## Faculty of Engineering & Technology

## Mechanical Mechanisms

**Information :**

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| **Course Code :** | MAN 311 | **Level :** | Undergraduate | **Course Hours :** | 3.00- Hours |

**Department :** Department of Mechanical Engineering

**Instructor Information :**

| Title | Name | Office hours |
|---|---|---|
| Lecturer | Hassan Mohamed Shams Eldin Elsayed Eleashy | 8 |
| Lecturer | Arafa Soliman Sobh Khalil Arafa | 3 |
| Teaching Assistant | Eman Mohamed Hammad Ahmed | |
| Teaching Assistant | Osama Ahmed Ibrahim Mohamed Montaser | 2 |

**Area Of Study :**

Analyze position, displacement, velocity and acceleration for planar mechanisms.
Define and design different types of standard cams and equivalent mechanisms.
Explain the kinematics of gear train and force analysis of planar mechanisms and applications to engine balancing machines.

**Description :**

Kinematics Fundamentals: geometry of motion and mechanism topology, Linkage mechanisms and planar robots: position, displacement, velocity, and acceleration (Graphical, Analytical and Computers Assisted Methods), Cam-follower mechanisms: design and analysis (Graphical, Analytical and Computers Assisted Methods), Standard cams and equivalent mechanisms, Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains, Dynamics fundamentals: force analysis of mechanisms, Applications to engine balancing machines, Applications and use of Computers for Mechanism Simulation and Animation.

**Course outcomes :**

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| **a.Knowledge and Understanding: :** | |
| 1 - | Understand various parts involved in kinematics of machines for different applications. |
| 2 - | Identify requirements and the design aspects of basic machine elements. |
| 3 - | Develop an ability to design a system, component, or process to meet desired needs within realistic constraints. |
| 4 - | Develop an ability to identify, formulate, and solve engineering problems. |
| 5 - | Understand the fundamentals of the theory of kinematics and dynamics of machines |
| **b.Intellectual Skills: :** | |
| 1 - | Understand various cam motion profiles and follower mechanism, their classification and design based on the prescribed follower motion. |
| 2 - | Understand importance gear trains and their practical applications. |
| 3 - | Analyze the available inputs to attain the required outputs. |

| c.Professional and Practical Skills: : | |
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| 1 - | Create a schematic drawing of a real-world mechanism. |
| 2 - | Use graphical methods to study the motion of a planar mechanism. |
| 3 - | Use computer software to study the motion of a mechanism. |
| 4 - | Utilize the common mechanisms used in machines and everyday life. |
| 5 - | Apply graphical and analytical techniques for analysis of different mechanism types. |
| **d.General and Transferable Skills: :** | |
| 1 - | Use digital libraries and/or Learning systems. |
| 2 - | Introduce ideas and solutions for many practical and engineering problems efficiently in predetermined time plan. |

**Course Topic And Contents :**

| Topic | No. of hours | Lecture | Tutorial / Practical |
|---|---|---|---|
| Introduction to kinematics Fundamentals, Geometry of motion and mechanism topology, Linkage mechanisms and planar. robots | 8 | 4 | 4 |
| Velocity and acceleration analysis of any point on linkage for a plane motion. | 12 | 6 | 6 |
| Cam-follower mechanisms: design and analysis (Graphical, Analytical and Computers Assisted Methods). | 10 | 6 | 4 |
| Analysis of some standard cams and equivalent mechanisms. | 4 | 2 | 2 |
| Kinematics of gear trains: gears terminology, simple, compound, and planetary gear trains | 8 | 4 | 4 |
| Dynamics fundamentals: force analysis of mechanisms. | 4 | 2 | 2 |
| Balancing of rotating masses. | 4 | 2 | 2 |
| Project follow -up. | 4 | 2 | 2 |
| Midterm Exams ,Quizzes | 6 | 2 | 4 |

**Teaching And Learning Methodologies :**

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| Interactive Lecturing |
| Problem solving |
| Discussion |
| Project |

**Course Assessment :**

| Methods of assessment | Relative weight % | Week No | Assess What |
|---|---|---|---|
| 1 st -Mid-term examination | 15.00 | 6 | Written Exam |
| 2 nd -Mid-term examination | 15.00 | 11 | Written Exam |
| Assignments, Participation, & Quizzes | 20.00 | 16 | Reports follow up during tut. /lab work, & written exam. |
| Final examination | 40.00 | | Written Exam |

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| Project. | 10.00 | 12 | Practical |

| **Course Notes :** |
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| Lecture notes on the course moodle page, FUE website |

| **Recommended books :** |
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| Charles E. Wilson and J. Peter Sadler, ñKinematics and Dynamics of Machinery, SI Third Editionò, Prentice Hall, ISBN: 0131866419, (2003) |