هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Classical Mechanics (2)**
Course Code:	**2033103-2**
Program:	**Bachelor in Physics**
Department:	**Department of Physics**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification **3**

6. Mode of Instruction (mark all that apply) 3

B. Course Objectives and Learning Outcomes **3**

1. Course Description 3

2. Course Main Objective 3

3. Course Learning Outcomes 4

C. Course Content **4**

D. Teaching and Assessment **5**

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods 5

2. Assessment Tasks for Students 5

E. Student Academic Counseling and Support **5**

F. Learning Resources and Facilities **5**

1.Learning Resources 5

2. Facilities Required 6

G. Course Quality Evaluation **6**

H. Specification Approval Data **6**

A. Course Identification

1. Credit hours:2
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 7th Level / 3nd Year
4. Pre-requisites for this course (if any)**:** Classical Mechanics 1 / 2032202-3
5. Co-requisites for this course (if any)**:**None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	3	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers important parts in advanced classical mechanics. Students will study two and many Bodies Problem. Lagrange's Equations and their applications will be studied. Finally, Hamiltonian's Equations and their applications are also included.

2. Course Main Objective

Manipulate the physical quantities and the laws of classical mechanics for a discrete or continuous system of material point in the reference frame of the mass center. Apply the laws of conservation to a two material points system. Extend the idea of coordinates system to the generalized coordinates. Construct the Lagrangian and Hamiltonian for simple mechanical systems, rigid bodies and coupled oscillations , as well as, apply the Lagrange and Hamilton equations to determine its motion's differential equations.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the different physical quantities and write clearly mechanics laws and the expression of Hamiltonian and Lagrangian describing the system motion.	K2
1.2	Distinguish between coordinates and generalized coordinates.	K2
2	**Skills :**	
2.1	Apply classical laws of mechanics and deduce the motion equations of some system.	S1
2.2	Apply Lagrangian and Hamiltonian equations to some systems and explain the difference by comparison with Newtonian mechanics.	S1
3	**Values:**	
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	V1

C. Course Content

No	List of Topics	Contact Hours
1	**Unit 1: Two and many Bodies Problem (method and applications):** • Motion of a system of two bodies • Center of Mass for Particles • Kinetic energyof many particle systems in Laboratory & Centercoordinates • Linear momentum of many particle systems in Laboratory & Centercoordinates • Angular momentum of many particle systems in Laboratory & Centercoordinates • Collisions of many particle systems in Laboratory & Centercoordinates	**11**
2	**Unit 2: Lagrange's Equations:** • Motion of many particle systems • Constrained systems & free systems **First Periodic Exam** • Constrained equations • Generalized coordinates • Generalized forces • Conservative and constrained systems • Lagrange's equation • Lagrange's equations for constrained systems • Applications	**2** **1** **6**
3	**Unit 3: Hamiltonian's Equations:** • Generalized momenta and cyclic coordinates **Second Periodic Exam** • conservative laws • Hamiltonian equations of motion • Electromagnetic forces and velocity dependent potential • Applications	**1** **1** **6**
4	Revision	2
	Total	30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Define the different physical quantities and write clearly mechanics laws and the expression of Hamiltonian and Lagrangian describing the system motion.	Lecture Discussion	Written exam
1.2	Distinguish between coordinates and generalized coordinates.	Lecture Discussion	Written exam
2.0	**Skills**		
2.1	Apply laws of motion and Newton, and deduce the motion equation of some system.	Problem solving	Written exam Activities
2.2	Solve the motion of mechanical system by using mechanic laws and the formalism of Hamilton and Lagrange.	Problem solving	Written exam Activities
3.0	**Values**		
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	Groups discussion	Homework

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Periodically	10%
2	Midterm exam	6^{th}	30%
3	Short exam	9^{th}	10%
4	Final exam	12^{th}	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Each faculty member is assigned a group of students for continuous academic advice during six office hours weekly (6 hrs./week).
- Teaching staff are available for individual student consultations during office hours

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Classical Mechanics by Tom Kibble and Frank Berkshire, Fifth Edition, Imperial College Press, 2004. • H. Goldstein, Classical Mechanics, AdisonWeley Pub. Company (1981).
Essential References Materials	Introduction to Classical Mechanics: With Problems and Solutions by David Morin. Cambridge University Press; 1st edition (2008).

Electronic Materials	• https://sites.google.com/site/aljalaliscientificsite/home/2 • http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html • wikipedia.org/wiki/ physics subjects
Other Learning Materials	• CD associated with the text books (when available). • Lecture notes and Power Points presentations prepared by the lecturer.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show • Laptop • Smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	• Students	• Indirect
Evaluation of Teaching	• Instructor • Program coordinator • Departmental council	• Indirect
Improvement of Teaching	• Program leaders • Relevant committee	• Direct
Quality of learning resources	• Students • Instructor Faculty	• Indirect
Extent of achievement of course learning outcomes,	• Program leaders • Instructor	• Direct
Course effectiveness and planning for improvement	• Program leaders • Instructor	• Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	
Date	October 2, 2022