AME 4193.001 INTRODUCTION TO COMPUTER-AIDED DESIGN (CAD) Spring 2016

Objectives: This course intends to introduce Computer-Aided Design, including theory, software tools, and practice, that enables you to apply the knowledge and experience to support engineering design. *SolidWorks 2015* and *PTC Creo 3.0* will be used as referencing CAD software to aid class instructions. This course will be taught in the context of e-Design, aiming at helping you become more knowledgeable in CAD and competent in engineering design practice.

Course Series: AME4193 is one of the four-course series focusing on e-Design, including: AME4193 Introduction to CAD (current course, Spring 2016) AME4283/5283 Current Design and Manufacturing (Fall 2016) AME4263/5263 Computer-Integrated Manufacturing (Fall 2016), and AME5740 Design Theory and Methods (Spring 2017)



Instructor:	Kuang-Hua Chang, Professor 201 Felgar Hall, Phone: 325-1746, E-mail: khchang@ou.edu						
Lecture:	3:00 - 4:15 p.m., MW, 101 AH (Adams Hall)						
Office Hours:	2:00 - 2:45 p.m., MW; or by appointment (arrange via e-mail please)						
Description:	Main topics to be introduced include: e-Design paradigm, geometric modeling (parametric curves, parametric surfaces, and geometric transformation), solid modeling (sketch, features, CSG, B-Rep, feature-based, parametric modeling, direct modeling), assembly modeling (assembly mates and kinematic joints), design parametrization, and product data management (including product data exchange and Workgroup PDM).						
Grade:	Homework (10-12) Test (1) Design Project (1) Attendance	30% 35% 35% extra 4%	A: B: C: F:	90 or higher 75-89.9 60-74.9 below 60			
Mandatory:	Attend <u>ALL</u> classes on time (5 minutes early to get your laptop ready for class) Work on all assignments and turn in your <u>ORIGINAL</u> work on time						
HW Policy:	No late HW will be accepted. HW solutions will be posted on D2L soon after the HW is due. Please start early to avoid last-minute hassle and subpar performance.						
Class Attendance:	2% of the 4% extra credit will be deducted for each unexcused absence. Two unexcused absences negate the extra 4% extra credit. Any anticipated absence will have to be pre- approved by Dr. Chang. Personal trip, vacation, and non-academic related activity are not considered excused absence. Absence due to medical situations will require a doctor's note.						
Pre-Requisites:	AME 3103 Engineering Design Graphics (or familiar with SolidWorks)						

	Strong background in Math, specifically MATH1823/2423/2433/2443 Calculus and Analytical Geometry I-IV (or MATH1914/2924/2934 Differential and Integral Calculus I-III)					
Textbooks:	Chang, K.H., <i>Product Design Modeling</i> using CAD/CAE, The Computer Aided Engineering Design Series, Academic Press, Elsevier Science & Technology, 30 Corporate Drive, Suite 400, Burlington, MA 01803, ISBN 978-0-12-398513-2, February 2014					
Other References:	Technical papers, handouts, and web links. Will be made available as needed.					
Software Install:	<i>SolidWorks 2015</i> and <i>PTC Creo 3.0</i> are required on your laptop. It is <u>your responsibility</u> to bring your laptop with <u>working software</u> to attend class meetings. Software may be available in CoE labs for you to work on assignments. We will be using MATLAB and Excel for graphing and basic calculations.					
Academic Integrity:	Collaboration with other students is encouraged in the following forms: discussing how to approach a problem, helping each other to understand concepts or develop skills, studying for test in groups; the following actions are unacceptable and are considered examples of academic misconduct: copying another person's work, copying from solutions, using banned materials during a test					
Recipe for success:	Preview-Listen-Review Preview materials according to the reading assignment, come to class and pay close attention to lecture (listen), and review lecture (and textbook) right after the class and work on assignments (homework and project). Allow yourself adequate time to review material and prepare well for test. Work hard with a genuine effort to make the most out of this class.					
Final Note:	This class is highly Math-centered and will be taught with focus on understanding the "behind the-scene-operations" while using CAD to create solid models. Your dedication and hard wor throughout the semester are highly appreciated.					

LIST OF LESSONS

(Tentative, depending on the pace of the class)

5 Design Lessons

Design Lesson 1: Introduction to e-Design Design Lesson 2: SolidWorks Motion Design Lesson 3: SolidWorks Simulation Design Lesson 4: CAMWorks Design Lesson 5: Rapid Prototyping

8 Geometric Modeling Lessons

GM Lesson 0: Loft and Sketch GM Lesson 1: Quadratic Parametric Curves GM Lesson 2: Cubic Parametric Curves GM Lesson 3: B-spline Curves and NURB Curves GM Lesson 4: Parametric Surfaces GM Lesson 5: CAD Generated Surfaces GM Lesson 6: Geometric Transformations GM Lesson 7: Case Studies

6 Solid Modeling Lessons

SM Lesson 1: Basics of Solid Modeling (CSG and B-Rep)

