

# ENGR 100 Introduction to Engineering and Design, Cuyamaca College

Spring Semester 2012, Section 5247

Thursday 6:00 – 8:50 pm, Room H224

Introduction to engineering as a way of perceiving the world, including an overview of design and analytical techniques, problem solving and strategic thinking, disciplines, history, and ethics. Fundamentals of engineering graphics as a universal language, and application to the visualization, representation, and documentation of designed artifacts. This course focuses on the design process and on spatial reasoning and visualization.

## Instructor

Dr. Duncan McGehee

Office: F303

Phone: 619-660-4242

email: [duncan.mcgehee@gcccd.edu](mailto:duncan.mcgehee@gcccd.edu), Website: [www.cuyamaca.edu/duncan.mcgehee](http://www.cuyamaca.edu/duncan.mcgehee).

Blackboard Website: <https://gcccd.blackboard.com>.

Office Hours: MW 1 – 2:30 pm, MW 5:30 – 6 pm, Th 5 – 6 pm, or by appointment

## Units and Prerequisites

3 units. No prerequisites.

## Tentative Schedule

Date	Lecture Topic	Lab Topic
26 Jan	Intro, What is engineering?	Intro: Sketching
2 Feb	Design 1: Engineering design overview	Sketching and lettering, Engineering drawings
9 Feb	Analysis 1: Engineering units and numbers	Orthographic projections 1
13 Sept	Design 2: Defining the design problem	Orthographic projections 2
23 Feb	Analysis 2: Selecting the right material	Design Team Meetings – Design Brief
1 Mar	Design 3: Generating design ideas	Isometric views 1
8 Mar	Analysis 3: Structures	Isometric views 2
15 Mar	Design 4: Selecting the best design	Oblique views
22 Mar	Analysis 4: Mechanical systems	Dimensioning
29 Mar	Design 5: Reverse Engineering	Using Drawings
2-6 Apr	<b>Spring Break</b>	
12 Apr	Design 6: Documentation and prototyping	Assembly drawings, Puzzle cube design
19 Apr	Analysis 5: Digital circuits	Microcontrollers
26 Apr	Design 7: Tolerances	Auxiliary Views
3 May	Ethics 1	Section views
10 May	Ethics 2	Design Team meetings
17 May	Design 8: Group Presentations	The future of engineering
24 May	Final Examination	

## Important dates

3 February: Final day to add classes, or to drop without a 'W'.

20 April: Final day to drop classes.

*subject to minor changes*

# ENGR 100 Introduction to Engineering and Design, Cuyamaca College

Spring Semester 2012, Section 5247

Thursday 6:00 – 8:50 pm, Room H224

## Grading

A: 90 - 100  
B: 80 - 89.9999  
C: 70 - 79.9999  
D: 60 - 69.9999  
F: < 60

Online Pre-class quizzes	10%
Weekly Homework and Drawings	40%
Design Project 1 – Puzzle Cube	10%
Design Project 2 – Team Design Proj.	20%
Engineering Drawing portfolio	8%
Engineering Design Notebook	2%
Final Examination	10%
	<hr/>
	100%
Extra credit: e-choices career assessment	2%

## Text

Required:

*Engineering Graphics: Tools for the Mind (with DVD)*. B. Graham, ISBN 978-1-58503-412-3, SDC Publishing Co., 2007.

*ENGR 100 Lecture Notes*, available only in the bookstore.

## Required supplies

Scientific calculator – bring it to all classes

Mechanical Pencil – 0.7 mm or 0.9 mm (if you don't already have one of these, choose 0.9 mm). Use HB lead

White vinyl eraser

High quality quad ruled (square) graph paper (4 squares/inch, 8.5" x 11", 70 sheets). **Do not buy it with holes.**

¼ inch isometric graph paper. Download a printable pdf version from [www.cuyamaca.edu/duncan.mcgehee](http://www.cuyamaca.edu/duncan.mcgehee)

Quad ruled (5 squares/inch) bound notebook, 9.75" x 7.5" format

3-ring binder and 10 plastic sheet protectors for your drawing portfolio. I recommend a ½-inch or 1-inch binder.

Access to a personal computer with speakers or earphones and internet access

## Policies

- 1) This course stresses teamwork, particularly on Design Project 2. It is vital that all communication remain respectful and courteous.
- 2) Timeliness is a vital part of engineering. This means 2 things:
  - a) Don't be late for class.
  - b) Homework, lab projects, and drawings turned in more than 5 minutes after class starts will receive 50% of the grade they otherwise would have earned. Work submitted after the due date will not be accepted. If you must miss class, you may submit the work early, or ask a classmate to submit it for you.
- 3) Cell phones must be off before class begins. This includes text messages transmitted and received.

