iii) Methods of assessment of knowledge acquired:

- Midterm theoretical exams (2) 30%
- Homework and Activities 10%
- quizzes 10%
- Final exam 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

We will apply the principles of statistics to develop

- Preparing main outlines for teaching
- Following some proofs
- Define duties for each chapter
- Home work assignments
- Encourage the student to look for the information in different references
- Ask the student to attend lectures for practice solving problem.

Doing small research

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Asking questions during lectures.
2. Midterm exams and quizzes.
3. Doing homework.
4. Discussion same physical method, check the problems solution.

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture.

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

-learn to rely on him and to have the ability to hard work independently and with groups.

Develop his English language. -

(xi) Teaching strategies to be used to develop these skills and abilities

- Internet websites.
- Library.
- Small group discussion.

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the work in team.
- Evaluation of student's presentations.
- The ability to search through the library and internet to give information on the course.
- The ability to understand and the think of problems by solving the exercises and questions in solving problems.

d. Communication, Information Technology and Numerical Skills

(ix) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

17. know how to use computer ,
18. know how to search in the internet
19. Know how to improve his English language.

20. Teaching strategies to be used to develop these skills

26. **Homework**

27. **Seminars presentation**

(iii) Methods of assessment of students numerical and communication skills

16. Give students tasks to measure their calculations and analysis, problem solving. Encourage students to seek help if necessary.

17. Encourage students to ask a good question to help solve the problem.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

(i) Description of the psychomotor skills to be developed and the level of performance required

1. Not applicable.

(ii) Teaching strategies to be used to develop these skills

Not applicable.

28. Methods of assessment of students psychomotor skills

- Not applicable.

5. Schedule of Assessment Tasks for Students During the Semester			
Assessment task (e.g. essay, test, group project, examination, etc.)		Week Due	Proportion of Total Assessment
1	Midterm 1	5th week	15 %
2	Midterm 2	10th week	15 %
3	quizzes	During the semester	10%
4	Home works	During the semester	10%
5	Final exam	15th week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (Include amount of time faculty are available each week).

1- 12-office hours per week in the lecturer schedule.

2- The contact with students by e-mail.

E. Learning Resources

Required Text(s):

1. Thermodynamics, Kinetic theory, and statistical thermodynamics, 3rd edition, Francis W. Sears and Gerhard L. Salinger.
2. An introduction to thermodynamics and statistical mechanics second edition(2007).
3. Fundamentals of Statistical and Thermal Physics, by R. Reif, (2008).
4. Concepts in thermal physics, Stephen J.Blundell and Katherine M.Blundell,2006

.

Recommended Reading List

1. M.D. Sturge, Statistical and Thermal Physics, Fundamentals and Applications (A.K. Peters, Natick, Massachusetts, 2003) ISBN 1-56881-196-9..

Electronic Materials, Web Sites

.Electronic Materials, Web Sites etc.

Other learning material such as computer-based programs/CD, professional standards/regulations.

- **There are so many computer programs that can be used for Statistical Mechanics calculations such as Mathematica, Maple, Matlab,…etc**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room and a board to write on
- The area of class room is suitable concerning the number of enrolled students (30) and air conditioned.

2. Computing resources

- Calculator,
- Computer Lab..

3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- None.

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Questionaries • Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • Course report • Program report and Program self-study and a tutorial lecture
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title Electromagnetism I

Course code: 4033132-3

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

17. Course title: Electromagnetism I 18. Course code: 4033132-3	
2. Credit hours: 3hrs	
3. Program(s) in which the course is offered. : B.Sc. Pure Physics	
13. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 3nd Year / Level 6	
6. Pre-requisites for this course (if any): Theoretical Methods in Physics (2) (4032141-4)	
7. Co-requisites for this course (if any): Theoretical Methods in Physics (1) (4033142-4)	
8. Location if not on main campus: Main Campus & El-Zaher Campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?
c. e-learning	What percentage?

d. correspondence	What percentage?
f. other	What percentage?
	Comments:

B Objectives

After completing this course student should be able to:

1. **Define the basic fundamentals of electromagnetic phenomena.**
2. **Using the mathematics to solve the problems in electromagnetism.**
3. **Using the mathematics to express the phenomena in electromagnerism.**
4. Define the electric field, the electric potential, and electric dipole, .
5. **Calculate the electrostatic field, electrostatic potential of the charge, dipole and multipoles**
6. Apply the Gauss law to solve some problems.
7. Apply Poisson's equation to solve some problems
8. Apply Laplace's equation to solve some problems.
9. Define the electric displacement, polarization of the materials, dielectric constant, and electric susceptibility.
10. Calculate the electric field outside a dielectric materials.
11. **Calculate the electrostatic field and potential in dielectric materials, microscopic theory of dielectric and electrostatic energy**
12. Define the Ferroelectricity phenomena.
13. Calculate the energy density of the electrostatic field.
14. Calculate the energy of a System of Charged Conductors
15. Describe, in words, the ways in which various concepts in electromagnetism come into play in particular situations; to represent these electromagnetic phenomena and fields mathematically in those situations; and to predict outcomes in other similar situations.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

This course deals primarily with a vector calculus based description of static electric field in case of fixed charges, volume and surface charge distribution, dipole, multipole, conductor and dielectric beside the calculation of the electrostatic potentials in each case. Description the calculation of the electric field by applying Gauss's law for the fixed charge and dielectric materials. Also, it concern to the study of the polarization and dielectric constant and the boundary conditions at the interface at the two different dielectric medium. The calculation of the molecular field , electrostatic energy and descriptions of moving charges for the case of steady electric currents are also presented.

1. Describe the vector and scalar fields, Cartesian, spherical polar, cylindrical coordinates, integral vector calculus , div, grad, and curl operations with geometric interpretations, stokes and gauss theorems, Dirac delta function

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Electrostatics:** 1-Electric Charge 2-Coulomb 3-The Electric Field 4-Electrostatic Potential 5-Conductors & Insulators 6-Gauss's Law 7-The Electric Dipole 8-Multipole Expansion	**2**	**6**
❖ **Solution of the Electrostatic Problem** 1-Poisson's Equation 2-Laplace's Equation 3-Laplaces's Equation in one independent Variable 4-Laplace's Equation in Spherical Coordinates 5-Conducting Sphere in Uniform 6-Cylindrical Harmonics 7-Electrostatic Images 8-Point charge & Conducting Sphere 9-Line charges & Line Images 10-System of Conductors 11-Poisson's Equation.	**4**	**12**
❖ **The Electrostatic Field in Dielectric Media** 1-Polarization 2-Field Outside of a Dielectric Medium 3-The Electric Field Inside a Dielectric 4-The Electric Displacement 5-Electric Susceptibility and Dielectric Constant 6-Point Charge in a Dielectric Field 7-Boundary Conditions on The Field Vector 8-Boundary Value Problem Involving Dielectrics 9-Dielectric Sphere in a Uniform Electric Field.	**3**	**9**

❖ **Microscopic Theory of Dielectrics** 1-Molecular Field in Dielectric 2-Induced Dipoles 3-Polar Molecules 4-Ferroelectricity	**2**	**6**
❖ **Electrostatic Energy** 1-Potential Energy of a Group of Point Charges 2-Energy Density of an Electrostatic Field 3-Energy of a System of Charged Conductors 4-Capacitors.	**1.5**	**4.5**
❖ **Electric Current** 1-Current Density & Equation of Continuity 2-Ohm's Law 3-Steady Currents in Continous Media 4-Microscopic Theory of Conduction.	**1.5**	**4.5**
❖	**14 weeks**	**42 hrs**

2 Course components (total contact hours per semester):			
Lecture : 42 hrs	Tutorial: 28 hrs	Practical: 42	Other: Homework 42 hrs

19. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): **28 h (reports and project research for the electrical properties of dielectric materials)**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

1. **A brief summary of the knowledge or skill the course is intended to develop;**
2. **A description of the teaching strategies to be used in the course to develop that knowledge or skill.**
3. **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

j. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course the student will be able to:

2. Describe the vector and scalar fields, Cartesian, spherical polar, cylindrical coordinates, integral vector calculus , div, grad, and curl operations with geometric interpretations, stokes and gauss theorems, Dirac delta function
3. Calculate the force between the charges by Coulomb's Law, Electric Field and potentials of fixed charge points, linear charge, surface and volume charge density, dipole and multipole expansion. Gauss' Law in integral and differential form.
4. Solve the Electrostatic Problems by Laplace's Equation and Uniqueness by Separation of variables in Cartesian, Spherical and cylindrical coordinates, Image Charge Methods for grounded planes and spheres in external fields.
5. Understand the Dielectric materials , Polarization and its Realization in Matter, The displacement field D, free charge, and modified Gauss Law, Boundary conditions and symmetric problems with displacement field, molecular fields and ferroelectricity.
6. Determine the electrostatic energy and capacitance of Capacitors
7. Explain the Currents and the Continuity Equation

(ii) Teaching strategies to be used to develop that knowledge

1. The methodology of teaching that includes a curriculum design, planning and delivering teaching and assessment, combination of lectures and web-interactions by the lecturer. These will be given the opportunity of students to understand the basic science of the electromagnetic specially in electrostatic case and its different applications in life.
2. Feedback and evaluation that include:

- Flipping the lecture by using quizzes, blackboard, power point and e-learning
- Effective by solve some examples during the lecture
- Reflective learning, multi-cultural of electromagnetic and emotional intelligence.
- Creating productive online electromagnetic for learning and teaching, transition and participation into education.
- Observing teaching and learning and creating productive classroom.
- Small group teaching and assessment learning.
- Designing and implementing an 'outcomes-based' curriculum.
- Teaching for reflective learning and research methods.
- Seminar presentation and on-line learning process with (images and movies)
- Collect the new information about what the new in electromagnetic
- Enable the reference books and scientific sites concerning electromagnetic and its application in internet.
- Teaching for employability,
- Monitoring the student experience

(iii) Methods of assessment of knowledge acquired:

1. Periodical quizzes, assignments and homework
2. First and second mid- term exam and final exam
3. Emphasis of the students in the presence of the lecture continuously
4. Making the students are working small projects and report for electromagnetically and its applications around us.
5. Ask the student to clear the miss understanding of the course

b. Cognitive Skills

(i) Cognitive skills to be developed

At the end of the course students should be able to have

1. Understanding of the physical principles of electromagnetism, and their application to physical phenomena.
2. Use physical laws and principles to understand the subject
3. Simplify problems and analyze phenomena
4. Analyse and explain natural phenomena.
5. **Ability to explain the idea with the student own words.**
6. **Ability to identify, formulate and solve the electromagnetic represent the problems mathematically**

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Preparing main outlines for teaching in the starting of the lecture
2. Define tasks for each chapter
3. Open discussions during the lectures
4. Brain storming, group work, homework assignments and small project
5. Encourage the student to look for the information in different sources

(iii) Methods of assessment of students cognitive skills

1. All exams and short quizzes must contain questions that can measure these skills.
2. Asking the students about physical meaning and laws previously taught
3. Emphasize the student writing reports on selected parts of the course
4. Discussions of how to simplify or analyse after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

1. Learn independently and take up responsibility
2. Fluent in dealing with others and collaborative work.
3. Respects the opinions of others .
4. Accepts criticism.
5. Evaluate electromagnetic information.
6. Analyse electromagnetic data.
7. Choose representative examples for each group of electromagnetic .

(xii) Teaching strategies to be used to develop these skills and abilities

1. Learn how to search the internet and use the library
2. Teamwork and small group discussion
3. Interactive learning
4. Case Study

(xiii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

1. Making quizzes on the previous lecture.
2. Checking report and evaluate the efforts and scientific values of each student in preparing report.
3. Mini project and evaluate the work in team
4. Evaluation of the role of each student in teamwork assignment
5. Assignments and evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(x) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

1. Feeling mathematical reality of solving the problems
2. Enhancing the ability of students to use computers and internet for electromagnetic research.
3. Interpretation and discussing the electromagnetic phenomena and data
4. Present electromagnetic data orally and know how to write a report.

21. Teaching strategies to be used to develop these skills.

1. Know the basic physical principles of electromagnetic.
2. Discuss with the student
3. Homework (preparing a report on some topics related to the course depending on web sites).
4. Seminars presentation
5. Field visits to laboratory and factories

(xi) Methods of assessment of students numerical and communication skills

1. Their interaction with the lectures and discussions
2. Evaluation of presentations
3. Evaluation of reports
4. Practical exam

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

- NA

(ii) Teaching strategies to be used to develop these skills

- NA

(xii) Methods of assessment of students psychomotor skills

- NA

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm 1	5th week	15%
2	Midterm 2	10th week	15%
3	Quizzes and In-Class Problem Solving	Each 2 weeks w	5%
4	Presence of students	All lectures	5%
5	Small project	12th week	5%
6	Homework	Every week	5%
7	Final exam	End of semester	50%

D. Student Support

3. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

- Department and Faculty web-page with communication tolls in black board. •
- 4 Office hours/ week.

E. Learning Resources

1- Required Text(s):

- Foundations of Electromagnetic Theory by Reitz, John R., Milford, Frederick J., Christy, Robert W. [Addison-Wesley, 2008] 4th Edition

- Electromagnetic Fields and Waves by Paul Lorrain, Dale R. Corson, Francois Lorrain [W. H. Freeman and Company, 1988] 3rd Edition
- Introduction to Electrodynamics by David J. Griffiths, [Prentice-Hall, Inc., 1999], 3rd Edition.

2- Recommended Reading List

- Elements of Electromagnetics : M. N. O. sadiku [Oxford University Press, 2001] 3rd Edition.

3-Electronic Materials, Web Sites

- Web Sites, Social Media, Blackboard, Facebook, Twitter, etc.)
- Consult courses in website of the certified universities,.

4- Other learning material such as computer-based programs/CD, professional standards/regulations

- PPT lectures prepared by Prof. Dr. Roshdi Seoudi

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. **Accommodation (Lecture rooms, laboratories, etc.)**

- Classrooms enough for 40 students, Black (white) boards
- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (60) and air conditioned.

2. Computing resources

- Providing class rooms with computers , AV, data show, Smart Board, software, etc.)

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- Does not exist

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures
- Meeting with students
- Open door policy

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students
- E-Learning Suggestions - e-Learning Documentation

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Periodical revision of course content.
- Report writing of the course and determine goals.
- Fortification of the student learning.
- Handling the weakness point

4- Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

After the agreement of Department and Faculty administrations

- The instructors of the course are checking together and put a unique process of evaluation.
- Feedback evaluation of teaching from independent organization.

5 Describe the planning arrangements for periodically reviewing course effectiveness and

planning for improvement.

