BU ENG ME 414 Capstone Design

Spring 2012

COURSE INFORMATION SHEET – ALL SECTIONS

Course Coverage: (Prereq: ENG ME 413. Continuation of ENG ME 413 focusing on the capstone senior design project, in which students conceive, plan, and carry out a significant mechanical engineering design project, working in groups. Also included are machine elements not covered in ME 413, such as bearings, gears, belts, brakes, and clutches; finite element analysis; project management; project cost estimation; professional liability; and engineering ethics. Written reports and oral presentations required. 4 cr, 2nd sem.)

Course Syllabus (Schedule): Issued as a separate document.

Course Staff:

Staff Member	*Primary Phone* *Other Phone*	*e-Mail*	*Office Location*	*Office Hours*
Prof. Frank A. DiBella Instructor	781-937-4718 617-353-6616	fdibella@conceptsnrec.com	ENG 307	As arranged
Prof. William Hauser Instructor / Course Coordinator	617-358-0663 978-681-1866	wmhauser@bu.edu	EMB 144	Thur 1:00 – 4:00
Prof. Morton S. Isaacson Instructor	617-353-2825 781-891-3207	isaacson@bu.edu	ENG 207	TBA
Mr. Ali Beyzavi Graduate Teaching Fellow	Contact by e-mail	beyzavi@bu.edu	ENG 117	TBA
Mr. Jeremy Stark Graduate Teaching Fellow	Contact by e-mail	jwstark@bu.edu	PHO 110	TBA
Mr. Joe Estano ME Laboratory Manager	617-353-6653	jestano@bu.edu	ENG 110	
Mr. David Campbell ME Laboratory Engineer	617-353-3952	dcampbel@bu.edu	ENG 203	
Mr. Robert Sjostrom CIM Specialist / Lab Supervisor	617-353-4246	sjostrom@bu.edu	GCB B05	

ENG = 110 Cummington Street *EMB = 15 St. Mary's Street* *GCB = 750 Commonwealth*

Class Meeting Place and Time:

➔ **Please note that room assignments are different from first semester**

A1	Isaacson	PHO 210	Tue, Thur	10:00 - 12:00
A2	DiBella	PHO 205	Mon, Wed	6:00 - 8:00
A3	Isaacson	PHO 202	Mon, Wed	2:00 - 4:00
A4	Hauser	PHO 201	Mon, Wed	2:00 - 4:00
A5	Hauser	PHO 205	Tue, Thur	10:00 - 12:00

The A1 and A5 and the A3 and A4 sections will sometimes meet together in PHO 205. Joint meetings will be announced.

Required Textbooks (Available at BU Bookstore or at various sites online):
[Texts required or recommended in ME414 are the same as those used in ME 413.]

- Robert C. Juvinall; Kurt M. Marshek, *Fundamentals of Machine Component Design*, 4th ed., **ISBN 9780471661771 (The basic text for ME413 and ME414. The printed edition [non-electronic] is permitted in exams and quizzes except when otherwise noted.)**
- *Notebook-Value Marble Quad 100,* XX Supply, **ISBN 9780471661771 (Bound notebook for recording of project design information. Notebooks will be collected and evaluated from time to time during the course.)**

Additional References:

- *Machinery's Handbook, 28th ed.,* Industrial Press, 2008, ISBN 978-0-8311-2800-5 (Contact Joe Estano for ordering information at a reduced price. Also available in large print and CD-ROM editions. Earlier editions remain useful. Check online availability.)
- Edward Lumsdaine; Monika Lumsdaine; J. William Shelnutt, *Creative Problem Solving and Engineering Design*, 1999, ISBN 978-0-07-236058-5
- George Dieter; Linda Schmidt, *Engineering Design*, 4th ed., 2009, ISBN 9780072837032, (Useful as a reference on the design process, but can be challenging as a tutorial for first-time readers.)
- David G. Ullman, *The Mechanical Design Process,* 4th ed., 2009, ISBN 0072975741 (Useful as a reference on the design process. Accessible style. Earlier editions remain useful.)
- Robert L. Norton, *Machine Design*, 4th ed., 2011, ISBN 9780136123705 (Parallels the content of the course text. Provides useful alternate expositions if the treatment in *Juvinall* is not accessible.)
- Jack A. Collins, *Mechanical Design of Machine Elements and Machines*, 2nd ed, 2009, ISBN-13: 9780470413036 (Parallels the content of the course text. Provides useful alternate expositions if the treatment in *Juvinall* is not accessible.)
- Richard Budynas; J. Nisbett, *Shigley's Mechanical Engineering Design*, 9th ed., 2011, ISBN 9780073529288 (The grandfather of mechanical design textbooks. All other texts are, to some extent, derivatives of Shigley. Parallels the content of the course text. Provides useful alternate expositions if the treatment in *Juvinall* is not accessible.)