## Course Objectives (Expected Student Learning Outcomes)

Students will be able to:

- 1) Describe the role of the engineer in our society as a critical thinker, innovator, and problem solver. Differentiate among the various disciplines of engineering, describing typical projects done within each, and describing the necessary academic preparation and reasons for each.
- 2) Apply engineering design methods and strategic thinking to solve problems in the development of new or improved products.
- 3) Apply engineering analytical skills and methods to solve real world problems, including for example the application and conversion of units.
- 4) Use appropriate written and oral forms of technical communication to present, explain, and justify engineering design decisions.
- 5) Apply engineering graphics as a universal language for technical communication:
  - a. Draw freehand technical sketches which demonstrate knowledge of basic engineering conventions, including the American standard arrangement of views, the use of a title block, standard drawing sizes, basic line types, proper dimensioning technique.
  - b. Apply techniques of descriptive geometry and spatial reasoning to represent 3-dimensional objects in 2 dimensions. Translate single-view pictorials into multi-view orthographic drawings. Given two orthographic views, draw a third orthographic view and a single-view pictorial.
  - c. Given a real object, draw all necessary orthographic, pictorial, sectional, and auxiliary views. Include sufficient but not excessive dimensions.
- 6) List the basic ethical rules governing engineers and apply them in ethically murky situations.

*subject to minor changes*

# ENGR 100 Introduction to Engineering and Design, Cuyamaca College

Spring Semester 2012, Section 5247

Thursday 6:00 – 8:50 pm, Room H224

## Grading criteria for drawings

These criteria will be applied in evaluating your engineering drawings, both informally during the semester, then very formally at the end of the semester when your drawing portfolio is evaluated.

Each drawing is worth 5 points, if perfect.

Points are removed according to the following:

### Format

*Paper:* Use 4 squares per inch (aka 1/4") graph paper for multiview and oblique drawings, 1/4" isometric paper for isometric drawings. Paper does not have holes in it. (5 pts)

*Border:* All drawings must have a border. Please draw borders as close to the edge of the paper as possible. (5 pts)

*Title bar:* Title bar must contain the following: Your name, ENGR 100, the date, and the drawing number (5 pts)

*American Standard Arrangement of Views:* All drawings must follow (5 pts)

### Lines and points

Lines and points must be shown correctly, including proper weight and precedence of lines.

1 point will be removed for each of the following problems:

Points located incorrectly (1 point for each incorrectly located point)

Lines missing or located incorrectly (1 pt for each missing or incorrect line)

Lines shown using wrong linetype (1 pt overall)

Line weight is consistently incorrect (1 pt overall)

### Other information

#### Dimensions

Extension lines shown incorrectly (1 pt for 1 problem area, 2 pts max)

Arrows not shown (2 pts)

Diameters and radii incorrectly represented (1 pt per problem area, 2 pts max)

Dimensions to hidden lines (1 pt overall)

Insufficient dimensions to fully describe part (1 pt per insufficiency)

Excess dimensions (part overdescribed) – no points off, but a warning

#### Scale information

Scale information missing if drawing scale is anything other than 1:1 (1 pt)

### Neatness

*Up to 5 points may be removed at the discretion of the instructor for neatness problems.*

Lines must be straight and clean

Lettering must be 1/4 inch tall and neat in the title bar, 1/8 inch tall in dimensions and notes

Circles and ellipses must be neat and well-formed.

## The Engineering Design Notebook

1. Put your name, phone number, and email address on the cover. Also label your first notebook Design Notebook #1, and write the present date with a hyphen. So for example if you're starting the notebook on January 26, 2012, write January 26, 2012 - . When you have filled up all pages of the notebook, write the ending date on the front cover, and start Design Notebook #2.
2. Put an index on the first page.
3. Date every page. I find it easiest to put the date in the upper outer corner of the page.
4. *Never* tear out a page.
5. Leave no blank pages between used pages. Draw a big X through any such blank pages.
6. Write in ink, preferably, or if you write in pencil, NEVER ERASE. Instead, draw a big X through any calculations or drawings that you believe are in error.
7. Use the notebook to document all your thoughts and activities relating to any engineering task, or any inventions.
  - a. Include all data, sketches, calculations, notes, etc.
  - b. Document meetings, including results and assigned tasks.
  - c. Paste or tape in computer outputs, photos, etc.
  - d. If there is something in your notebook that might be patentable, ask someone else to sign and date all the relevant pages as a witness.

*subject to minor changes*

# ENGR 100 Introduction to Engineering and Design, Cuyamaca College

Spring Semester 2012, Section 5247

Thursday 6:00 – 8:50 pm, Room H224

## Additional books, magazines, and websites

### Books

*The Design of Everyday Things*, Donald Norman, 2002.

*Why Buildings Stand Up*, Mario Salvadori, 2002.

*The World Is Flat*, Thomas Friedman, 2007.

*Soul of a New Machine*, Tracy Kidder, 2000.

*The Existential Pleasures of Engineering*, Samuel Florman, 1994.

### Magazines

*Wired*

*Make*

### Websites:

[www.cuyamaca.edu/engr](http://www.cuyamaca.edu/engr): Cuyamaca College's Engineering Website.

[www.asce.org](http://www.asce.org): The American Society of Civil Engineers (ASCE) is the leading organization of civil engineers. Good deals for students.

[www.asme.org](http://www.asme.org): The American Society of Mechanical Engineers (ASME) is the leading organization that mechanical engineers belong to.

[www.ieee.org](http://www.ieee.org): The Institute of Electrical and Electronic Engineers (IEEE) is the leading organization of electrical engineers.

This course adheres to policies outlined in the Cuyamaca College Catalog. For further information, please see the section of the catalog entitled *Academic Policies*.

*subject to minor changes*