- Periodical revision by Quality Assurance Units in the Department and institution for (Student evaluation, Course report, Program report, Program Self-study, Plan of improvement should be given.
- Collect all reports and evaluations at the end of the year for a reviewing purpose.
- Conduct a workshop to presents finding of reports and evaluation to share knowledge.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Quantum Mechanics (2)**

Course code: **4033146-3**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: Umm Al-Qura University
College/Department: Faculty of Applied Science – Department of Physics

A Course Identification and General Information

20. **Course title:** Quantum Mechanics (2) 21. **Course code:** 4033146-3	
2. **Credit hours:** 3 hrs	
3. **Program(s) in which the course is offered. :** BSc Physics	
14. **Name of faculty member responsible for the course:** One of the academic staff member	
5. **Level/year at which this course is offered:** 3rd Year / 6th Level	
6. **Pre-requisites for this course (if any):** Quantum Mechanics (1) (4033145-4)	
7. **Co-requisites for this course (if any):** ---	
8. **Location if not on main campus:** Main campus	
9. **Mode of Instruction (mark all that apply)**	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

By the end of the course, students should understand each major concept of the following and be able to demonstrate their understanding in problems resolving as well as in applications in modern physics and in this field:

- Method of operators (lowering and rising operators, ...).
- Addition of angular momenta and spin.
- Matrix representation.
- Approximation methods to solve Schrödinger Equation.
- Emission and Absorption of Radiation.
- Scattering theory.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Review of Quantum Mechanics 1** • Postulates. • Wave Mechanics and Schrodinger's Equation. • Operator Methods. • Bound and Unbound states in one-dimension. • Quantum Mechanics in more than one-dimension. • Matrix Mechanics. • Angular Momentum, Commutation Relations. • Spin; Spin Representation and Pauli matrices. • Addition of angular Momenta and spin.	2	6

❖ **Time –Independent Perturbation Theory** • Perturbation Series; First and Second Order Expansion. • Degenerate Perturbation Theory. • The Fine Structure of Hydrogen. • The Stark Effect. • The Zeeman Effect.	3	9
❖ **Variational Principle** • Theory • The Ground State of Helium.	2	6
❖ **The WKB Approximation** • The Classical Region. • Tunneling.	1	3
❖ **Time-Dependent Perturbation Theory** • Two- Level Systems: The Perturbed System, Time-Dependent Perturbation Theory, Sinusoidal Perturbations. • Emission and Absorption of Radiation, Absorption, Stimulated Emission, and Spontaneous Emission, Incoheret Perturbations. • Spontaneous Emission: Einstein's A and B coefficients, The Lifetime of an Excited State, Selection Rules.	4	12
❖ **Scattering** • Introduction. • Partial Wave Analysis. • The Born Approximation.	2	6
	14 **Week**	**42** **Hours**

2 Course components (total contact hours per semester):			
Lecture: 42 hr	Tutorial:	Practical:	Other: 14 hr

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 14 hr (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

4- **A brief summary of the knowledge or skill the course is intended to develop.**
5- **A description of the teaching strategies to be used in the course to develop that knowledge or skill.**
6- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

k. Knowledge: Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

57- Describe the fundamentals in quantum mechanics theory.
58- Understand the quantum physics precisely the approach methods to solve the Schrodinger's equation such as variational, perturbations and WKB.
59- Use mathematical formulation to describe the physical principle or phenomena.
60- Explain how things work.

(ii) Teaching strategies to be used to develop that knowledge

1. Demonstrating the basic information and principles through lectures and the achieved applications.
2. Discussing phenomena with illustrating pictures and diagrams.
3. Lecturing method:
   a. Blackboard.
   b. Power point.
   c. e-learning.
4. Tutorials.
5. Revisit concepts.
6. Discussions.
7. Brain storming sessions.
8. Start each chapter by general idea and the benefit of it.
9. Learn the student background of the subject.
10. Show the best ways to deal with the problem.
11. Keep the question "why" or "how" to explain always there.
12. Build a strategy to solve the problem.

(iii) Methods of assessment of knowledge acquired:

- Quizzes and Homeworks 20%
- Short exams (mid term exams) 30%
- Long exams (final) 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

a. How to use physical laws and principles to understand the subject.
b. How to simplify problems and analyze phenomena.
c. Analyze and explain natural phenomena.
d. Explain the idea with the student own words.
e. Represent the problems mathematically.

(ii) Teaching strategies to be used to develop these cognitive skills:

27. Preparing main outlines for teaching.
28. Following some proofs.
29. Define duties for each chapter.
30. Home work assignments.
31. Encourage the student to look for the information in different references.
32. Ask the student to attend lectures for practice solving problem.
33. Ask the student to do a small research.

(iii) Methods of assessment of students cognitive skills

9. **Midterm exam. Exams, short quizzes.**
10. **Asking about physical laws previously taught.**
11. **Writing reports on selected parts of the course.**
12. **Discussions of how to simplify or analyze some phenomena.**

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

5. Work independently.
6. The students learn independently and take up responsibility.

(xiv) Teaching strategies to be used to develop these skills and abilities

15.Learn how to search the internet and use the library.

16. Learn how to cover missed lectures.

17. Learn how to summarize lectures or to collect materials of the course.
18. Learn how to solve difficulties in learning: solving problems – enhance educational skills.
19. Develop the interest in science through :(lab work, field trips…).
20. Encourage the student to attend lectures regularly by:
    i. Giving bonus marks for attendance
    ii. Assigning marks for attendance.
21. Give students' tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

10. Quizzes on the previous lecture.
11. Discussion.
12. **The accuracy of the result gained by each group will indicate the good group work.**
13. **Presenting the required research on time and the degree of the quality will show the sense of responsibility.**

d. Communication, Information Technology and Numerical Skills

(xiii) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

7. Computation
8. Problem solving
9. Data analysis and interpretation.

22. Teaching strategies to be used to develop these skills

23. **Know the basic mathematical principles.**
24. Use the web for research.
25. **Discuss with the student.**
26. **Exams to measure the mathematical skill.**
27. **Encourage the student to ask for help if needed.**
28. Computational analysis.
29. Data representation.
30. Focusing on some real results and its physical meaning.
31. **Lectures for problem solution.**
32. Encourage the student to ask good questions to help solve the problem.

33. Display the lecture note and homework assignment on the web.

(iii) Methods of assessment of students numerical and communication skills

13. **Their interaction with the lectures and discussions.**
14. The reports of different asked tasks.
15. **Homework, Problem solutions, assignment and exam should focus on the understanding.**
16. Results of computations and analysis.
17. Comments on some resulting numbers.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to: (NA)

(ii) Teaching strategies to be used to develop these skills (NA)

(iii) Methods of assessment of students psychomotor skills **(NA)**

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	Exercises & Home works	All weeks	5 %
2	Participation	All weeks	5 %
3	In-Class Problem Solving	13th,7th week	10%
4	Midterm 1	6^{th} week	15%
5	Midterm 2	10^{th} week	15%
6	Final Exam	16^{th} week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Each student will supervised by an academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4 hrs office hours)

E. Learning Resources

Required Text(s):

4. David J. Griffiths "Introduction to Quantum Mechanics", Pearson Prentice Hall, New York, USA, (2005).
5. S. Gasiorowicz, "Quantum Mechanics", John Wiley & Sons, Inc., 3rd Ed. (2003).

Recommended Reading List

1. Nouredine Zettili, "Quantum Mechanics: Concepts and Applications", John Wiley & Sons, Inc. (2001).

Electronic Materials, Web Sites

- http://en.wikipedia.org/wiki/Quantum Mechanics/
- http://www.dmoz.org/Science/Physics/Quantum Mechanics/

Other learning material such as computer-based programs/CD, professional standards/regulations (NA)

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room for 30 students.
- Library.

2. Computing resources

- Computer room.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) (NA)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- 10 minutes Quiz per week.
- Home works.
- Term paper.
- Final Exam.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- At the end of term, Students fill an evaluation Sheet (without names).
- Student Marks are analyzed by considering Standard Deviation.

3. Processes for Improvement of Teaching

- Strategies are modified each term according to the student feedback.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- In case of more than one section taken this course, the instructors are cooperated to give unified Exams and they use the same marks distribution for the answer sheet. Students can see their corrected sheet and compare it with key answer sheet.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

17- The following points may help to get the course effectiveness
- Student evaluation
- Course report
- Program report
- Program Self study

18- According to point 1 the plan of improvement should be given.

19- Contact the college to evaluate the course and the benefit it add to other courses.

20- Add some subject and cut off others depending on the new discoveries in physics.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title Statistical thermodynamics

Course code: 4033111-3

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of physics

A Course Identification and General Information

22. Course title Statistical thermodynamic 23. Course code: 4033111-3			
2. Credit hours: 3hrs			
3. Program(s) in which the course is offered. : BSc physics			
15. Name of faculty member responsible for the course: One of the academic staff member			
5. Level/year at which this course is offered: 3^{rd} Year / Level 6			
6. Pre-requisites for this course (if any): Heat and thermodynamics (4033110-3)			
7. Co-requisites for this course (if any): ---			
8. Location if not on main campus: Main campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	

c. e-learning	What percentage?
d. correspondence	What percentage?
f. other	What percentage?
	Comments:

B Objectives

After completing this course student should be able to:

1. Realize the difference between the energy levels and energy states.
2. Define the concept of the thermodynamic probability and how to deal with some physical applications through this concept.
3. Differentiate between distinguishable and indistinguishable particles.
4. Compare between the different distribution functions and the different cases in use every one.
5. Define the concept of the partition function and redefine the thermodynamic quantities in terms of the partition function.
6. apply some statistics and some quantum statistics to the systems.

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

The course will give the new mathematical treatment in the concept of probability for some physical quantities for a system consists of a large number of particles such as a monatomic or diatomic ideal gas or steam of electrons or quantity of photons radiated from black body radiation. These quantities are given according to classical or quantum treatment.

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Introduction:** **-Energy states and energy levels, macro states and microstates, thermodynamic probability.**	**2**	**6**

The three statistics and its distribution functions: -The Bose-Einstein statistics, the Fermi-Dirac statistics , the Maxwell-Boltzmann statistics, The statistical interpretation of entropy, The Bose-Einstein distribution function, the Fermi-Dirac distribution functions, the classical distribution function, comparison of distribution functions for indistinguishable particles, the Maxwell-Boltzmann distribution function.	3	9
❖ **The partition function:** Thermodynamic properties of a system.	1	3
❖ **Applications of statistics to gases:** - The monatomic ideal gas, the distribution of molecular velocities, The principle of equipartition of energy, the quantized linear oscillator and specific heat capacity of a diatomic ideal gas.	4	12
❖ **Applications of quantum statistics to other systems :** The Einstein and Debye theories of the specific heat capacity of a solid, Black body radiation, Para magnetism and the electron gas.	4	12
	14 weeks	42hrs

2 Course components (total contact hours per semester):			
Lecture : 42	Tutorial: 12	Practical: 0	Other: Office hours 12

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning
For each of the domains of learning shown below indicate: • **A brief summary of the knowledge or skill the course is intended to develop;** • **A description of the teaching strategies to be used in the course to develop that knowledge or skill;** • **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**
I. Knowledge : Description of the knowledge to be acquired Upon successful completion of this course The student will be able to: 1. Understand and apply the principles of statistical mechanics on ensembles of molecules. 2. Understand and apply the principles of statistical mechanics on ensembles of molecules. 3. Recognize the association between statistical mechanics and thermodynamics. 4. Understanding of how intermolecular interaction affects the properties of matter. 5. Use statistical mechanical computer programmers to calculate the properties of macroscopic systems.
(ii) Teaching strategies to be used to develop that knowledge • Theoretical teaching is supported by problem solving. • Give the students the summary of course after the end of each chapter. • Recommended text books, data show, internet.
(iii) Methods of assessment of knowledge acquired: • Midterm theoretical exams (2) 30% • Homework and Activities 10% • quizzes 10% • Final exam 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

We will apply the principles of statistics to develop
(1) The concepts of ensembles and distribution functions.
(2) Statistical mechanical expressions for thermodynamic functions.
(3) Models of polyatomic gases, monatomic crystals, polymers.

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Asking questions during lectures.
2. Midterm exams and quizzes.
3. Doing homework.
4. Discussion same physical method, check the problems solution.

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture.

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

-learn to rely on him and to have the ability to hard work independently and with groups.

- Develop his English language.

(xv) Teaching strategies to be used to develop these skills and abilities

- Internet websites.
- Library.
- Small group discussion.

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the work in team.
- Evaluation of student's presentations.
- The ability to search through the library and internet to give information on the course.
- The ability to understand and the think of problems by solving the exercises and questions in solving problems.

d. Communication, Information Technology and Numerical Skills

(xiv) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

23. know how to use computer ,
24. know how to search in the internet
25. Know how to improve his English language.

26. Teaching strategies to be used to develop these skills

29. **Homework**

30. **Seminars presentation**

(iii) Methods of assessment of students numerical and communication skills

18. Give students tasks to measure their calculations and analysis, problem solving. Encourage students to seek help if necessary.

19. Encourage students to ask a good question to help solve the problem.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

(i) Description of the psychomotor skills to be developed and the level of performance required

2. Not applicable.

(ii) Teaching strategies to be used to develop these skills

Not applicable.

31. Methods of assessment of students psychomotor skills

- Not applicable.

5. Schedule of Assessment Tasks for Students During the Semester			
	Assessment task (e.g. essay, test, group project, examination, etc.)	Week Due	Proportion of Total Assessment
1	Midterm 1	5th week	15 %
2	Midterm 2	10th week	15 %
3	quizzes	During the semester	10%
4	Home works	During the semester	10%
5	Final exam	15th week	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (Include amount of time faculty are available each week).

1- 12-office hours per week in the lecturer schedule.

2- The contact with students by e-mail.

E. Learning Resources

Required Text(s):

5. Thermodynamics, Kinetic theory, and statistical thermodynamics, 3rd edition, Francis W. Sears and Gerhard L. Salinger.
6. An introduction to thermodynamics and statistical mechanics second edition(2007).
7. Fundamentals of Statistical and Thermal Physics, by R. Reif, (2008).
8. Concepts in thermal physics, Stephen J.Blundell and Katherine M.Blundell,2006

.

Recommended Reading List

1. M.D. Sturge, Statistical and Thermal Physics, Fundamentals and Applications (A.K. Peters, Natick, Massachusetts, 2003) ISBN 1-56881-196-9..

Electronic Materials, Web Sites

.Electronic Materials, Web Sites etc.

Other learning material such as computer-based programs/CD, professional standards/regulations.

