MECHANICAL ENGINEERING (PRODUCTION ENGINEERING AND MECHANICAL SYSTEMS DESIGN) PROGRAM

COURSE SYLLABI

KING ABDULAZIZ UNIVERSITY
Engineering Faculty
Production Engineering and Mechanical Systems Design Department

MENG 102: Engineering Graphics, 3 cr., required, **Fall 2006/2007**

Course description:
Introduction: Skills of Freehand Sketching. Methods of Projection: Orthographic, Isometric Dimensioning of View. Third View Prediction, Primary and Successive Auxiliary Views. Intersections of Surfaces and Bodies. Development of Surfaces. Sectioning. Introduction to Assembly Drawings. Steel Sections. Pipe Connection Standards and Conventions.

Prerequisite: None

Instructor:

Dr. Ahmed Khairy,	Room #217, Ext.: 68307

Teaching Assistant:

Eng. Wesam	Room No.208 Ext. 68265
Eng. Alawi	Room No.228 Ext. 68046
Eng. Ashraf	Room No.208 Ext. 68265
Mr. M. Alabdaly	Room No.480 Ext. 68218
Mr. M. Alotaby	Building No.22 Ext. 682657

Schedule: Group 1 (Sec. 1,2,3,4) Sat., Mon. 1-4 (1 hour Lec.)
Group 1 (Sec. 5,6,7,8) Sun., Tues. 1-4 (1 hour Lec.)

Text books: Lecture and exercise notes by the Instructor, K.A.U, 2003

References:
1- Gary Robert, Eric N wiebe "Fundamentals of graphics" Communications", McGraw Hill, 2006.
2- William Howard, Joe Musto " Introduction to solid Modeling " Using Solid Works, Mcgraw Hill , 2005.

Course Learning Objectives:
1- To help students learn the Principals of graphics whether done manually or on the Computer.
2- To develop students visualization, imagination and ability to represent the shape size and specifications of physical objects.
3- To give student basic knowledge of technical drawings professions and means of communications to others.
4- To give students ability to draw three dimension objects on the paper and to draw the pectoral drawings.
5- To give students principal command of solid works package to do drawing on the computer.
6- To help students how to use command while working on actual project.

Grading:

Manual		**Comp. Solid Works package**	
Exercises	10%	Exercises & Home work	10%
Home works	10%	Quizzes	10%
Quizzes	10%	Project	10%
Mid Term Exam	20%	Final Term Exam	20%

Note: 75% attendance is required

Contribution of the course to meet the ABET professional component: engineering science 3 credits

Course Syllabus:

The following represent the actual course syllabus as given to students, it contains the time table for the course lectures, exercises, home works, Quizzes and term exams as distributed on the semester week days .

MENG 102: Engineering Graphics, Fall 2006/2007

Week	Lecturer SAT.-SUN.-Exercise SAT.-SUN.-MON.-	Exercise	Home	Quiz's	Final
1	Lecture: Introduction, Drawing Equipments, type of		8,9,11		
	Lecture: Introduction – Methods Of projections	10,12,15,16			
2	Lecture: Orthographic projections and dimensions of	10,12,16,16,17	18		
3	Lecture: Orthographic projections	19-22	23	No.	
4	Lecture: Isometric projections Isometric Cube,	44,45	48		
5	Lecture: Isometric circles curves	49, 52	50,54		
6	Lecture: Third view Predictions	57,62,64,65,66	68	No. 2	
7	Lecture: Missing View & Sectioning	92	94		
	Lecture: Sectioning of Bodies	95		No. 3	
8	Lecture: Sectioning & Missing View	96,97			
9	Final Term Manual Exam				
	Lecture: What are solid works, Model, Feature,				
10	Lecture: Creating 2D sketch ,Sketch tools ,Features	17	Complete		
	Lecture: Solid Works Commands	23	17		
11	Lecture: Construction Features	23	18	No. 1	
	Lecture: Solid Works Commands	104			
12	Lecture: Solid Works Commands	112	Project		
	Lecture: Solid Works Commands	104		No. 2	
13	Lecture: Assembly Drawing	104, 112	Project	No. 3	
14	Lecture: Assembly Drawing	112	Project		
	Project Discussion			No. 4	
15	Project submission				
16	Final Term Solid Works Exam				

Prepared by Prof. Ahmed Khairy, Sept. 2006

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and
Mechanical Systems Design Department

Course: **MENG 130, BASIC WORKSHOP, Fall 2007/2008**

Course description:

Introduction to principles of production; production management and production planning, engineering materials, foundry, metal forming (forging, extrusion, drawing, press work, rolling, wire drawing), sheet metal work, welding, metal cutting and machine tools (sawing, drilling, turning, milling, shaping, slotting, grinding), fitting, industrial safety, measurements, standards, specifications, quality control.

Prerequisite: MENG 102 Engineering Graphics

Textbook: Power Point Handout & CD.

Course Objectives: By the completion of the course, the students should be able to:

1. Familiarize with the process of extracting basic metals from their ores.
2. Train to deal with the primary processes of making structural members from steel.
3. Train to use the basics of casting process.
4. Train to use the basics of turning process.
5. Train to use the basics of drilling process.
6. Train to use the basics of milling process.
7. Train to use the basics of sheet-metal process.

Course Topics and their duration:

Course Topic	Week
Engineering Materials	1
Metal Forming	1
Foundry	2
Machining Processes	2
Welding Processes	3
Measurements	2
Quality Control	2

Class Schedule:

- Lecture: one 50 minutes per week.
- Workshop: one 2.5 hour per week.

Course Contribution to Professional Component:

- Engineering Science 100%
- Engineering Design 0%

Course Relationship to Program Outcomes:

Program Outcomes	ABET Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
Highest Attainable Level of Learning*	2	2	3				3				2

*1: Low level (knowledge & Comprehension), 2: Medium (Application & Analysis), 3: High (Synthesis & Evaluation)

Prepared by: Dr. Saad M. Aldousari
Last Updated: Oct 2007

KING ABDULAZIZ UNIVERSITY
ENGINEERING FACULTY
PRODUCTION ENGINEERING AND
MECHANICAL SYSTEMS DESIGN DEPARTMENT

MENG 204, Computer Aided Graphics, 3 Cr., REQUIRED, FALL 2007/2008

Course Description: Introduction to CAG. Skills of using a drafting package. Geometrical and dimensional tolerances. Applications on mechanical elements (bolts, welded and riveted joints, shafts and keys, springs, gears). Applications on assembly and working drawings (valves, presses etc.).

Prerequisite: MENG 102, Engineering Graphics

Instructor: Prof. Ahmed Khairy, Room # 217 B, Ext.: 68307

Teaching assistant:
Eng. Mamdouh Al-Gindy, Room 229, Ext.: 68312
Eng. Ashraf Aly Mandal , Room 208, Ext.: 68265

Schedule: Group 1 (sec. 1, 2) Sat., Mon., 10 – 1 (1 hour lecture), Build. #22
Group 2 (sec. 3, 4) Sun., Tues., 10 – 1 (1 hour lecture), Build. #22

Text books: Lecture and exercise, notes by the instructor, K.A.U., 2005

References:
1. "Engineering Design Graphics", James H. Earle, AutoCAD 2004, Pearson Education Inc.
2. "Engineering Drawing" with a primer on AutoCAD, Archad Noor etc., Prentice-Hall 2004

Course Learning Objectives:

1. Ability to draw mechanical elements according to specifications and standards manually and by computer.
2. Ability to draw mechanical joints such as fixed joints, movable joints and gear engagements.
3. Ability to draw simple assemblies manually and by computer such as steel assemblies.
4. Ability to draw mechanical assemblies manually and by computer.
5. Ability to apply fits and tolerances, machining marks and materials on detail drawings.
6. Ability to draw detail and assembly drawings for actual projects using AutoCAD.

