



Kingdom of Saudi Arabia
The National Commission for Academic Accreditation &
Assessment

T6. Course Specifications (CS)

Course title: Modern Physics

Course code: 23062351-4

Course Specifications

| | |
|--|-------------------------|
| Institution: Umm AL – Qura University | Date : 18/1/1439 |
| College/Department : Jamoum University College – Physics Department | |

A. Course Identification and General Information

| | | |
|---|-------------------------------------|---------------------------------------|
| 1. Course title and code: Modern Physics 23062351-4 | | |
| 2. Credit hours: 4 hrs. | | |
| 3. Program(s) in which the course is offered. BSc Physics. (If general elective available in many programs indicate this rather than list programs) | | |
| 4. 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) : --- | | |
| 7. Co-requisites for this course (if any) : --- | | |
| 8. Location if not on main campus: Al-Jamoum | | |
| 9. Mode of Instruction (mark all that apply) | | |
| a. traditional classroom | <input checked="" type="checkbox"/> | What percentage? 70% |
| b. blended (traditional and online) | <input type="checkbox"/> | What percentage? <input type="text"/> |
| c. e-learning | <input type="checkbox"/> | What percentage? <input type="text"/> |
| d. correspondence | <input type="checkbox"/> | What percentage? <input type="text"/> |
| f. other | <input checked="" type="checkbox"/> | What percentage? 30% |
| Comments: Lab 30% | | |

B Objectives

1. What is the main purpose for this course?

This course is designed to study and consolidate the modern physics concepts in the branches of physics such as The relativity, the black body radiation, the particles properties of waves, wave properties of particles and the atomic structure.

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

- 1- Outlines of the modern physics laws, principles and the associated proofs.
2. Highlighting the day life applications whenever exist.
3. Encourage students to search for details in the web and references in the library.
- 4- Encourage the student to build an example of different experiments related to course
- 5- Frequently check for the latest discovery in science.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

This course will cover the principle of the modern physics concepts in the branches of physics such as The relativity, the black body radiation, the particles properties of waves, wave properties of particles and the atomic structure.

1 Topics to be Covered

| Topics | No of Weeks | Contact hours |
|--|-------------|---------------|
| ❖ THE SPATIAL THEORY OF THE RELATIVITY <ol style="list-style-type: none"> 1- Reference frame, 2- Inertial reference frame, 3- Galilean relativity and Einstein's postulate of relativity, 4- Relativity of the simultaneity, 5- Time dilatation, length contraction, and Lorentz transformations, 6- Relativistic velocity transformations and relativistic mechanics, 7- Mass, energy, transformation of energy, momentum and force, 8- Doppler effect, 9- Relativistic collisions. | 3 | 3 |
| ❖ BLACK BODY RADIATION <ol style="list-style-type: none"> 1- radiation of heated objects, and thermal radiation, 2- cavity radiation treated with classical physics, 3- UV catastrophe, 4- Planck's solution, and quantum of energy. | 3 | 3 |
| ❖ PARTICLE PROPERTIES OF WAVES <ol style="list-style-type: none"> 1- The photoelectric effect, 2- The quantum theory of light, 3- X rays X-ray diffraction, the Compton effect, and Pair production, 4- Gravitational red shift. | 3 | 3 |

| | | |
|---|---------------------|--------------|
| ❖ WAVE PROPERTIES OF PARTICLES 1- De Broglie waves, and wave function, 2- De Broglie wave velocity, 3- Phase and group velocities, 4- The diffraction of particles. 5- The uncertainty principle, and its applications. 6- The wave-particle duality. | 2 | 3 |
| ❖ ATOMIC STRUCTURE 1- Atomic models, 2- Alpha-particle scattering, 3- The Rutherford scattering formula. 4- Nuclear dimensions, 5- Electron orbits, and Atomic spectra, 6- Energy levels and spectra, 7- Nuclear Motion, and atomic excitation, 8- The correspondence Principle. | 3 | 3 |
| ❖ Exercises and Solved problems | 1 | 3 |
| | 15 weeks | 45hrs |

Practical part:

1. Safety, security and introduction to the Lab.
2. Determination of e/m for electron.
3. Determination of Planck's constant.
4. Determination of ionization Potential.
5. Study of Palmer series of Hydrogen lamp.
6. Electron Diffraction: Thomson Experiment.
7. Transmission & Absorption of X-ray.
8. Franck Hertz experiments.
9. Zeeman effect.
10. Verification of Bragg's law.
11. Millikan's Experiment.
12. Stefan-Boltzmann's law.

| 2. Course components (total contact hours and credits per semester): | | | | | | |
|--|-----------|----------|----------------------|-----------|--------|-----------|
| | Lecture | Tutorial | Laboratory or Studio | Practical | Other: | Total |
| Contact hours | 45 | | 42 | | | 87 |
| Credit | 3 | | 1 | | | |

| | |
|--|---|
| 3. Additional private study/learning hours expected for students per week. | 4 |
|--|---|

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table).

Second, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes.

