EK156 DESIGN AND MANUFACTURE
FALL 2008

COURSE SYLLABUS

Prof. T. A. de Winter
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Office hours: Monday 7-11AM, 1-4PM
Tuesday 7AM-NOON
Wednesday by appointment only
Thursday 7AM-NOON
Friday 7:00-11:15AM
Text: Kalpakjian and Schmid , Manufacturing Processes for Engineering Materials, 5th edition, Prentice Hall
Classroom: 8 St. Mary's Street, Room PHO 210
Time: Friday, lectures: 1:00-2:00PM
Friday, lab demos: 2:00-3:00PM
Agganis Arena: Section 112, Row Q, seat 2
Lab demonstration locations: see attached schedule
Grad. Teaching Fellow: Jay Chow, jchow@bu.edu
Grader: Jacqueline Martin, jackam@bu.edu

The format of the course will consist of a 1 hour lecture each Friday, and a laboratory demonstration. Attendance will be taken at both the lectures and the demonstrations. The locations of the demonstrations and the membership of each group of students for each demonstration will be announced. In order to be effective, the lab demo groups should be 10-15 students each.

The CAD demonstrations will be on Solidworks and PTC software WILDFIRE. There will be a CAD assignment, and all EK156 students will be assigned Solidworks and WILDFIRE accounts. Those Manufacturing majors who complete the course with a passing grade will be allowed to continue to use their accounts for all course related projects for the rest of their undergraduate years at BU ENG.

Boston University has an honor system, and the work you submit for grading is expected to be your own. On your exams you will be required to affirm that the work you are submitting is your own by signing a short statement to that effect, a copy of which is shown on the attached typical exam cover. While the homework doesn't require an individual statement like the exams, it is expected to be your own work.

The following pages detail the grading, the reading and the lecture schedules for the semester.

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LECTURE AND LABORATORY SCHEDULE

DATE	LAB.*	LECTURE	READING	REMARKS
Sep. 5	no lab**	Introduction	Introduction(pp1-45)	
Sep. 12	Lab	Matr. Properties Project Description	Ch. 1, 2, 3	Sample Proposal
Sep. 19	Lab	Surface Effects	Ch. 33, 34, 35	
Sep 26	Lab	Metals and alloys	Ch. 4, 5	Proposal Due
Oct 3	Lab	Casting	Ch. 10, 11, 12	
Oct. 10	Lab	Bulk Deformation	Ch. 5, 14	
Oct. 17	Lab	Sheet metal forming	Ch. 13, 16	
Oct. 21/22		Midterm exam review		
Oct 24	no lab	Midterm exam, open book, open notes		
Oct. 31	Lab	Joining, Fastening	Ch. 30, 31, 32	
Nov 7	Lab	Machining	Ch. 21, 22, 23, 24	
Nov. 14	Lab	Exotic Machining	Ch. 26, 27	Progress Report
Nov. 21	Lab	Polymers, composites	Ch. 7, 8, 9	
Dec. 5	Lab	Costs, schedules Rapid Prototyping, Integrated circuits, MEMS, nanotechnology	Ch. 20, 28, 29, 38	

2-3PM Project presentation, Project Report Due

Final projects will be displayed before a panel of judges and can be taken home after being judged.

Exam #2: To be scheduled

All lectures are held on Fridays in Room PHO 210

All reading assignments are from the assigned course text

* Lab locations and demo schedule are detailed in the attached Lab Demo Schedule

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PROJECT DESCRIPTION

In engineering, the vast majority of work can best be described as projects. A project has a design and analysis phase, and a manufacturing phase. The mantra of the successful engineer is: "On schedule, to specifications and within budget". Nothing comes close as second best to that mantra.

In order to drive this home in EK156, all students will be required to generate the design of a product, estimate the cost of the materials, plan the schedule of implementing(producing) the design, and then actually make the product.

In order to accommodate the large enrollment in the course and the finite access to the Manufacturing Engineering Machine Shop, Welding and Casting facilities, the project will be done by teams of 3 students. A proposal showing the product design, including an estimate of the cost of materials and parts as well as a schedule for the completion of the product must be submitted by each team on September 26, 2008. Each team must meet in consultation with one or more of the following Manufacturing Engineering Department members to discuss their design, the materials selection, cost estimate and the method of producing the design. The team may meet with Jay Chow, Bob Sjostrom or Professor de Winter. In designs requiring welding, casting, brazing or soldering, Kara Mogensen will have to be consulted. All team members must be present at such meetings, and the consultant will sign off on the meeting report sheet. Teams completing the consultation meeting on or before September 24, 2008 will receive 5 bonus points toward the proposal grade. A signoff sheet must be enclosed with the proposal.