Topics Covered:

1. Assembly and detail drawings

2. Assembly of steel structures
3. Fixed Joints :Riveted ,welded and Bolted joints
4. Movable Joints :Shafts, keys, springs and Gears
5. Fits and tolerances
6. Geometry tolerances
7. Machining marks
8. AutoCAD drawing package

Grading:

Exercises and home works	30%
Quizzes	30%
Project	10%
Final Term Exam	30%

Note: 75% attendance is requested.

Contribution of the course to meet the ABET professional component:
Engineering science: 3 credits

Course relation to program outcomes

Program Outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
H	H			M		M				M			L	M		L			

Prepared by Prof. Ahmad Khairy Abdellatif, Sept. 2007.

MEP 261, Thermodynamics I (4:3, 2) Core Course (College Compulsory)

1. **Catalog course description:**

   Concepts and definitions. Properties of pure substances. First law of thermodynamics. Specific heats and enthalpy. Application to first law on closed system and control volume. Second law of Thermodynamics. Entropy. Principle of increase of entropy and definition of isentropic efficiency. Some power and refrigeration cycles including Rankine and vapor compression cycles.

2. **Prerequisite:**

   MATH 202 General Mathematics II, PHYS 101 Physics I

3. **Textbooks and/or other Required Material:**

   Fundamentals of Thermodynamics

   By: Sonntag, Borgnakke and Van Wylen. John Wiley & Sons, Inc. Sixth Edition, 2003

4. **Course topics and Course learning objectives:**

Topics Covered	Course Learning Objectives
Introduction, concepts and Definitions (1 week)	CLO_1: Students will be able to define a thermodynamic system, closed and open systems, state, equilibrium, process, cycle and system properties. CLO_2: Students will be able to define intensive/extensive properties and explain the Zeroth law of thermodynamics.
Properties of a pure substance (2 weeks)	CLO_3: Students will be able to define the pure substance, different phases (compressed liquid, saturated liquid phase, saturated liquid-vapor mixture and super heated vapor). CLO_4: Students will be able to determine the properties of a pure substance using thermodynamic tables CLO_5: Students will able to define the ideal gas and state the ideal gas relation.
Work and heat (1 weeks)	CLO_6: Students will be able to define the work as a system property. CLO_7: Students will be able to calculate the system work for a closed system undergoing different quasi-equilibrium processes. CLO_8: Student will be able to define the heat as a system property.
First law of Thermodynamics (2 weeks)	CLO_9: Students will be able to explain the first law of thermodynamics. CLO_10: Students will be able to define the internal energy and enthalpy for a system. CLO_11: Students will be able to define the specific heat at constant pressure and specific heat at constant volume. CLO_12: Students will be able to apply the first law of thermodynamics on closed systems.
First law of Thermodynamics for a control volume (1 week)	CLO_13: Students will be able to apply the first law of thermodynamics on a control volume where a steady state flow process is performed. CLO_14: Students will be able to define various control volumes: e.g. turbine, compressor, heat exchanger, throttle valves, nozzles, diffusers and mixing chambers.

The second law of thermodynamics (1 week)	CLO_15: Students will be able to define thermal reservoirs, heat engines, refrigerators and the heat pumps. CLO_16: Students will be able to explain the statements of the second law: Kelvin-Planck statement and Clausius statement. CLO_17: Students will be able to define thermal efficiency, coefficient of performance, reversible processes and irreversible processes. CLO_18: Students will be able to define the Carnot cycle.
Entropy (2 weeks)	CLO_19: Students will be able to define the entropy as a system property. CLO_20: Students will be able to find the entropy change of a pure substance, a solid, a liquid and an ideal gas. CLO_21: Student will be able to define the isentropic process undergoing a given process. CLO_22: Students will be to define the entropy generation and apply the second law of thermodynamics for closed systems.
Second law analysis for a control volume (1 week)	CLO_23: Students will be able to apply the second law of thermodynamics for control volumes undergoing steady state flow processes. CLO_24: Students will be able to define the isentropic efficiency of turbines and compressors.
Power and refrigeration cycle (2 weeks)	CLO_25: Students will be able to identify and analyze some ideal cycles: e.g. Rankine's cycle, Otto's cycle, Diesel's cycle and the Brayton's cycle, Ideal vapor compression cycles.
Thermodynamic laboratory	CLO_26: Students will be able to conduct and analyze experiments.

5. Class/Laboratory schedule:

(a) Lab tour.

(b) Determination of the saturation pressure of pure water.

(c) Analysis of vapor compression refrigeration machine.

6. Contribution of course to meeting the professional component:

Engineering Science: 100 %

7. Relationship of course to Program Outcomes (PO):

MEP 261	Program Outcomes														
	ABET Outcomes											Program Criteria			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	3	1			3		1			1				1	

8. Person Who Prepared This Description and Date of Preparation:

Dr. Abdul Rahim A. Khaled, May 2006

Revised by Dr. Samir E. Aly and Dr. Omar Al-Rabghi

MENG 262 Engineering Mechanics, Dynamics (3:3.1), Required.
http://engg.kaau.edu.sa/main/HomePage/MENG/courses/meng262/
Fall 2007

Prerequisite: CE 201

1. Principles of mechanics
2. Equivalence of force systems
3. State of equilibrium
4. Friction

Course Description:
Rotation and translation of a rigid body in the plane. General motion. Displacement, velocity, and acceleration of rigid bodies, including Coriolis motion.Equations of motion for a rigid body. Constrained plane motion. Work and energy. Impulse and momentum.

Course Instructors:

* Dr. Mohammed Akyurt Office: 42/211 ext.: 68298
  e-mail: makyurt@kau.edu.sa
  fax: 695 2193
* Dr. Talal Aboumansour Office:42/ 229 ext.: 68045

Schedules: various in several locations

Textbook:
M. Akyurt, A.A. Aljawi, A. Mohamed, A. Jinaidi and H.A. Bogis, Vectorial Engineering Dynamics, 2nd Edition, Al-Homaithi Press, Riyadh, 2000.

Course Objectives:
The course is designed to develop the capacity to analyze engineering problems involving forces and motion in two-dimensional mechanical systems.

Grading:
T1 25%
T2 25%
Class participation and quizzes 20%.
Final Exam 30%.

Reference:
R.C. Hibbeler, Engineering Mechanics - Dynamics, Prentice-Hall Inc., 2003, 10th edition.

