EK156 DESIGN AND MANUFACTURE
FALL 2015
COURSE SYLLABUS

Prof. T. A. de Winter
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Office hours: Tuesday and Thursday 7AM to Noon
Wednesday 7AM-Noon, 1-3PM
Friday: 7AM-Noon

Text: Groover, Fundamentals of Modern Manufacturing, 5th edition,
ISBN 978-1-118-23146-3

Classroom: Photonics PHO 211

Time: Fridays: Group A, Lecture 1:00-2:00PM, Demo 2:00-3:00PM
Group B, Demo 1:00-2:00PM, Lecture 2:00-3:00PM,

EK156 Faculty and Staff

Joe Estano, Senior Supervisor, jestano@bu.edu
Bob Sjostrom, Senior Specialist, sjostrom@bu.edu
David Campbell, Laboratory Engineer, dcampbel@bu.edu
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All have offices in EPIC

GTF: Jonathan Russell, joncr@bu.edu
Grader, Jacqueline Farnsworth, jfarnswo@bu.edu

The format of the course will consist of a 1 hour lecture each Friday and a 1 hour laboratory demonstration. Attendance will be taken at both the lectures and the demonstrations. The locations of the demonstrations and the membership of each demonstration group will be announced before Friday, September 11 and demonstrations will start on that date. Each demo group will consist of about 15 students.

The work you submit for grading is expected to be your own. On your exams you will sign a statement to that effect, a copy of which is shown on the attached sample exam cover. While homework doesn't require a signed statement like the exams, it is expected to be your own work.

The following pages detail the grading policy, the reading assignments and the lecture and lab demo schedules for the semester.

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LECTURE AND LABORATORY SCHEDULE

DATE	LAB*	LECTURE	READING	REMARKS
Sept. 4	No Lab	Introduction	Ch. 1	
Sept. 11	Lab	Material selection Project Descriptio	Ch 2, 3, 4	
Sept. 18	Lab	Surface effects	Ch. 26, 27	Project concept approval
Sept. 25	Lab	Metals and alloys	Ch. 6	
Oct. 2	No Lab	Power point project proposals and hard copy		
Oct. 9	Two lab demos	No lecture		
Oct. 16	Lab	Casting	Ch. 10, 11	
Oct. 23	Lab	Bulk deformation Sheet metal forming	Ch. 17, 18, 19	Take home exam due 10/26
Oct. 30	Lab	Joining, fastening	Ch. 28, 29, 30, 31	
Nov. 6	Lab	Machining	Ch. 21, 22, 23	
Nov. 13	Lab	Polymers, composites, Ceramics	Ch. 7, 8, 9	
Nov. 20	Lab	Additive manufacturing, MEMS, IC	Ch. 32, 33	
Dec. 4	Lab	Exotic machiing, costs Grinding PROJECT PRESENTATION	Ch. 24, 25	

Exam #1 Take home, October 23-October 26
Exam #2 Take home, to be scheduled

All lectures are on Fridays in Room PHO 211(except lecture 1 in SAR 101)
All reading assignments are from the assigned course text

- Lab locations and demo schedule are detailed below

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COURSE WORK AND GRADING

An attendance sheet will be circulated in class during each lecture and a separate attendance sheet will be available at the lab demos. It is your responsibility to sign both before leaving class or the lab demo. At the conclusion of the lecture, the attendance sheet will be on the desk. If the sheet has passed you seat before you came in, sign in after class. Excessively and chronically late students may not receive full credit for regularly signing the attendance sheet after the end of the lecture. LAPTOPS ARE NOT PERMITTED AT ANY TIME DURING THE LECTURES or DEMOS.

Homework will be assigned each week and will be due in a week. Homework assignments will be handed out on Friday and will be due in class the following Friday

The project will be the design and making by teams of three students of a project of their choice. The design must be done by the team and built from scratch. The project normally requires 30 to 60 hours to design and build. The use of metals and plastics is strongly recommended as building materials. Wood is not allowed as a building material except as a display base. Kits or commercially available designs are not acceptable. All work requiring machining or other use of shop tools on the project must be done in EPIC.

The Project Proposal should be written to conform to the model described in class and handed in as hard copy according to the course schedule. A hard copy of the power point presentation is not acceptable. Two copies should be handed in, one for grading, the other for the EPIC supervisory personnel.

The Project Report should be written after the project has been completed and should compare the actual project with the one described in the proposal. It should clearly show any differences in schedule, cost, design, function and materials between the proposed and the actual project.

Grading: Homework 20%, Exam 1 20%, Exam 2 20%, Attendance 10%, Project(s) 30%.

The exams will be based on lecture material, assigned reading and laboratory demos. Virtually all the questions will deal with the lecture material and demos. In searching for your answer to exam questions, the order of priority should be: lecture notes, reading assignments and other sources, in that order.

Lab demonstrations occasionally do not last the entire hour scheduled. The staff welcomes and appreciates those students who stay after the demo's completion to ask questions and exhibit extra interest in the subject of the day's demo.