- **There are so many computer programs that can be used for Statistical Mechanics calculations such as Mathematica, Maple, Matlab,…etc**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room and a board to write on
- The area of class room is suitable concerning the number of enrolled students (30) and air conditioned.

2. Computing resources

- Calculator,
- Computer Lab..

3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- None.

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Questionaries • Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • Course report • Program report and Program self-study and a tutorial lecture
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title Classical Mechanics (2)

Course code: 4033144-2

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

24. Course title Classical Mechanics (2) 25. Course code: 4033144-2			
2. Credit hours: 2hrs			
3. Program(s) in which the course is offered. : B.Sc Degree in Pure Physics			
16. Name of faculty member responsible for the course: One of the academic staff member			
5. Level/year at which this course is offered: 3rd Year / Level 6			
6. Pre-requisites for this course (if any): Classical Mechanics(1) (4033143-4)			
7. Co-requisites for this course (if any):			
8. Location if not on main campus: Main Campus and El-Zaher Campus			
9. Mode of Instruction (mark all that apply)			
a. traditional classroom	✓	What percentage?	100%
b. blended (traditional and online)		What percentage?	

c. e-learning	What percentage?
d. correspondence	What percentage?
f. other	What percentage?
	Comments:

B Objectives

After completing this course student should be able to:

1. Discuss the fundamental concepts in classical mechanics.
2. Understand the physical basis of mechanics and dynamics of rigid body.
3. Aanalyse the center of mass and moment of inertia of a rigid body.
4. Describe the theorems of static equilibrium of rigid body.
5. Use of matrices in rigid body dynamics.
6. Build the link between Physics theories and ideas with applications in the students daily life.
7. Discuss the Euler's equation of motion of a rigid body.
8. Realize that the Lagrangian and the Hamiltonian formalism derived from the "least action principle" though they are alternative formulation of Newton's second law they are more general and allow to derive the relation between symmetries and conservation laws
9. Use Lagrangian and the Hamiltonian formalisms to solve mechanical problems.
10. Use the scientific method to understand the enormous variety of classical mechanics in terms of a few relatively simple laws as an overall goal.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

This course concern to by study the mechanics of rigid bodies in plan motion and motion of rigid bodies in three dimensions and their applications. Moreover extensions of Newton's equations due to Lagrange and Hamilton which allow for simplified treatments of many interesting problems and which provide the foundation for the modern understanding of dynamics. This course provides students a sufficient background on the basics of classical mechanics enabling students to take more advanced courses in physics.

1 Topics to be Covered

Topic	No of Weeks	Contact hours
❖ **Mechanics of Rigid Bodies , Planar Motion:** - Center of mass of a rigid body. - Some theorems of static equilibrium of rigid body. - Rotation of a rigid body about a fixed axis (Moment of inertia). - Calculation of the moment of inertia. - The physical pendulum. - General theorem concerning angular momentum. - Laminar motion of rigid body. - Body rolling down in inclined plane. - Motion of a rigid body under an impulsive force. - Collisions of rigid bodies.	**5**	**10**
❖ **Motion of Rigid Bodies in Three Dimensions:** - Angular momentum of a rigid body, Products of inertia. - Use of matrices in rigid body dynamics (the inertia tensor). - Determination of principle axes. - Rotational kinetic energy of a rigid body. - Moment of inertia of a rigid body about an arbitrary axis, the momental ellipsoid. - Euler's equation of motion of a rigid body. - Free rotation of a rigid body under no forces. Geometric description of the motion. - Free rotation of a rigid body with an axis of symmetry. Analytical treatment. - Gyroscopic precession motion of a top.	**5**	**10**

❖ **Lagrangian Mechanics**: - Generalized coordinates. - Generalized forces. - Lagrange's equations. - Some Applications of Lagrange's equations. - Generalized moments ignorable coordinate. - Lagrange's equations for impulsive forces. - Hamilton's variational principle. - The Hamiltonian function (Hamiltonian equation). - Lagrange's equations of motion with constrain, Examples.	**5**	**10**
	15 weeks	**30hrs**

2 Course components (total contact hours per semester):			
Lecture : 30	Tutorial:	Practical:	Other: Office hours : 14 hr

3. Additional private study/learning hours expected for students per week. (This should be an average: for the semester not a specific requirement in each week): 12h (reports & essay) 14 office hour in the semester to help students for solving assigned problems.

4. Development of Learning Outcomes in Domains of Learning **For each of the domains of learning shown below indicate:** • **A brief summary of the knowledge or skill the course is intended to develop;** • **A description of the teaching strategies to be used in the course to develop that knowledge or skill;** • **The methods of student assessment are used in the course to evaluate learning outcomes in the domain concerned.**
m. Knowledge : Description of the knowledge to be acquired Upon successful completion of this course the student will be able to: 1. **Develop important physical concepts of classical mechanics.** 2. **Understand mechanics and dynamics of rigid bodies.** 3. **Derive equations of motion from the least action principle.** 4. **Classify the motion of rigid bodies (Eular classification).** 5. **Use mathematical formulae to describe the physical principles or phenomena.** 6. Improve logical thinking.

(ii) Teaching strategies to be used to develop that knowledge

13. Demonstrating the basic information and principles through lectures and the achieved applications.
14. Discussing phenomena with illustrating pictures and diagrams.
15. Lecturing method:
    a. Blackboard.
    b. Power point.
    c. e-learning.
16. Tutorials.
17. Revisit concepts.
18. Discussions.
19. Brain storming sessions.
20. **Start each chapter by general idea and the benefit of it.**
21. **Learn the student background of the subject.**
22. **Show the best ways to deal with problem.**
23. **Keep the question "why" or "how" to explain always there.**
24. **Build a strategy to solve problem.**

(iii) Methods of assessment of knowledge acquired:

1. Solve some example during the lecture.
2. Exams**:**
    a) Quizzes
    b) Short exams (midterm exams)
    c) Long exams (final)
    d) Oral exams
3. Emphasis of the students in the presence of the lecture continuously
4. Making the students are working report for classical mechanics and its applications around us.
5. Discussions with the students.
6. Ask the student to clear the misunderstanding of some physical principle.
7. Ask quality question

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

6. Use physical laws and principles to understand the subject.
7. Simplify problems and analyze phenomena.
8. **Analyse and explain natural phenomena.**
9. **Ability to explain the idea with the student own words.**
10. **Represent the problems mathematically.**

(ii) Teaching strategies to be used to develop these cognitive skills:

34. Preparing main outlines for teaching.
35. Following some proofs.
36. **Define duties for each chapter.**
37. Home work assignments.
38. **Encourage the student to look for the information in different references.**
39. **Ask students to attend lectures for practice solving problem.**
40. **Ask students to do small researches.**

(iii) Methods of assessment of students cognitive skills

5. All exams and short quizzes must contain questions that can measure these skills.
6. Asking the students about physical meaning and laws previously taught.
7. Emphasize the student writing reports on selected parts of the course.
8. Discussions of how to simplify or analyse after the lecture.

c. Interpersonal Skills and Responsibility

(i)At the end of the course, the student will be able to:

The students should learn independently and take up responsibility through:

8. Writing a report
9. Developing his English language
10. Solving problems
11. Searching on the internet
12. Collecting the material of the course
13. Dealing with the lost lectures that he missed.
14. The students should know how to do that independently and through discussions with the others.

(ii) Teaching strategies to be used to develop these skills and abilities

1- Learn how to search the internet and use the library.
2- Learn how to cover missed lectures.

3- Learn how to summarize lectures or to collect materials of the course.
4- Learn how to solve difficulties in learning: solving problems – enhance educational skills.
5- Encourage the student to attend lectures regularly by giving bonus marks for attendance.
6- Give students tasks of duties.
7- Learn how to write reports some of them in English language.
8- Teamwork and small group discussion
9- Interactive learning
10- Case Study

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

14. Quizzes on the previous lecture.
15. Checking report on internet use.
16. Discussion.
17. **The accuracy of the result gained by each group will indicate good group work.**
18. **Presenting the required research on time and the degree of the quality shows the sense of responsibility.**

d. Communication, Information Technology and Numerical Skills

(xv) Description of the skills developed in this domain. At the end of the course, the student will be able to:

1. **Communication with others: the lecturer – students in the class**
2. **IT through: the Internet – computer skills**
3. Numerical skills through: solving problems- computation – data analysis – feeling physical reality of results.

(xvi) Teaching strategies to be used to develop these skills

34. **Know the basic mathematical principles.**
35. Use the web for research.
36. **Discuss with the student.**
37. **Measure the mathematical skill by Exams.**
38. Clear the weakness point that should be eliminated.
39. **Encourage the student to ask for help if needed.**
40. Computational analysis.
41. Data representation.

42. Focusing on some real results and its physical meaning.

10. Lectures for problem solution.

11. Encourage the student to ask good question to help solve the problem.

12. Display the lecture note and homework assignment at the web.

(iii) Methods of assessment of students numerical and communication skills

18. Interact with lectures and discussions.

19. The reports of different asked tasks.

20. Homework, Problem solutions assignment and exam should focus on the understanding.

21. Results of computations and analysis.

22. Comments on some resulting numbers.

23. Research.

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

Not applicable

(ii) Teaching strategies to be used to develop these skills

Not applicable

(xvii) Methods of assessment of students psychomotor skills

Not applicable

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	Midterm 1	6th week	15 %
2	Midterm 2	11th week	15 %
3	Participation	All weeks	5 %

4	Presence and absence	All weeks	5 %
5	Exercises & Homework	All weeks	10%
6	Final Exam	End of the semester	50%

D. Student Support

4. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Office hours: 14 hrs

E. Learning Resources

Required Text(s):

1. G.R. Fowles, and G.L.Cassiday, "Analytical Mechanics" (7th Ed.), Brooks Cole. (2005).
2. G.R. Fowles, "Analytical Mechanics" (3th Ed.), Holt, Rinehart and Winston (1977).

Recommended Reading List

1. Thornton, Stephen T.; Marion, Jerry B. Classical Dynamics of Particles and Systems (5th ed.). Brooks Cole. (2003).
2. Kibble, Tom W. B.; Berkshire, Frank H. Classical Mechanics (5th ed.). Imperial College Press. (2004).

Electronic Materials, Web Sites

http://academicearth.org/lectures/modern-physics-classical-mechanics-2

Other learning material such as computer-based programs/CD, professional standards/regulations

Wikipedia

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Lecture room for 30 students, Black (white) boards
- Class room is already provided with data show

2. Computing resources

- Providing class rooms with computers , data show, Smart Board, software, etc.)

3. Other resources (specify --e.g. If specific laboratory equipment is required, list requirements or attach list)

Not applicable

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Open discussion in the class room at the end of the lectures
- Quiz.
- Midterm and final exam.
- Questionaries
- Meeting with students
- Open door policy

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- At the end of term, Students fill an evaluation Sheet (without names).
- Analysis the grades of students.

4. Processes for Improvement of Teaching

- Handling the weakness point is done each term according to the results of the questionnaires of course evaluation
- Periodical revision of course content.
- Report writing of the course and determine goals.
- Fortification of the student learning.

5. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- In the case of taking more than one group this course, the faculty members (giving this course) cooperate to give unified Exams and use the same marks distribution for the questions in the exams. Students can see their corrected sheets and compare them with the model answers' sheets.

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

21- The following points may help to get the course effectiveness
- Student evaluation
- Course report
- Program report
- Program Self study

22- According to point 1 the plan of improvement should be given.

23- Contact the college to evaluate the course and the benefit it add to other courses.

24- Add some subject and cut off others depending on the new discoveries in physics.

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Electromagnetism 2**

Course code: **4034133-3**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

26. Course title Electromagnetism 2 27. Course code: 4034133-3	
2. Credit hours: 3hrs	
3. Program(s) in which the course is offered. : B.Sc. Pure Physics	
17. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 4st Year / Level 7	
6. Pre-requisites for this course (if any): Electromagnetism 1 (4033132-3)	
7. Co-requisites for this course (if any):	
8. Location if not on main campus: Main campus & El-Zaher Campus	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?
c. e-learning	What percentage?

d. correspondence ☐ What percentage? ☐

f. other ☐ What percentage? ☐

Comments:

B Objectives

After completing this course student should be able to:

1. **Define the fundamentals of electromagnetic field and radiations.**
2. Define the magnetic field, magnetic flux, magnetic scalar potential, magnetic vector potential.
3. Apply Biot-Savart law to calculate the magnetic field due to electric current.
4. Apply Lorentz law to calculate the force acting on a wire carrying electric current placed in a magnetic field.
5. Calculate the magnetic field using Ampere's law.
6. Define the Faraday law of electromagnetic induction.
7. Calculate the self-inductance and mutual inductance.
8. Calculate the magnetic field due to a magnetized object.
9. Define the magnetization, magnetic intensity, the magnetic permeability, magnetic susceptibility.
10. Define the hysteresis loop.
11. Define the diamagnetism, Paramagnetism, and ferromagnetism.
12. Calculate the magnetic energy stored within the electric circuits.
13. Calculate the density of the magnetic energy.
14. **List the Maxwell's equations in vacuum and in the materials.**
15. Define the displacement current.
16. Explain the electromagnetism in bulk materials (permittivity and permeability, D and H fields) and investigating the concepts of field potential and energy was spent.
17. Discuss the Maxwell's equations and resulted in the triumphal prediction of electromagnetic radiation, but it's surprisingly hard to derive the specific equations for the radiation from an antenna.
18. Describe, in words, the ways in which various concepts in electromagnetism come into play in particular situations; to represent these electromagnetic phenomena and fields mathematically in those situations; and to predict outcomes in other similar situations.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

The course will cover the principle of electromagnetism, such as calculating the magnetic field due to steady current, calculating the magnetic induction, Calculating the magnetic energy, the magnetic materials and their fields, Maxwell's equations and their applications, Electromagnetic waves, propagation of electromagnetic wave in different media. This course will provide a conceptual background in electromagnetism sufficient to enable students to take courses that are more advanced in related fields.