Contribution of the Course to meeting the ABET professional component:
Engineering Sciences: 3 credits

Syllabus:

Week	Topic (Sections in textbook)	Evaluation	Suggested problems

1	2.1 – 2.2		
2	2.3 – 2.4	Q1	2.3.3, 8, 17
3	2.4 – 2.5	Q2	2.4.2, 4, 15, 47
4	2.5 – 1.6	Q3	2.5.1, 10, 21, 45
5	3.1 – 3.4	T1	
6	3.5	Q4	3.4.1, 4, 10
7	3.6	Q5	3.5.1, 8, 22, 25
8	3.7	Q6	3.6.1, 9, 16, 30
9	4.1 – 4.2	T2	3.7.3, 7, 18, 19
10	4.2	Q7	
11	4.3 – 4.4	Q8	4.4.4, 17
12	5.1 – 5.4	Q9	4.4.26, 56
13	5.4	Q10	5.4.1, 17
14	6.1	Q11	5.4.39, 50
15	6.2		6.2.2, 5, 10

COURSE LEARNING OBJECTIVES

1. Ability to analyze rigid body motion in the plane.
2. Ability to analyze Coriolis-type of motion in the plane.
3. Ability to use mass moments of inertia of rigid bodies to solve problems..
4. Ability to draw free-body diagrams.
5. Ability to determine accelerations and forces in plane motion.
6. Ability to determine velocities in systems of rigid bodies by the use of work and energy relationships.
7. Ability to use impulse and momentum principles to determine velocities in time-constrained rigid body systems.

Prepared by Prof. Dr. Mehmet Akyurt, September 2007.

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and
Mechanical Systems Design Department

MENG 270, MECHANICS OF MATERIALS, 4 Crd., REQUIRED, FALL 2007

Course description: Axial stress, strain, Hook's law, deformation and transverse forces. Torsion and power transmission. Stress concentration. Pure bending and bending strain. Shear force and Bending moment conventions and diagrams. Beam design for pure bending. Shear stresses in beams. Combined stresses. Principal planes and principal stresses. Static failure theories for ductile materials. (MSST and DE). Shaft design for static loads. Beam deflection. Use of superposition. Columns. Euler and Johnson formulae. Thin-walled pressure vessels. Thick-walled vessels under internal pressure.

Prerequisite: CE 201

Instructor: Dr. Abdel Salaam Mohamad, Room #216, Ext: 68030
Dr. Khaled Alnefaie, Room # 481, Ext: 52277

Schedule: Sat. and Mon., 11:00-12:20 Wed. 11:00-13:20, classroom # 310
Sun., and Tue., 08:00 – 09:30. Sun. 02:30 – 05:30, classroom # 310

Textbook

F. Beer, E. Johnston and J. DeWolf, ***Mechanics of Materials***, McGraw-Hill, 4^{th} Edition 2006.

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Course Learning Objectives:

1. Ability to find direct stress and strain for axial loads.
2. Ability to identify yield and ultimate stress on the stress-strain curve.
3. Ability to find direct shear stress bearing stresses.
4. Ability to understand rotating bending.
5. Ability to understand and use the torsion formula in shaft design for pure torsion.
6. Ability to understand strain measurement.
7. Ability to draw shear force and bending moment diagrams.
8. Ability to understand and use the bending formula in the design of beams.
9. Ability to calculate transverse shear in beams.
10. Ability to calculate principal stresses and their planes.
11. Ability to understand the creep test.
12. Ability to understand and use the theory of failures for ductile materials in the design of circular shafts.
13. Ability to calculate beam deflections using superposition.
14. Ability to understand the use of the Euler and Johnson formulae.
15. Ability to calculate stresses in thin and thick-walled pressure vessels.

Grading:

Exam 01	15 %
Exam 02	15 %
Exam 03	15 %
Lab	15 %
Final Exam	40 %

Contribution of the course to meet the ABET professional Component:
Engineering science: 4 credits

Course relation to program outcomes

Program outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
H		H		H											M				

Prepared by Abdel Salaam Mohamad, Sept. 2006.

COURSE DESIGN AND ASSESSMENT

COURSE ABET SYLLABUS

Course name and type:

MEP 290 Fluid Mechanics, Credit: (4–3–2)

Catalog course description:

Concepts and definitions. Fluid statics. Forces on submerged surfaces and bodies. Non–viscous flow, Conservation of mass, momentum and energy equations. Bernoulli's equation. Dimensional analysis, the Pi–theorem, and similarity. Pipe flow, Losses in conduit flow. Laminar and turbulent flow.

Prerequisite:

Math. 102E General Mathematics II, Phys. 101E Physics I

Textbooks and/or other Required Material:

Fluid Mechanics, Fundamentals and Applications

By: Yunus A. Çengel and John M. Cimbala, 1st Ed.

Course topics and Course learning objectives:

Topics Covered	Course Learning Objectives
INTRODUCTION AND BASIC CONCEPTS	**CLO 1** Identify the basic properties of fluids and the various types of fluid flow configurations encountered in practice. **CLO 2** Recognize the importance and application of dimensions, units and dimensional homogeneity in engineering calculations.
PROPERTIES OF FLUIDS	**CLO 3** Compute the viscous forces in various engineering applications as fluids deform due to the no-slip condition. **CLO 4** Discuss the various effects of surface tension, e.g. pressure difference and capillary rise.
PRESSURE AND FLUID STATICS	**CLO 5** Determine the variation of pressure in a fluid at rest. **CLO 6** Calculate the forces exerted by a fluid at rest on plane or curved submerged surfaces. **CLO 7** Compute the effect of buoyancy on submerged bodies.
FLUID KINEMATICS	**CLO 8** Identify the various types of flow and plot the velocity and acceleration vectors.

MASS, BERNOULLI, AND ENERGY EQUATIONS	**CLO 9** Apply the mass conservation equation in a flow system. **CLO 10** Utilize the Bernoulli equation to solve fluid flow problems and recognize its limitation. **CLO 11** Utilize the energy equation to determine turbine power output and pumping power requirements. **CLO 12** Incorporate the energy conversion efficiencies in the energy equation.
MOMENTUM ANALYSIS OF FLOW SYSTEMS	**CLO 13** Determine the various kinds of forces and moments acting on a fluid flow field.
DIMENSIONAL ANALYSIS AND MODELING	**CLO 14** Apply the method of repeating variables to identify non–dimensional parameters. **CLO 15** Understand the concept of dynamic similarity and how to apply it to experimental modeling.
FLOW IN PIPES	**CLO 16** Calculate the major and minor losses associated with pipe flow system and determine the pumping power requirements.

Class/Laboratory schedule:

a) Lab Tour
b) Viscosity measurement Experiment
c) Calibration of a pressure gage
d) Calculation of Hydrostatic force
e) Impact of a jet
f) Venturi meter
g) Friction losses in Pipe

Contribution of course to meeting the professional component:

Engineering Science: 100 %

Relationship of course to Program Outcomes (PO):

MEP 290	Program Outcomes														
	ABET Outcomes											Program Criteria			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	3	2			3		2				3	3			

Person(s) Who Prepared This Description and Date of Preparation:

Prof. Abdulhaiy M. Radhwan, Dr Majed Al–Hazmy, Dr. Ahmad Bokhary and Dr. Ibrahim Olwi June 2006

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and
Mechanical Systems Design Department

MENG 310, Machine Element Design, 3 Crd., REQUIRED, SPRING 2007

Course description: Material selection in design, Static failure theories, Fatigue failure. Design of Shafts for static and dynamic loads. Selection of Ball bearings, Lubrication and Journal Bearings. Gear geometry and forces. Use of the AGMA code in gear design. Power transmission by belts and/or chains. Power screws, Bolted Joints, Welded joints. Design of helical compression springs. Introduction to clutches, brakes and couplings.