Grading:
Grades have both an individual and a team component. The starting point in determining a student's grade in a team effort is the performance of the team as a whole. That is, with no other information, each member of the team will usually receive the same grade. Nonetheless, an individual may receive a lower or higher grade than the team as a whole, depending on such inputs as peer evaluations, comments from customers, and comments from shop personnel. In recent times, individual performance has been marked up or down relative to the team as a whole by as much as a full grade, e.g., B+ lowered to C+, based on peer evaluation confirmed by the instructor's own observations. More severe adjustment is possible in cases where a team member is clearly non-contributing.

Quizzes, homework, exams, design journal, and attendance are counted as measures of a student's individual performance.

The table below documents the weight assigned to individual and team elements for the Capstone Project and for Design Foundations (failure analysis and machine elements).

Grading	Indiv	Group
Professionalism (including class attendance and conscientious approach to collaboration on the team project)	5%	
Design journal	5%	
Homework (machine elements and FEA)	5%	
Midterm test (machine elements)	10%	
Engineering ethics assignments	5%	
Capstone Project Report III (Written)		15%
Capstone Project Report III (Oral)	5%	
Capstone Project Report IV: Detail Design (written)		15%
Final Design Report (written)		20%
Final Design Report (oral)	10%	
Working model or prototype (submitted to customer)		5%
Total	**45%**	**55%**

Academic Behavior Standards: Your behavior in this course is bound by the 2011-2012 Boston University Academic Conduct Code found at the website http://www.bu.edu/academics/academic-conduct-code. You are responsible for understanding the requirements of this code.

Homework on machine elements should be done individually, unless you identify on each homework problem what help you received from what source. This is the same policy followed last semester in ME 413. The assignment on Professional Ethics must be done individually. If an assignment is not handed in on time, without an acceptable excuse, your score will be penalized.

***Notes*:**

Evening Session: Wednesday, February 29, from 7:00 to 9:00 PM, we will have the **Midterm Exam** for all sections. Please plan ahead to be available at this time. If you have a commitment until 9 p.m. you may take the test from 9-11 p.m. Please contact Prof. Hauser to arrange this. A make up exam will be given only for very extenuating circumstances. Class will not meet during regular hours on Wednesday and Thursday.

Evening Session: On **Monday, March 19, from 6:30 to 8:30 PM**, we will have a guest lecture on finite element analysis (FEA). Unless you have another regularly scheduled class at that time, you are expected to attend the lecture. Please contact your section instructor if you have a conflict for that time. Class will not meet during regular hours on Monday and Tuesday.

Revision of preliminary design: Within the first two weeks of the semester you must address the weaknesses found in your proposed preliminary design (Project Report II) and must develop an acceptable preliminary design. This design will be presented in a formal written report and oral presentation in just three weeks. Joe, Bob, and Dave, as well as the course instructors, are available for consultation outside of class.

Team meetings with project customers: For teams with real customers, please set up a meeting with your customer and your course instructor (if possible) within the first two weeks of classes.

The purpose of the meeting is to present your proposed design to be sure it will satisfy your customer's requirements.

Financial support for model or prototype: Please also note that the model or prototype developed for your project is the property of your customer (or the ME Department if you have no identified customer). It is to be left with your customer (or the Department) on completion of the project. By accepting the project proposed by your customer, you enter into an implicit contract. The customer will have been waiting all year for your product, and might well have sought it elsewhere if you had not agreed to supply it. So there is a cost to your customer even if he/she has not paid money. In addition to being of use to your customer, prototypes are important to the Department to show to future students as well as to our accreditors and other visitors.

Funding of each team by the ME Department is capped at $200. This funding is for the purchase of supplies, equipment, and fabrication services for the prototypes or models. This is in addition to funds your customer may supply. Please use this money wisely. Often donations of parts can be obtained from companies. You are encouraged to seek such donations. Materials and components that may be useful to you are available from previous years' projects. Talk with Joe Estano, David Campbell, or Bob Sjostrom.

Reports and Presentations: Capstone Project Final Reports and recordings of Capstone Project Final Presentations will be retained by the department and may be used in the instruction of future classes. When so used, grades awarded to the reports will not be revealed. However, the fact that a project was judged best for its year would ordinarily be revealed.

Final presentations will be recorded (video and audio) and may be streamed live to coworkers, relatives, and friends of the presenters, to alumni and friends of the Department, and to others with an interest in the topics being presented.

Professional Registration: Though it is not formally a part of the course, we encourage students to register for and take the Fundamentals of Engineering Exam which will be administered on Saturday, April 14. The registration deadline is Thursday, February 23. The department will reimburse up to $100 of the $189 registration fee to students who take the exam, direct that their scores be submitted to BU, and inform the department of their address after graduation. We will post additional information to the website as it becomes available.

Final Exam: No final exam is scheduled for this course.

Drop Date: Tuesday, February 21, 2012 (no "W" on record).

