Web Page: http://www-personal.umich.edu/~bobden/bob me450.html

Instructors:

Bob Dennis, Course Coordinator <yoda@umich.edu> Prof. Kannatey-Asibu <asibu@umich.edu> Prof. Kota <kota@umich.edu> Prof. Luntz <jluntz@umich.edu> Bob Coury, Director of ME Machine Shop Facilities <hornet@umich.edu> Steven Emanuel, Staff Engineer <fulcrum@umich.edu> Dave Nay, GSI <dnay@engin.umich.edu>

Lectures: T-Th 1:00 to 2:30 pm Chesborough Auditorium; Room 220 Chrysler Bldg

Lab 002: M-W	8:30 - 11:30	2150 Dow	Kannatey-Asibu	
Lab 003: M-W	11:30 - 2:30	104 EWRE	Jon Luntz	
Lab 004: M-W	2:30 - 5:30	1005 DOW	Dave Nay	
Lab 005: T-Th	9:30-12:30	3433 EECS	Dennis	
Lab 006: T-Th	2:30-5:30	3437 EECS	Kota	

Overall structure of the course (divided into the following four periods, approximately by month):

- I September: Design Specification + Concept Generation
- **II October**: Detailed Design
- **III** November: α-Prototype (due before Thanksgiving)
- **IV December**: Redesign, β -Prototype, Design Expo

<u>% of grade</u> <u>Graded Deliverable for each of the four periods:</u>

- 25% I Design Review I: Detailed Design Specification & 5 Design Concepts
- 25% **II** Design Review II: Review of Detailed Design & Engineering Analysis
- 25% **III** Evaluation of α-Prototype vs. Design Specification: Quantitative Metrics
- 25% **IV** Evaluation of Redesign and β -Prototype (at the Design Expo)

Grading is done by each individual section instructor. Final grades will be assigned at the end of the term when the performance of all Design Teams can be evaluated collectively. Peer Evaluations will count heavily toward individual grades. In some cases, Prof. Dennis may make sweeping and arbitrary judgments with no basis in fact or reason.

NOTE: Formal Reports are not necessary. Stick with the facts; be concise and complete. Check each requirement below:

Requirements for each Deliverable:

I - Design Review I: Detailed Design Specification & 5 Design Concepts

Peer Evaluation I from each team member (these will remain *confidential*)

- Definition of the Design Problem or Opportunity (brief, 1 paragraph)
- QFD Chart filled in for each Project, including:
 - An evaluation of competing products, if any
 - An evaluation of 5 alternative Design Concepts

A Gantt Chart (a timetable of each step in the design process until completion of the α -Prototype)

Definition of Functional Metrics (how will you quantitatively evaluate your prototypes?)

II - Design Review II: Review of Detailed Design & Engineering Analysis

Peer Evaluation II from each team member (these will remain *confidential*) The Detailed Design must include:

3-view drawings of all components to be manufactured in the Machine Shop

- A description of manufacturing processes to be used for fabrication of the parts
- A Bill of Materials (BoM), listing each item to be purchased, including the vendor & cost

III - Evaluation of a-Prototype vs. Design Specification: Quantitative Metrics

Peer Evaluation III from each team member (these will remain *confidential*) Completed Gantt Chart, showing Projected Time Table vs. Actual Time Table

The α -Prototype hardware

Prototype Evaluation: Quantitative functional test results for the α -Prototype hardware (vs. Design Spec) A detailed critique of your design, quantitatively comparing performance against your Design Specification Final Bill of Materials (BoM) for the α -Prototype

IV - Evaluation of Redesign and β -Prototype (at the Design Expo)

Peer Evaluation IV from each team member (these will remain confidential)

Redesign Plan based on evaluation of the α -Prototype, to include:

Engineering Change Notices (ECNs), Modifications to the Design Specification, Detailed Design & BoM β -Prototype Hardware and Poster for the EXPO

Final Bill of Materials (BoM) for the β -Prototype

Engineering Notebook (this includes records of all aspects of the design process, from Day 1)

ME450: Design & Manufacturing III

Fall 2003 Syllabus

	ATTENDANCE AT LECTURES IS MANDATORY					
Date	Topic [Lect	turer]	Deliverables Due			
9-2	Introduction, Inspiration, Course Schedule, Project Descriptions [Dennis Design Process, Project Planning, Problem Definition, Notebook, QFD, Gant LAB: Students discuss Project Selection & Team Formation	s] t, Pugh, Desig	n Specification [Dennis]			
9-4	Final Team Formation, Project Selection, Section Swapping[DennisLAB: Teams set individual meeting times with section instructorsDESIGN TEAMS SHOULD CONTACT THEIR SPONSORS AS SOON AS PRO	s] OJECTS ARE	ASSIGNED			
9-9	Use of the Design Portal [Dave Nay]; IDEO Video [Dave N Final team resolution and section swapping as necessary	Nay]				
9-11	Design in Research: Manufacturing Processes [Kannatey-Asibu]					
9-16	Design in Research: Compliant Systems; Exploiting Elasticity in Engineering Design [Kota]					
9-18	Design in Research: Bio Design [Dennis]					
9-23	Electromechanical Design [Luntz]					
9-25	Material Selection [Dennis] For Rev#2: Concept generation, Detailed Design expectations [Dennis] (3-view drawings, assembly drawings, process specifications) LAB: Design Review I Design Specification Due					
9-30	Mechanical Components (how to find and use them) [Dennis] Hand out books from <i>Stock Drive Products</i> (drive components & applications)					
10-2	Reverse Engineering: Dissection of a Mechatronic Device [Dennis]					
10-7	Mechanisms [Kota]					
10-9	CAD-I: Review of Solid Modeling (+ sketch, extrusion, revolution), 3-View Drawings [Steven Emanuel] CAD-II: Assembly Drawings, relational expressions for dimensions [Steven Emanuel] Also: Master Model Concept, Concurrent Engineering, Post-Processing for CAM					
10-14	FALL RECESS No Lab sections during Recess (Oct 13-14)					
10-16	Product Development Process & Tools in Industry [Hank Lenox, host: Kota]					
10-21	Manufacturing Process Planning [Kannatey-Asibu]					
10-23	Safety in Design Survey (short lecture) [Dennis]					
10-28	Rapid Prototyping [Kannatey-Asibu]					
10-30	Design for Ease of Assembly & Manufacturing [Kota] LAB: Design Review II Detailed Design Due					
11-4	Machine Shop Practices: Prototyping & Processes [Coury, Dennis] Tooling & Fixturing; A brief introduction [Dennis]					
11-6	No Lecture					
11-11	No Lecture					
11-13	No Lecture					
11-18	No Lecture					
11-20	Virtual (e-mail) Lecture Notes on Redesign and Evaluation of α -Prototype [Dennis] Engineering Notebooks, Testing and Evaluation, Redesign, BoM, ECN: Expectations for the Expo					
11-25	α-Prototypes MUST be complete: Fly or Die! <i>LAB:</i> Design Review III: Demonstrate and critically evaluate each $α$ -Prototype against the Design Specification					
11-27	THANKSGIVING RECESS					
12-2	No Lecture					
12-4	No Lecture					
12-9	No Lecture Virtual (e-mail) Lecture Notes on Preparation for the DESIGN EXPO [Dennis]					
12-10	DESIGN EXPO: Media UnionDesign Review IV: Performance metrics & redesign strategy of α-Prototypeβ-Prototype Due					

Note: Deliverables and Peer Evaluations (see ME450 web page) are due in the Laboratory section immediately following the indicated lecture, or as arranged with your section instructor.