Prerequisite: MENG 204 and MENG 270

Instructors: Dr. Abdel Salaam Mohamad, Room # 216, Ext: 68030
Dr. Khaled Alnefaie, Room # 481, Ext: 52277

Schedule: Sat, Mon, Wed 8:00-8:50, Sat 2:30-4:20
Sun, Tue 9:30-10:50, Tue 2:30-4:20

Textbook

Mechanical Engineering Design, Shigley, Mischke, Budynas, McGraw Hill
7^{th} Ed, 2003,

Course Learning Objectives:

1. Ability to select a material in the static loading of shafts
2. Ability to design a shaft using the DE-Goodman line.
3. Ability to choose a deep groove ball bearing for a given set of radial and axial loads.
4. Ability to identify the design parameters of journal bearings.
5. Ability to analyze spur and helical gear forces.
6. Ability to design spur and helical gears using the AGMA code.
7. Ability to select a suitable V-belt specification for a given power transmission system.
8. Ability to determine the torque and stresses in a power screw.
9. Ability to design a bolt for a tensile load.
10. Ability to design a welded joint for tensile, torque and moment loads.
11. Ability to design a helical compression spring.
12. Ability to qualitatively understand the operation of clutches, brakes and couplings.

Grading:

Exam 01	20 %
Exam 02	20 %
Exam 03	20 %
Final Exam	40 %

Contribution of the course to meet the ABET professional Component:
Engineering science: 3 credits

Course relation to program outcomes

Program outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
M		H		H	H		M								M				

Prepared by Dr. Abdel Salaam Mohamad, Sept. 2006.

COURSE ABET SYLLABUS

Course name and type:

MEP 360, Heat Transfer (4:3, 2) Core Course (In-Department Compulsory)

Catalog course description:

General Conduction equations, composite walls and cylinders. Heat generation. Heat transfer from extended surfaces. Transient and two-dimensional analysis. Convection heat transfer, forced external and internal convection heat transfer. Natural convection. Radiation heat transfer, emission and heat exchange between surfaces. Black and gray bodies. View factors and enclosures

Prerequisite:

MEP 261; Thermodynamics I; MEP 290; Fluid mechanics

Textbooks and/or other Required Material:

Fundamentals of heat and mass transfer

By: Incropera and De Witt, Sixth edition, 2007.

Course topics and Course learning objectives:

Topics Covered	Course Learning Objectives
Introduction (1.5 weeks)	CLO_1: students will be able to identify the different modes of heat transfer mechanisms. CLO_2: students will be able to recall the energy balance equation.
Introduction to conduction (1 week)	CLO_3: Students will be able to define heat conduction. CLO_4: Students will be able to describe the heat diffusion equation for conduction problems and list its boundary conditions.
Steady 1-D conduction (2 weeks)	CLO_5 Students will be able to derive heat diffusion equation for steady 1-D conduction. CLO_6: Students will be able to solve steady 1-D basic heat conduction problems (plane walls, cylinders, spheres, composite walls, conduction with internal heat generation and extended surfaces).
Two-D computational conduction analysis (0.5 week)	CLO_7: Students will be able to apply finite difference methods to solve steady state 2-D heat basic conduction problems
Transient conduction heat transfer analysis (2 weeks)	CLO_8: Students will be able to define lumped systems and solve unsteady basic heat conduction problems using lumped analysis. CLO_9: Students will be able to solve unsteady 1-D basic heat conduction problems (plane walls, cylinders, spheres).
Introduction to convection heat transfer (1 week)	CLO_10: Students will be able to define heat convection. CLO_11: Student will be able to describe velocity and thermal boundary layers.

Forced convection heat transfer analysis for external flows (1.5 weeks)	CLO_12: Students will be able to solve basic heat transfer problems involving forced convection over flat plates, circular cylinders, non-circular cylinders, spheres and over bank of tubes
Forced convection heat transfer analysis for internal flows (1.5 weeks)	CLO_13: Students will be able to solve basic heat transfer problems involving forced convection inside circular and non-circular ducts.
Natural convection (1 week)	CLO_14: Students will be able to define natural convection. CLO_15: Students will be able to solve basic heat transfer problems involving natural convection over vertical plates, inclined plates, horizontal plates, vertical cylinders, horizontal cylinders and spheres.
Thermal radiation (1 week)	CLO_16: Students will be able to define thermal radiation, irradiation, radiosity, spectral and total hemispherical emmisivity, transmissivity, absorptivity, and reflectivity. CLO_17: Students will be able to define the black body and the gray body.
Radiation exchange between surfaces (1 week)	CLO_18: Students will be able to calculate basic radiation heat transfer problems between gray surfaces
Heat transfer Laboratory	CLO_19: Students will be able to conduct and analyze experiments in heat transfer domain

Class/Laboratory schedule:

- Determination of thermal conductivity in solids.
- Forced convection from cylinder in cross flow.
- Determination of view factor.

Contribution of course to meeting the professional component:

Engineering Science: 100 %

Relationship of course to Program Outcomes (PO):

MEP 360	Program Outcomes														
	ABET Outcomes											Program Criteria			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	3	1			3		1						2	2	

Person Who Prepared This Description and Date of Preparation:

Dr. Abdul Rahim A. Khaled, April 2006 (Reviewed by Dr. Abdullah Turki)

Course Syllabus

Production Engineering and Mechanical Systems Design Department

MENG 364   Machine Dynamics (3:3.1)

REQUIRED

Course Description:

Design of ordinary gear trains and analysis of epicyclic gear trains. Analytical design of disk cams. Grashof rules. Basic types of mechanisms. Design of mechanisms for transmission angle and time ratio. Position, velocity and acceleration analysis of linkages. Static and dynamic force analysis of mechanisms by the use of computers.

Prerequisites:

EE 202, MENG 262

1. Drawing of free-body diagrams
2. Solution of a set of linear equations
3. Plane kinematics of rigid bodies
4. Plane dynamics of rigid bodies

Course Instructor:

* Dr. Mohammed Akyurt   Office: 42/211   ext.: 68298
E-mail: makyurt@kaau.edu.sa
Fax: 695 2193

Textbook:

Analysis of Mechanisms and Machinery , by M. Akyurt, KAU Center for Sci. Publ., Jeddah, 1412.

References:

E. Soylemez, "Mechanisms", METU Publication No.64, 1999 and

J.E. Shigley and J.J. Uicker, "Theory of Machines and Mechanisms", 2nd Edition, McGraw-Hill, 1995.

Course Objectives:

The objective of the course is to introduce preliminary concepts of mechanisms, and to make use of the computer in the analysis of motion and force transmission in mechanisms and machinery.

Syllabus:

1. Ordinary and epicyclic gear trains (8 classes)
2. Introduction to mechanisms; basic concepts, joint and link types, four-bar linkage: Grashof's law, transmission angle, mechanical advantage, coupler curves (8 classes)
3. Computer aided kinematic analysis; loop closure equations, solution of loop closure equations (10 classes)
4. Displacement, velocity and acceleration analysis by the use of a software package

(8 classes)
5. Cam mechanisms; analysis and design (10 classes)
6. Computer-aided static and dynamic force analysis (12 classes)
7. Tests (10 classes)

Computer Usage:

Students are required to solve, using the computer, all quiz problems during the semester as well as those on the final examination. The only exception is the quiz on gear trains.

