**University**: Benha University

**Faculty**: Faculty of Engineering at Shoubra

**Department offering the program**: Mechanical Engineering Department

**Department offering the course**: Mechanical Engineering Department

**1- Course Data (Basic Information)**

**Course Code:** MDP221 **Course Title:** Theory of Machines

**Semester/ Academic year:** Second semester / 2020-2021

**Prerequisite Course(s):** None

**Credit Hours:** 6 **Weekly Contact Hours**: **Lecture:** 3 **Tutorial:** 3 **Laboratory:** 0

**2- Course Aims**

The aim of this course is to provide the students with the basic knowledge and skills of the fundamentals of theory of machines. Study the gear trains, mechanisms, cams, flywheels and balancing.

**3- Course Contents** (As indicated in the program Bylaw)

Introduction to theory of machines, systems kinematics, velocity and acceleration of different mechanisms, analysis of dynamic forces, cams, balancing, flywheels and gear trains

**4- Program Competences Served by The Course (A1, B1 and B3)**

**Level (A) Engineering Competencies**

**A1:** Identify, formulate, and solve complex engineering problems by applying engineering fundamentals, basic science, and mathematics.

**Level (B) Mechanical Engineering Competencies**

**B1**: Model, analyze and design physical systems applicable to the specific discipline by applying the concepts of Thermodynamics, Heat Transfer, Fluid Mechanics, solid Mechanics, Material Processing, Material Properties, Measurements, Instrumentation, Control Theory and Systems, Mechanical Design and Analysis, Dynamics and Vibrations.

**B3**: Select conventional mechanical equipment according to the required performance.

**5- Learning Outcomes (LO’s)**

*At the end of this course, the student will be able to:*

|  |  |
| --- | --- |
| Cognitive Domain | |
| #1 | Explaining the working principles of gear trains, mechanisms, cams, flywheels and balancing. |
| #2 | Analyze gear trains, mechanisms, cams, flywheels and balancing by equations. |
| #3 | Apply the acquired knowledge for solving problems in gear trains, mechanisms, cams, flywheels and balancing. |
| Psychomotor Domain | |
| #4 | Detect the gear trains velocities and number of teeth, velocity and acceleration of mechanisms, cams dimensions, flywheels masses and dimensions, and the necessary balanced masses. |
| #5 | Design of gear trains, mechanisms, cams, flywheels and balancing. |
|  |  |
| Affective Domain | |
|  |  |
|  |  |

**6- Mapping Learning Outcomes (LO’s) with Competencies**

|  |  |  |  |
| --- | --- | --- | --- |
| **LO’s NARS** | **A1** | **B1** | **B3** |
| Cognitive Domain | | | |
| #1 | ◼ |  |  |
| #2 |  | ◼ |  |
| #3 | ◼ |  |  |
| Psychomotor Domain | | | |
| #4 |  |  | ◼ |
| #5 |  | ◼ |  |
|  |  |  |  |
| Affective Domain | | | |
|  |  |  |  |
|  |  |  |  |

**7- Lecture Plan**

*Please delete this blue text after updating the file.*

*There are 15 weeks per term. You should consider 14 weeks for teaching and one week for mid-term examination.*

1. Topics to be Covered weekly & Matrix of LO’s

| Week | Topics | Planned Hours | Learning Outcomes | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| A1-1 | B1-2 | A1-3 | B3-4 | B1-5 |
| W1 | -Introduction – Mechanism & machine | **6** | ◼ |  |  |  |  |
| W2 | -Types of mechanisms. | **6** | ◼ |  |  |  |  |
| W3 | -Velocity diagram – four bar mechanism. | **6** |  | ◼ |  |  |  |
| W4 | -Velocity diagram – Slider crank mechanism. & quick return mechanism (Home assignments) | **6** |  |  |  |  | ◼ |
| W5 | -Acceleration diagram – four bar mechanism. –& Slider crank mechanism. | **6** |  |  | ◼ |  |  |
| W6 | -Acceleration diagram quick return mechanism | **6** |  |  |  |  | ◼ |
| W7 | - Gear trains (simple) | **6** | ◼ |  |  |  |  |
| W8 | - Gear trains (compound) [Quiz] | **6** |  | ◼ |  |  |  |
| W9 | - Flywheel working principles (Home assignments) | **6** | ◼ |  |  |  |  |
| W10 | - Solved examples on flywheel | **6** |  |  | ◼ |  |  |
| W11 | - Mass balancing (single mass in the same plane) | **6** |  |  |  | ◼ |  |
| W12 | - Mass balancing (two masses in two different planes) [Quiz] | **6** |  |  |  |  | ◼ |
| W13 | - Working principles of cams (Home assignments) | **6** | ◼ |  |  |  |  |
| W14 | -Came profile (Solved problems) [Quiz] | **6** |  |  | ◼ |  |  |