SM Lesson 2: Feature-Based Parametric Solid Modeling

SM Lesson 3: Direct Solid Modeling

SM Lesson 4: Product Data Exchange I: Basic Methods

SM Lesson 5: Product Data Exchange II: Feature Recognition

SM Lesson 6: Part Construction Plan

5 Assembly Modeling Lessons

AM Lesson 1: Mating constraints and Kinematic Joints AM Lesson 2: Assembly Modeling Technique AM Lesson 3: Kinematic Modeling Technique AM Lesson 4: Case Study AM Lesson 5: Tutorial Examples

2 Product Data Management Lessons

PDM Lesson 1: Fundamentals of PDM PDM Lesson 2: SolidWorks Workgroup PDM

3 Design Parameterization Lessons

DP Lesson 1: Design Parameterization at the Part Level

DP Lesson 2: Design Parameterization at the Assembly Level

DP Lesson 3: Case Studies

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Spring 2016

Class Schedule

(Tentative, depending on the pace of the class)

Week	eek Date		Topic	Contents	
1	January	20	Course introduction,	Course syllabus	
			e-Design Paradigm	Design Lesson 1: Introduction to e-Design	
				Design Lesson 2: SolidWorks Motion	
2		25		Design Lesson 3: SolidWorks Simulation	
		27		Design Lesson 4: CAMWorks	
3	February	1		Design Lesson 5: Rapid Prototyping	
		3	Project Assignment		
			Geometric Modeling	GM Lesson 1	
4		8		GM Lesson 2	
		10		GM Lesson 3	
5		15		GM Lesson 4	
		17		GM Lesson 5	
6		22		GM Lesson 6, GM Lesson 7	
		24	Solid Modeling	SM Lesson 1	
7		29	Ŭ	SM Lesson 2, SM Lesson 3	
	March	2		SM Lesson 4	
8		7		SM Lesson 5	
		9	Mid-Term Presentation	Projects	
9		14	Spring Break	× ·	
		16	Spring Break		
10		21	Assembly Modeling	AM Lesson 1	
		23		AM Lesson 2	
11		28		AM Lesson 3	
		30		AM Lesson 4	
12	April	4		AM Lesson 5	
	-	6	Product Data	PDM Lesson 1	
			Management		
13		11	Test		
		13		PDM Lesson 2	
14		18	Design Parameterization	DP Lesson 1	
		20		DP Lesson 2	
15		25		DP Lesson 3	
		27	Final Presentations	Projects	
16	May	2		Projects	
	-	4	Summary and Wrap Up	ž – ž	

About Your Instructor

Dr. Kuang-Hua Chang is a *David Ross Boyd Professor* and *Williams Presidential Professor* at the University of Oklahoma (OU), Norman, OK. He received his diploma in Mechanical Engineering from the National Taipei Institute of Technology, Taiwan, in 1980; and M.S. and Ph.D. degrees in Mechanical Engineering from the University of Iowa in 1987 and 1990, respectively. Since then, he joined the Center for Computer-Aided Design (CCAD) at Iowa as a Research Scientist and CAE Technical Area Manager. In 1997, he joined OU. He teaches mechanical design and manufacturing, in addition to conducting research in computer-aided modeling and simulation for design and manufacturing of mechanical systems.

His work has been published in 8 books (see book covers below), and more than 140 articles in international journals and conference proceedings. He has also served as technical consultants to US industry and foreign companies, including LG-Electronics, Seagate Technology, etc. Dr. Chang received numerous awards for his teaching and research since joined OU, including the Williams presidential professorship in 2005 for meeting the highest standards of excellence in scholarship and teaching, OU Regents Award for Superior Accomplishment in Research and Creative Activity in 2004, OU BP AMOCO Foundation Good Teaching Award in 2002, and OU Regents Award for Superior Teaching in 2010. He is a five-time recipient of CoE Alumni Teaching Award, given to top teachers in CoE. His research paper was given a Best Paper Award at the iCEER-2005 iNEER Conference for Engineering Education and Research in 2005. In 2006, he was awarded a Ralph R. Teetor Educational Award by SAE in recognition of significant contributions to teaching, research and student development. Dr. Chang was honored by the OKC Mayor's Committee on Disability Concerns with the 2009 Don Davis Award, which is the highest honor granted in public recognition of extraordinarily meritorious service which has substantially advanced opportunities for people with disabilities by removing social, attitudinal & environmental barriers in the greater Oklahoma City area. In 2013, Dr. Chang was named David Ross Boyd Professor, one of the highest honors at the University of Oklahoma, for having consistently demonstrated outstanding teaching, guidance, and leadership for students in an academic discipline or in an interdisciplinary program within the University.

Dr. Chang serves as an Associate Editor for two international journals: Computer-Aided Design and Applications, and Mechanics Based Design of Structures and Machines. In addition, he serves on the Editorial Boards of ISRN Mechanical Engineering, International Journal of Scientific Computing, and Journal of Software Engineering and Applications. All are well-known and internationally reputable journals.