1 Topics to be Covered		
Topics	**No of Weeks**	**Contact hours**
❖ **The Magnetic Field of Steady Current** 1. Induction to magnetic field, 2. Lorentz force law and its applications. 3. Biot-Savart Law and its applications. 4. Ampere's Law (differential and integral shape) 5. Application of Ampere's law. 6. Divergence and curl of magnetic field. 7. The Magnetic Vector Potential, 8. The Magnetic Scalar Potential 9. The Magnetic Flux	4	12
❖ **The Electromagnetic Induction** 1- Self Induction 2- Mutual Induction 3- The Neumann Formula	1.33	4

❖ **Magnetic Properties of Matter** 1. The origin of magnetism in the matter. 2. Magnetic moment of the atom. 3. Magnetization. 4. Magnetic current density. 5. Surface current density. 6. Magnetic Intensity. 7. Calculation of magnetic Field of a Magnetized Object. 8. Magnetic susceptibility, 9. Magnetic Permeability, 10. Hysteresis loop. 11. Classification of magnetic materials. 12. Diamagnetic materials 13. Paramagnetic materials. 14. Ferromagnetic materials. 15. Boundary condition of magnetic field. 16. Electric circuits containing magnetic media. 17. Magnetic circuits. 18. Examples.	**4**	**12**
❖ **Magnetic Energy** 1- Magnetic energy of a solid circuit. 2- Magnetic Energy of Coupled Circuits, 3- Energy Density in Magnetic Field, 4- Force and Torques on Rigid Circuits	**1.33**	**4**

❖ **Maxwell's Equation's and Electromagnetic Waves** 1- Displacement Current, 2- Maxwell's Equation's 3- Wave Equation for Electric and Magnetic Field 4- Plane Wave 5- Plane Waves in Isotropic Insulating Media 6- Transfer of Plane Waves in Conductor 7- Resistance of conductors at ultra high frequencies. 8- Applications of Maxwell's Equations a. Boundary Conditions. b. Refraction and Reflection at the boundary of two non-conducting media. 9- Electromagnetic waves Energy 10- The Wave Equation with Sources	**3.33**	**10**
	14 weeks	**42hrs**

2 Course components (total contact hours per semester):			
Lecture : 42	Tutorial: 28	Practical: 42	Other:42

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): **28 Office hours for the semester to help students for solving assigned problems**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

n. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course the student will be able to:

1. Describe current density and equation of continuity, Ohm's law, steady currents in continuous media
2. Calculate the induction to magnetic field, Lorentz force law and its applications, Biot-Savart Law and its applications, Ampere's law (differential and integral shape), divergence and curl of magnetic field, magnetic vector and scalar potential and magnetic flux
3. Solve the self-induction, mutual induction problems and the Neumann formula
4. Understand the origin of magnetism in the matter, magnetic moment of the atom, magnetization, magnetic and surface current density, magnetic intensity.
5. Calculation of magnetic field of a magnetized object, magnetic susceptibility and permeability, hysteresis loop, diamagnetic, paramagnetic, ferromagnetic materials, boundary condition of magnetic field, electric circuits containing magnetic media.
6. Determine the magnetic energy of a solid and coupled circuit, energy density in magnetic field and force and torques on rigid circuits
7. Explain the Maxwell's equation's and electromagnetic waves: displacement current, wave equation for electric and magnetic field, plane wave in isotropic insulating media, transfer of plane waves in conductor, resistance of conductors at ultra-high frequencies , applications of Maxwell's equations , electromagnetic waves energy and the wave equation with sources

(ii) Teaching strategies to be used to develop that knowledge

3. The methodology of teaching that includes a curriculum design, planning and delivering teaching and assessment, combination of lectures and web-interactions by the lecturer. These will be given the opportunity of students to understand the basic science of the electromagnetic and its different applications in life.
4. Feedback and evaluation that include:
   - Flipping the lecture by using quizzes, blackboard, power point and e-learning
   - Effective by solve some examples during the lecture
   - Reflective learning, multi-cultural of electromagnetic and emotional intelligence.
   - Creating productive online electromagnetic for learning and teaching, transition and participation into education.
   - Observing teaching and learning and creating productive classroom.
   - Small group teaching and assessment learning.
   - Designing and implementing an ‘outcomes-based’ curriculum.
   - Teaching for reflective learning and research methods.
   - Seminar presentation and on-line learning process with (images and movies)
   - Collect the new information about what the new in electromagnetic
   - Enable the reference books and scientific sites concerning electromagnetic and its application in internet.
   - Teaching for employability,
   - Monitoring the student experience

(iii) Methods of assessment of knowledge acquired:

1. Periodical quizzes, assignments and homework
2. First and second mid- term exam and final exam
3. Emphasis of the students in the presence of the lecture continuously

4. Making the students are working small projects and report for electromagnetically and its applications around us.
5. Ask the student to clear the miss understanding of the course

b. Cognitive Skills

(i) Cognitive skills to be developed

At the end of the course students should be able to have

1. Define the physical principles of electromagnetism, and their application to physical phenomena.
2. Use physical laws and principles to understand the subject
3. Simplify problems and analyze phenomena
4. Analyse and explain natural phenomena.
5. **Ability to explain the idea with the student own words.**
6. Ability to identify, formulate and solve the electromagnetic represent the problems mathematically

(ii) Teaching strategies to be used to develop these cognitive skills:

1. Preparing main outlines for teaching in the starting of the lecture
2. Define tasks for each chapter
3. Open discussions during the lectures
4. Brain storming, group work, homework assignments and small project
5. Encourage the student to look for the information in different sources

(iii) Methods of assessment of students cognitive skills

1. All exams and short quizzes must contain questions that can measure these skills.
2. Asking the students about physical meaning and laws previously taught
3. Emphasize the student writing reports on selected parts of the course
4. Discussions of how to simplify or analyse after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

1. Learn independently and take up responsibility
2. Fluent in dealing with others and collaborative work.
3. Respects the opinions of others .
4. Accepts criticism.
5. Evaluate electromagnetic information.
6. Analyse electromagnetic data.
7. Choose representative examples for each group of electromagnetic .

(xvi) Teaching strategies to be used to develop these skills and abilities

5. Learn how to search the internet and use the library
6. Teamwork and small group discussion
7. Interactive learning
8. Case Study

(xvii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

6. Making quizzes on the previous lecture.
7. Checking report and evaluate the efforts and scientific values of each student in preparing report.
8. Mini project and evaluate the work in team
9. Evaluation of the role of each student in teamwork assignment
10. Assignments and evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

17. Enhancing the ability of students to use computers and internet.
18. Interpret Physical phenomena.
19. Present Physical phenomena orally.
20. Know how to write a report.
21. Computation
22. Problem solving

23. Data analysis and interpretation.
24. Feeling physical reality of results

(ii) Teaching strategies to be used to develop these skills

6. Know the basic physical principles of electromagnetic.
7. Discuss with the student
8. Homework (preparing a report on some topics related to the course depending on web sites).
9. Seminars presentation
10. Field visits to laboratory and factories

(iii) Methods of assessment of students numerical and communication skills

1. Their interaction with the lectures and discussions
2. Evaluation of presentations
3. Evaluation of reports
4. Oral discussion

e. Psychomotor Skills (if applicable)

(i) Description of the psychomotor skills to be developed and the level of performance required

- NA

(ii) Teaching strategies to be used to develop these skills

- **NA**

(iii) Methods of assessment of students psychomotor skills

- **NA**

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm 1	5^{th} week	15%
2	Midterm 2	10^{th} week	15%
3	Quizzes and In-Class Problem Solving	Each 2 weeks w	5%
4	Presence of students	All lectures	5%
5	Small project	12^{th} week	5%
6	Homework	Every week	5%
7	Final exam	End of semester	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)
   - Department and Faculty web-page with communication tolls in black board. •
   - 4 Office hours/ week.

E. Learning Resources

Required Text(s):

- Foundations of Electromagnetic Theory by Reitz, John R., Milford, Frederick J., Christy, Robert W. [Addison-Wesley, 2008] 4^{th} Edition
- Electromagnetic Fields and Waves by Paul Lorrain, Dale R. Corson, Francois

Lorrain [W. H. Freeman and Company, 1988] 3rd Edition

- Introduction to Electrodynamics by David J. Griffiths, [Prentice-Hall, Inc., 1999], 3rd Edition.

.

Recommended Reading List

- I.S. Grant and W.R. Phillips, Electromagnetism, Second Edition, John Wiley & Sons, New York, 2008.
- Elements of Electromagnetics : M. N. O. sadiku [Oxford University Press, 2001] 3rd Edition.

Electronic Materials, Web Sites

- Web Sites, Social Media, Blackboard, Facebook, Twitter, etc.)
- Consult courses in website of the certified universities,.
- www.youtube.com.)
- http://en.wikipedia.org/wiki/Electromagnetism

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. **Accommodation (Lecture rooms, laboratories, etc.)**

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.
- Library
- Laboratory for electricity and magnetism and laboratory of optics and modern physics.

2. Computing resources

Providing class rooms with computers , AV, data show, Smart Board, software, etc.)

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- .

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures
- Meeting with students
- Open door policy

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.
- E-Learning Suggestions - e-Learning Documentation

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.
- Report writing of the course and determine goals.
- Fortification of the student learning.
- Handling the weakness point

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an

independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) After the agreement of Department and Faculty administrations • The instructors of the course are checking together and put a unique process of evaluation. • Feedback evaluation of teaching from independent organization.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution for (Student evaluation, Course report, Program report, Program Self-study, Plan of improvement should be given. • Collect all reports and evaluations at the end of the year for a reviewing purpose. • Conduct a workshop to presents finding of reports and evaluation to share knowledge.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title Nuclear Physics

Course code: 4034160-4

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

28. Course title Nuclear physics 29. Course code: 4034160-4
2. Credit hours: 4hrs (three hours lecture and one hour Lab.)
3. Program(s) in which the course is offered. : BSc Physics
18. Name of faculty member responsible for the course: One of the academic staff member
5. Level/year at which this course is offered: 4^{th} Year / Level 7
6. Pre-requisites for this course (if any): Quantum mechanics (1) (4033145-4)
7. Co-requisites for this course (if any): ---
8. Location if not on main campus: Main campus
9. Mode of Instruction (mark all that apply) a. traditional classroom ✓ What percentage? 100% b. blended (traditional and online) What percentage?

c. e-learning What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course.	
The objective of this course is to establish the meaning of the ends of the computational and use in communication, and differentiation, integration and applications of it. The objectives of this course are to establish the meaning of the concepts of nuclear physics and elementary particles, and to ease out the theoretical models to describe the nuclear properties. We want to be able: The benchmark statement of the main learning outcomes are as follows: 1. **To understand basic fundamentals of nuclear properties.** 2. **The students should be trained on physical and generic skills (knowledge – cognitive – interpersonal – communication – problem solving – IT)** 3. To understand the liquid drop model. 4. To understand the nuclear drop model. 5. To understand the origin of alpha transition within the nucleus. 6. **To understand the origin of Gamma transition within the nucleus.** 7. To understand the origin of Beta transition within the nucleus. 8. To understand the elementary particles. The overall goal is to understand the fundamentals of nuclear physics.	
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field) 8. Explain strategy of the course in the beginning of the semester 9. Outlines of the Nuclear concepts, theories and the associated proofs. 10. Highlighting the day life applications whenever exist. 11. Encourage the students to see more details in the international web sites and reference books in the library. 12. Discussing some selected problems in each chapter. 13. Cooperate with different institution to find how they deal with the subject 14. Renew the course references frequently 15. Frequently check for the latest discovery in science	

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

1 Topics to be Covered :-

Topics	No of Weeks	Contact hours
1- Nuclear Properties		
1- Definitions & Nuclear radii	1	1
2- Nuclear Mass-Binding Energy		1
3- Nuclear Radiation, Energy levels.		1
4- Nuclear Isomers.	1	1
5- Angular Momentum, Parity and Symmetry		1
6- Dipole moment, qudropole moment		1
2- Liquid Drop Model		
1- Finding Energy	1	1
2- Sem-emperical Formula		2
3- Mass Spectrometer	1	1
4- Nuclear Reactions and Q-value		2
3- Nuclear Shell Model		
1- Single Particle model with square well and Harmocia Oscillator	1	1
2- Magic Numbers		1
3- Spin for Different nuclei		1

4- Excited rootes nuclear magnetic moments		1
5- Parity	1	2
6- Isotopic spin		1
4- Gamma Transitions		
1- Multiple Moments		1
2- Decay Constants	1	1
3- Selection Nucles		1
4- Angular Correlation	1	2
5- Internal Conversion		1
5- Alpha Transitions		
1- Heavy Ions-Stalitlity	1	2
2- Decay Constants		1
3- Tunnel Effect	1	2
4- Energy Levels		1
6- Beta Transitions		
1- Theorgy of B-decay	1	2
2- Allowed and Forbiddin transitions		1
3- Selection Nucles	1	2
4- Non Conservation of Parity		1
7- Elementary Particles		
1- Nucler Force and Meson Theory	1	2

2- Pions & Mions		1
3- Kaons & Hyperons	1	2
4- Classi Fiction of demeray Pancles		1
Total	14	42

2 Course components (total contact hours per semester):			
Lecture : 42 hrs	Tutorial:	Lab: 10 hrs	Total: 52 hrs

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

o. **Knowledge :** Description of the knowledge to be acquired

(i) knowledge that students should know and understand when they complete the course are as follow:

1 **Learning fundamentals in nuclear physics.**

2 **Understanding the models and theories which explain the nuclear properties.**

3 **Improving logical thinking.**

4 **To use concepts of nuclear physical in daily life.**

5 Ability to describe the nuclear phenomena.

(ii) Teaching strategies to be used to develop that knowledge

25. Demonstrating the basic information and principles through lectures and the achieved applications
26. Discussing phenomena with illustrating pictures and diagrams
27. Lecturing method:
    a. E-learning gate of Umm Al-Qura university
    b. Power point

28. Tutorials
29. Revisit concepts
30. Discussions
31. Brain storming sessions
32. **Start each chapter by general idea and the benefit of it;**
33. **Learn the student background of the subject;**
34. **Show the best ways to deal with problem;**
35. **Keep the question "why" or "how" to explain always there;**
36. **Build a strategy to solve problem.**

(iii) Methods of assessment of knowledge acquired:

8. Solve some example during the lecture.
9. Exams**:**
    a) Online Quizzes
    b) First mid-term exam
    c) Second Mid term exam
    d) Oral exams
    e) Final exams
10. Discussions with the students.
11. Ask the student to clear the misunderstanding of some mathematical principle.
12. Ask quality question.

b. Cognitive Skills

(i) Cognitive skills to be developed

Cognitive skills to be developed

11. How to use physical laws and principles to understand the subject
12. How to simplify problems and analyze phenomena
13. **Analyse and explain natural phenomena.**
14. **Ability to explain the idea with the student own words.**
15. Represent the problems mathematically.

(ii) Teaching strategies to be used to develop these cognitive skills:

41. Preparing main outlines for teaching
42. Following some proofs
43. **Define duties for each chapter**
44. Home work assignments
45. **Encourage the student to look for the information in different references**
46. **Ask the student to attend lectures for practice solving problem**
47. **Ask the student to do small research.**

(iii) Methods of assessment of students cognitive skills

10. - Midterm's exam. Exams, short online quizzes
11. Asking about physical laws previously taught
12. Writing reports on selected parts of the course
13. Discussions of how to simplify or analyze some phenomena

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Work independently.
- The students learn independently and take up responsibility.