Homework, Quizzes, Projects:

Six exams, each 120 minutes, and a final examination

Detailed Course Schedule:

Wk	Subject	Suggested problems	Test No.
1	Introduction. Gear trains 2.1 - 2.2	# 2.1, 2.2	
2	Gear trains 2.3.	# 2.5 - 2.7, 2.15 - 2.16	
3	Introduction to BASIC. Disk cams 3.1	# 3.1, 3.14	1
4	Disk cams 3.2, 3.2.1, 3.2.2	# 3.4, 3.6, 3.11 - 3.12	
5	Linkages 4.1, 4.3, 4.4	# 4.4 - 4.5	2
6	Linkages 4.5	# 4.6, 4.14, 4.16, 4.26	
7-8	Kinematic analysis by loop-closure 6.1, 6.2	# 6.2, 6.9, 6.15, 6.33	3
8-9	Kinematic analysis by Al-Yaseer 7.1, 7.2, 7.3	# 7.1 - 7.3, 7.5	4
9-10	Kinematic analysis by Al-Yaseer 7.4, 7.5	# 7.4, 7.8, 7.14, 7.20, 7.25, 7.44, 7.45	5
11-14	Dynamic analysis 11.1, 11.3	# 11.1, 11.40, 11.43, 11.4, 11.9, 11.36, 11.41, 11.45	6
14/15	Flywheels 12.4	# 12.10, 12.12, 12.15	
15/16	Balancing 13.1-13.5	# 13.1 - 13.3, 13.7	

NOTES:

* *Grading*

Five tests out of six: 60 %
Final exam 40 %

* Computer: Fx-880P
* *No* make-up *examinations.*
* If you *cheat* from someone or *allow someone to copy from you*, both of you get **zero**.
* Students who *miss* more than 25% of the classes get the DN grade.

Prepared by Prof. Mehmet Akyurt, February 2006.

KING ABDULAZIZ UNIVERSITY

Faculty of Engineering

Production Engineering and Mechanical Systems Design Department

MENG 366, AUTOMATIC CONTROL, REQUIRED, 3 Cr., FALL 2007

Course description: Laplace Transforms. Transfer Function. Block diagrams. State Space Equations of Control Systems. Mathematical Modeling of Dynamic Systems; Mechanical, Electrical, Electromechanical, Liquid Level, Thermal, and Pressure systems. Industrial Automatic Controllers; Basic Control Actions, Tuning Methods. Transient Response Analysis. Root Locus. Frequency Response. State Space.

Prerequisite: MENG 262 Dynamics

Instructor: Dr. Hamza Diken, Room # 225, Ext: 68253
Lab. Eng.: Abdurrahman Fatani, Room # 219, Ext: 68250

Schedule: Sat. Mon. and Wed. 10:00 to 10:50, Classroom # 318

Textbook: Lecture notes.
References:
1. System Dynamics, William J. Palm III, McGraw-Hill, 2005.
2. K. Ogata, Modern Control Engineering, 4th Edition, Prentice Hall, 2002.

Course Learning Objectives:
1. Ability to do Laplace and inverse Laplace Transformations.
2. Ability to obtain transfer function of a block diagram.
3. Ability to obtain transfer function of a physical system such as mechanical, electrical, thermal, hydraulic, and pneumatic.
4. Ability to obtain state space equation of a physical system.
5. Ability to obtain response of a first or second order transfer function for step input, impulse input and ramp input.
6. Ability to identify specifications of a transient response of a second order system. (maximum overshoot, rise time, peak time, settling time)
7. Ability to analyze a system error related to a transient response of a control system.
8. Ability to design a control system by using basic control actions. (P. PI. PD. PID control)
9. Understand and obtain mathematical model of an industrial controller like mechanical, electrical, hydraulic, and pneumatic.
10. Ability to design a control system by using root-locus method.
11. Ability to obtain logarithmic (Bode) and polar (Nyquist) plots of a control system.
12. Ability to design a control system by applying frequency response methods.
13. Ability to use MATLAB to solve control problems.
14. Ability to conduct experiment to find steady state response and frequency response of a first and second order control systems.

Topics Covered

1. Laplace transforms
2. State Space Equations
3. Modeling of Physical Systems
4. Transient Response
5. Basic Control Actions
6. Industrial Controllers
7. Root Locus Analysis and Design
8. Frequency Response Analysis and Design

Grading:

Quiz	20 %	
Homework	10 %	
Laboratory	10 %	(Contact Lab. Eng.)
Midterm Exam	25 %	
Final Exam	35 %	

Not: 75% attendance is required. No makeup for quiz or midterm exam. Student must attend the laboratory to pass the course.

Contribution of the course to meet the ABET professional Component:
Engineering science: 2credits, Engineering design: 1 credit.

Course relation to program outcomes

Program outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
H	H	H		M		L				H		H		M					

Prepared by Prof. Hamza Diken, Sept. 2007

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and
Mechanical Systems Design Department

MENG 410, MECHANICAL DESIGN, 3 Crd., REQUIRED, SPRING 2007

Course description: Introduction. Design methodology and concepts. Team work skills. Problem solving heuristic. Comprehensive design projects (includes fixed and movable joints, shafts, sliding and rolling bearings, gears, couplings, clutches, belts, chains and ropes drives). Producing assembly and working drawings. Using of Standards and Design codes. Structure design and Cost Analysis. Using of available Computer software in drawing and design.

Prerequisite: MENG 310, MENG 364

Instructors: Prof. Mostafa A. Hamed, Room # 225, Ext: 68290
Prof. Mahmoud Abdrabou, Room # 223, Ext: 68252
Lab. Eng.: Ali Abu Ezz, Room # 229, Ext: 68255

Schedule: Sec. (1, 2) Sa M (W) 11:00 AM – 12:20 PM (11:00 AM – 1:00 PM)
Sec. (3, 4) Su T (Su) 8:00 AM – 9:20 PM (2:30 PM – 4:20 PM)
Room: 42-B 229

References

1. Dieter, E. "Engineering Design", 3rd edition, McGraw-Hill, 2000.
2. Fogler, and LaBlanc, "Strategies for Creative Problem Solving", Printice Hall, 1995.
3. Shigley J.E. and Mischke C.R. "Mechanical Engineering Design",7th Edition, McGraw-Hill, 2001
4. Software manuals.
5. Vendor catalogues.
6. DIN Standards and Design codes.
7. Handouts from Roloff / Matek "Maschinen-elemente", Vieweg & Sohn Verlag, 2003

Course Learning Objectives:

1. Ability to choose the suitable materials with suitable dimensions for machine components.
2. Ability to analyze components under acting loads.
3. Ability to design a system to carry on given ideas for specific tasks.
4. Ability to design system with definitive dimensional and arrangement.
5. Ability to use computers and available software in drawing and design.
6. Ability to develop team work skills.

