Sample Syllabus

Penn State University
Department of Mechanical Engineering

ME 460 – ADVANCED MACHINE DESIGN PROBLEMS

Prerequisite: ME 360, M E 370.

Description: Special machine design problems in unusual types of springs; gear problems and involutometry; cam design and application; multiple diameter shaft deflections and ball bearings.

Required Text: None. Recommended readings are i) Machine Design – An Integrated Approach, by R. L. Norton, Prentice Hall, 5th edition, (ii) Cam Design Handbook – Harold Rothbart, McGraw Hill 2004 (iii) Fundamental of Fluid Film Lubrication -- Bernard J. Hamrock, Steven R. Schmid, Bo. Jacobson, Marcel Dekker, Inc., 2004.

Time & Place: M W F 02:30P - 03:20P   TBD

Instructor: Professor Aman Haque, 317A Leonhard Bldg., Tel: 865-4248, Email: mah37@psu.edu

Office Hours: Thursday 2:00 – 5:00 PM or by appointment.

Course Objectives: Upon completion of the course, students should be able to:
1. Approach and solve unique problems in the design of machine components and integrate and expand understanding of engineering fundamentals.
2. Demonstrate professionalism in interactions with colleagues, faculty, and staff.

Program Objectives: This course covers the following program objectives:
1. Perform analysis of mechanical components
2. Perform analysis of mechanical systems
3. Demonstrate professionalism in interactions with colleagues, faculty, and staff
4. Make effective use of spreadsheets as an analysis and design tool
5. Use software such as Matlab and MathCAD to solve engineering problems including ODE's, systems of linear equations, and numerical integration.

Tentative Class Schedule

Week		Date	Topic	Out	Due
1	M	1/13	Introduction.		HW0
	W	1/15	Cam design fundamentals; SCCA Family for cam design		
	F	1/17	SCCA Family for cam design	HW1	
2	M	1/20	**Dr. Martin Luther King Day**		
	W	1/22	Polynomial techniques		
	F	1/24	Project discussion	HW2	HW1
3	M	1/27	Cam sizing and contouring		
	W	1/29	Cam force and torque		
	F	1/31	Spring design for cams	HW3	HW2

4	M	2/3	Spring design for cams		
	W	2/5	Spring design for cams		
	F	2/7	Spring design for cams		HW 3
5	M	2/10	Cam torque calculation		
	W	2/12	Power Transmission (flexible elements)		
	F	2/14	Power Transmission (flexible elements)		
6	M	2/17	**Exam 1**	HW 4	
	W	2/19	Power Transmission (flexible elements)		
	F	2/21	Power Transmission (flexible elements)		
7	M	2/24	Helical Gears	HW5	HW4
	W	2/26	Helical Gears		
	F	2/28	Bevel Gears		
8	M	3/3	Bevel Gears	HW6	HW5
	W	3/5	Worm Gears		
	F	3/7	Worm Gears		
9	M	3/10	**Spring Break**		
	W	3/12	**Spring Break**		
	F	3/14	**Spring Break**		
10	M	3/17	Hydrostatic Bearing Design	HW7	HW6
	W	3/19	Hydrostatic Bearing Design		
	F	3/21	Hydrostatic Bearing Design		
11	M	3/24	Hydrostatic Bearing Design		
	W	3/26	Clutches & Brakes		
	F	3/28	Project discussion	HW8	HW7
12	M	3/31	Clutches & Brakes		
	W	4/2	Clutches & Brakes		
	F	3/4	Clutches & Brakes		HW8
13	M	4/7	**Exam 2**		
	W	4/9	Kinematics & Dynamics of IC Engines		
	F	4/11	Kinematics & Dynamics of IC Engines		

14	M	4/14	Engine Balancing	HW9	
	W	4/16	Multi-cylinder Engine Design		
	F	4/18	Project discussion		
15	M	4/21	Multi-cylinder Engine Design		HW9
	W	4/23	Leaf Springs; Spring washers		
	F	4/25	Spring washers		
16	M	4/28	Unusual springs (compliant mechanisms)		
	W	4/30	Project presentations & peer review		
	F	5/2	Project presentations & peer review		
17			**Final Exam (TBA)**		

Grading:

Midterm Exam	30%	(2 exams)
Homework	20%	(6 to 8 HWs, equally weighted)
In-class quizzes	20%	(10-12 quizzes)
Final Exam	30%	(all lectures included)
TOTAL	100%	

Standard grading scale (A>93, A- >90, B+ >87, B >83, B- >80, C+ >77, C >70, D >60 and F <60) will be followed.

Course website: The course website is in the CANVAS system. I will use the course website to post homework, solutions and all other announcements. Canvas grades are **not** properly weighted, so please do not deduce your final grades from Canvas.

Homework: Assignments are due in-class only. Papers must be stapled, not crimped at the corner or paper clipped. **No** late homeworks will be accepted.

Make up Exams: Medical excuses must produce doctors notes. Plan for travel according to the exam schedule. No remote exam will be administered.

Grading Complaints or Concerns: Must be submitted in writing to the UG Programs office.

Academic Integrity: Information pertaining to Penn State's policy on academic integrity can be found at http://www.engr.psu.edu/undergrad/acad_int/students/. In this course, students are permitted to work together on homework assignments, but each student is required to submit his or her own original work. Students are required to work together on class projects and should submit reports completed by the group.

Disability Support: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.