

ME99 Course Outline

Location: Building 530, Room 539
(The Synthesis Courseware Studio-Laboratory, or "The Morgue")

Times: *Classes* MF 3:15-4:05, W 3:15-5

Instructor: Prof. Sheri D. Sheppard Office Hours: M 11-12, T 1-2:30,
Room 503, Terman & by appointment
725-1590 (office), 494-2363 (home)

Teaching Assistants

Melissa Regan (regan@sunrise) sheppard@sunrise
Center for Design Research, Bldg 560
Chetan Maini (cmains@leland)
521 Terman, 725-3805

Course objectives: The objectives of this course are to give mechanical engineering students:

- (1) a number of experiences in disassembling and reassembling mechanical systems/artifacts in order to be able to reason about function
- (2) insight into the importance of functional specifications in design and how they map into specific functions
- (3) awareness of the non-unique mapping between functional specifications and the final design solution (i.e., multiple solutions)
- (4) the ability to communicate (orally, graphically, and textually) about the function of mechanical components.
- (5) appreciation of technological history.

Targeted Student Group: This course is targeted at freshman- or sophomore-level engineering students. It is particularly well-suited to students who have had little "hands on" experience. It is assumed that students taking this course have had exposure to basic physics, but *no* prior exposure to engineering graphics, statics, strength of materials, or sketching.

Approach: ME99 is based on a series of in-depth dissections. "Dissection" in this context refers to a process of studying the intent and function of a mechanical system, disassembling it in order to see how this intent is realized, then reassembling it. The dissections are of a fishing reel, a ten-speed bicycle, a multi-action toy, an electric drill, and an individual project (to be selected by each student). These dissections are supported by lectures, class activities, tours, and assignments. Unless specified, dissections are done in team of two.

Timing: This course is being offered for three credits on the quarter system. The class will meet three times per week; MWF. The Monday and Friday are 50 minutes, and the session on Wednesday is 1 hour and 45 minutes. It is expected that students will put in 9-10 hours a week on the class outside of the formal class time.

Grading: Grading will be based on class participation, assignments, and final report and presentation. The breakdown is as follows

Class assignments		
	Fishing Reel	10%
	Bike	25%
	Dissection #3 (Toy)	10%
	Dissection #4 (Drill)	10%
	Multimedia addition	15%
Class presentation/participation		10%
Final poster session		20%

Texts:

- Norman, D.A., *The Design of Everyday Things*, Doubleday, 1988
- *Bicycling Magazine's Complete Guide to Bicycle Maintenance*
- Course Reader

Course Communications:

E-Mail: If you do not yet have an account on one of the computer systems on campus, it is highly recommended that you go over to AIR, located on the third floor of Sweet Hall, and obtain one. We will be using e-mail as one, if not *the*, primary communication link for announcements in this class. Even with the best laid plans, classes are hardly static in nature. Changes are inevitable. Please try to check your account at least three or four times a week.

As you probably already know, it can be very difficult to contact someone at Stanford. The urgency of a need is most assuredly inversely proportional to the ease of finding the answer. The nature of this class tends to bring up questions at odd hours. Fortunately, we religiously read e-mail at *almost all* hours of the day. Communicating with us electronically is the fastest and the preferred way to get a response to your query. We encourage you to talk to us anytime; e-mail is the best way to do this. If we are on when you send your request (which you can find out by "fingering" us) you can expect an answer to your question immediately. Usually you will have an answer in a couple of hours.

As soon as possible, please provide us with your e-mail address.

Ours are: sheppard@sunrise, regan@sunrise, cmaini@leland

Drop Boxes: A drop-off box for turning in homework assignments is located in the classroom. In addition, homeworks can be slid under Sheri's office door (503 Terman), or can be given to Kristin Burns (Design Division Secretary) in 551 Terman. In general, assignments will be returned to you in class. Those that are "undeliverable" will be placed in a "pick-up" box in the classroom.

Additional Equipment

Throughout the quarter you may find that you need additional tools for your projects. Please contact Chetan or Melissa and they will attempt to arrange for you to borrow the tools from one of the many shops on campus.

If you have any further suggestions for the tool kits, please let us know and we will attempt to provide them for you.

Video Camera

There is an 8 mm video camera available for your use. This may be helpful in preparing presentations, keeping a video notebook of your project, etc. Please see Melissa to obtain the camera.

Audio/Visual Needs

Throughout the quarter you will be required to do several in-class presentations. The class is equipped with a whiteboard and an overhead projector. If you need any special equipment for these presentations (e.g., slide projector, VCR and monitor), please let us know in advance so we can arrange it for you.

Readings:

- <1> Chapter 1 of Norman, D., The Design of Everyday Things. New York, Doubleday Currency, 1988.
- <2> Introduction to Tools (in course reader)
Story about fishing reels (in course reader)
- <3> Notes on Bearings, Cams, etc. (in course reader)
- <4> Chapters 1, 2 & 3 (pgs. 28-47) in Complete Bicycle Section in Course Reader
1. "Who Invented the Bicycle?"
 2. "The Freedom of the Wheel"
 3. "The Bicycle Story"
- <5> Chapters 12 & 16 in *Bicycling Magazine's Complete Guide ...*
- <6> Chapters 8 & 7 in *Bicycling Magazine's Complete Guide ...*
- <7> Chapters 10, 6 & 4 in *Bicycling Magazine's Complete Guide ...*
- <8> Materials Section of Course Reader
- "A Material World"
 - Reshaping Our Lives"
 - Chapter 2 from Gordon, "Why structures carry loads"
- <9> Chapters 6 & 7 of Norman, D., The Design of Everyday Things. New York, Doubleday Currency, 1988.

