**Credits-04**

**S.E. (Production) (semester IV) (2019-2020) Lecture Plan**

**Subject: Dynamics of Machines (DOM-PEC402)**

**FR. Conceicao Rodrigues College Of Engineering**

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

**Department of Production Engineering**

# Syllabus.





1. **CO Statements.**

Learner will be able to

PEC402.1: Understand the common mechanisms used in machines, correlate the concepts of kinematics with kinetics of rigid body dynamics and Design of four bar mechanisms, gyroscopic devices etc.

PEC402.2: Determine the velocity and acceleration of various links in motion.

PEC402.3: Illustrate different types of cams, followers with their different motions for their application and Develop profiles of cams for engineering applications.

PEC402.4: Illustrate various types of gears/ their terminology areas of application along with parameters pertaining to spur gears and gear trains.

PEC402.5: Develop basic concepts pertaining to balancing/vibrations in evaluation of simple machine components.

PEC402.6: Illustrate different types of clutches, brakes and dynamometers for evaluation of braking force.

# CO-PO-PSO Mapping.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO# / PO# | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| PEC402.1 | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| PEC402.2 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| PEC402.3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEC402.4 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEC402.5 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEC402.6 | 3 | 3 | - |  |  |  |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| CO# / PSO# | PSO1 | PSO2 |
| PEC402.1 | - | - |
| PEC402.2 | - | - |
| PEC402.3 | - | - |
| PEC402.4 | - | - |
| PEC402.5 | - | - |
| PEC402.6 | - | - |

1. **CO Assessment tools with target.**

**Co Statement #**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Unit Test** | **End Semester****Exam** | **Course Exit Survey** |
| PEC402.1 | 50% | 40% | 60% |
| PEC402.2 | 50% | 40% | 60% |
| PEC402.3 | 50% | 40% | 60% |
| PEC402.4 | - | 40% | 60% |
| PEC402.5 | - | 40% | 60% |
| PEC402.6 | 40% | 40% | 60% |

**Target for Assessment Tools**

1. Curriculum Gap/Content beyond syllabus (if any).

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1. Lecture/Lab/Mini Project/Assignment Plan.

|  |  |  |  |
| --- | --- | --- | --- |
| **Week No.** | **Topics** | **Module** | **Hours** |
|  | Links, kinematics pairs, kinematics pairs giving one, two and |  |  |
| **Week 1** (06/01/2020 – 12/01/2020) | three degrees of freedom, kinematics chains, degree of freedom and mobility criterion. Constrained kinematics chains as mechanism. | **1** | **4** |
| **Week 2** (13/01/2020 – 19/01/2020) | Inversions of four bar, single and double slider crank chains and their applications, Introduction to gyroscope (no numerical problems). | **1** | **4** |
| Types of brakes. viz. block and shoe brakes, band brake |  |
|  | Band and block brakes ,.  | **6** |  |
|  |  |  |  |
| **Week 3**(20/01/2020 –26/01/2020) | Types of dynamometersProny brake, Rope brake, belt transmission Introduction to clutches |  |  |
| **6** | **4** |
|  |  |  |
| **Week 4** (27/01/2020 – 2/02/2020) | Study and analysis of single plate clutch, multiple plate clutches. Study and analysis of cone clutchesbraking of vehicles | **3** | **4** |
| **Week 5** (3/02/2020 – 9/02/2020) | Introduction to types of cams, types of followers.Follower motions. viz. simple harmonic motions, constant velocity, uniform and constant acceleration and retardation and cycloidal motion | **3** | **4** |
| **Week 6**(10/02/2020 – 16/02/2020) | Layout of cam profile for specified displacement characteristics. Cams with oscillating follower systems. | **3** | **4** |
| **Week 7** (17/02/2020 – 23/02/2020) | Euphoria | **-** | **-** |
| **Week 8**(24/02/2020 –1/03/2020) | **Unit Test 1 (Feb 26 to 28) – FE, SE, TE.** |  |  |
| **-** | **-** |
|  |  |
| **Week 9**(2/03/2020 –8/03/2020) | Velocity Analysis Analysis of mechanisms with single degree of freedom system using graphical method with Coriollis component using graphical method. |  |  |
| **2** | **4** |
|  |  |
| **Week10** (9/03/2020– 15/03/2020) | Introduction: Types of gears and applications, Gear terminology, condition for constant velocity ratio−conjugate profiles, profiles used in gears. length of path of contact and contact ratio Interference of involute teeth, methods of preventing interferences through undercutting, no of teeth to avoid Interference.  | **4** | **3** |
| **Week 11** (16/03/2020 – 22/03/2020) | Numericals on Gears Gear trains: Simple, compound, planetary and epicyclic gear trains (with numerical) | **4** | **4** |
| **Week 12** (23/03/2020 – 29/03/2020) | Introduction−free vibrations; longitudinal, transverse and torsional vibrations. Dunkerly’s equation, critical or whirling speed of shaft. Torsional vibrations of two rotor system- torsionally equivalent shaft. | **5** | **3** |
| **Week 13**(30/03/2020 –5/04/2020) | Introduction. Rotary masses: several masses in same plane,several masses in different planes. Balancing of reciprocating masses, primary balancing and secondary balancing. Balancing of locomotives− Variation of Tractive Effort, Swaying Couple and Hammer blow |  |  |
| **5** | **4** |
|  |  |
| **Week14** (6/04/2020 – 12/04/2020) | **Unit Test 2 (April 7 to 9) – SE, TE.** | **-** | **-** |
| **Week 15** (13/04/2020 – 19/04/2020) | **Term End (April 18)** | **--** | **--** |