Withdrawal: Friday, March 30, 2012 (with a "W" on record). No withdrawals will be allowed after March 30**.**

Incomplete: Incompletes will be permitted only for the most extenuating of circumstances. They must be arranged for before the end of classes.

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COURSE SYLLABUS - ALL SECTIONS

Date	Session	Topic	Events
Tue, Jan 17 Wed, Jan 18 Thu, Jan 19	1	Introduction to 414. Team Meetings for Capstone Project Report II feedback. See First-Week Schedule Posted Separately.	
Mon, Jan 23 Tue, Jan 24	2	Machine elements: Rolling-Element Bearings **[Juvinall 14]**	HW 1 (Bearings) Assigned
Wed, Jan 25 Thu, Jan 26	3	Machine elements: Gears I **[J:15.1-15.5; 15.13]**	
Mon, Jan 30 Tue, Jan 31	4	Machine elements: Gears II **[Juvinall 16 (for familiarity)]**	
Wed, Feb 01 Thu, Feb 02	5	Machine elements: Clutches and Brakes I **[Juvinall 18]**	HW 2 (Clutches, Brakes, Belts) Assigned
Mon, Feb 06 Tue, Feb 07	6	Machine elements: Clutches and Brakes II **[Juvinall 18]**	HW 1 (Bearings) Due
Wed, Feb 08 Thu, Feb 09	7	**Capstone Project Report III:** Complete Architectural Design: Written and Oral.	*[Career Fair at GSU]* *[Peer & Team Evaluations]* *[Choose new team leaders]*
Mon, Feb 13 Tue, Feb 14	8	Machine elements: Belts and Chains I **[Juvinall 19]**	
Wed, Feb 15 Thu, Feb 16	9	Team Meetings: Feedback on Capstone Project Report III	
Mon, Feb 20 ***Tue, Feb 21***		No class, Monday, February 20th Project Time, Tuesday, February 21st	HW 2 (Clutches, Brakes, Belts) Due
Wed, Feb 22 Thu, Feb 23	10	Machine elements: Belts and Chains II **[Juvinall 19]**	*[**2-23 FE Exam Registration Deadline**] *** *[2-24 Order of the Engineer Ceremony]*
Mon, Feb 27 Tue, Feb 28	11	Design Team Meetings	
Wed, Feb 29 6:30 PM	12	**Midterm Exam (All Sections)**	No Class Wed 2:00 PM or Thur 10:00 AM
Mon, Mar 05 Tue, Mar 06	13	Project Work Time	
Wed, Mar 07 Thu, Mar 08	14	**Capstone Project Report IV:** Detail Design	*[Choose new team leaders]*
Spring Break			
Mon, Mar 19 6:30 PM	15	Guest Lecture on Finite Element Analysis	No Class Mon 2:00 PM or Tue 10:00 AM
Wed, Mar 21 Thu, Mar 22	16	Team Meetings: Feedback on Capstone Project Report IV	
Mon, Mar 26 Tue, Mar 27	17	Professional Ethics Lecture I	Ethics HW Assigned
Wed, Mar 28 Thu, Mar 29	18	Professional Ethics Lecture II	

** See http://www.ncees.org/Exams/FE_exam.php for exam and registration information

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Date	Session	Topic	Events
Mon, Apr 02 Tue, Apr 03	19	Project Work Time	
Wed, Apr 04 Thu, Apr 05	20	Team Meetings. **Brief written progress report**	
Mon, Apr 09 Tue, Apr 10	21	Project Work Time	
Wed, Apr 11 Thu, Apr 12	22	**Demonstration of work in progress** on model, mock-up, or prototype.	
Sat, Apr 14			**Fundamentals of Engineering Exam**
Mon, Apr 16		Holiday, Classes Suspended	
Tue, Apr 17 Wed, Apr 18	23	Project Work Time	
Thu, Apr 19 Mon, Apr 23	24	Project Work Time. **Brief written progress report**	Ethics HW Due
Tue, Apr 24 Wed, Apr 25	25	Project Work Time	
Thu, Apr 26 Mon, Apr 30	26	Project Work Time	
Tue, May 01 Wed, May 02	27	**FINAL REPORTS DUE**	Course, Peer, and ABET Evaluations
Thu, May 03			Project Presentation Practice Session (Voluntary, but recommended)
Fri, May 04		**Project Presentations**	
Mon, May 07		Final Exams (No Final in ME414)	
Tue, May 08		Final Exams (No Final in ME414)	
Wed, May 09		Final Exams (No Final in ME414)	
Thu, May 10		Final Exams (No Final in ME414)	
Fri, May 11		Final Exams (No Final in ME414)	
Mon, May 14		Senior Week	
Tue, May 15		Senior Week	
Wed, May 16		Senior Week	
Thu, May 17		Senior Week	
Fri, May 18		Senior Week	
Sun, May 20		**Commencement**	