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 (1)

Course code: 23063221-4

Course Specifications

Institution: **Umm AL – Qura University**	Date : **11/3/1439**
College/Department : **College of Applied Science – Department of Physics**	

A. Course Identification and General Information

1. Course title and code: **Classical Mechanics (1) (code: 23063221-4)**			
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: **3rd Year / Level 5**			
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 the main campus: **Main campus and Al-Zaher**			
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? This course is designed to demonstrate and consolidate the basic physics concepts in classical mechanics, the general motion of the particles in three dimensions, the noninertial reference systems, the gravitation, central forces, and the dynamics of many-particle systems.
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 websites and reference books in the library. 4- Encourage the student to build an example of different experiments related to the 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:
Chapter 1: A brief preparation in vector algebra and vector differentiation.
Chapter 2: Newton's laws of motion and the rectilinear motion of a single particle.
Chapter 3: Harmonic motion, damped and forced harmonic oscillator.
Chapter 4: The general motion of a particle in three dimensions.
Chapter 5: Noninertial reference systems.
Chapter 6: The central forces and celestial mechanics.
Chapter 7: Many-particle systems, collisions, and the rocket motion.

1 Topics to be Covered

Topics	No of Weeks	Contact hours
❖ **Fundamental Concepts Vectors** 1- Physical quantities and units. 2- Scalar and vector quantities. 3- Formal definition and rules. 4- The Scalar and Vector Products. 5- Triple products 6- Derivative of a vector. 7- Position vector of a particle velocity and Acceleration in Rectangular Coordinates. 8- Velocity and Acceleration in Polar Coordinates. 9- Velocity and Acceleration in Cylindrical and Spherical Coordinates.	**2**	**8**

❖ **Newtonian Mechanics, Rectilinear Motion of a Particle** 1- Newton's Law of Motion. 2- Rectilinear Motion: Uniform Acceleration Under a Constant Force. 3- Forces that Depend on Position: The Concepts of Kinetic and Potential Energy. 4- Velocity-Dependent Forces: Fluid Resistance and Terminal Velocity.	**2**	**8**
❖ **Oscillations** 1- Linear Resoring Force: Harmonic Motion. 2- Energy Considerations in Harmonic Motion. 3- Damped Harmonic Motion. 4- Forced Harmonic Motion: Resonance.	**2**	**8**
❖ **General Motion of a Particle in Three Dimensions** 1- Introduction. 2- The Potential Energy Function in Three-Dimensional Motion: The Del Operator. 3- Forces of the Separable Type. 4- The Harmonic Oscillator in Two and Three Dimensions. 5- Constrained Motion of a particle.	**2**	**8**
❖ **Noninertial Reference Systems** 1- Accelerated Coordinate Systems and Interial Forces. 2- Rotating Coordinate Systems. 3- Dynamics of a Particle in a Rotating Coordinate System. 4- Effects of Earth's Rotation. 5- The Foucault Pendulum.	**2**	**8**
❖ **Gravitation and Central Forces** 1- Introduction. 2- Gravitational Force between a Uniform Sphere and a Particle. 3- Kepler's Laws of Planetary Motion. 4- Kepler's Second Law: Equal Areas. 5- Kepler's Firs Law: The Law of Ellipses. 6- Kepler's Third Law: The Harmonic Law. 7- Potential Energy in a Gravitational Field: Gravitational Potential. 8- Potential Energy in a General Central Field. 9- Energy Equation of an Orbit in a Central Field. 10- Orbital Energies in an Inverse-Square Field.	**2**	**8**
❖ **Dynamics of Systems of Particles** 1- Introduction: Center of Mass and Linear Momentum of a System. 2- Angular Momentum and Kinetic Energy of a system. 3- Motion of Two Interacting Bodies: The Reduced Mass. 4- Collisions. 5- Oblique Collisions and Scattering: Comparison of Laboratory and Center of Mass Coordinates. 6- Motion of a Body with Variable Mass: Rocket Motion.	**2**	**8**
	14 weeks	**56 hours**

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory or Studio	Practical	Other:	Total
Contact Hours	**56**		**--**		**14**	**70**
Credit	**4**					

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. 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	Exercises & Home works	All weeks	5 %
2	Participation in activities, lectures	All weeks	5 %
3	In-Class Problem solving	All weeks	10 %
4	Midterm Exam1 (theoretical)	6th week	15%
5	Midterm Exam2 (theoretical)	11th week	15%
6	Final Exam (theoretical)	16th week	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 an academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4 hours per week)

E Learning Resources

1. List Required Textbooks

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

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

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

S. T. Thornton, and J. B. Marion, "Classical Dynamics of Particles and Systems", 5th edition, Brooks Cole (2003).

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.) Classroom for 40 students with data show Library
2. Computing resources (AV, data show, Smart Board, software, etc.) Computer room Data show
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) Each Classroom data show, and double layer white board.

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 students in the course. • Evaluating the progress of student by projects.
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 Strategies are modified each term according to the student feedback.
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.

Name of Instructor: _____Fatma El-Sayed Mahrous Othman_____

Signature: _____Fatma El-Sayed_____ Date Report Completed: ___11/3/1439__

Name of Field Experience Teaching Staff _____

Program Coordinator:_____

Signature: _____ Date Received: _____