It is useful for engineers to consider the two likely outcomes of any project or venture, success or failure. Actually there are an infinite number of degrees of success or failure. But it is useful to think of the two extremes when engaged in a project. If the project is a success, we want to replicate it over and over in the volume production of the product or design. If it is a failure in any sense, we want to analyze what caused the failure and make sure it doesn't happen again. Both the replication of success and the avoidance of a repeat failure require that the process parameters be available for analysis. Data you don't have, is data you can't use in this strategy. Documenting what you are doing, when you are doing it and how you are doing it is essential if you want to look back on the process and make improvements.

It is important to document your design, and the steps you are taking to implement it, in order to be able to replicate your success or to avoid repeating your failures. The final project report is designed to force you to debrief yourself on the project. If you were to make a second version, what would you do different? What changes did you make in the schedule, in the design, in the materials, in the way you produced the product, and why?

It is only by following this process that engineers get better, by realizing your mistakes when they are fresh in your mind, by determining not to leave the writing of the report to the last minute, but to allow some time to do a thorough job on it.

Think about it, if your project turned out exactly as you planned and budgeted it, if the design was not modified, if the materials were purchased in exactly the quantities you planned, if their cost estimates were "dead on" and if every step was carried out as scheduled, you wouldn't have to write a final project report because all you would need is a new title page for your proposal.

While we cannot simulate raises in salary or promotions(or terminations) which accompany success or failure in industry, it is important to have your eye on the big picture.

If, when employed as an engineer in industry, your boss calls you into her office and tells you that an important customer has asked your company to prepare a proposal and she is putting you in charge of preparing that proposal. In general it takes an officer of the company to sign such a proposal, and you will have to convince that officer that the company can successfully complete the project, by meeting the schedule and the specifications and make a profit while having a good chance to beat the competition with your price. If you succeed in convincing the officer of all that, the proposal will be sent out to the customer containing the following statement(in much greater detail of course):

"Our company will furnish all materials, labor, subcontracts and facilities in order to design, manufacture, test, deliver and install the product to your specifications, and guarantee its performance, on or before the delivery date at the quoted price"

Weeks later you are called into your boss's office again, and when you walk in she says: "I have good news and I have bad news". Without waiting which you would like to hear first, she informs you of the good news, "the company got the job thanks to the proposal you prepared, congratulations". While you are wondering what could possibly be the bad news, it is not long in coming. "You said we could do it, prove it", she adds, "it is your baby".

If you complete that project, "on schedule, to specifications and within budget" your next assignment will be more important. Important to your company, and not incidentally to your career.

The EK156 project is intended to give you a taste of this process and to familiarize you with the design process and with methods of manufacturing, hence the course title: DESIGN AND MANUFACTURE.

In industry, team projects usually require a division of responsibility. Individual tasks are assigned to individual team

members and regular meetings are held to monitor progress and to schedule and assign the next tasks.

While it would seem that simulating this type of efficiency should be encouraged in EK156 projects, it would detract from the experience that each team member is required to get from the project and the course. To have one member do the proposal, while another member takes care of parts and materials and a third one schedules and witnesses the machining deprives each member from experiencing the entire project in all its significant phases.

Part of the importance of working in a team is to help coordinate the work and to be at meetings on time. This builds confidence in each member's commitment and dependability.

Each phase of the project is to have the participation of all the project group members. While some of this will be difficult if not impossible for the instructor to monitor,

One footnote on the proposal. The Manufacturing Engineering Department holds an annual Design Portfolio Competition. The concept of a design portfolio is essentially a collection of work of which you are proud, which can be presented as evidence of your efforts during an interview for an internship or a full-time position. Keep this in mind when preparing your proposal for this course, that it can be a building block and a substantial start of your design portfolio.

While variety is expected in the project designs, projects involving weapons or games and devices to promote excessive drinking or other hazardous behavior will not be approved.

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COURSE WORK AND GRADING

An attendance sheet will be circulated in class each day. It is your responsibility to sign the sheet before the start of the next class in the classroom. Excessively and chronically late students may not get full credit for signing the attendance sheet after the end of the class. A separate attendance sheet will be used to record attendance in the laboratory demonstrations.

1 Homework: 10 homeworks will be assigned, each to be completed in a week. The homeworks will be due at the start of class on Friday.

2. Project: In the course, in teams of two or three students you are required to design and build a project of your choice and to manage it as an engineering project in industry. The design has to be yours and the project must be built from scratch. The project should require 30 to 60 hours to design and build. Students are strongly urged to do a project using metal or plastics as building materials. Kits or commercially available designs are not acceptable.