(ii) Teaching strategies to be used to develop these skills and abilities

13. Learn how to search the internet and use the library.
14. Learn how to cover missed lectures.
15. Learn how to summarize lectures or to collect materials of the course.
16. Learn how to solve difficulties in learning: solving problems – enhance educational skills.
17. Develop her interest in Science through :(lab work, field trips, visits to scientific and research.

- Encourage the student to attend lectures regularly by:

- Giving bonus marks for attendance
- Assigning marks for attendance.
- give students tasks of duties

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

19. Online Quizzes on the previous lecture
20. Creating reports
21. Discussion
22. **The accuracy of the result gained by each group will indicate good group work**
23. **Presenting the required research on time and the degree of the quality will show the sense of responsibility.**

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

1. Computation
2. Problem solving
3. Data analysis and interpretation.
4. Feeling physical reality of results

(ii) Teaching strategies to be used to develop these skills

43. **Know the basic physical principles.**
44. Use the web for research.
45. **Discuss with the student.**
46. **Exams to measure the physical skill.**
47. Clear the weakness point that should be eliminated.
48. **Encourage the student to ask for help if needed.**
49. Computational analysis.
50. Data representation.
51. Focusing on some real results and its physical meaning.
52. **Lectures for problem solution.**
53. Encourage the student to ask good question to help solve the problem.
54. Display the lecture note and homework assignment at the web.

(iii) Methods of assessment of students numerical and communication skills

24. **Online quizzes**
25. **Their interaction with the lectures and discussions.**
26. The reports of different asked tasks.
27. **Homework, Problem solutions assignment and exam should focus on the understanding.**
28. Results of computations and analysis.
29. Comments on some resulting numbers.
30. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

19. Perform the experiments with high accuracy.
20. Operate instruments safely.
21. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

32. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

5. Schedule of Assessment Tasks for Students During the Semester			
1	Midterm 1	5th week	20
2	Midterm 2	10th week	20
3	Online quizzes	every week	10
4	Homework	Every week	10
5	Interactive discussions	Every week	10
5	Final exam	End of semester	30

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week) 8 office hours per week

E. Learning Resources

Required Text(s):

1) K. Heyde, Basic ideas and concepts in nuclear Physics, An introductory approach, second edition, Institute of physics publishing, Bristol and Philadelphia (1999) ISBN 0 7503-0534 7 hbk, 07503 0535 pbk.
2) Irving Kaplan, Nuclear Physics, Second Edition, Addison-Wesley Publishing Company (1977).
3) Kenneth S. Krane , Introductory nuclear Physics, , first edition, Jone Wily & Sons Inc. (1988) ISBN 0 - 471-80553-X .
4) Burcham, Nuclear and Particle Physics, 2 Edition, Longman Publisher (1995),ISBN-10 : 0582 450888 , -13: 978 - 0582 4508882

Recommended Reading List

[1] Introductory Nuclear Physics, Krene, 1987

Electronic Materials, Web Sites

Other learning material such as computer-based programs/CD, professional standards/regulations

- **Power points (use e-learning gate of Umm Al-Qura university)**
- **Youtube videos(use e-learning gate of Umm Al-Qura university)**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) • Class room is already provided with data show • The area of class room is suitable concerning the number of enrolled students and air conditioned. • Lab with for 20 students
2. Computing resources • Providing class rooms with computers and labs with data show.
3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list) •

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Questionaries (using of e-learning gate of Umm Al-Qura university) • Online Quizzes (using of e-learning gate of Umm Al-Qura university) • Open discussion (using of e-learning gate of Umm Al-Qura university)
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member if evaluable • Analysis the grades of students.
3. Processes for Improvement of Teaching • Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations • The instructors of the course are checking together and put a unique process of evaluation. • Check marking of a sample of papers by others in the department. • Feedback evaluation of teaching from independent organization.
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 25- The following points may help to get the course effectiveness ▪ Student evaluation ▪ Course report ▪ Program report ▪ Program Self study ▪ E-learning 26- According to point 1 the plan of improvement should be given. 27- Contact the college to evaluate the course and the benefit it add to other courses. Add some subject and cut off others depending on the new discoveries in physics.

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Solid State Physics I**

Course code: **4034170**-4

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY

College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

30. Course title Solid State Physics I
31. Course code: 4034170-4

2. Credit hours: 4 hrs

3. Program(s) in which the course is offered. : BSc Physics

19. Name of faculty member responsible for the course:
One of the academic staff member

5. Level/year at which this course is offered: 4th Year / Level 7

6. Pre-requisites for this course (if any): Quantum Mechanics (1) – 4033145-4

7. Co-requisites for this course (if any): …

8. Location if not on main campus: Main campus & Girls section

9. Mode of Instruction (mark all that apply)

Mode	Mark	What percentage?
a. traditional classroom	✓	100%
b. blended (traditional and online)		
c. e-learning		

d. correspondence

What percentage?

f. other

What percentage?

Comments:

B Objectives

After completing this course student should be able to:

7. Define the principles and concepts of solid state physics.
8. Compare the origin of bonding in materials
9. Define the lattice planes & directions.
10. Explain the different types of defects in solid state and understand how it affect the physical properties of matter.
11. Explain how X-Rays Diffraction can be used in studying the solid structure.
12. Define phonons in crystals and distinguish between their different modes
13. Choose the right formulas to calculate specific heat & thermal conductivity of the lattice.
14. Recognize the main drawbacks of the free electron model in metals.
15. Identify: Bloch's theorem, Brillouin zones & Fermi surface in metals.
16. Classify different types of solid according to The Band Theory.
17. Distinguish between intrinsic & extrinsic Semiconductors and know their properties and applications.
18. Recognize the idea behind the Superconductivity phenomenon and be aware of its applications.

19. Evaluate students' interest in ethical aspects in the exploitation of solid state physics

C. Course Description (Note: General description in the form to be used for the Bulletin or Handbook should be attached):

The course will cover An introduction to the physics governing the different types of binding in solid state materials, Geometry of Solids and crystalline state of matter, Reciprocal Lattice, Brillouin zone, Modern theories describing lattice vibrations, Energy bands, X-Ray Diffraction, Electrons in solids, and Optical properties of solid materials. Free electron theory in metals ,band theory, thermal properties of solid materials, Lecture 4 hours..

1 Topics to be Covered

Topic	No of Weeks	Contact hours

❖ The atomic Theory and Binding Forces 1- Review of atomic structure 2- Atomic binding and band theory 3- Binding forces between atoms 4- Lattice Energy Calculations 5- Types of bonds 6- Nucleation and growth kinetic 7-Experimental methods of crystal growth	1.5	6
❖ Crystalline Structure 1- Long range and short rang order 2- The crystalline state 3- Basic definitions of crystallography 4- The seven crystal systems 5- Wigner Seitz primitive cell 6- Symmetry elements of crystals 7- Important plane systems in a cubic crystals 8- Miller's indices for crystal planes,	1.5	6
❖ Crystals Properties 1- Crystal Directions and distance between crystal plans 2- Zone , Zone Axis and angles between zones 3- Atomic structure of crystals 4- Cubic and hexagonal close-packed 5- Characteristic of FCC and BCC structure 6- The crystal structure of some simple crystals	1.5	6
❖ Structural Defects in Crystals 1- Point defects and Free energy of a crystal 2- Point defects in ionic crystals 3- Line defects and types of dislocation 4- Planer defects 5- Determination of vacancies concentration and the activation energy	1	4

❖ **X-Rays Diffraction in Crystals** 1- Used rays in studying crystal structure 2- Generation and properties of X-rays 3- X-Rays scattering from an atom 4- X-Rays scattering from a crystal and Reciprocal lattice	1.5	6
❖ **Lattice Vibrations** 1- Elastic waves 2- Modes of vibrations and density of states of a continuous medium 3- The phonon 4- Elastic and non-elastic scattering 5- Lattice waves of one-atomic linear chain 6- Vibration Modes of 1D diatomic	1	4
❖ **Free electrons in metals** 1. The Electrical Conductivity in Metals 2. The Specific Resistance in Metals 3. The Electrical and Thermal Conductivity in Metals 4. The Quantum Theory in Free Electrons 5. Ground State Property of Free Electrons 6. Electronic Specific Heat of Metals 7. Some Problems in Free Electron Model	2	8
❖ **Band theory in the solids** 1. Origin of the Bands in Solid 2. Periodic Potential 3. Bloch Function 4. Crystal Structure in One-Dimensional Atomic Chain 5. Brillouin Zones 6. Band Theory in Free Electron Model 7. Density of States 8. The Effective Mass 9. Concept of Holes 10. Fermi Surfaces	2	8

❖ **Thermal properties of solid materials** • **Specific heat:** • **Einstein model for specific heat,** • **Debye model for specific heat,** • **Heat capacity of solid body,** • **Heat capacity of electron gas,** • **Thermal conductivity of solid body,** • **Thermal expansion**	**3**	**12**
	14weeks	**56 hrs**

2 Course components (total contact hours per semester):			
Lecture : 56	**Tutorial:**	**Practical:**	**Other:**

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

p. Knowledge : Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

6. Describe the importance of solid state physics in relation to physics and environment.
7. Define the principles and concepts of solid state physics.

8. Describe the different types of binding in material.
9. List different types of crystal structures.
10. Describe how the crystal defects and x-ray diffraction.
11. Apply the use mathematical formulation to describe the physical principle or phenomena in solid state physics.
12. Describe Methods of measurement and assessment of properties of solids

(ii) Teaching strategies to be used to develop that knowledge

- The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important solid state physics in different applications and human service.
- At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
- All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions.
- Using images and movies
- Encouraging students to collect the new information about what the new in solid state physics
- Enable the reference books and scientific sites concerning solid state physics in internet.

(iii) Methods of assessment of knowledge acquired:

- Periodical exam and reports 20%
- Mid- terms theoretical exam 30%
- Final exam 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

1. Differentiate between the different types of binding in solid materials.
2. Diagram the different types of crystal structure
3. Analyse the electrical and thermal conductivity in Metals
4. Explain how solid state physics is important to a relevant societal issue.
5. Interpret the band theory in solids
6. Explain methods of measurement and assessment of properties of solids.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Lectures
-Brain storming
-Discussion

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Evaluate solid state physics information.
-Analyse solid state physics data.
-Judge the importance of solid state physics.
-Choose representative examples for each group of solid state physics.

(xviii) **Teaching strategies to be used to develop these skills and abilities**

- Case Study
- Active learning
- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(xviii) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

27. Enhancing the ability of students to use computers and internet.
28. Interpret solid state physics data
29. Present solid state physics data orally.
30. Know how to write a report.

31. **Teaching strategies to be used to develop these skills**

33. **Homework (preparing a report on some topics related to the course depending on web sites).**

34. **Seminars presentation**

35. **Field visits to factories**

(iii) Methods of assessment of students numerical and communication skills

20. **Evaluation of presentations**

21. **Evaluation of reports**

22. **Practical exam**

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

(ii) Teaching strategies to be used to develop these skills

36. **Methods of assessment of students psychomotor skills**

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	Exercises & Home works	All weeks	10 %
2	Participation	All weeks	10 %
3	Written Test (1)	6th week	15%
4	Written Test (2)	11th week	15%
6	Final Exam (theoretical)	16th week	50%

D. Student Support

5. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Office hours: 10 hrs

E. Learning Resources

Required Text(s):

1. - C.Kittel / Introduction to Solid State Physics. 7th. dition
2. Walter A. Harrison/ Solid State Theory , Dover edition 1979

.

Recommended Reading List

Elementary Solid State Physics by M. Ali Omar, 1997

فيزياء الحالة الصلبة وتطبيقاتها (المرجع الشامل) تأليف د يسري مصطفى و د احمد الغامدي، مركز النشر العلمي، جامعة الملك عبد العزيز، جدة، ١٤٣٦.

Electronic Materials, Web Sites

- http://www.phys.lsu.edu/~jarrell/COURSES/SOLID_STATE_HTML/course_solid.html
- http://www.encyclopedia.com/topic/solid-state_physics.aspx
- http://www.physics.byu.edu/research/condensed
- http://web.utk.edu/~tbarnes/website/cm/cm.html

http://www.answers.com/topic/solid-state-physics

Other learning material such as computer-based programs/CD, professional standards/regulations

PPT prepared by

Prof.Dr. Yosry Moustafa,

Dr. Ameena Alahmadi, and

Dr. Abdelrahman Lashin

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.

2. Computing resources

- Providing class rooms with computers and labs with data show.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

-

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- After the agreement of Department and Faculty administrations

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title Computational Physics

Course code: 4034180-3

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL– QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

32. Course title Computational Physics 33. Course code: 4034180-3	
2. Credit hours: 3 hrs: 2 hrs theoretical + 1 hr experimental	
3. Program(s) in which the course is offered. : BSc Physics	
20. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 4th Year / Level 7	
6. Pre-requisites for this course (if any): Theoretical Methods in Physics (2) (4033142-4)	
7. Co-requisites for this course (if any):	
8. Location if not on main campus: Main campus and Al-Zaher Branch	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?
c. e-learning	What percentage?

d. correspondence What percentage?

f. other What percentage?

Comments:

B Objectives

After completing this course student should be able to:

1. Understand computer hardware
2. Design flowcharts of scientific problems
3. Solve some computational physics problems using MATLAB.
4. Analyze and plot data,
5. Develop algorithms, and create models and applications using MATLAB.
6. Write well-structured C++ programs.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

Computational physics is becoming more and more important, and this course will address this. In this course, the student will use algebra/calculus programs, like MATLAB.

A major goal of this course is to teach the student how to solve scientific problems using calculus software. In particular, the student will use the computational software, like MATLAB, in order to increase active learning in physics. This will enable student to perform

- Physical problems both numerically and analytically.
- Interactive simulations.

Knowledge:

Most researches in physics require students to become familiar with the basic of computer programming and use MATLAB as an essential tool. The intention of this course is to fulfil this goal and freeing up precious time in learning different computer languages.

Skills:

Use MATLAB as a language for solving any physical problem and locate any desired function with MATLAB's extensive on-line help facilities.

