Kingdom of Saudi Arabia
National Commission for
Academic Accreditation & Assessment

المملكة العربية السعودية
الهيئة الوطنية للتقويم
والاعتماد الأكاديمي

كلية العلوم التطبيقية
Faculty of Applied Sciences

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

T6. Course Specifications (CS)

Course Title: Classical Mechanics (2)

Course Code: 23063322-2

Course Specifications

Institution: **Umm AL – Qura University**	Date : **18/1/1439**
College/Department : **College of Applied Science – Department of Physics**	

A. Course Identification and General Information

1. Course title and code: **Classical Mechanics (2) (code: 23063322-2)**			
2. Credit hours: **2 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 : **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) : **General Physics (2)**			
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

1. What is the main purpose for this course?

- Discuss the fundamental concepts in classical mechanics.
- Understand the physical basis of mechanics and dynamics of rigid body.
- Aanalyse the center of mass and moment of inertia of a rigid body.
- Describe the theorems of static equilibrium of rigid body.
- Use of matrices in rigid body dynamics.
- Build the link between Physics theories and ideas with applications in the students daily life.
- Discuss the Euler's equation of motion of a rigid body.
- 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
- Use Lagrangian and the Hamiltonian formalisms to solve mechanical problems.
- Use the scientific method to understand the enormous variety of classical mechanics in terms of a few relatively simple laws as an overall goal.

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 physical laws, principles and the associated proofs.
2. Highlighting the day life applications whenever exist.
3. Encourage the students to see more details in the international web sites and reference books in the library.
4. 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 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 courses that are advanced 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.	**6**	**12**
❖ **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.	**4**	**8**
❖ **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.	**4**	**8**
	14 weeks	**28 hrs**

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	28				Office hours : 14 hr	42
Credit	**2**					

3. Additional private study/learning hours expected for students per week.	2

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. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams .
1.2	Describe the physical laws and quantities using mathematics		
2.0	**Cognitive Skills**		
2.1	Apply the laws of physics to calculate some quantities.	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught
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.	4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some 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	• 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).	• 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.	• 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	• 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 (NA)**		

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	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 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 timetable for academic advice were given to the student each semester. (2hrs per week)

E Learning Resources

1. List Required Textbooks

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).

2. List Essential References Materials (Journals, Reports, etc.)

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

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).

4. List Electronic Materials, Web Sites, Facebook, Twitter, etc. http://academicearth.org/lectures/modern-physics-classical-mechanics-2
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. Wikipedia

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.) • Lecture room for 30 students, Black (white) boards • Class room is already provided with data show
2. Computing resources (AV, data show, Smart Board, software, etc.) 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) NA

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.
3 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.

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)

- 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.

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.
3- Contact the college to evaluate the course and the benefit it add to other courses.
4- Add some subject and cut off others depending on the new discoveries in physics.

Name of Instructor: _____ Doaa Abdallah Said _____

Signature: _____ Date Report Completed: _____

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____