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This course is designed to simulate a lengthy process in industry, starting with a concept, continuing with the design and planning of a prototype and culminating in a successful and profitable production of the product so conceived and developed. You are required to write a proposal which describes the project, its design, materials, costs and schedule. You will then actually make the project (at least one, but if time and money permit, one for each member of the team). When you have completed the project, normally referred to as a prototype or an Alpha, you need to do what every engineer needs to do upon completing an assignment. That is, to debrief yourself on what you have done. Would you do it the same way if you could do it over, what have you learned, what mistakes would you avoid the next time? In short, in industry, if your efforts resulted in a successful prototype, you want to replicate that success in volumes which are orders of magnitude larger. If the prototype is unsatisfactory, the search is on to find the mistakes made and the modifications necessary to make it a success. In all of this process, data is essential. Record your design, with sketches, calculations and written hard copy records. Do not commit any of your work to memory, record it. All you need to remember then is that you did it and wrote it down, so that you can find it when you need it, Remember: DATA YOU DON'T HAVE IS DATA YOU CAN'T USE! Always give yourself credit for having designed, calculated, analyzed and thought things through by writing it down.

It is interesting to note that if your project went exactly as you proposed, the design needed no change, the materials and their costs didn't change, the schedule was adhered to exactly and the thing worked exactly as it should, you will not have to write a project report, all you need to do is to put a different cover on your proposal, one that says: Project Report.

If when employed as an engineer in industry, your boss calls you into her office and informs you that an important customer has asked the company to submit a proposal, you might wonder why she called you in to tell you that. She next tells you that because you have been with the company for a while and you fully understand how things are done that she would like you to prepare the proposal. In general, only a company officer can legally sign a contract or a proposal. When you have prepared the proposal, you will have to convince a top executive of the company that you have considered the three key mandates of engineering in industry: "ON SCHEDULE, TO SPECIFICATIONS AND WITHIN BUDGET" and that the company can meet all three on this proposal, while making a profit and beating the competition's prices.

In essence, a proposal can be summed up very briefly by the following work statement: "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". While this crisply sums up the essence of a proposal, in actuality it may be thick as a book.

Weeks later you are called into your boss's office again, and when you walk in she greets you with:" I have good news and bad news for you". Without waiting to see which you would like to hear first, she says, " the good news is that we received a contract for that proposal you

prepared, congratulations!" The bad news is not long in coming: " You said we could do is, prove it, it's your contract, you will be the contract manager."

If you complete that project "ON SCHEDULE, TO SPECIFICATIONS AND WITHIN BUDGET", your next assignment will be more important. It will be more important to your company and, not incidentally, to your career.

The EK156 project is intended to simulate, on a modest scale, 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 team members and regular meetings are held to monitor progress and to assign additional tasks. This is not appropriate in teaching engineering, because each team member needs to observe as much of the entire process as possible. It is for this reason that the team membership will be determined on the availability of each member for a common weekly open time block of at least three hours. This will enable each member to experience the full activity for the project in EPIC.

One footnote to the proposal, The Mechanical Engineering Department holds an annual Design Portfolio Competition. It consists of an individual student's work, assembled in an attractive format. The EK156 proposal and final report are both appropriate items to put in such a portfolio, which can also contain designs not associated with coursework. The competition is by class, there are prizes for each class each year.

WHILE VARIETY IS EXPECTED IN PROJECT DESIGNS, PROJECTS INVOLVING WEAPONS OR GAMES AND DEVICES TO PROMOTE EXCESSIVE DRINKING, SMOKING OR OTHER HAZADOUS BEHAVIOR WILL NOT BE APPROVED.

ALL PROJECTS MUST BE MACHINED AND ASSEMBLED IN EPIC. NO WORK ON ANY PROJECT MAY BE MACHINED IN ANY OTHER FACILITY, ON OR OFF BOSTON UNIVERSITY CAMPUS. THE USE OF THE "TINKER LAB" FOR ANY COURSE PROJECT IS STRICTLY FORBIDDEN BY THE COLLEGE OF ENGINEERING. THIS OBVIOUSLY APPLIES TO ALL EK156 PROJECTS.

EXCEPT AS A DISPLAY BASE FOR A PROJECT, THE USE OF WOOD IS NOT PERMITTED AS AN ACCEPTABLE EK156 PROJECT MATERIAL.

THE USE OF LAPTOPS OR CELLPHONES IS NOT ALLOWED IN THE LECTURES OR THE DEMOS AT ANY TIME.

"ON SCHEDULE, TO SPECIFICATION AND WITHIN BUDGET!!!!"