1. Additional private study/learning hours expected for students per week is Six hours

**8) Teaching and Learning Methods**

| **Learning Outcomes** | | **Teaching and Learning Methods** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Face-to-face Lecture | Online Lectures | Tutorial / Exercise | Group Discussions | Laboratory | Site Visit | Presentation | Collaborate Learning (Team Project) | Research and Reporting | Brain Storming |
| **Cognitive Domain** | #1 | ⚫ | ⚫ | ⚫ |  |  |  | ⚫ |  |  |  |
| #2 | ⚫ | ⚫ | ⚫ |  |  |  | ⚫ |  | ⚫ |  |
| #3 | ⚫ | ⚫ | ⚫ |  |  |  | ⚫ | ⚫ |  |  |
| **Psychomotor Domain** | #4 | ⚫ | ⚫ | ⚫ |  |  |  | ⚫ |  | ⚫ |  |
| #5 | ⚫ | ⚫ | ⚫ |  |  |  | ⚫ | ⚫ |  |  |
|  |  |  |  |  |  |  |  |  |  |  |
| **Affective Domain** |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

**Student Academic Counseling and Support**

* Students are directed to contact teaching staff for academic support during specific office hours.
* Regarding this course, Instructor and TA will be available two hours a week as indicated on the time table declared for students from the beginning of the semester.

<https://chat.whatsapp.com/ExosjhSuERkKzKvS8ig7A5>

**9- Student Assessment**

**a) Student Assessment Methods**

| **Learning Outcomes** | | **Assessment Methods** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Written Exams | Online Exams | Oral Exam | Pop Quizzes | In-class Problem Solving | Take-Home Exam | Research Assignments | Reporting Assignments | Project Assignments | In-class Questions |
| **Cognitive Domain** | #1 | ⚫ |  |  | ⚫ |  |  | ⚫ |  | ⚫ |  |
| #2 | ⚫ |  |  | ⚫ |  |  | ⚫ |  | ⚫ |  |
| #3 | ⚫ |  |  | ⚫ |  |  | ⚫ |  | ⚫ |  |
| **Psychomotor Domain** | #4 | ⚫ |  |  | ⚫ |  |  | ⚫ |  | ⚫ |  |
| #5 | ⚫ |  |  | ⚫ |  |  | ⚫ |  | ⚫ |  |
|  |  |  |  |  |  |  |  |  |  |  |
| **Affective Domain** |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

**b- Assessment Schedule and Weight**

|  |  |  |
| --- | --- | --- |
| **Assessment Tools** | **Week** | **Weight** |
| Midterm Examination | 7 | 20 % |
| Second Midterm Examination | - | - |
| Final Examination | (As Scheduled) | 60 % |
| Quizzes | 8,12,14 | 10 % |
| Home assignments | 4, 9. 13 | 10 % |
| Oral Exam | - | - |
| **Total** |  | **100** % |

**10- Facilities**

The following facilities are needed for this course:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ■ | Classroom | □ | Smart Board | □ | Computer with software |
| □ | Lecture Hall | ■ | White Board | ■ | MIS system |
| □ | Sound and Microphone | ■ | Data Show | ■ | Internet Access |
| □ | Other: ………………… |  |  |  |  |

**11- List of References**

**a- Course Notes**

Lectures Notes in PDF

**b- Books**

1. R. Khurmi and J. Gupta, "A Textbook of," ed: Garden, 2015.

**c- Recommended Books**

1. S Trymbaka Murthy, “Textbook of elements of mechanical engineering” (IK International Pvt Ltd, 2010).

d)

**- Course Coordinator: Prof. Ahmed Gaafar Signature:**

**Dr. Mohammed Gamil Signature:**

**- Program Coordinator: Prof. Ramadan Sakr Signature:**