**Credits-01**

**FR. Conceicao Rodrigues College Of Engineering**

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

**Department of Production Engineering**

**S.E. (Production) (semester IV) (2019-2020)**

**Lecture Plan**

**Subject: Dynamics of Machines Laboratory (DOM-PEL401)**

# Syllabus.



1. **CO Statements.**

Learner will be able to

PEL401.1: Compute the natural frequencies of 1 DOF system. PEL401.2: Apply the working principles of gyroscope and Cam.

PEL401.3: Demonstrate the understanding of static and dynamic balancing. PEL401.4: Compute velocity and acceleration in mechanisms.

PEL401.5: Carryout Cam analysis.

PEL401.6: Demonstrate the practical significance of interference and undercutting in gears.

# CO-PO-PSO Mapping.

**Laboratory**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO# / PO# | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| PEL401.1 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEL401.2 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEL401.3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEL401.4 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| PEL401.5 | 3 | 3 | 5 | - | - | - | - | - | - | - | - | - |
| PEL401.6 | 3 | 3 | - |  |  |  |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| CO# / PSO# | PSO1 | PSO2 |
| PEL401.1 | - | - |
| PEL401.2 | - | - |
| PEL401.3 | - | - |
| PEL401.4 | - | - |
| PEL401.5 | - | - |
| PEL401.6 | - | - |

1. **CO Assessment tools with target.**

|  |  |
| --- | --- |
| **Co Statement #** | **Target for Assessment Tools** |
| **Assignments** | **Experiments** | **Oral Exam** | **Course Exit****Survey** |
| PEL401.1 | - | 70% | 60% | 60% |
| PEL401.2 | - | 70% | 60% | 60% |
| PEL401.3 | - | - | 60% | 60% |
| PEL401.4 | 70% | - | 60% | 60% |
| PEL401.5 | 70% | 70% | 60% | 60% |
| PEL401.6 | - | - | 60% | 60% |

1. **Curriculum Gap/Content beyond syllabus (if any).**

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# Lab Plan.

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| --- | --- | --- |
| **Week No.** | **Topics** | **Hours (Per****Batch)** |
| **Week 3**(20/01/2020 –26/01/2020) | Compound Pendulum | **2** |
| **Week 4** (27/01/2020 – 2/02/2020) | Gyroscope | **2** |
| **Week 5** (3/02/2020 – 9/02/2020) | Cam and Follower | **2** |
| **Week 6**(10/02/2020 – 16/02/2020) | Whirling Speed of Shaft | **-** |
| **Week 7** (17/02/2020 – 23/02/2020) | Euphoria | **2** |
| **Week 8**(24/02/2020 –1/03/2020) | **Unit Test 1 (Feb 26 to 28) – FE, SE, TE.** | **2** |
| **Week 9**(2/03/2020 –8/03/2020) | Coriolis Component of Acceleration | **2** |
| **Week10** (9/03/2020– 15/03/2020) | Velocity and Acceleration Analysis Assignment | **2** |
| **Week 11** (16/03/2020 – 22/03/2020) | Velocity and Acceleration Analysis Assignment | **2** |
| **Week 12** (23/03/2020 – 29/03/2020) | Cam and Follower Profile Assignment | **2** |
| **Week 13**(30/03/2020 –5/04/2020) | Cam and Follower Profile Assignment | **2** |
| **Week14** (6/04/2020 – 12/04/2020) | **Unit Test 2 (April 7 to 9) – SE, TE.** | **2** |
| **Week 15** (13/04/2020 – 19/04/2020) | **Term End (April 18)** | **--** |