REFERENCES:

General descriptions of how things work

Corbeil, J.C., The Facts on File: A Visual Dictionary. New York: Facts on File Publications, 1986.

Fisher, D., and Bragonier, R. J., What's What: A Visual Glossary of the Physical World. Maplewood, N.J.: Hammond Inc., 1990.

Macaulay, D., The Way Things Work. Boston: Houghton Mifflin Company, 1988.

Meyer, J.S., Great Inventions. New York: Pocket Books Inc., 1956.

Montgomery Ward & Co.: Catalogue and Buyer's Guide 1895 (reprint). New York: Dover Publication, 1969.

Parker, S., The Random House Book of How Things Work. New York: Random House, 1991.

Automobile- and Plane-Related

Crouse, W. H. Automotive Mechanics. New York: McGraw-Hill Book Company Inc., 1951.

Heldt, P.M., The Automotive Chassis. New York: Nyack, 1945.

Morton., C.W., A History of Rolls-Royce Motor Cars. London: G.T. Foulis & Co. LTD., 1964.

The Time-Life Book of the Family Car, Time Life Books, 1973.

Wright, O., How We Invented the Airplane. New York: David Mckay Company, Inc., 1953.

Interesting Reads

Burke, J., Connections. Boston: Little, Brown and Co., 1978.

Burke, J., The Day the Universe Changed. Boston: Little, Brown and Co., 1978.

Hughes, T.P., American Genesis: A Century of Invention and Technological Enthusiasm. New York: Penquin Books, 1989.

Norman, D., The Design of Everyday Things. New York, Doubleday Currency, 1988.

Panati, C., Extraordinary Origins of Everyday Things. New York: Harper Collins, 1990.

Tools

Philbin, t., and Ettlinger, S., The Complete Illustrated Guide to Everything Sold in Hardware Stores. New York: Macmillan Publishing Company, 1988.

Watson, A., Hand Tools: Their Ways and Workings. New York: W.W. Norton and Company, 1982.

(Series)

American Heritage of Invention and Technology. New York: American Heritage, a division of Forbes & Co., 1984-present.

Fix it Yourself. Time Life Series, Alexandria Va.: Time Life Books, 1987.

How Things Work. Time-Life Series (12 books), Alexandria, Va. : Time Life Books, 1991.

Time Life Books: Reader Information
 541 North Fairbanks Court
 Chicago, Illinois 60611

Bicycle Repair

Sloane, E. A., Sloane's New Bicycle Maintenance Manual. New York: Simon & Schuster, 1991.

Derailleur 5,10 & 15-Speed Bicycle Repair. Canoga Park, Ca. : Xyzyx Information Corporation, 1972.

Derailleur 3-Speed Bicycle Repair. Canoga Park, Ca. : Xyzyx Information Corporation, 1972.

Bicycle Technology

Sharp, Archibald, Bicycles & Tricycles An Elementary Treatise on Their Design and Construction, The MIT Press, 1984.

Whitt, Frank Rowland, Wilson, David Gordon, Bicycling Science, The MIT Press, 1988.

Bicycle Technology

- Alderson, F., Bicycling: A History. New York: Praeger Publishers, 1972.
- Hayduk, D., Bicycle Metallurgy for the Cyclist. Boulder: Johnson Publishing Co., 1987.
- Leek, S., and Leek, S., The Bicycle: That Curious Invention. Nashville: Thomas Nelson Inc., 1973.
- Marino, J., May, L., and Bennett, H., Bicycling Book. Los Angeles: J.P. Tarcher Inc., 1981.
- Ritchie, A., King of The Road: An Illustrated History of Cycling. Berkeley: Ten Speed Press, 1975.
- Sharp, A., Bicycles and Tricycles. Cambridge: The MIT Press, 1977.
- Sumner, P., Early Bicycles. London: Hugh Evelyn Limited, 1966.
- Whitt, F.R., and Wilson, D.G., Bicycling Science: Ergonomics and Mechanics. Cambridge: The MIT Press, 1974.
- Woodforde, J., The Story of The Bicycle. New York: Universe Books, 1971.
- (Periodicals)
- Brown, S. "Aluminum bikes." Popular Science, March 1987, pp. 86 (3).
- Brown, S. "Exotic material, aerospace technology: world's most advanced bike; featherweight and aerodynamic, it's an Olympic winner." Popular Science, Feb. 1985, pp. 95.
- Kudoda, J. "In praise of steel; fiber's important, but chrome-moly is still the main course." Bicycling, July 1988, pp. 110 (7).
- Redcay, J. "Bicycling's titanium project; how we built a roadworthy 15-pound bicycle." Bicycling, April 1988, pp. 166 (4).
- Williams, L. "Reinventing the wheel: recent advances make bicycles faster, safer and simpler to ride." Time, May 7, 1990, pp. 114.
- "Bicycle and Automobile Number." Scientific American, May 13, 1899.