1 Topics to be Covered

Topics	Number of weeks	Contact hours
Basics- Variables and arrays, creating and initializing variables, Multidimensional array, subarrays, Special values, Displaying output data	1	3
Basics- Data files, scalar and array operations, Built in functions, Introduction to plotting, examples	1	3
Program design- The logical data type, Branches, Additional plotting features, exercises.	0.5	1.5
Loops- the while Loop, the for Loop, examples	0.5	1.5
*1st Periodic exam	1	2
Loops- Logical arrays, Vectorization, examples, exercise		1
User defined functions- MATLAB functions, Variable passing, optional arguments, sharing data using Global memory	1	3
User defined functions- Preserving data between calls to a function, sub Functions and private functions, examples	1	3
Complex data- Complex variables, using complex numbers with relational operators	1	3
Complex data- Complex functions, plotting complex data, examples and exercises.	1	3
Applications in Linear Algebra- Solving a linear system, Gaussian elimination and exercises.	0.5	1.5
Applications in Linear Algebra – Finding eigenvalues and eigenvectors, Matrix factorizations and examples	0.5	1.5
*2nd Periodic exam		2
Applications in fitting and interpolation- Polynomial fitting, Least square fitting, non-linear fits and examples	1	1

Applications in Numerical integration-Double integration	**0.5**	**1.5**
Applications in ordinary differential equations- A first order Linear equation and a second order equation	**0.5**	**1.5**
Introduction to programming language C++ Flow Charts and Algorithms Constructing, compiling and building simple (Fortran or C++) program Some programming techniques (looping, branching, IF) **Some applications**	**3**	**9**
Total number	**14**	**42 hrs**

2 Course components (total contact hours per semester):			
Lecture : 42	Tutorial:	Practical:	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): **Online quizzes each week to help students understanding the basics of each chapter**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

A brief summary of the knowledge or skill the course is intended to develop;

A description of the teaching strategies to be used in the course to develop that knowledge or skill;

The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

7- **Knowledge :** Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

Understanding the principles of computational physics.

Applying calculus software for different physical problems.

Improving logical thinking.

Using mathematical software to describe the physical principle or phenomena

Ability to explain how things are working.

Teaching strategies to be used to develop that knowledge

8- Demonstrating the basic information and principles through lectures and the achieved applications
9- Discussing phenomena with illustrating pictures and diagrams

10- Lecturing method:
 11- Blackboard
 12- Power point
 13- e-learning
14- Tutorials
15- Revisit concepts
16- Discussions
17- Brain storming sessions

Start each chapter by general idea and the benefit of it;

Learn the student background of the subject;

Show the best ways to deal with problem;

Keep the question "why" or "how" to explain always there

Build a strategy to solve problem.

(ii) Teaching strategies to be used to develop that knowledge

3. The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand how to solve different physical problems.
4. At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course.
5. All students will be involved in on-line learning process and each student is required to activate his account on Umm Al-Qura web page to facilitate student web interactions.

4- Using images and movies
5- Encouraging students to collect the new information about what the new in programming.
6- Enable the reference books and scientific sites concerning Physics in internet.

(iii) Methods of assessment of knowledge acquired:

7- Solve some example during the lecture.
8- Exams:
    9- Online Quizzes
    10- Short exams (mid term exams)
    11- Long exams (final)
    12- Homeworks.
    13- Activities.
14- Discussions with the students.
15- Ask the student to clear the misunderstanding of some physical problem and solve it numerically.

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

Define the physical phenomena.
Express the physical phenomena mathematically.
Apply the calculus software in solving it numerically.
Plot the results and analyse it.

(ii) Teaching strategies to be used to develop these cognitive skills:

Preparing main outlines for teaching

Following flow charts for the specific physical problem

Define duties for each chapter

Home work assignments

Online quizes

Encourage the student to look for the information in different references

Ask the student to attend lectures for practice solving problem

(iii) Methods of assessment of students cognitive skills

8- Midterm's exam. Exams, short online quizzes
9- Asking about functions previously taught
10- Writing reports on selected parts of the course

Discussions of how to simplify and calculate some physical phenomena

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

8. Do calculations independently.
9. Plot and analyse the results
10. Learn independently and take up responsibility.

Teaching strategies to be used to develop these skills and abilities

7. Extensive use of MATLAB library.
8. Lab work.
9. Case Study.
10. Small group discussion.
11. Enhance educational skills.
12. Develop their interest in computational physics
13. Encourage the student to attend lectures regularly
14. Give students tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

16- Evaluate the efforts of each student by online quizzes.
17- Evaluate the scientific values of solving specific physical problem.
18- Evaluate the work in team
19- Evaluation of the role of each student in lab group assignment
20- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

15. Enhancing the ability of students to use computers and internet.
16. Interpret Physical phenomena.
17. Present Physical phenomena orally.
18. Know how to write a report.
19. Computation
20. Problem solving
21. Data analysis and interpretation.
22. Feeling physical reality of results

Teaching strategies to be used to develop these skills

Homework (preparing a report on some topics related to the course depending on web sites).

Seminars presentation

Online quizzes

(iii) Methods of assessment of students numerical and communication skills

Evaluation of presentations

Evaluation of reports

Practical exam

- Online quizzes
- First periodical exam
- Second Periodical Exam
- Homework.
- Final exams.
- Research.

e. Psychomotor Skills (if applicable)

(ii) Teaching strategies to be used to develop these skills

- Follow up students the students in lab and during carry out all computations
Methods of assessment of students psychomotor skills

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	Exercises & Home works	All weeks	10%
2	Online quizzes	All weeks	10%
3	Oral exam	5th Week	10%
4	Participation in activities lectures and labs	All weeks	10%
5	Test (1)	6th week	15%
6	Test (2)	13th week	15%
7	Scientific project	14th Week	10 %
8	Final Exam	16th week	20%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week) Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

1- Object oriented programming in C++, Robert Lafore, fourth edition, Pearson and Sam Publishing (2001), ISBN 0-672-32308-7.
2- Object oriented programming using C++, Joyce Farrel, fourth edition, 2009, ISBN-13: 978-1-4239-0257-7.
3- Getting started with MATLAB, Rudra Pratap, New York, 2010, ISBN: 978-0-19-973124-4
4- MATLAB, "An introduction with Applications", fourth edition, Amos Gilat, John Wiley and Sons, INC, 2011, ISBN-13 978-0-470-76785-6.
5- Essentials of MATLAB programming, Second Edition, Stephen J. Chapman, 2009, ISBN-13: 978-0-495-29568-6.

Recommended Reading List

Solving Applied Mathematical problems with MATLAB, DINGYU XUE and YANGQUAN CHEN, CRC Press, 2009 by Taylor and Francis Group, ISBN-13: 978-1-4200-8250-0

Electronic Materials, Web Sites

(eg. www.youtube.com.)

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories

(ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

17- Class room is already provided with data show

18- Computer Lab provided with data show

19- The area of class room is suitable concerning the number of enrolled students and air conditioned.

20- King Abdulah Library (Umm Al-Qura University)

2. Computing resources

11. Computer room.
12. MATLAB software.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

21- .

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

22- Questionaries using the e-learning gate of Umm Al-Qura university

23- Open discussion in the class room using the e-learning gate of Umm Al-Qura university.

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answers by another staff member.
- Analysis the grades of students using the e-learning gate of Umm Al-Qura University..

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using the e-learning gate of umm Alqura university
- Using scientific movies.

• Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) 4. After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 5. Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title: **Radiation Physics**

Course code:**4034162-3**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: Umm AL – Qura University
College/Department : College of Applied Sciences – Department of Physics

A Course Identification and General Information

Course title : radiation physics **Course code: 4034162-3**
2. Credit hours: 3 hrs
3. Program(s) in which the course is offered. : B.Sc Physics
5. Level/year at which this course is offered: 8th level
6. Pre-requisites for this course (if any): Nuclear physics (4034160-4)
7. Co-requisites for this course (if any): ---
8. Location if not on main campus: Main campus
9. Mode of Instruction (mark all that apply) a. traditional classroom ✓ What percentage? 100%

b. blended (traditional and online) ☐	What percentage? ☐
c. e-learning ☐	What percentage? ☐
d. correspondence ☐	What percentage? ☐
f. other ☐	What percentage? ☐
	Comments:

B Objectives

1-Acquire basics of information about interaction of radiation with matter .,

2-Acquire the basic of the radiation dosimetry.

3-Describe types of radiation Detectors.

4- Acquire information about biological effects of radiation.

5- Acquire information about units of radiation dosimetry.

6-Acquire the basic of externat radiation protection.

7- List the natural and the artificial sources of radiation.

8- Acquire procedure of radiation dosimetry.

9- Describe the methods for radiation dosimetry.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

This course is interested in studying how the internal and external radiation doses and different ways to measure the radiation doses and the study of the nature of the radioactive contamination and how to remove them measure

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached)**

1 Topics to be Covered		
List of Topics	No of Weeks	Contact hours

1- Interaction of Radiation with Matter - The energy transfer, - Range of heavy charged particles (alpha particles), **- The specific ionization and the stopping power,**	Week ***(week 1)***	3hrs
1- Interaction of Radiation with Matter -The energy transfer from electron to the matter. -Energy loss by inelastic collision and by radiation. Absorption of electrons, the half-thickness. -Range determination from the absorption curve.	Week ***(week 2)***	3hrs
Interaction of gamma radiation with matter: -The energy transfer from gamma radiation to matter (the photoelectric effect, Compton effect, the pair production, the nuclear resonance scattering), attenuation of gamma radiation in matter.	Week ***(week 3)***	3hrs
-Interaction of neutrons with matter: - Classification of neutrons, the neutrons sources. -The neutron elastic and inelastic scattering. -The neutron capture, Transmutation . -The total neutron cross-section and its determination	Week ***(week 4)***	3hrs

2- Units of Radiation Dosimetry: radiation flux density, the exposure, Roentgen, the radiation absorbed dose, relative biological effectiveness,	Week ***(week 5)***	3hrs
-The radiation weighting factor, -The tissue equivalent dose, -The tissue weighting factor, -The effective dose, -The collective effective dose, the dose rate.	Week ***(week 6)***	3hrs
First Periodic Exam	Week ***(week 7)***	3hrs
Term Vacation	Week ***(week 8)***	

3- Biological Effects of Radiation: Interaction of the ionizing radiation with the cell (the physical stage, the physico-chemical stage, the chemical stage, the biological stage), -The deterministic and stochastic effects, -The late effects, -The risk factor, -The hereditary effects of radiation	Week ***(week 9)***	3hrs
4- Radiation detectors: motion of electrons and ions in gases (the drift motion, the attachment, the recombination), -The electron and ion currents in gases	Week ***(week 10)***	
-The gas detectors :the ionization chamber, -The proportional counters, Geiger-Muller counters. -The scintillation detectors. -The semiconductor detectors. Cerencov detectors.	Week ***(week 11)***	3hrs
5- Dosimeters: Pocket Dosimeters. Film Badges. Thermo-luminescent Dosimeter. Ion Current Chamber	Week ***(week 12)***	

6- External Radiation Protection: **the natural and non-made sources of radiation and their sources (cosmic rays, the terrestrial radiation, the radon gas), the artificial sources of radiation (the diagnostic radiology, therapeutic radiology, the nuclear energy and industries, the radioactive waste, the radioactive dust), Techniques of protection (time, distance, shields).**	Week ***(week 13)***	3hrs
Fundamental Sciences -Quantities and units in science and engineering Background information **-Excitation and Ionization**	Week ***(week 14)***	3hrs
Second examination 1	Week ***(week 15)***	
Final examination	Week ***(week 16)***	

2 Course components (total contact hours per semester):			
Lecture 36 (Credit Hrs)	**Tutorial:** ------	**Practical/Fieldwork/Internship:**	**Other: --**

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

q. Knowledge : Description of the knowledge to be acquired

knowledge that students should know and understand. ***At the end of the programme the student should be able to:***

1-Define interaction of radiation with matter.

2- **List units of radiation dosimetry**

3- **state biological effects of radiation**

4- acquire basics of **information about radiation detectors**

5- define and describe the **dosimeters**

6- acquire basics of **information about external radiation protection.**

7- **describe different types of** quantities and units in science and engineering Background information.

r. Cognitive Skills

b1. justify **biological effects of radiation**.

b2. justify the mathematical expressions in calculating the external and internal doses due to external and internal exposure.

b3. integrate information technology (IT) based radiation .

(ii) Teaching strategies to be used to develop these cognitive skills:

- Lectures
-Brain storming
-Discussion

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:
- work effectively in a group to make a decision.
-Analyse obtained data and how to manage it.
-make a certain decision fast especially during data acquisition.

(xix) Teaching strategies to be used to develop these skills and abilities

- Lab work
- Case Study
- Active learning
- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(xix) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

32. Enhancing the ability of students to use computers and internet.
33. Interpret image pre-processing data
34. Use effectively image processing package to enhance the obtained image.
35. Know how to write a report.

36. Teaching strategies to be used to develop these skills

37. **Homework (preparing a report on some topics related to the course depending on web sites).**
38. **Seminars presentation**
39. **Field visits to factories**

(iii) Methods of assessment of students numerical and communication skills

23. Evaluation of presentations

24. Evaluation of reports

25. Practical exam

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

NA

(ii) Teaching strategies to be used to develop these skills

- Follow up students the students in lab and during carryout all microbiological techniques

40. Methods of assessment of students psychomotor skills

- Giving additional marks for preparing correct media, good seminar presentation

5. Schedule of Assessment Tasks for Students During the Semester

Assessment task	Week Due	Proportion of Total

(e.g. essay, test, group project, examination, speech, oral presentation, etc.)			Assessment
1	Exercises & Home works+ quizzes	All weeks	5%
	Assay	15th week	5%
2	Laboratory	All weeks	20 %
3	Written Test (1)	6th week	10%
4	Written Test (2)	11th week	10%
6	Final Exam (theoretical)	16th week	50%

D. Student Support

6. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Office hours: 10 hrs

E. Learning Resources

Required Text(s):

Recommended Reading List

1- "A Primer In Applied Radiation Physics", F.A.SMITH, Ed. World Scientific, 2000.
2- "Radiation Physics for Medical Physicist", E. B. Podgorsak, Ed. Springer. 2006

3- . Radiation physics for medical physicists Ervin B. Podgorsak Springer 2006.

Electronic Materials, Web Sites

(eg. Web Sites, Social Media, Blackboard, etc.) http://www.IAEA.com, http://ICRP.com, http://NCRP..com., http://ICRU.com, http://UNSCAR.com, http://ANSI.com, http://WHO.com

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Other learning material such as computer-based programs/CD, professional standards/regulations

- **PPT prepared by Associate prof. Dr.**

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.

2. Computing resources

- Providing class rooms with computers and labs with data show.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- Availability of some reference bacterial strains
- Availability different specific media and chemicals used for isolation.

