**GRAPHIC ERA UNIVERSITY, DEHRADUN**

**First Semester 2016-2017**

**Model Course Handout**

**Course No*.* : TME 102**

**Course Title: Engineering Mechanics**

**Instructor-in-Charge: Mr Neeraj Sengar**

**Instructor(s): 1. Mr Jivesh Dixit**

**: 2. Ms Surbhi Uniyal**

**Course Description:**

Introduction to Engineering mechanics; Laws of mechanics; Composition of forces; Conditions of static equilibrium for different force systems; Introduction to beam and trusses; Centroid of plane figures; Friction.

**Scope & Objective:**

This course is introduced the basic principles of engineering mechanics with emphasis on their analysis and application to practical engineering problems. After learning this course, you should have the ability to:

1. Solve for the resultants of any force systems
2. Determine equivalent force systems
3. Determine the internal forces in plane frames, simple span trusses and beams
4. Solve the mechanics problems associated with friction forces
5. Obtain the centroid, first moment and second moment of an area

**Text Books:**

1. Mechanics for engineers: Statics by Ferdinand P B and E.Russel Jhonston

2. Engineering Mechanics by S.S. Bhavikatti, New Age International Publisher, New Delhi,

2nd edition 2010

3. Engineering Mechanics by K L Kumar, TATA McGraw-Hill Book Company, New Delhi

**Reference Books:**

1. Engineering Mechanics by S.Timoshenko, D.H.Young, and J.V.Rao TATA McGraw-Hill

Book Company, New Delhi

**Course Plan:**

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| --- | --- | --- | --- |
| **Unit No.** | **Lecture No** | **Topic** | **Reference Chap (book)** |
| **1** | **1** | **Introduction to Engineering mechanics: Basic idealizations - Particle, Continuum and Rigid body** | **Ch 1(TB2)**  **Pg 2** |
| **1** | **2** | **Force and its characteristics, types of forces, Classification of force systems** | **Ch 1(TB2)**  **Pg 10** |
| **1** | **3** | **Principle of physical independence of forces, Principle of superposition of forces, Principle of transmissibility of forces** | **Ch 1(TB2)**  **Pg 4,6** |
| **1** | **4** | **Newton's laws of motion, Introduction to SI units** | **Ch 1(TB2)**  **Pg 4** |
| **1** | **5** | **Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system** | **Ch 3(TB2)**  **Pg 47** |
| **1** | **6** | **Resolution of forces, composition of forces** | **Ch 2(TB2)**  **Pg 19,17** |
| **1** | **7** | **Numerical problems on moment of forces and couples, on equivalent force - couple system** | **Ch 3(TB2)**  **Pg 48** |
| **2** | **8** | **Composition of forces - Definition of Resultant** | **Ch 2(TB2)**  **Pg 17** |
| **2** | **9** | **Composition of coplanar - concurrent force system, Principle of resolved parts** | **Ch 2(TB2)**  **Pg 21** |
| **2** | **10** | **Composition of coplanar - non-concurrent force system** | **Ch 3(TB2)**  **Pg 44** |
| **2** | **11** | **Varignon's principle of moments** | **Ch 3(TB2)**  **Pg 45** |
| **2** | **12** | **Numerical problems on composition of coplanar concurrent and coplanar non-concurrent force systems** | **Ch 2,3(TB2)**  **Pg 17, 44** |
| **2** | **13** | **Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems** | **Ch 2(TB2)**  **Pg 25** |
| **2** | **14** | **Lami's theorem** | **Ch 2(TB2)**  **Pg 27** |
| **2** | **15** | **Numerical problems on equilibrium of coplanar – concurrent and non concurrent force systems** | **Ch 2(TB2)**  **Pg 28** |
| **3** | **16** | **Types of supports** | **Ch 3(TB2)**  **Pg 64** |
| **3** | **17** | **Types of beams** | **Ch 3(TB2)**  **Pg 65** |
| **3** | **18** | **Statically determinate beams** | **Ch 3(TB2)**  **Pg 66** |
| **3** | **19** | **Numerical problems on support reactions for statically determinate beams** | **Ch 3(TB2)**  **Pg 70** |
| **3** | **20** | **Trusses, introduction, simple force, determination of forces in simple truss members** | **Ch 4(TB2)**  **Pg 83** |
| **3** | **21** | **Method of joint and method of sections** | **Ch 4(TB2)**  **Pg 86, 97** |
| **3** | **22** | **Numerical problems** | **Ch 4(TB2)**  **Pg 88** |
| **4** | **23** | **Centroid of plane figures; Locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle using method of integration** | **Ch 9(TB2)**  **Pg 226** |
| **4** | **24** | **Centroid of simple built up sections** | **Ch 9(TB2)**  **Pg 233** |
| **4** | **25** | **Numerical problems on centroid** | **Ch 9(TB2)**  **Pg 234** |
| **4** | **26** | **Moment of inertia of an area.** | **Ch 9(TB2)**  **Pg 240** |
| **4** | **27** | **Polar moment of inertia, Radius of gyration** | **Ch 9(TB2)**  **Pg 241** |
| **4** | **28** | **Perpendicular axis theorem and Parallel axis theorem** | **Ch 9(TB2)**  **Pg 242** |
| **4** | **29** | **Moment of Inertia of rectangular, circular and triangular areas from method of integration** | **Ch 9(TB2)**  **Pg 245** |
| **4** | **30** | **Moment of inertia of composite areas** | **Ch 9(TB2)**  **Pg 249** |
| **4** | **31** | **Numerical problems** | **Ch 9(TB2)**  **Pg 260** |
| **5** | **32** | **Friction - Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose** | **Ch 5 (TB2)**  **Pg 117** |
| **5** | **33** | **Impending motion on horizontal and inclined planes** | **Ch 5(TB2)**  **Pg 119** |
| **5** | **34** | **Wedge friction; Ladder friction** | **Ch 5(TB2)**  **Pg 129** |
| **5** | **35** | **Numerical problems** | **Ch 5(TB2)**  **Pg 120** |

**Evaluation Scheme:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Component** | **Duration** | **Marks** | **Weightage (%)** | **Date & Time** | **Nature** |
| **1** | **Mid Semester Examination** | **2 hrs** | **60** | **As per University guidelines** | **As per University Schedule** | **Closed book** |
| **2** | **End Semester Examination** | **3 hrs** | **100** |
| **3** | **Assignments and Tests** |  | **15** |  | **See Note 1 \*** |  |

**Chamber Consultation**: Mr Neeraj Sengar: Thursday 9:00-11:00

Mr Jivesh Dixit: Monday 9:00-11:00

Ms Surbhi Uniyal: Saturday 9:00-11:00

Mr Anurag Singh: Tuesday 3:00-5:00

Mr Ankur Dixit: Friday 10:30-12:30

**\*Note1:** A total of five assignments will be given in the entire semester. One assignment per unit.

**Notices:** All notices concerning this course will be communicated through the email.

**Instructor-in-charge**

**TME 102**