Third, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

| Code # | NQF Learning Domains And Course Learning Outcomes | Course Teaching Strategies | Course Assessment Methods |
|------------|---|---|---|
| 1.0 | Knowledge | | |
| 1.1 | Define the physical quantities, physical phenomena, and basic principles. | 1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. | Solve some example during the lecture. Discussions during the lectures Exams: |
| 1.2 | Describe the physical laws and quantities using mathematics | 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it. | a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams |
| 1.3 | Determine the physical quantities at the Lab. | 1. Doing team research or team project. 2. Doing team work to perform some experiments 3. Perform the experiments correctly. 4. Demonstrate the results correctly. 5. Write the reports about the experiment. 6. Discussion with the student about the results | Writing scientific Reports. Lab assignments Exam. |

| 2.0 Cognitive Skills | | | |
|--|---|--|--|
| 2.1 | Apply the laws of physics to calculate some quantities. | <ol style="list-style-type: none"> 1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem. | <ol style="list-style-type: none"> 1. Exams (Midterm, final, 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. |
| 2.2 | Solve problems in physics by using suitable mathematics. | | |
| 2.3 | Analyse and interpret quantitative results. | | |
| 2.4 | Apply physical principle on day life phenomena. | | |
| 2.5 | Derive the physical laws and formulas. | | |
| 3.0 Interpersonal Skills & Responsibility | | | |
| 3.1 | Show responsibility for self-learning to be aware with recent developments in physics | <ul style="list-style-type: none"> • Search through the internet and the library. • Small group discussion. • Enhance self-learning skills. • Develop their interest in Science through : (lab work, visits to scientific and research institutes). | <ul style="list-style-type: none"> • Evaluate the efforts of each student in preparing the report. • Evaluate the scientific reports. • Evaluate the team work in lab and small groups. • Evaluation of students presentations. |
| 3.2 | Work effectively in groups and exercise leadership when appropriate. | | |
| 4.0 Communication, Information Technology, Numerical | | | |
| 4.1 | Communicate effectively in oral and written form. | <ul style="list-style-type: none"> • Incorporating the use and utilization of computer, software, network and multimedia through courses • preparing a report on some topics related to the course depending on web sites | <ul style="list-style-type: none"> • Evaluating the scientific reports. • Evaluating activities and homework |
| 4.2 | Collect and classify the material for the course. | | |
| 4.3 | Use basic physics terminology in English. | | |
| 4.4 | Acquire the skills to use the internet communicates tools. | | |
| 5.0 Psychomotor | | | |
| 5.1 | Use experimental tools safely and correctly. | Follow up the students in lab and during carryout all experimental work. | <ul style="list-style-type: none"> • Practical exam. • Giving additional marks for the results with high and good accuracy |
| 5.2 | Determine the physical quantity correctly at the Lab. | | |

5. Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

| Course LOs # | Program Learning Outcomes (Use Program LO Code #s provided in the Program Specifications) | | | | | | | | | | | | | | | |
|--------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 3.1 | 3.2 | 4.1 | 4.2 | 4.3 | 4.4 | 5.1 | 5.2 |
| 1.1 | ✓ | | | | | | | | | | | | | | | |
| 1.2 | | ✓ | | | | | | | | | | | | | | |
| 1.3 | | | ✓ | | | | | | | | | | | | | |
| 2.1 | | | | ✓ | | | | | | | | | | | | |
| 2.2 | | | | | ✓ | | | | | | | | | | | |
| 2.3 | | | | | | ✓ | | | | | | | | | | |
| 2.4 | | | | | | | ✓ | | | | | | | | | |
| 2.5 | | | | | | | | ✓ | | | | | | | | |
| 3.1 | | | | | | | | | ✓ | | | | | | | |
| 3.2 | | | | | | | | | | ✓ | | | | | | |
| 4.1 | | | | | | | | | | | ✓ | | | | | |
| 4.2 | | | | | | | | | | | | ✓ | | | | |
| 4.3 | | | | | | | | | | | | | ✓ | | | |
| 4.4 | | | | | | | | | | | | | | ✓ | | |
| 5.1 | | | | | | | | | | | | | | | ✓ | |
| 5.2 | | | | | | | | | | | | | | | | ✓ |

6. 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 (lectures) | All weeks | 5% |
| 2 | Exercises & Home works (lab) | All weeks | 5% |
| 3 | Participation in lectures activities | All weeks | 5% |
| 4 | Participation in lab activities | All weeks | 5% |
| 5 | Midterm Exam (theoretical) | 8 th week | 20% |
| 6 | Lab. Reports (Practical) | 11 th week | 5% |
| 7 | Final Exam (Practical) | 14 th week | 15% |
| 8 | Final Exam (theoretical) | 16 th week | 40% |

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be 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. (4hrs per week)

E Learning Resources

1. List Required Textbooks
2. List Essential References Materials (Journals, Reports, etc.)
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)
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.
4. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

F. Facilities Required

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

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)
There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board.
There are enough laboratories for experimental physics, provided with air conditions, good data show, and experimental equipment.
2. Computing resources (AV, data show, Smart Board, software, etc.)

In each class room and laboratories, there is a data show, and board.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Course reports
- Course evaluation.

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 flash and movies.
- Coupling the theoretical part with laboratory part
- Periodical revision of course content.

4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at 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.
- 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
- Program Self study

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