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

• Questionaries • Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department • Revision of student answer paper by another staff member. • Analysis the grades of students.
3. Processes for Improvement of Teaching • Preparing the course as PPT. • Using scientific movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) • After the agreement of Department and Faculty administrations
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Solid State Physics II**

Course code: **4034172**-4

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

34. Course title **Solid State Physics II** 35. Course code: Course code: **4034172-4**	
2. Credit hours: 4 hrs	
3. Program(s) in which the course is offered. : **B.Sc. Physics**	
21. Name of faculty member responsible for the course: One of the academic staff member	
5. Level/year at which this course is offered: 4^{th} Year / Level 7	
6. Pre-requisites for this course (if any): Solid state physics I 4034170-4	
7. Co-requisites for this course (if any): …	
8. Location if not on main campus: Main campus & Girls section	
9. Mode of Instruction (mark all that apply)	
a. traditional classroom ✓	What percentage? 100%
b. blended (traditional and online)	What percentage?
c. e-learning	What percentage?
d. correspondence	What percentage?

f. other	What percentage?
	Comments:

Topics	Planned Contact Hours
Dielectrics: **Review of Basic Formulas, the Dielectric Constant, Polarizability and The Local Field. Sources of polarizability, Dipolar polarizability, and Dipolar Dispersion. Dipolar Polarization in Solids, Ionic Polarizability, Electronic Polarizability and Classical and Quantum Theory of Treatment.** Ferro-Electricity**: The Microscopic Model, Ferro-electric Domain and Pizo-Electricity.**	9
Magnetism and Magnetic Resonance**: Review of Basic Formulas and Magnetic susceptibility, Langevin theory. Diamagnetism, and Classical and Quantum Theory of Paramagnetism. The Atomic Origin of Magnetism, Rare Earth and Iron Group Ions and Magnetism in Metals. Ferro-Magnetism in Insulators, the Molecular Field Theory, Anti and Ferri-Magnetism and Ferro-Magnetization Process. The Magnetization Process, Para-magnetic Resonance: The Maser, Nuclear Magnetic Resonance, and Ferro-Magnetic Resonance: Spin Waves.**	9
Superconductivity**: Zero Resistance, Occurrence of Super Conductivity and the Meissner Effect. The Critical Field, Thermodynamics of the Super Conductivity Transition and the Two-Fluid Model. Superconductivity theory and Copper pair electron. Josephson Junction and SOQUED**	6
Theory of Electrical Conduction: Drift of electrons in an electric field, Mobility, Drift current, Diffusion current, Transport equations, Quasi-Fermi levels	3
Generation/Recombination Phenomena: Direct and indirect transitions, Generation/recombination centers, Excess carrier lifetime, SRH recombination, Surface recombination	3
The PN Junction Diode: Unbiased and biased PN junction, Current-voltage characteristics, PN junction capacitance. Models for the PN junction, Solar cell, PiN diode	3
Metal-semiconductor contacts: Schottky diode, Ohmic contact	3

Junction Field Effect, JFET and Bipolar Junction Transistors, BJT.	4

Practical work

1- Safety and Security at the lab.
2- Introduction and Instruments within the lab.
3- Crystallographic study of the sample by x-ray
4- Hall effect
5- Activation energy
6- DC conductivity
7- AC conductivity
8- Dielectric constant

Course description:

1- **Dielectric Properties of Insulating Materials:** General properties of materials, the three dielectric vectors, the effect of uniform electric field on dielectric materials, polarization and polarizability, theory of local field, polarization sources, electronic polarizability, classical and quantum treatment of electronic polarizability, ionic polarizability, orientational polarizability, dielectric constant of solids and liquids, dielectric properties of insulators in alternating field, Debye equation and the process of relaxation.
2- **Ferroelectric Materials:** Definition of ferroelectric materials, ferroelectric domains, hysteresis loop, polarization catastrophe and Curie-Weiss law.
3- **Landau Theory of Phase Transition:** First and second order phase transitions, the order parameter, Landau theory of ferroelectric to paraelectric phase transition,
4- **Magnetic Properties of Solids:** Origin of magnetic phenomena, classification of magnetic materials, Hund's rule, Langevin theory of diamagnetism, The quantum theory of Paramagnetism, paramagnetic susceptibility of conduction electrons, ferromagnetic and antiferromagnetic materials, properties of ferromagnetic and antiferromagnetic materials, nuclear magnetic resonance,
5- **Superconducting Materials:** occurrence of superconductivity, Meissner effect, the critical field, thermodynamical description of superconductors, what causes superconductivity, penetration depth, quantization of magnetic flux, Superconductivity theory and Copper pair electron, and Josephson junction and SOQUED.
6- Theory of Electrical Conduction: Drift of electrons in an electric field, Mobility, Drift current, Diffusion current, Transport equations, Quasi-Fermi levels
7- Generation/Recombination Phenomena: Direct and indirect transitions, Generation/recombination centers, Excess carrier lifetime, SRH recombination, Surface recombination.
8- The PN Junction Diode: Unbiased and biased PN junction, Current-voltage characteristics, PN junction capacitance. Models for the PN junction, Solar cell, PiN diode.
9- Metal-semiconductor contacts: Schottky diode, ohmic contact

10- Characteristics of Junction Field Effect, JFET and Bipolar Junction Transistors, BJT.
المراجع **Textbook:** 1. Charles Kittel, Introduction to Solid State Physics (8th ed) , 2005, John Wiley & sons. 2. Omar M., Elementary Solid State Physics, Addison Wesley, Reading, 1993 3. *Semiconductors* by Smith 4. *Physics of Semiconductors* by Sze. ٥. فيزياء الحالة الصلبة وتطبيقاتها (المرجع الشامل)، د. يسري مصطفي و د. احمد الغامدي، مركز النشر العلمي ب جامعة الملك عبد العزيز، جدة، ٢٠١٥. ٦.
Objectives and Course learning Outcomes After finishing the study of this syllabus a student is expected to be able to: • Know the interpretation of the studied physical Dielectric Properties of Insulating Materials, Ferroelectric Materials, Magnetic Properties of Solids and Superconducting Materials. • Classify the solid state material depending on their properties • Discus the change of the physical properties of solid material in terms of the atomic and crystalline structure of material. • Understand the origin of the physical properties • Know the different theories describe these properties of sold state materials. • Apple to analyses and interpret the change pf studied properties with temperature and pressure or with any changed parameter. • Compare between solid materials depending on their properties. • Propose a candidate for the different materials depending on their type. • To be ready to continue higher studies and research in the field of solid state physics. • Understanding the physics of semiconductors and their applications mentioned in the text. • Improving logical thinking. • Ability to understand and design simple semiconductor-based elements • Ability to explain how diodes and metal junction and transistors work

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week): 12h (reports & essay)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

s. **Knowledge :** Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

13. Describe the importance of solid state physics in relation to physics and environment.
14. Define the principles and concepts of solid state physics.
15. Describe the electrical, magnetic and dialectical physics properties of material.
16. List different types of ferromagnetic materials and its application..
17. Describe the different application if dielectric and ferromagnetic application of solid state matter
18. Define the superconductivity phenomena and understand the theory explain it.
19. Apply the use mathematical formulation to describe the physical principle or phenomena in solid state physics.
20. Describe Methods of measurement and assessment of properties of solids
21. Define the semiconductor material and physical laws stand behind the properties.
22. Explain the different mechanisms for current flow in semiconductors.
23. Characterize the semiconducting devices such as diode, metal-semiconductor junction, field effect transistor and bipolar junction transistor and laws govern it.

(ii) Teaching strategies to be used to develop that knowledge
• The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. Students will be given opportunity to understand the role of important solid state physics in different applications and human service. • At the end of the programme, students will be divided into groups for seminar presentation on important areas of the course to assess their understanding and comprehension of the course. • All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions. • Using images and movies • Encouraging students to collect the new information about what the new in solid state physics • Enable the reference books and scientific sites concerning solid state physics in internet.
(iii) Methods of assessment of knowledge acquired:
• Periodical exam and reports 20% • Mid- terms theoretical exam 30% • Final exam 50%

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

7. Differentiate between the different types of solid materials.
8. Characterize the different types of dielectric solid materials
9. Classify the typed of ferromagnetic materials
10. Classify the different types of the superconductive material
11. Interpret superconductivity theory in solids
12. Explain how solid state physics is important to a relevant societal issue.
13. Interpret the band theory in solids
14. Explain methods of measurement and assessment of properties of solids.
15. Explain the different mechanisms govern the operation of the semiconducting devices such as diode, metal-semiconductor junction, field effect transistor and bipolar junction transistor and laws govern it.

(ii) Teaching strategies to be used to develop these cognitive skills:

- Lectures
-Brain storming
-Discussion

(iii) Methods of assessment of students cognitive skills

- Exam must contain questions that can measure these skills.
- Quiz and exams
- Discussions after the lecture

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Evaluate solid state physics information.
-Analyse solid state physics data.
-Judge the importance of solid state physics.
-Choose representative examples for each group of solid state physics.

(xx) Teaching strategies to be used to develop these skills and abilities

- Case Study
- Active learning
- Small group discussion

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

(xx) Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

37. Enhancing the ability of students to use computers and internet.
38. Interpret solid state physics data
39. Present solid state physics data orally.
40. Know how to write a report.

41. Teaching strategies to be used to develop these skills

41. **Homework (preparing a report on some topics related to the course depending on web sites).**
42. **Seminars presentation**
43. **Field visits to factories**

(iii) Methods of assessment of students numerical and communication skills

26. Evaluation of presentations

27. Evaluation of reports

28. Practical exam

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

22. Perform the experiments with high accuracy.
23. Operate instruments safely.
24. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

44. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Exercises & Home works	All weeks	10 %
2	Participation	All weeks	10 %
3	Written Test (1)	6th week	15%
4	Written Test (2)	11th week	15%
6	Final Exam (theoretical)	16th week	50%

D. Student Support

7. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Office hours: 12 hrs

E. Learning Resources

Required Text(s):

3. - C.Kittel / Introduction to Solid State Physics. 7th. dition
4. Walter A. Harrison/ Solid State Theory , Dover edition 1979

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Recommended Reading List

Elementary Solid State Physics by M. Ali Omar, 1997

فيزياء الحالة الصلبة وتطبيقاتها (المرجع الشامل) تأليف د يسري مصطفى و د احمد الغامدي، مركز النشر العلمي، جامعة الملك عبد العزيز، جدة، ١٤٣٦.

Electronic Materials, Web Sites

- http://www.phys.lsu.edu/~jarrell/COURSES/SOLID_STATE_HTML/course_solid.html
- http://www.encyclopedia.com/topic/solid-state_physics.aspx
- http://www.physics.byu.edu/research/condensed
- http://web.utk.edu/~tbarnes/website/cm/cm.html
- http://www.answers.com/topic/solid-state-physics

Other learning material such as computer-based programs/CD, professional standards/regulations

PPT prepared by:-

Prof.Dr. Yosry Moustafa,

Dr. Ameena Alahmadi, and

Dr. Abdelrahman Lashin

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room is already provided with data show
- The area of class room is suitable concerning the number of enrolled students (68) and air conditioned.

2. Computing resources

- Providing class rooms with computers and labs with data show.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

-

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- After the agreement of Department and Faculty administrations

5 Describe the planning arrangements for periodically reviewing course effectiveness and

planning for improvement. • Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title ELECTRONICS

Course code: 4034173-4

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UMM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

36. Course title Electronics 37. Course code: 4034173-4
2. Credit hours: 4 hrs 3+ lab)
3. Program(s) in which the course is offered. : B.Sc. Physics
22. Name of faculty member responsible for the course: One of the academic staff member
5. Level/year at which this course is offered: 4th Year / Level 8
6. Pre-requisites for this course (if any): Solid state physics I (4034170-4)
7. Co-requisites for this course (if any): ...
8. Location if not on main campus: Main campus & Girls section
9. Mode of Instruction (mark all that apply) a. traditional classroom ✓ What percentage? 100% b. blended (traditional and online) What percentage? c. e-learning What percentage? d. correspondence What percentage?

f. other

What percentage?

Comments:

B Objectives

1. Summary of the main learning outcomes for students enrolled in the course. Outcomes of this course are to introduce the basic physical principles and fundamentals of semiconductors and their usage and applications in electronic components like diodes and transistors. This course introduces basic principles of linear and digital electronic circuits that are used in the everyday experience, like • Semiconductor Diodes • Circuit rectifiers. • Special types of diodes • Bipolar junction transistors • Small signal amplifiers and biasing • Field effect transistors • Signal operational amplifiers, • Digital circuits like logic gates • Applications to memory chips and timers used in most of electronic devices **At the end of this course the student should be able to** 1. Understand and analyze relatively simple electronic layouts and circuits 2. Design special purpose circuits that meet his requirements in his scientific life
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field) 16. Explain strategy of the course in the beginning of the semester 17. Outlines of the physical laws, principles and the associated proofs. 18. Highlighting the day life applications whenever exist. 19. Encourage the students to see more details in the international web sites and reference books in the library. 20. Discussing some selected problems in each chapter. 21. Cooperate with different institution to find how they deal with the subject 22. Renew the course references frequently 23. Frequently check for the latest discovery in science

C. Course Description :

- **Conduction mechanisms in semiconductors: Energy Bands of metals, semiconductors and insulators, Intrinsic semiconductors, Extrinsic (impurity) semiconductors (n-type semiconductors, p-type semiconductors), majority and minority carriers, generation and recombination rates.**

- **Junction diode physical electronics: The pn junction: Physical model, Current flow, carrier concentration at edge of space charge layer, Current voltage characteristics at direct and reverse bias - Temperature dependence of idealized diode equation- pn dynamic behavior, junction structures, contacts and metal-semiconductor junctions, Examples of diode**

circuit analysis.