Topics Covered

1. Design Methodology, Synthesis, Creativity and Conceptualization.
2. Shaft design based on strength and rigidity.
3. Shaft mounting.
4. Bearings Selection. (Using SKF)
5. Design of gears. (According to AGMA)
6. Belt Drive Design. (Using DIN)
7. Chains and Rope Drives.
8. Structure Design in Mechanical Systems.
9. Electric Motors, Selection and Cost Analysis.
10. Use of standards and design codes for machine elements and implemented in three major mechanical systems design projects worked by students in teams.

Assessment Methods:

Quiz	5 %
Projects Include:	45 %
- Oral Presentations	
- Log Book and Written reports	
- Peer Assessments	
Midterm	20 %
Final Exam	30 %

Note: 75% attendance is required. No makeup for *quiz or midterm* exam.

Prepared by Prof. Mostafa A. Hamed, September 2007.

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and Mechanical Systems Design Department

MENG 412, COMPUTER AIDED DESIGN, 3 Cr., Fall 2007, Required

Course description: Introduction to Computer Aided Engineering Environment. Solid Modeling. Introduction to Finite Element Method. CAD packages. Static linear analysis in one, two and three dimensions. Steady state thermal analysis. Introduction to non linear analysis. Optimum design. Computer application in mechanical design.

Prerequisite: MENG 410 Mechanical Design

Instructor: Dr. Mahmoud Abd-Rabou, Room # 223, Ext: 68252
Lab. Eng.: Ali Abou-Ezz, Room # 229, Ext: 68255

Schedule: Sun. and Tue. 9:30 to 10:50, CAD LAB # 233
Sun. 14:30 to 16:30, CAD LAB # 233

Textbook:

1. Eliahu Zahavi "The Finite Element Method in Machine Design" Prentice Hall, 1992

Reference:

1. Zienkiewicz,O. C., Taylor, R. L. "The Finite Element Method" 5th ed., Butterworth and Heinemann , 2000
2. Shigley J. E. and Mischke C. R. "Mechanical Engineering Design" Sixth edition, McGraw-Hill, 2001

Discussion Group: kau_cad@yahoogroups.com

Course Learning Objectives:

15. Ability to develop three dimensional solid modeling of mechanical parts.
16. Ability to develop one dimensional FEM using truss element.
17. Ability to develop one dimensional FEM using beam element.
18. Ability to develop two dimensional FEM using plane stress element.
19. Ability to develop two dimensional FEM using plane strain element.
20. Ability to develop two and half dimensional FEM using axisymmetric element.
21. Ability to develop a three dimensional FEM using solid element.
22. Ability to obtain natural frequencies and mode shapes of multi degrees of freedom system using FEM.
23. Ability to develop and analyze steady state thermal systems using FEM.
24. Ability to develop and analyze pressure vessels problems using FEM.
25. Ability to optimize some engineering problems using FEM.
26. Ability to work in teamwork to solve real life problems.

Topics:

1. Solid Modeling
2. Frequency Analysis using Finite Element Modeling
3. 1-D FEA using Truss and Beam elements
4. 2-D FEA using Plane stress, Plane strain and axisymmetric elements
5. 3-D FEA using shell and brick element
6. Thermal Analysis
7. Optimization

Grading:

Quiz	15 %
Term Project	25 %
Exam1	15 %
Exam2	15%
Final Exam	30 %

Note: 75% attendance is required. No makeup for quiz or midterm exam. Student must attend the tutorial to pass the course.

Contribution of the course to meet the ABET professional Component:
Engineering science: 1credit, Engineering design: 2 credits.

Course relation to program outcomes

Program outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
H		H		H	H	H	H	L	L	H			M	H					

Prepared by Prof. Mahmoud Abd-Rabou, Sep. 2007.

KING ABDULAZIZ UNIVERSITY
FACULTY OF ENGINEERING
DEPT. OF PRODUCTION ENGINEERING & MECH. SYSTEMS DESIGN
MENG 436 - METROLOGY & QUALITY CONTROL
3 CREDIT HOURS - REQUIRED - SPRING 2007

COURSE SYLLABUS

COURSE DESCRIPTION

Introduction: concepts, importance, categories, activities and bases of metrology - concept and objectives of dimensional metrology - standards of measurements - concepts of accuracy, precision and reliability - principle of errors in dimensional measurements. **Linear Measurements:** steel rules - simple calipers - vernier calipers - micrometers. **Comparators:** mechanical comparators - electronic comparators - pneumatic comparators. **Gauges:** categories and tolerance of gauges - linear gauge blocks. **Angular Measurements:** precision squares - techniques of angular measurements - autocollimators - clinometers - angle gauge blocks - sine devices - vernier protractors - spirit levels. **Geometric Dimensioning & Tolerancing:** concepts - categories - definitions - examples. **Surface Texture Measurements:** concepts - importance - methods - parameters. **Principles of Optical Metrology:** concept of light waves interference - interferometry. **Introduction to Quality:** concepts - review of statistics. **Quality Control Charts:** concepts - analyses - for variables - for attributes.

PREREQUISITE MENG 434 and IE 331

TUTOR Dr. Ismail Najjar, Bldg. 42B, Room 311, Tel. 66427

LAB INSTRUCTORS

Eng. Ashraf Mandal + Eng. Wesam Sulimani, Building: 42B, Room: 208, Tel.: 68265

SCHEDULE Sun. + Tue. 11:00-12:20 and Wed. 13:00-14:20, Building: 42B, Room: 311

TEXTBOOK Lecture notes (September 2006)

REFERENCES

1. Fundamentals of Dimensional Metrology, C. Dotson, R. Harlow, and R. Thompson, Delmar Learning, 4^{th} ed., 2003.
2. Quality Control, D. Besterfield, Prentice-Hall Inc., 6^{th} ed., 2001.

COURSE LEARNING OBJECTIVES

1. Recognize the importance, basics and types of dimensional measurements and quality control techniques in production processes. → (**Lecture**)
2. Describe fundamental methods of linear, angular and surface texture measurements and their related instrumentation. → (**Lecture**)
3. Recall essential knowledge about geometric forms and their technique of dimensioning and tolerancing. → (**Lecture**)

4. Evaluate production performance of manufacturing processes using control chart techniques. → (**Lecture**)
5. Employ simple measuring instruments to perform common dimensional measurements. → (**Laboratory**)
6. Summarize and express up-to-date topics on dimensional metrology and quality control of production. → (**Assignment**)

TOPICS COVERED

1. Introduction to Metrology
2. Leaner Measurements
3. Comparators
4. Gauges
5. Angular Measurements
6. Geometric Dimensioning & Tolerancing
7. Surface Texture Measurements
8. Optical Measurements (Interferometry)
9. Introduction to Production Quality
10. Principles of Control Charts Technique
11. Control Charts for Variables

GRADING

6 Exams	30%	
Assignment (Report + Presentation)	15%	(list of subjects will be provided)
12 Lab reports + 2 Lab Tests	20%	(organized by lab instructors)
Final Exam	35%	

NOTES

1. Attendance will be taken within the first 10 minutes of each lecture. Absence will be calculated in the overall class performance. No excuse for being absence unless for medical reasons. A maximum of 15% absence (including sick leaves) is allowed to secure a seat in the final exam.
2. No makeup for exams. No exams for absent students.
3. Additional notes must be taken in the lecture from the lecturer and the whiteboard.
4. For announcements and contacts with the course tutor during the semester, all students must register in the course Yahoo! Group: http://groups.yahoo.com/group/MENG436_KAU/.

