

SYLLABUS: STATICS AND MECHANICS OF MATERIALS

Date / Revision 15 August 2017 / 15-08-17/ MaS
Faculty Engineering
Study Programs AVE, AUE, MEE, INE, ELE, MTE

SUBJECT: Statics and Mechanics of Materials

1 Basic Information

1.01	Subject Name	Statics and Mechanics of Materials
1.02	Semester	2
1.03	Level	2
1.04	SKS	4
1.05	Mandatory / Curriculum	Mandatory / F-09
1.06	Subject Code	MECH
1.07	Subject Code	ENG-F-MECH-2209
1.08	Year	2017 (7)
1.09	Quality Control	Final Test, OFSE, see evaluation
1.10	Limitations	Min 12 and Max 32 students in one class
1.11	Combined with	AVE, AUE, MEE, INE, ELE, MTE
1.12	Perquisite	None
1.13	Responsible	Dean of Engineering- Faculty
1.14	Revision	15-08-2017/MaS

2 Description of Subject

This course is intended for students in engineering faculty. The course will cover two major topics ie.: statics problem and mechanics of material.

The first phase, the course will discuss about forces in plane, forces in space, equilibrium of particles and equilibrium of rigid body and analysis of structure for truss problem.

The second phase, the course will cover the concept of stress, the axial load, torsion load, bending load and combine load. The deflection due to load will also be discussed in form of solving some respective problems.

Finally the mechanical design of a system will also be discussed in order to train the analyzing thinking for solving the real problem in mechanics.

3 Objectives

- to introduce the first Newton's law to solve the mechanical problems.
- to learning the Force, Stress, Strain, Torsion, Deformation
- to analyse the mechanical design

4 Competency

After having the course, students are expected to:

- Be able to solve the basic mechanics problem dealing with force operation
- Solve the equilibrium problem in particle or in rigid body
- Be able to analyze of structure
- Have understanding of Stress, Strain, Torsion, Deformation
- Be able to solve problem in axial load, torsion load, bending load
- Be able to determine the deflection of beams
- Be able to analyze the mechanical design.

5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Tutorial/Practice Classes: preview of materials, revision;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.

6 Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	05 Points
5.3	Homework / Classwork	05 Points
5.4	Presentation /Simulation	10 Points
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

1	Main Text Book: “Statics and Mechanics of Materials”, Author: Ferdinand P. Beer, E. Russell Johnston, Jr., John T. DeWolf, David F. Mazurek –, Publisher: Mc. Graw Hill Higher Education
2	Supplement Textbooks: • “Statics and Mechanics of Materials”, Author: Russel C. Hibbeler, Publisher: Pearson

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1	Introduction to Mechanics: <ul style="list-style-type: none"> • What is Mechanics? • Fundamental concept and principles – Mechanics of Rigid Body. • Fundamental Concepts – Mechanics of Deformable Bodies. • Method of Problem Solution. 	Ch 1	
2	Statics of Particles: <ul style="list-style-type: none"> • Forces in a Plane: Resultant of Forces, Vectors, Resolution of Force, Force in Cartesian notation, Equilibrium of a Particles, Free Body Diagrams • Forces in Space: Component of Force, Addition forces in space, Equilibrium of a Particles in Space, Free Body Diagrams. 	Ch 2	
3	Rigid Bodies, Equivalent System of Forces: <ul style="list-style-type: none"> • External and Internal Forces. • Equivalent Forces, Moment of Force about a Point. Varignon’s Theorem. • Moment of a Force about a given Axis. • Moment of a Couple. Addition of a Couple. • Equivalent System of Forces. 	Ch 3	Homework
4	Equilibrium in Rigid Body: <ul style="list-style-type: none"> • Equilibrium in Plane: Support reaction, Free Body Diagram, Two Force Member, Three Force Member, Graphical Solution, and Analytical Solution. • Equilibrium in Space: Support reaction, Free Body Diagram, Two Force Member, Three Force Member, Analytical Solution. 	Ch 4	Quiz
5	Distributed Forces: <ul style="list-style-type: none"> • Area and Lines: Centre of Gravity. Centroid of Area and Lines. Distributed Loads on Beams. • Volumes: Centre of Gravity 	Ch 5	
6	Analysis of Structures: <ul style="list-style-type: none"> • Trusses: Definition of Truss. Simple truss. Analysis of Truss by Joint Method. Analysis of Truss by Section Method. • Frame and Machine: Multiforce Members. Analysis of Frame. Machines 	CH6 Quiz	

7	Moments of Inertia of Area: <ul style="list-style-type: none"> • Moment of Inertia of an Area. Polar Moment of Inertia. • Radius of Gyration. • Parallel Axis Theorem. • Moment of Inertia of Composite Areas. 	Ch8	
8	MIDTERM SEMESTER BREAK		
9	Concepts of Stress: <ul style="list-style-type: none"> • Normal Stress. Shearing Stress. Stress-Strain Diagram. • Hooke's Law. Shearing Strain. • Modulus of Elasticity. • Modulus of Rigidity. • Poisson's Ratio 	CH9 Quiz	Quiz Homework
10	Axial Load: <ul style="list-style-type: none"> • Saint Venant's Principle • Elastic Deformation of an Axially Loaded Member • Principle of Super Position 	Ch9	Quiz
11	Axial Load: <ul style="list-style-type: none"> • Statically Indeterminate Axial Load • Force Method of Analysis for Axially Loaded Member • Thermal Stress • Stress Concentration 	Ch9	Quiz Homework
12	Torsion Load: <ul style="list-style-type: none"> • Deformation in a Circular Shaft. Stresses in regard of Torsion Load. • The Torsion Formula • Power Transmission 	Ch11	Quiz
13	Torsion Load: <ul style="list-style-type: none"> • Angle of Twist • Statically Indeterminate Torsion Load • Solid Circular Shaft • Stress Concentration 	Ch11	
14	Bending Load: <ul style="list-style-type: none"> • Shear and Bending Moment Diagram • Graphical Method for Constructing Shear and Bending Moment Diagram 	Ch14 Quiz	QUIZ
15	Bending Load: <ul style="list-style-type: none"> • Bending Deformation of a Straight Member • The Flexure Formula • Unsymmetrical Bending • Stress Concentration 	Ch14 Quiz	QUIZ
16	Final Examination		