3. Project Proposal: Written proposals for the projects selected are to be written and handed in according to the course schedule. Two copies of the proposal should be submitted, one for grading and return to the student, the second for the use of shop supervisory personnel.

4. Project Report: After the completion of the project, a project final report will have to be submitted. It should clearly show the differences, if any, in schedule, cost, function and appearance, between the project as built, and the originally proposed version.

5. Work Samples: Samples of the project proposal and report will be furnished to all students as a guide and model for their work.

6. Grading: The grade for the course will be based on 7 components, each carrying equal weight. They are: 1. Homework, 2. Project Proposal, 3. Exam #1, 4. Exam #2, 5. Attendance, 6. Final Project and 7. Project Report.

7. Drawings, Proposal and Report: In designing the projects, careful and detailed sketches are encouraged, and rewarded especially if done on Autocad, Solidworks or WILDFIRE or similar CAD software packages. All reports should be typed.

8. Incomplete grades; there will be none given.

9. Laboratory Demonstrations: In the weeks indicated in the schedule, laboratory demonstrations will be given on Fridays. Questions are encouraged during the demonstrations, some of the problems and questions on the exams will deal with material covered in the demonstrations.

EK156 DESIGN AND MANUFACTURE
FIRST EXAMINATION
March 18, 1996

NAME: _____

ID #: _____

PROBLEM	POINTS
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
7	_____
8	_____
9	_____
10	_____
TOTAL	_____

STATEMENT

This examination is my own work. I have not had access to anyone else's solution or notes for this exam, nor have I given anyone else access to my exam solution or notes.* I have not collaborated or discussed this exam with anyone** and I have neither received nor given any help in solving the problems I am submitting for grading.

_____
SIGNATURE DATE

* Anyone handing in another student's exam is deemed to have had access to that exam.
** with the exception of the instructor.

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LAB DEMO SCHEDULE
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	Group I	Group II
SEP 12	MACHINING I BOB SJOSTROM	SOLIDWORKS ADAM DETWILER
SEP 19	SOLIDWORKS ADAM DETWILER	MACHINING I BOB SJOSTROM
SEP 26	WELDING KARA MOGENSEN	MACHINING II BOB SJOSTROM
OCT 3	MACHINING II BOB SJOSTROM	WELDING KARA MOGENSEN
OCT 10	METALLOGRAPHY KARA MOGENSEN	AUTOMATION GERRY SHEPPARD
OCT 17	AUTOMATION GERRY SHEPPARD	METALLOGRAPHY KARA MOGENSEN
OCT 24	MIDTERM EXAM	
OCT 31	MACHINING III BOB SJOSTROM	CASTING KARA MOGENSEN
NOV 7	CASTING KARA MOGENSEN	MACHINING III BOB SJOSTROM
NOV 14	HEAT TREATMENT KARA MOGENSEN	RAPID PROTOTYPING
NOV 21	RAPID PROTOTYPING	HEAT TREATMENT KARA MOGENSEN
DEC 5	PROJECT PRESENTATIONS, PROJECT REPORT DUE	

LOCATIONS: ALL MACHINING DEMOS, BASEMENT, GUITAR CENTER BUILDING
WELDING AND CASTING DEMOS, ROOM 306, 730 COMM. AVE.
HEAT TREATMENT AND METALLOGRAPHY DEMOS, ROOM 308 "
PROE WILDFIRE, CAE LAB, ROOM 216, 730 COMM. AVE.
RAPID PROTOTYPING, FRAUNHOFER BASEMENT
AUTOMATION: ADMS LAB 730 COMM. AVE.

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CLASS LIST REGISTRATION

Note: This information and statement simply confirm your intention to attend this course, and your understanding of the syllabus, the grading policy and the honor system. It is strictly for the use of the instructor and the teaching assistant in the course. This information is necessary to list you on the grade sheet for the course. Since the official class lists are not available until well after the start of the semester, and even then are not always complete, you cannot be sure of being on the grade sheet until you have submitted this information.

NAME: _____

ID#: _____

MAJOR: _____

TERM PHONE #: _____ *

e-mail address: _____ *

* Listing your phone and/or e-mail address will allow us to get in touch with you in case of missed assignments or exams.

I acknowledge the receipt of the EK156 DESIGN AND MANUFACTURE syllabus for the FALL 2008 Semester. I have read and I understand the grading policy and the dates of the exams. I have also read the sample exam cover and I understand the honor policy and the honor system statement which I am expected to sign with each exam in the course.

_____

SIGNATURE DATE