CONTRIBUTION TO MEET ABET PROFESSIONAL COMPONENT

Engineering science: 3 credits

COURSE RELATION TO PROGRAM OUTCOMES

Program Outcomes																			
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
M	L	-	L	L	L	M	L	M	L	L	-	-	M	-	L	-	L	M	L

PREPARED BY Dr. Ismail Najjar, **DATE** February 2007

COURSE ABET SYLLABUS

Course name and type:

MEP 360, Heat Transfer (4:3, 2) Core Course (In-Department Compulsory)

Catalog course description:

General Conduction equations, composite walls and cylinders. Heat generation. Heat transfer from extended surfaces. Transient and two-dimensional analysis. Convection heat transfer, forced external and internal convection heat transfer. Natural convection. Radiation heat transfer, emission and heat exchange between surfaces. Black and gray bodies. View factors and enclosures

Prerequisite:

MEP 261; Thermodynamics I; MEP 290; Fluid mechanics

Textbooks and/or other Required Material:

Fundamentals of heat and mass transfer

By: Incropera and De Witt, Sixth edition, 2007.

Course topics and Course learning objectives:

Topics Covered	Course Learning Objectives
Introduction (1.5 weeks)	CLO_1: students will be able to identify the different modes of heat transfer mechanisms. CLO_2: students will be able to recall the energy balance equation.
Introduction to conduction (1 week)	CLO_3: Students will be able to define heat conduction. CLO_4: Students will be able to describe the heat diffusion equation for conduction problems and list its boundary conditions.
Steady 1-D conduction (2 weeks)	CLO_5 Students will be able to derive heat diffusion equation for steady 1-D conduction. CLO_6: Students will be able to solve steady 1-D basic heat conduction problems (plane walls, cylinders, spheres, composite walls, conduction with internal heat generation and extended surfaces).
Two-D computational conduction analysis (0.5 week)	CLO_7: Students will be able to apply finite difference methods to solve steady state 2-D heat basic conduction problems
Transient conduction heat transfer analysis (2 weeks)	CLO_8: Students will be able to define lumped systems and solve unsteady basic heat conduction problems using lumped analysis. CLO_9: Students will be able to solve unsteady 1-D basic heat conduction problems (plane walls, cylinders, spheres).
Introduction to convection heat transfer (1 week)	CLO_10: Students will be able to define heat convection. CLO_11: Student will be able to describe velocity and thermal boundary layers.

Forced convection heat transfer analysis for external flows (1.5 weeks)	CLO_12: Students will be able to solve basic heat transfer problems involving forced convection over flat plates, circular cylinders, non-circular cylinders, spheres and over bank of tubes
Forced convection heat transfer analysis for internal flows (1.5 weeks)	CLO_13: Students will be able to solve basic heat transfer problems involving forced convection inside circular and non-circular ducts.
Natural convection (1 week)	CLO_14: Students will be able to define natural convection. CLO_15: Students will be able to solve basic heat transfer problems involving natural convection over vertical plates, inclined plates, horizontal plates, vertical cylinders, horizontal cylinders and spheres.
Thermal radiation (1 week)	CLO_16: Students will be able to define thermal radiation, irradiation, radiosity, spectral and total hemispherical emmisivity, transmissivity, absorptivity, and reflectivity. CLO_17: Students will be able to define the black body and the gray body.
Radiation exchange between surfaces (1 week)	CLO_18: Students will be able to calculate basic radiation heat transfer problems between gray surfaces
Heat transfer Laboratory	CLO_19: Students will be able to conduct and analyze experiments in heat transfer domain

Class/Laboratory schedule:

h) Determination of thermal conductivity in solids.

i) Forced convection from cylinder in cross flow.

j) Determination of view factor.

Contribution of course to meeting the professional component:

Engineering Science: 100 %

Relationship of course to Program Outcomes (PO):

MEP 360	Program Outcomes														
	ABET Outcomes											Program Criteria			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
	3	1			3		1						2	2	

Person Who Prepared This Description and Date of Preparation:

Dr. Abdul Rahim A. Khaled, April 2006 (Reviewed by Dr. Abdullah Turki)

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Production Engineering and
Mechanical Systems Design Department

MENG 468, PLASTICITY AND METAL FORMING, 3 Cr., REQUIRED, FIRST TERM 2008G

Course description: Yield criteria, Plastic stress- strain relation. Plane stress and plane strain problems. Determination of flow equation. Applications: instability in thin vessels, thick vessels subjected to internal pressure, and beam under pure bending. Classification of metal forming processes. Bulk deformation processes. Technique of analysis; slab method, upper bound method. Slip line field, application to indentation problem, Forging, rolling, extrusion, and Rod and wire drawing.

Prerequisite: MENG 270 and MENG 332

Instructor: Dr. Talal M Abu Mansour, Room # 227, Ext: 68045
Lab. Eng.: Eng. Alawi Al Attas, Room # 220, Ext: 68046

Schedule: Sat. and Mon., 11:00-12:20, Classroom # 42B-231
Wed., 11:00-12:50, Lab.

Textbook

Lecture Notes, February 2007.

References

1. Manufacture Process for Engineering Materials, Addison - Wesley, 2005.
2. Mechanical Metallurgy, Mc-Graw Hill, 1976.
3. Engineering Plasticity, Van-Nostrand Reinhold, 1973.

Topics

1. Stress and Strain Relationship for Elastic Behavior
2. Applications to Materials Testing
3. Elements of The Theory of Plasticity
4. Analysis of Metal Forming Processes
5. Classifications of Metal Forming

Course learning objectives:

1. To find the principal stresses by using the cubic equation.
2. To find the flow equation by using data obtained from at least, one of the following tests(simple tension test , compression test, torsion test, plane strain compression test
3. To obtain the load, and current dimensions of thin vessel, at necking.
4. To find the stresses at any point from inner surface to outer surface of a thick vessel, subjected to internal pressure, at any of the following cases; when the vessel is fully elastic; when the vessel is partially plastic; and when the vessel is fully plastic.

5. To find the residual stresses at any point from inner surface to outer surface of a thick vessel, subjected to internal pressure, when unloaded
6. To find the stresses at any point, of a beam subjected to pure bending, at any of the following cases; when the beam is fully elastic; when the beam is partially plastic; and when the beam is fully plastic.
7. To find the residual stresses at any point, of a beam subjected to pure bending, when the beam is unloaded.
8. To use the energy method, to find the load needed to initiate plastic deformation
9. To use the slab method, to find the load needed to initiate plastic deformation
10. To use the upper bound technique, to find the load needed to initiate plastic deformation.
11. To use a programmable calculator**,** to find the roots**,**
12. To work in team effectively,
13. To use the internet to increase their knowledge of up-to-date technology.

Grading:

Home works	8 %	
Self Regulations	10 %	
Quiz	7 %	
Lab. Report	10 %	(contact Lab. Eng.)
Project Report	10 %	(Bonus)
Major Exams	35 %	
Final Exam	35 %	

Contribution of the course to meet the ABET professional Component:
Engineering science: 3 credits

Prepared by Dr. Talal M. Abu Mansour, SEPTEMPER 2007G.