- **Bipolar junction transistors (BJT): BJT as control valves, Operation of BJT, Circuit models of low speed active region operation, Examples of transistor circuit analysis.**
- **Field effet transistors BJT: Electrical properties of semiconductor surfaces, Volt-Amper characteristics of MOSFET, Dynamics for MOSFET and circuit applications, Junction field effect transistors, Static drain characteristics, Comparison of MOSFET and JFET transistors.**
- **Operational amplifiers: Introduction, connecting the amplifier to the circuits, Ideal and real amplifiers, Linear amplification and negative feedback, Special application of amplification, Addition and subtraction of signal, Memory and timing applications using positive feedback (Multivibrators), Integration and differentiation.**
- **Digital electronics: Digital logic (binary numbers-logic levels,. Logic gates-truth. Tables logic. Families-Practical circuits, Main gates (AND-OR-NOT-NAND-NOT-AND-OR-NOT-NAND-NOR), Combinations of gates, Logic laws, XOR and XNOR gates, Adding of binary numbers, Memory elements (Multivibrators-Flip flops).**

(Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered

Topic	No of Weeks	Contact hours
1- Semiconductors and PN Junction Atoms Covalent bonds Conduction in Semiconducting Crystal PN Junction PN Junction Biasing	2 week	6 hrs
2- Diode and its applications Diodes Calendar Half-wave rectifier Full -wave rectifier Full wave rectifier filters	2 weeks	6 hrs
3- Special types of diode Diode "zener" Diode "zener" Applications Variable capacitance diode Optical diodes Other types of diode	2 weeks	6 hrs

4- BIPOLAR JUNCTION TRANSISTORS BJT as control valves Operation of BJT Circuit models of low speed active region operation An example of transistor circuit analysis ; Transistor operation at extremes of collector voltage	2 weeks	6 hrs
5- Bias transistor bipolar DC operating point Base Biasing Emitter Biasing Voltage divider Biasing Collector bias by feedback	2 weeks	6 hrs
4 FIELD-EFFECT TRANSISTORS Electrical properties of semiconductors for surfaces Volt-Ampere characteristics of MOSFET A brief view of dynamics for MOSFET and circuit applications Junction Field-Effect Transistors static drain characteristics; Comparison of MOSFET and FET transistors	1 weeks	3 hrs
5 Operational amplifiers Introduction Connecting the Amplifier to the circuit Ideal and real Amplifiers Linear Amplification and negative feedback Special applications of amplifications Addition and subtraction of signals Memory and timing applications; using positive feedback (Multivibrators) Integration and Differentiation	1 weeks	3 hrs

6 DIGITAL ELECTRONICS Digital logic (Binary numbers, Logic levels, Logic gates; Truth tables; Logic families-practical circuits) Main gates (AND, OR, NOT, NAND, NOR) Combination of gates Logic laws XOR and XNOR gates Adding of binary numbers Memory elements (Multivibrators, Flip-Flops)	2 weeks	6 hrs

In Addition To Experimental Part containing the following experiments: (3 hrs lab/week).

1. Laboratory Safty Guidelines
2. P-N Junction Diode Characteristic
3. Half and Full-wave rectifiers
4. Filters circuits
5. Zener diode
6. Light emitted diodes
7. Characteristic of bipolar junction transistors
8. Transistor Load line
9. Transistor Biasing
10. Small signal amplifiers
11. JEFT transistor
12. Logic circuits

2 Course components (total contact hours per semester):			
Lecture: 52 hrs	**Tutorial: 48 hrs**	**Practical/Fieldwork/Internship: 24**	**Other Office hours : 32 hr**

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of the knowledge or skill the course is intended to develop;**
- **A description of the teaching strategies to be used in the course to develop that knowledge or skill;**
- **The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.**

a. Knowledge

(i) Description of the knowledge to be acquired

6 **Learning fundamentals in electronics and electronic elements**

7 **Understanding the physics of electronics and their applications mentioned in the text.**

8 **Improving logical thinking.**

9 **Ability to understand and design simple electronic circuits**

10 **Ability to explain how things work.**

(ii) Teaching strategies to be used to develop that knowledge

37. Demonstrating the basic information and principles through lectures and the achieved applications
38. Discussing phenomena with illustrating pictures and diagrams
39. Lecturing method:
    a. Blackboard
    b. Power point
    c. e-learning
40. Tutorials
41. Revisit concepts
42. Discussions
43. Brain storming sessions
44. Start each chapter by general idea and the benefit of it;
45. Learn the student background of the subject;
46. Show the best ways to deal with problem;
47. Keep the question "why" or "how" to explain always there;
48. Build a strategy to solve problem.

(iii) Methods of assessment of knowledge acquired

13. Solve some example during the lecture.
14. Exams:
    a) Quizzes
    b) Short exams (midterm exams)
    c) Long exams (final)
    d) Oral exams
15. Discussions with the students.
16. Ask the student to clear the misunderstanding of some physical principle.
17. Ask quality question.

b. Cognitive Skills

(i) Cognitive skills to be developed

16. How to use physical laws and principles to understand the subject
17. How to simplify problems and analyze phenomena
18. Analyse and explain natural phenomena.

19. Ability to explain the idea with the student own words.
20. Represent the problems mathematically.

(ii) Teaching strategies to be used to develop these cognitive skills

1. Preparing main outlines for teaching
2. Following some proofs
3. Define duties for each chapter
4. Homework assignments
5. Encourage the student to look for the information in different references
6. Ask the student to attend lectures for practice solving problem
7. Ask the student to do small research.

(iii) Methods of assessment of students cognitive skills

14. Midterm's exam;. short quizzes
15. Asking about physical laws previously taught
16. Writing reports on selected parts of the course
17. Discussions of how to simplify or analyze some phenomena

c. Interpersonal Skills and Responsibility

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Work independently.
- The students learn independently and take up responsibility.

(ii) Teaching strategies to be used to develop these skills and abilities

18. Learn how to search the internet and use the library.
19. Learn how to cover missed lectures.
20. Learn how to summarize lectures or to collect materials of the course.
21. Learn how to solve difficulties in learning: solving problems – enhance educational skills.
22. Develop his interest in Science through :(lab work, field trips, visits to scientific and research institutions.
23. Encourage the student to attend lectures regularly by:
    i. Giving bonus marks for attendance
    ii. Assigning marks for attendance.
24. give students tasks of duties

(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

24. Quizzes on the previous lecture
25. Checking report on internet use and trips
26. Discussion
27. The accuracy of the result gained by each group will indicate good group work
28. Presenting the required research on time and the degree of the quality will show the sense of responsibility.

d. Communication, Information Technology and Numerical Skills

(i) Description of the skills to be developed in this domain.

5. Computation
6. Problem solving
7. Data analysis and interpretation.
8. Feeling physical reality of results

(ii) Teaching strategies to be used to develop these skills 55. Know the basic mathematical principles. 56. Use the web for research. 57. Discuss with the student. 58. Exams to measure the mathematical skill. 59. Clear the weakness point that should be eliminated. 60. Encourage the student to ask for help if needed. 61. Computational analysis. 62. Data representation. 63. Focusing on some real results and its physical meaning. 64. Lectures for problem solution. 65. Encourage the student to ask good question to help solve the problem. 66. Display the lecture note and homework assignment at the web.
(iii) Methods of assessment of students numerical and communication skills 31. Their interaction with the lectures and discussions. 32. The reports of different asked tasks. 33. Homework, Problem solutions assignment and exam should focus on the understanding. 34. Results of computations and analysis. 35. Comments on some resulting numbers. 36. Research.
e. Psychomotor Skills (if applicable)
At the end of the course, the student will be able to: 25. Perform the experiments with high accuracy. 26. Operate instruments safely. 27. Draw the data and curves.
(ii) Teaching strategies to be used to develop these skills - Follow up the students in lab and during carryout all experimental work.
45. Methods of assessment of students psychomotor skills • Practical exam. • Giving additional marks for the results with high and good accuracy

5. Schedule of Assessment Tasks for Students During the Semester

Assess ment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Midterm 1	5^{th} week	10%
2	Midterm 2	10^{th} week	10%
3	In-Class Problem Solving	13^{th},7^{th} week	10%
4	project	12^{th} week	10%
5	Homework	Every week	10%
6	Final exam	End of semester	50%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week) 8 office hours per week

E Learning Resources

1. Required Text(s) • Electronic Devices , 9th Edition by Thomas L. Floyd • Electronic Devices and Circuits by Jacob Millman and Christos C. Halkias
2. Essential References
3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

الأجهزة الالكترونية، طوماس فلويد، ترجمة دكتور يسرى مصطفى، جامعة السابع من ابريل ٢٠٠٧.
4-.Electronic Materials, Web Sites etc • http://www.physicsclassroom.com • http://www.electronicstheory.com/ • http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
5- Other learning material such as computer-based programs/CD, professional standards/regulations Wikipedia

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) • Lecture room for 30 students • Library • Laboratory for electronics there is a special course for laboratory related to electronics)
2. Computing resources • Computer room • Scientific calculator.
3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Questionaries
- Open discussion in the class room at the end of the lectures

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Revision of student answer paper by another staff member.
- Analysis the grades of students.

3. Processes for Improvement of Teaching

- Preparing the course as PPT.
- Using scientific movies.
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)

- After the agreement of Department and Faculty administrations

5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Periodical revision by Quality Assurance Units in the Department and institution

Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

COURSE SPECIFICATION

Course title **Graduation Project**

Course code: **40341990-3**

Revised 13 December 2015

Course Specification

For Guidance on the completion of this template, please refer to of Handbook 2 Internal Quality Assurance Arrangements

Institution: UM AL – QURA UNIVERSITY
College/Department : Faculty of Applied Science – Department of Physics

A Course Identification and General Information

38. Course title Graduation Project 39. Course code: 40341990-3
2. Credit hours: 3hrs
3. Program(s) in which the course is offered. : BSc Physics
23. Name of faculty member responsible for the course: One of the academic staff member
5. Level/year at which this course is offered: 4th Year / Level 8
6. Pre-requisites for this course (if any): Agreement of the Department council
7. Co-requisites for this course (if any): ---
8. Location if not on main campus: Main campus and Alzaher.
9. Mode of Instruction (mark all that apply) a. traditional classroom ☐ What percentage? ☐ b. blended (traditional and online) ☐ What percentage? ☐

c. e-learning		What percentage?	
d. correspondence		What percentage?	
f. other	✓	What percentage?	100%

Comments:

B Objectives

After completing this course student should be able to:

1. Gain first-hand experience of work place environment in the field of scientific research.
2. Gain practical and theoretical knowledge to apply the concepts of basic sciences in a particular area of physics.
3. Gain the ability to perform analysis, design and evaluation of physics problem.
4. **Work independently on the research project under the supervision of academic member or staff, and should be able to design experiments to answer the particular question posed, and critically analysed the results. There will be scope for initiative in this element of the project.**
5. **Be able to set the work in the context of work done by other experimentalists, and provide a concise summary of relevant literature.**
6. Acquire all the necessary skills to work in relevant work field.
7. Apply all the knowledge gained from previous course in relevant work settings.
8. Develop interpersonal skills / work under pressure / solve work related problems.
9. Improve skills to work independently and in teamwork.

C. Course Description **(Note: General description in the form to be used for the Bulletin or Handbook should be attached):**

Physics is concerned with the observation, understanding and prediction of natural phenomena and the behavior of manmade systems. It deals with profound questions about the nature of the universe and with some of the most important practical, environmental technology issues. Its scope is broad and involves mathematical theories, experiments and observation, computing technology, materials, nuclear energy and magnetism.

The program will require a project program that enables the students to experience the real work environment in laboratories. It also provides an opportunity to participate in group work. The student will spend a time working in a physics Lab. Upon completion of Project, a student will be required to write a brief report on his work experience and present it orally

1 Topics to be Covered

Topics	No of Weeks	Contact hours
	15	45

2 Course components (total contact hours per semester):			
Lecture :	Tutorial:	Practical:	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average : for the semester not a specific requirement in each week): **6 Office hours to help students for solving assigned problems**

4. Development of Learning Outcomes in Domains of Learning

For each of the domains of learning shown below indicate:

- **A brief summary of how to perform a scientific research.**
- **A description of research process**
- **Writing a scientific report.**

t. **Knowledge :** Description of the knowledge to be acquired

Upon successful completion of this course The student will be able to:

(ii) Teaching strategies to be used to develop that knowledge

- Each student will do his project under the supervision of a staff member.
- At the end of the project, student should write a scientific report.
- The student should give an oral presentation at the end of the semester.

(iii) Methods of assessment of knowledge acquired:

- **Writing a report.**
- Oral presentation

b. Cognitive Skills

(i) Cognitive skills to be developed

Having successfully completed the course students should be able to:

11- Apply the laws of physics.
12- Analyse the physical phenomena.
13- Express the physical phenomena mathematically.
14- Writing a scientific report.
15- Doing small researches

(ii) Teaching strategies to be used to develop these cognitive skills:

7- Preparing main outlines for teaching

(iii) Methods of assessment of students cognitive skills

5- Writing a report
6- **Oral presentation**

c. Interpersonal Skills and Responsibility

At the end of the course, the student will be able to:

- Work independently.
- The students learn independently and take up responsibility.

(xxi) Teaching strategies to be used to develop these skills and abilities

9- Search through the internet and use the library.
10- Lab work.
11- Case Study.
12- Small group discussion.
13- Enhance educational skills.

14- Develop their interest in Science through :(lab work, field trips, visits to scientific and research.

15- Encourage the student to attend lectures regularly

16- Give students tasks of duties

(iii) Methods for assessment of the students interpersonal skills and capacity to carry responsibility

- Evaluate the efforts of each student in preparing the report.
- Evaluate the scientific values of reports.
- Evaluate the work in team
- Evaluation of the role of each student in lab group assignment
- Evaluation of students presentations

d. Communication, Information Technology and Numerical Skills

42. Description of the skills to be developed in this domain. At the end of the course, the student will be able to:

25. Enhancing the ability of students to use computers and internet.
26. Interpret Physical phenomena.
27. Present Physical phenomena orally.
28. Know how to write a report.
29. Computation
30. Problem solving
31. Data analysis and interpretation.
32. Feeling physical reality of results

43. Teaching strategies to be used to develop these skills

46. **Homework (preparing a report on some topics related to the course depending on web sites).**

47. **Seminars presentation**

48. **Field visits**

(iii) Methods of assessment of students numerical and communication skills

29. Evaluation of presentations

30. Evaluation of reports

31. Practical exam

32. Research.

e. Psychomotor Skills (if applicable)

At the end of the course, the student will be able to:

28. Perform the experiments with high accuracy.
29. Operate instruments safely.
30. Draw the data and curves.

(ii) Teaching strategies to be used to develop these skills

- Follow up the students in lab and during carryout all experimental work.

49. Methods of assessment of students psychomotor skills

- Practical exam.
- Giving additional marks for the results with high and good accuracy

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	Scientific activities		10%
2	Collection of Data		10%
3	Doing a research		20%
4	Writing report		50%
5	Final oral presentation		10%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

E. Learning Resources

Required Text(s):

-

Recommended Reading List

Electronic Materials, Web Sites

Other learning material such as computer-based programs/CD, professional standards/regulations

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)

1. Accommodation (Lecture rooms, laboratories, etc.)

- Class room
- Library

- Laboratory

2. Computing resources

- Computer room
- Scientific calculator.

3.Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)

- .

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Date: 13 December 2015

Head of the Physics Department

Dr. Hatem Alamri