EK156 DESIGN AND MANUFACTURE
LAB DEMO SCHEDULE, FALL 2015

	GROUP I	GROUP II	GROUP III
SEPT. 11	MACHINING I BOB SJOSTROM	CAD I RYAN LACY	DESIGN JOE ESTANO
SEPT. 18	DESIGN JOE ESTANO	MACHINING I BOB SJOSTROM	CAD I RYAN LACY
SEPT. 25	CAD I RYAN LACY	DESIGN JOE ESTANO	MACHINING I BOB SJOSTROM
OCT. 2	NO LAB DEMOS, POWER POINT PROPOSAL PRESENTATIONS		
OCT. 9	TWO LAB DEMOS, NO LECTURE		
A 1PM B 2PM,	AUTOMATION , RYAN LACY	MACHINING II BOB SJOSTROM	HANDS ON JOE ESTANO
B 1PM A 2PM	WELDING KARA MOGENSEN	METROLOGY DAVID CAMPBELL	CAD II TBA
OCT. 16	MACHINING II BOB SJOSTROM	HANDS ON JOE ESTANO	AUTOMATION RYAN LACY
OCT. 23	HANDS ON JOE ESTANO	AUTOMATION RYAN LACY	MACHINING II BOB SJOSTROM
OCT. 30	CAD II RYAN LACY	WELDING KARA MOGENSEN	METROLOGY DAVID CAMPBELL
NOV. 6	METROLOGY DAVID CAMPBELL	CAD II RYAN LACY	WELDING KARA MOGENSEN
NOV. 13	MACHINING III BOB SJOSTROM	CASTING KARA MOGENSEN	ADDITIVE MANUF. DAVID CAMPBELL
NOV. 20	ADDITIVE MANUF. DAVID CAMPBELL	MACHINING III BOB SJOSTROM	CASTING KARA MOGENSEN
DEC. 4	CASTING KARA MOGENSEN	ADDITIVE MANUF. DAVID CAMPBELL	MACHINING III BOB SJOSTROM

*THERE WILL BE TWO LAB DEMOS FOR EVERY STUDENT ON OCTOBER 9, AND NO LECTURE. THE TIMES FOR THE A AND B SECTIONS ARE INDICATED ABOVE
ALL DEMOS ARE IN EPIC, EXCEPT CAD WHICH IS IN THE ECL, ROOM 125, 15 ST. MARY'S STREET

EK 156 DESIGN AND MANUFACTURE
FIRST EXAMINATION
December 7, 1941

PROBLEM	POINTS	PROBLEM	POINTS
1.	_____	14	_____
2.	_____	15.	_____
3.	_____	16.	_____
4.	_____	17.	_____
5.	_____	18.	_____
6.	_____	19.	_____
7.	_____	20.	_____
8.	_____	21.	_____
9.	_____	22.	_____
10.	_____	23.	_____
11.	_____	24.	_____
12.	_____	25.	_____
13.	_____	26.	bonus

_____
GRADE

STATEMENT

This examination is my own work. I have not had access to anyone else's solution, notes, worksheets for this exam, nor have I given anyone else access to my exam solution, notes or worksheets.* I have not collaborated or discussed this exam with anyone** and 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, given by the other student. If you cannot hand in your own exam, consult the instructor for advice.

**With the exception of the instructor

General Information

In order to bring current relevance to the teaching of engineering courses, to remain up-to-date on the state of the art of various technologies and to satisfy my own curiosity, I subscribe to and read(or scan) a number of publications. Some of these are available in my office for your use. If I am aware of the particular interests of some of my students, I look for and save copies of relevant, current articles about those interests. If you would like to indicate such interests to me on the appropriate line of your registration form for this course, I'll try to spot relevant articles and call your attention to them or provide you with copies for your use and information. Feel free to indicate your interest in a company, industry, technology, product line or one of the publications listed below. A partial list of publications follows.

Daily:

- The New York Times
- The Wall Street Journal
- The Boston Globe
- The Nashua Telegraph

Weekly:

- Time
- Aviation Week*
- Fortune

Monthly:

- Popular Science*
- Popular Mechanics*
- Technology News(MIT)*
- Yachting*
- Car and Driver*
- Automotive Industries*
- Manufacturing Engineering*
- Mechanical Engineering*
- Marine News*
- Maritime Reporter*
- Road and Track*
- Marine Technology*
- Outdoor Life*
- Field and Stream*
- American Rifleman *
- Guns and Ammo *

Sporadically:

- The Times(London)
- Der Spiegel
- International Herald Tribune
- Bangor Daily News
- Trout and Salmon
- La Nacion
- De Telegraaf

*Publications marked with an asterisk are routinely available in my office

1/14/2014

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CLASS LIST REGISTRATION

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 grader in the course.

NAME_____

ID #_____

MAJOR_____

TERM PHONE #_____

EMAIL ADDRESS_____

SPECIAL INTERESTS *_____

_____

- Special interests refers also to any magazines listed of which you would like a copy

Listing your phone and email will allow us to contact you in case of missed assignments or exams.

I acknowledge the receipt of the EK156 DESIGN AND MANUFACTURE syllabus for the FALL 2015 Semester. I have read and I understand the grading policy and the dates of the lab demos and the exams. I have also read the sample exam cover and I understand the honor policy and the statement which I am expected to sign with each exam in the course.

_____

SIGNATURE DATE