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|  | **Mutah University** **Detailed Syllabus Form** | Description: C:\Users\lamasat.lamasat-PC\Pictures\Picture1.png |

**First :** Course Information**:**

|  |  |
| --- | --- |
| * Course Number: 0302714
 | * Course Title: Classical Mechanics
 |
| * Credit Hours:3
 | * College: Science
 |
| * Pre-requisite
 | * Department: Physics
 |
| * Instructor: Prof. Hussain Omari
 | * Semester & Academic Year:
 |
| * The time of the lecture:
* Mon 14:00 – 17:00
 | * Office Hours: Mon 12:30 – 14:00 Wed 9:00 – 11:00
 |

**Second :** General Course Description

**1. Elementary Principles**

1.1 Mechanics of a single Particle

1.2 Mechanics of a System of Particles

1 .3 Constraints

1.4 D'Alembert's Principle and Lagrange's Equations

1.5 Velocity-Dependent Potentials and the Dissipation Function

1.6 Simple Applications of the Lagrangian Formulation

**2. Variational Principles and Lagrange**'**s Equations**

2.1 Hamilton's Principle

2.2 Some Techniques of the Calculus of Variations

2.3 Derivation of Lagrange's Equations from Hamilton's Principle

2.4 Extension of Hamilton's Principle to Nonholonomic Systems

2.5 Advantages of a Variational Principle Formulation

2.6 Conservation Theorems and Symmetry Properties

2.7 Energy Function and the Conservation of Energy

**6. Oscillations**

6.1 Formulation of the Problem

62 The Eigen-value Equation and the Principal Axis Transformation

5.3 Frequencies of Free Vibration, and Normal Coordinates

6.4 Free vibrations of a linear tri-atomic molecule

6.5 Forced vibrations and the effect of dissipative forces

**8. The Hamilton Equations of Motion**

8.1 Legendre Transformations and the Hamilton Equations of Motion

8.2 Cyclic Coordinates and Conservation Theorems

8.3 Routh's Procedure

8.5 Derivation of Hamilton's Equations from a Variational Principle

8. The Principle of Least Action

**9. Canonical Transformations**

9.1 The Equations of Canonical Transformation

9.2 Examples of Canonical Transformations

9.3 The Harmonic Oscillator

9.5 Poisson Brackets and Other Canonical Invariants

9.6 Equations of Motion, Infinitesimal Canonical Transformations, and Conservation Theorems in the Poisson Bracket Formulation

9.7 The Angular Momentum Poisson Bracket Relations

**Third :** Course Objectives

Classical mechanics affords student an opportunity to master many of the mathematical techniques necessary to prepare him for quantum mechanics while still working in terms of the familiar concepts of classical mechanics.

 **Fourth:** Expected Learning Outcomes

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**Fifth :** Course Plan Distribution & Learning Resources

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| **Learning Resources**  | **Topics to be Covered** | **Week****No.** |
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**Sixth :** Teaching Strategies and Methods

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| --- | --- |
| **Teaching Strategies and Methods** | No  |
|  | **1** |
|  | **2** |
|  | **3** |
|  | **4** |
|  | **5** |

**Seventh :** Methods of Assessment

|  |  |  |  |
| --- | --- | --- | --- |
| **Proportion of Final Evaluation** | **Evaluation Methods of**  | **Week & Date** | **No.** |
|  |  |  | **1.** |
|  |  |  | **2.** |
|  |  |  | **3.** |
|  |  |  | **4.** |
|  |  |  | **5** |
|  |  |  | **6** |
| **(100%)** |  | **Total** |

**Eighth :** Required Textbooks

**- Primary Textbook:**

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 **-** **Secondary References**

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**Ninth :** General Instructions

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| **Additional Notes, Office hours, Incomplete Exams, Reports, Papers, …etc** | **No**  |
|  | **1** |
|  | **2** |
|  | **3** |
|  | **4** |
|  | **5** |