COURSE OUTLINE

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PRE-REQUISITE	:
EQUIVALENCE	:
LECTURE HOURS	: 3 Hours Lectures

Lecturers	E-Mail	Room No.	Phone No.
1. Mohsin bin Mohd. Sies	mohsin@mail.fkm.utm.my	C24-313	
2. Dr. Natrah binti Kamaruzaman	natrah@mail.fkm.utm.my	C23-215	07-5534663
3. Dr. Md. Mizanur Rahman	mizanur@mail.fkm.utm.my		07-5534605
4.			

SYNOPSIS

This course is divided into two parts ie Solid Mechanics and Thermodynamics.

Part 1:Solid Mechanics

This part of the course provides students with the knowledge to determine the strength and stiffness of structures being used. The structures that will be studied in this course are bars, pins, bolts, shafts, and beams. The types of applied loadings are axial loads, torsional loads, and transverse loads. At the end of the course, students should also be able to determine the mechanical properties of the materials with respect to their strength and stiffness.

Part 2 Thermodynamics

This part of the course introduces students to the basic principles of thermodynamics. Thermodynamics is a basic science that deals with energy. It discusses basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A general relation for the conservation of energy principle will be developed and applied to closed systems and extended to open systems.

PREPARED BY :	CERTIFIED BY :
Name : (MBS & Thermodynamics Panels)	**Name** : Head of Department
Signature :	**Signature** :
Date : 18th February 2015	**Date** : 18th February 2015

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COURSE LEARNING OUTCOMES

By the end of the course, students should be able to :

No.	Course Learning Outcomes	Programme Learning Outcome(s) Addressed	Assessment Methods
1.	Identify loads and reactions of rigid body.	PO1	HW, T
2.	Determine the mechanical properties of solid materials which relate their strengths and deformations	PO1	HW, T
3.	Calculate the internal stresses and strains due to the external axial, torsional, and transverse loads.	PO1, PO3	HW, T
4.	Solve problems related to statically determinate structures.	PO1, PO3	HW, T
5.	Explain the basic concepts of thermodynamics, energy, energy transfer and laws of thermodynamics.	PO1	HW, T
6.	Determine the thermodynamics properties based on property tables, equations of states and charts	PO1	HW, T
7.	Analyze closed and open thermodynamics systems using the first law of thermodynamics	PO1, PO3	HW, T

Note :
(T – Test ; PR – Project ; Q – Quiz; A – Assignment ; Pr – Presentation; F – Final Exam)

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STUDENT LEARNING TIME

No.	Teaching and Learning Activities	Student Learning Time (hours/semester)
1.	Lecture, 14x3	42
2.	Tutorial	-
3.	Self learning - for lecture, 42x1.3=55	55
4.	Self learning - for assignment -	2
5.	Tests, 4x1.5=6	6
6.	Preparation for the tests, @2.5 hr/1 hr test	15
7.	Exam	-
8.	Preparation for exam, @3 hr per 1 hr exam	-
Total		**120**

TEACHING METHODOLOGY

1. Basic application of equilibrium for derivation of governing equations will be demonstrated.
2. Students will be required to solve problems.

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WEEKLY SCHEDULE

Week	Lecture	Topic / Content
Week 1 (12/02/2017-16/02/2017)	1 2 3	**PART 2** **DEFINITIONS & BASIC CONCEPTS** System, Properties, State, Process, Cycle, Pressure, Temperature.
Week 2 (19/02/2017-23/02/2017)	4 5 6	**PROPERTIES OF PURE SUBSTANCE** Phase Change Processes, P-V-T Relationships, Property Tables
Week 3 26/02/2017-02/03/2017	7 8 9	Phase Change Processes, P-V-T Relationships, Property Tables
Week 4 05/03/2017-09/03/2017	10 11 12	**IDEAL GAS** Equation of State, Property Diagram for Ideal Gases
Week 5 12/03/2017-16/03/2017	13 14 15	**ENERGY, HEAT & WORK** – Kinetic, Potential & Internal Energy. Heat Transfer. Boundary Work, Polytropic Processes, Forms of Energy, enthalpy, specific-heats, internal energy, enthalpy & specific heats of ideal gases.
Week 6 19/03/2017-23/03/2017	16 17 18	**TEST 1 (Basic Concepts, Pure Substance and Energy, Heat & Work)** **FIRST LAW OF THERMODYNAMICS** Conservation of Energy for Closed Systems.
Week 7 26/03/2017-30/03/2017	19 20 21	**FIRST LAW OF THERMODYNAMICS** Conservation of Mass and Energy for Open Systems. (Nozzle, Diffuser, Turbine, Compressor)
Week 8 31/03/2017-08/04/2017	Mid-semester Break	**TEST 2 (Closed Systems and Open Systems)**

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	22 23 24	**PART 1** **STATICS OF RIGID BODY.** Introduction. Free body diagram. Types of supports. Static equilibrium equations. Example.
	25 26 27	**STRESS AND STRAIN.** Introduction. Normal stress and normal strain. Stress-strain diagram. Elasticity and plasticity. Linearly elastic and Hooke's law. Shear stress and shear strain.
	28 29 30	Allowable stress and allowable load. Translation of axially loaded members. Examples.
	31 32 33	**TORSION**. Introduction to torsion of circular shaft. Non-uniform torsion. Power transmission of circular shaft. Example.
	34 35 36	**TEST 1 (Statics, Stress, and Strain)** **SHEAR FORCE AND BENDING MOMENT.** Introduction. Types of beams, loadings and supports. Shear force and bending moment diagrams.
	37 38 39	Example. **BENDING STRESS**. Introduction to bending of beams. Simple bending theory. Centroid. Second moment of area.
	40 41 42	Example Example **TEST 2 (Torsion, Shear Force and Bending Moment, and Bending Stress)**

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TEXTBOOK (PART 2)

Y.A. Cengel and M.A. Boles, *Thermodynamics: An Engineering Approach*, McGraw-Hill.

REFERENCES

1. Nash, W.A., *Theory and Problems of Statics and Mechanics of Materials,* McGraw-Hill.
2. Spiegel, L and Limbrunner, G.F., *Applied Statics and Strength of Materials*, Prentice Hall.
3. Morrow, H.W. and Kokernak, R.P., *Statics and Strength of Materials*, Prentice Hall.
4. M.J. Moran and H.N. Shapiro, *Fundamentals of Engineering Thermodynamics*, John Wiley & Sons.
5. R.E. Sontag, C. Borgnakke & G.J. Van Wylen, *Fundamentals of Thermodynamics,* John Wiley & Sons.

GRADING

No.	Assessment	Number	% each	% total	Dates
1.	Test 1 (Part 1)	1	20	20	Week 5
2.	Test 2 (Part 1)	1	20	20	Week 8
3.	Test 1 (Part 2)	1	20	20	Week 14
4.	Test 2 (Part 2)	1	20	20	Week 16
5.	Assignments: Part 1 Part 2	 2 2	 10 10	 10 10	
6.	Final Exam	-	-	-	
Overall Total				**100%**	

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ATTENDANCE

The student should adhere to the rules of attendance as stated in the University Academic Regulation :-

1. Student must attend not less than 80% of lecture hours as required for the course.
2. The student will be prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given to the course.