KING ABDULAZIZ UNIVERSITY

Engineering Faculty

Department of Production Engineering and Mechanical Systems Design

MENG 470 MECHANICAL VIBRATIONS, Required
FALL 2007

Course description: Free and damped vibration of single degree of freedom systems, Viscous damping, Forced vibration, Resonance, Harmonic excitation; Rotating unbalance, Base motion, Vibration isolation, Fourier analysis, Vibration measuring, General excitation, Step and impulse response, Two degree of freedom systems, Frequencies and mode shapes, Modal analysis, Undamped vibration absorber, Multi degrees of freedom systems, Matrix methods, Raleigh and Raleigh-Ritz methods, Continuous systems, axial, torsional and bending vibrations.

Prerequisites:

- MENG 262 Dynamics
- MENG 204 Computer Aided Graphics

Course Website: http://www.asiri.net/courses/meng470

Instructor: Dr. Saeed Asiri **Office:** 229B **Ext.**: 51345
Email: saeed@asiri.net

Lab. Eng.: Abdurrahman Fatani, **Office:** 219B **Ext.**: 68251
Email: amfatani@kau.edu.sa

Schedule: Sun. and Tue. 8:00 am to 9:30, Classroom # 331B

Textbook: Singiresu Rao, *Mechanical Vibrations*, Prentice-Hall, Fourth Edition.

Course Goals:

1. To give students knowledge of modeling and analyzing free and forced vibration of single and multi degree of freedom systems.
2. To introduce students to the modeling and analysis of continuous vibrational systems including approximate solution methods.
3. To develop students ability to apply these principles and analytical tools in the design of engineering systems and devices.

Course Learning Objectives:

1. Students will demonstrate the ability to set up appropriate equations of motion for 1, 2 and Multi-DOF systems using both Newton's laws and energy methods (e.g. Lagrangian method).

2. Students will be able to determine the free response and forced response of SDOF systems for a wide variety of forcing conditions including direct harmonic excitation, rotating unbalance, and base excitation.
3. Students will be familiar with normal modes and be able to find the normal modes and natural frequencies associated with Multi-DOF vibrational systems and to express the free and forced response of simple continuous systems in terms of normal modes.
4. Students will demonstrate an ability to design effective vibration isolation systems and demonstrate an understanding of the tradeoffs inherent in isolator designs.
5. Students will demonstrate their ability to apply the principles of vibration analysis in the design and re-design of machinery and structures.
6. Students will be able to derive the partial differential equation of motion and associated boundary conditions for simple continuous systems such as strings, rods, or beams.
7. Students will be able to use one or more approximate methods (e.g. FEM for finding system modes and natural frequencies).

Grading:

Pop. Quizzes & In-Class Activities	15%
Laboratory	15%
Midterm Exam	20 %
Term Project	10 %
Final Exam	40 %

Note: 75% attendance is required. No makeup for quiz or midterm exam. Student must attend the laboratory to pass the course.

Contribution of the course to meet the ABET professional Component:
Engineering science: 2 credit, Engineering design: 1 credit.

Prepared by: Dr. Saeed Asiri, September 2007

KING ABDULAZIZ UNIVERSITY

Faculty of Engineering

Production Engineering and
Mechanical Systems Design Department

MENG 472, FAULT DIAGNOSIS, 2 Crd., REQUIRED, FALL 2007

Course description: Review of vibration; Free vibration, Harmonically excited vibration, Fourier analysis. Instruments; Transducers, FFT analyzer, Sampling and aliasing. Vibration problems; Imbalance, Misalignment, Bearings, Gears, Fans, Belts. Techniques and Maintenance Management. Sound; Basic properties of waves, Intensity, Power level. Balancing; Static unbalance, Dynamic unbalance, Field balancing.

Prerequisite: MENG 410 and MENG 470

Instructor: Prof. Hamza Diken, Room # 225, Ext: 68253
Lab. Eng.: Abdurrahman Fatani, Room # 219, Ext: 68250

Schedule: Sat. and Mon., 13:00-13:50, Classroom # 318

Textbook

Lecture Notes, September 2006.

References

4. Machinery Vibration: Measurement and Analysis, Victor Wowk, McGraw-Hill, Inc., 1991.
5. Machinery Vibration: Balancing, Victor Wowk, McGraw-Hill, Inc., 1995.
6. Mechanical Vibrations, Singiresu S. Rao, 3rd Edition, 1995, Addison-Wesley Publishing Company.

Course Learning Objectives:

16. Ability to find natural frequency, period, amplitude, velocity and acceleration of a vibration.
17. Ability to find vibration amplitude, transmitted vibration/force or isolated vibration/force of an harmonically excited vibration.
18. Ability to describe and classify transducers for vibration measurement.
19. Ability to identify problems of vibration measurements and analysis; FFT analyzer, filtering, sampling, aliasing, averaging.
20. Ability to analyze and interpret vibration problems of machine components like; imbalance, bearings, gears, fans, etc.
21. Ability to obtain and interpret vibration data; accuracy, repeatability, best location of transducers, mode shapes, resonance test, maintenance management types.
22. Ability to do a balancing of a rotating system; static unbalance, dynamic unbalance, single plane balancing, four-run balancing.
23. Ability to describe sound wave types and calculate intensity, power level of a sound.
24. Ability to measure the vibration and interpret the vibration data to identify the vibration problem.

25. Ability to obtain and present up-to-date knowledge about a vibration problem.

Topics Covered

11. Free Vibration
12. Harmonically Excited Vibration
13. Vibration Measuring Instruments
14. Machinery Vibration Problems
15. Vibration Measuring and Analyzing Techniques
16. Balancing
17. Sound

Grading:

Quiz	15 %	
Lab.	10 %	(contact Lab. Eng.)
Project	10 %	
Midterm	25 %	
Final Exam	40 %	

Not: 75% attendance is required. No makeup for *quiz or midterm* exam. Student **must** attend the Lab. to pass the course.

Contribution of the course to meet the ABET professional Component:
Engineering science: 2 credits

Course relation to program outcomes

Program outcomes																			
a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**	**o**	**p**	**q**	**r**	**s**	**t**
H	H	M		H		M		M		L	H	M							

Prepared by Prof. Hamza Diken, Sept 2007.

COURSE SYLLABUS

MENG 499 Capstone Design
Fall 2007 / 1428-1429

Instructor:

Prof. Dr. Hassan Hedia ***Room 480*** ***Ph 68218***

Week	Date		Lecture		Tutorial
1			**Introduction (Team work and skills)**	***Team Formation***	***First Day Materials***
2			***Product Design Process (1)***		***Team Form Delivery***
3			**Project Requirements and Idea (2) Selection**		
4			***Need Identification & Problem Def.(3)***		
5			***Team Behavior & Tools(4)***		
6			**Meeting Minutes**		***Presentations 1***
7			**Presentation Skills (11)**		*Gantt Chart* ***& MS Project***
8			***Gathering Information(5)***		***Presentations 2 &Tech Report 1***
9			***Concept Generation & Evaluation(6)***		***Team Pres 3 -***
10			**Technical Report Guide Lines (10)**		
11			***Embodiment Design(7)***		***Bibliography***
12			***Legal and Ethical Issues in Design(8)***		***Tech Report 2***
13			**Software and programming tools (9)**		***Prepare your CV***
14			**Update**		***Presentations 3***
15			**Update**		
16			***Team Final Presentation - Final Technical Report***		