مركز الاعتماد وضمان الجودة
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Course Syllabus

1	**Course title**	***Classical Mechanics 2***	
2	**Course number**	0332352	
3	**Credit hours**	*(3, 0)*	
	Contact hours (theory, practical)	*(48, 0)*	
4	**Prerequisites/corequisites**	0302351	
5	**Program title**	Physics	
6	**Program code**	0302	
7	**Awarding institution**	University of Jordan	
8	**School**	Science	
9	**Department**	Physics	
10	**Course level**	*Third Year*	
11	**Year of study and semester(s)**	*Third , First Semester*	
12	**Other department(s) involved in teaching the course**	Non	
13	**Main teaching language**	English	
14	**Delivery method**	☒**Face to face learning** ☐Blended ☐Fully online	
15	**Online platforms(s)**	☒**Moodle** ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……	
16	**Issuing/Revision Date**	10/02/2023	

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17 Course Coordinator:

Name: Ahmad S Masadeh	Contact hours: Sunday Monday 11 -12
Office number:12	Phone number: 22065
Email: ahmad.masadeh@ju.edu.jo	

18 Other instructors:

None

19 Course Description:

Lagrangian mechanics; Hamiltonian mechanics; dynamics of systems of particles; dynamics of rigid bodies; coupled oscillators.

20 Course aims and outcomes:

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A- Aims:

B- Students Learning Outcomes (SLOs):

For purposes of mapping the course SLOs to the physics program SLOs, at the successful completion of the physics program, graduates are expected to be able to:

SLO (1) Master professionally a broad set of knowledge concerning the fundamentals in the basic areas of physics: Classical Mechanics, Electrostatics and Magnetism, Quantum Mechanics, Thermal Physics, Optics, Theory of Special Relativity, Mathematical Physics, Electronics.

SLO (2) Apply knowledge of mathematics and fundamental concepts in the basic areas of physics to identify and solve physics related problems.

SLO (3) Utilize computers and available software in both data collections and data analysis.

SLO (4) Utilize standard laboratory equipment, modern instrumentation, and classical techniques to design and conduct experiments as well as to analyze and interpret data.

SLO (5) Develop a recognition of the need and ability to engage in life-long learning.

SLO (6) Demonstrate ability to use techniques, skills, and modern scientific tools necessary for professional practice.

SLO (7) Communicate clearly and effectively in both written and oral forms.

SLO (8) Apply proficiently team-work skills and employ team-based learning strategies.

SLO (9) Apply professional and ethical responsibility to society.

Upon successful completion of this course, students will be able to:

Program SLOs / CourseSLOs	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1. Demonstrate proficiency in mathematical concepts needed for a proper understanding of classical mechanics.	✓		✓				✓		
2. Developing skills in analytical reasoning and problem-solving, including identifying and simplifying relevant physical principles and choosing appropriate mathematical methods.	✓	✓			✓				
3. Understanding the principles of rotational motion, including torque, angular momentum, and the moment of inertia.					✓				
4. Understanding the motion of systems of particles and rigid bodies, including the equations of motion and the conservation laws of energy and momentum.	✓								
5. Understanding the principles of Lagrangian and Hamiltonian mechanics, including the concept of action and the variational principle.			✓			✓			
6. understand and apply concepts of non-inertial frames of reference									
7. Understand the concept of central force a Derive Kepler's laws.									

21. Topic Outline and Schedule:

Week	Lecture	Topic	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous/ Asynchronous Lecturing	Evaluation Methods	Resources
1	7.1	*Center of Mass and Linear Momentum of a System*						
	7.2	*Angular Momentum and Kinetic Energy of a System*						
	7.3	*Motion of Two Interacting Bodies: The Reduced Mass*						
	7.5	*Collisions*						
	7.6	*Oblique Collisions and Scattering: Comparison of Laboratory and Center of Mass Coordinates*						
	7.7	*Motion of a Body with Variable Mass: Rocket Motion*						
2	8.1	*Center of Mass of a*						

		Rigid Body.						
	8.2	*Rotation of Rigid Body About a Fixed Axis: Moment of inertia*						
	8.3	*Calculation of the Moment of inertia*						
	8.4	*The Physical pendulum*						
	8.5	*The Angular Momentum of a rigid body in Laminar Motion.*						
	8.6	*Examples of Laminar Motion of a Rigid Body*						
	8.7	*Impulse and Collisions involving Rigid Body*						
Week	**Lecture**	**Topic**	**Intended Learning Outcome**	**Learning Methods(Face to Face/Blended/ Fully Online)**	**Platform**	**Synchronous/ Asynchronous Lecturing**	**Evaluation Methods**	**Resources**
3	9.1	*Rotation of Rigid Body about an*						

		Arbitrary Axis.							
	9.2	*Principle Axis of a Rigid Body*							
	9.3	*Euler's Equation of Motion of a Rigid Body*							
4	10.1	*Hamilton's Variational Principle*							
	10.2	*Generalized Coordinates*							
	10.3	*Calculating Kinetic and Potential Energies in terms of Generalized Coordinates*							
	10.4	*Lagrange's Equation of Motion for Conservative Systems*							
	10.5	*Some Applications of Lagrange's Equation*							
	10.6	*Generalized Momenta: Ignorable Coordinates*							
	10.7	*Forces of Constraint:*							

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		Lagrange Multipliers							
	10.8	*D'Alembert's Principle: Generalized Forces*							
	10.9	*The Hamiltonian Function: Hamilton's Equation*							

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First Exam	20	the motion of systems of particles and including the equations of motion and the conservation laws of energy and momentum	SLO(1) & SLO(2)	Week 8 (23/3/2023)	First Exam
Second Exam	30	The principles of rotational motion, including torque, angular momentum, and the moment of	SLO(2)& SLO(3)	Week 12 (15/5/2023)	Second Exam

		inertia.			
Final Exam	50	All course content	SLO(1) – SLO(9)		Final Exam

23 Course Requirements

White board and overhead projector.

Each student should have access to a computer& internet connection

24 Course Policies:

Attendance is mandatory. Students who record absences more than the legally acceptable limit **may lose their chance to sit for the final exam of the course**.

B- Absences from exams and submitting assignments on time:

The students are required to handle their responsibility and develop**positive learning attitudes**.

C- Health and safety procedures:

Follow the instructions regarding health and safety procedures in the university.

D- Honesty policy regarding cheating, plagiarism, misbehavior:

The course is designed to provide students with learning opportunities. Group work and discussions accompanied with individual input and hard work are encouraged to fulfill the objectives of the course, whereas**cheating and misbehavior are completely unacceptable**.

E- Grading policy:

Invest your time in fruitful learning.

F- Available university services that support achievement in the course:

- ✓ E-learning resources
- ✓ Microsoft Teams
- ✓ Smart Class rooms

Computer facilities.

25 References:

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A- Required book (s), assigned reading and audio-visuals:

Analytical Mechanics" by Grant R. Fowles and George L. Cassiday, 7th Edition, 2005, Thomson/Brooks-cole

B- Recommended books, materials, and media:

Marion, J. B., and Thornton, S. T., Classical Dynamics, 5th ed., Brooks/Cole-Thomson Learning, Belmont, CA, 2004.

26 Additional information:

A set of problems for each topic will be assigned as homework. Solutions of these and other Problems will be discussed in class.

Name of Course Coordinator: -: Ahmad Masadeh Signature: *Ahmad Masadeh* Date: -10-02-2023
Head of Curriculum Committee/Department:----------Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------