# COURSE INFORMATION

Spring 2009

**EGR 110**
**Engineering Graphics**
**Pre-requisite**: none
**Co-requisite**: MTH 166 or MTH 164
**Credits**: 3
**Lecture Hours**: 2 **Lab Hours**: 2

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## Course Description:

EGR 110 is an introductory engineering design course where students will be introduced to the engineering design process and will be given instruction in two powerful tools related to engineering design: Autodesk Inventor and MATLAB. The course includes three main topics: engineering graphics using sketching and solid modeling, the solution of engineering problems using MATLAB, and the engineering design process.

Instruction in engineering graphics will be given through the use of sketching exercises to cover orthographic projection, multiview drawings, dimensioning, tolerancing, fasteners, sectional views, and auxiliary views. Autodesk Inventor will also be used to investigate solid modeling, including extrusion, revolution, parametric modeling, mass properties of solids, and assembly drawings.

Instruction in engineering problem solving will be given using MATLAB and will include such topics as graphing, built-in and user-defined functions, formatted input/output, function m-files, script m-files, repetition structures, and decision structures.

Instruction in the engineering design process will include a semester long team project where students will design and build some product. The project will include research on related products, extensive modeling using Inventor, limited analysis using MatLab, assembly drawings, testing, team reports, and team presentations.

## Course Objective:

The general objectives of EGR 110 are:

1. to introduce the student graphical concepts, principles, and techniques in order that his/her ability to solve engineering design problems may be enhanced.
2. to introduce the student to standards and practices in drawings such that he/she will be able to read and understand working drawings.
3. to investigate techniques in descriptive geometry for determining spatial relationships.
4. to introduce the student to parametric solid modeling using Autodesk Inventor as a design tool.
5. to introduce the student to engineering problem solving using MATLAB, including such topics as graphing, built-in and user-defined functions, formatted input/output, function m-files, script m-files, repetition structures, and decision structures.
6. to introduce the student to the engineering design process and to give students an opportunity to work with a team in order to design and model a product using Inventor.

## Grading:

Course grades will be computed based on the following percentages:

| | |
|---|---|
| Sketching Test (classroom) | 20% |
| Sketching Assignments (≈8) | 20% |
| Inventor Assignments (≈9) | 20% |
| MATLAB Assignments (≈5) | 15% |
| Design Project (see below) | 25% |

## Grading Scale:

Grades will be based on the following scale:

A: 90 – 100
B: 80 – 89
C: 70 – 79
D: 60 - 69
F: 0 – 59

## Design Project:

Students will be divided into teams and will work together in a semester-long effort to design and model some product using Autodesk Inventor. The grade for the design project will include:

- Attendance – team members depend on each other and your grade will be reduced for each absence
- Solid modeling – the product to be designed will be modeled using Inventor and will include assembly drawings
- Report – a report on the steps of the design will be required (more details will be provided later)
- Presentation – the team will be required to make a presentation before the class on their design
- Assessment – team members will evaluate each other's level of participation in the project

**Late assignments:** Assignments will be accepted up to two weeks late with a 10% penalty. No assignments will be accepted that are more than two weeks late.

## Course Material:

1. **Lecture Notes** - This is an important source of information for this course. Material covered in lecture may not always be found in the textbook. If any lectures are missed, the student should try to copy the notes from another student. Note that missing class on days when students work as teams will result in a grade penalty.
2. **Graphics Workbook** - Reading assignments and problem assignments will be made from this workbook/textbook. It will serve to reinforce material covered in the lectures. The workbook used in this course is: Craig, ***Engineering Graphics Workbook–Series 2***, Schroff Development Corporation, 1999. (ISBN: 1-887503-88-9)
3. **Autodesk Inventor Textbook** - The following textbook is required and will be used for reading and problem assignments: Shih, ***Parametric Modeling with Autodesk Inventor 2009***, Schroff Development Corporation. (ISBN: 978-1-58503-457-4) Note: Students with a valid college email address can also download a 1-year version of the software from Autodesk at http://students3.autodesk.com/
4. **MatLab Textbook** - The following textbook is required and will be used for reading and problem assignments: Gilat, ***MatLab: Introduction with Applications, 3rd Edition***, Wiley, 2007. (ISBN: 978-0-470-10877-2).
5. **File storage device** - Students should bring some sort of storage device to class for storing files, such as a USB memory device. Be sure to put your name on any storage device as they are often left in lab!

## Absence:

Students are expected to attend all classes and to make good use of lab time to complete assignments. Students may be administratively withdrawn from the course for excessive absences according to college policy. Students are responsible for any material covered or assignments given in the case of absence. Note that missing class on days when students work as teams will result in a grade penalty.

## Tentative Course Outline:

EGR 110 will meet for one hour per week in a classroom and three hours per week in a CAD lab.

| Week | Classroom (1 hour/week) | Computer Lab (3 hours/week) |
|---|---|---|
| 1 | Introduction<br>Sketching, Line types, Multiview drawings<br>2-view, 3-view, and 6-view layouts<br>Sketching Assignment #1 | Chapter 1: Getting Started<br>Computer requirements, program stability, menus, file types (parts, drawings, etc)<br>Chapter 2 – Parametric Modeling Fundamentals<br>Parametric part modeling process, rough sketches, simple dimensions (constraints), editing dimensions, lines, circles, pan, zoom, dragging, Extrusion (E), 3D rotate, switching between sketches/models, Sketch planes, "Look At" tool, printing sketches<br>Inventor Assignment #1 |
| 2 | Isometric drawings<br>Discuss perspective views<br>Sketching Assignment #2 | Review Chapters 1 & 2<br>Geometric constraints (11 types), inferred points, showing/adding/removing constraints, fully constrained objects, snaps, editing tools (move, copy, trim, extend), Adding extruded features (additional sketches), sketch planes, "Look At"<br>Extrusion – cut, union, intersection;<br>Inventor Assignment #2 |

**Tentative Course Outline**: (continued)

| | | |
|---|---|---|
| 3 | Engineering Design Process, teamwork, presentations, reports<br>Design Project (semester team project)<br>Team Step 1: Form teams in class | Chapter 8 – Drawing Files<br>Binary tree/locator design (relate design approach to building the part)<br>Drawing files, base vies, projected views, annotating drawings (dimensions, centerlines, notes), dimension styles, scale, selecting/modifying a title page, printing<br>Inventor Assignment #3 |
| 4 | Isometric drawings<br>Missing line/missing view problems<br>Sketching Assignment #3 | Chapters 3, 4, 10<br>Grid and snap settings, sketched features versus placed features,<br>Hole (H) – depth, thru all, threads, etc<br>Chamfer and fillet, threads<br>Browser (model history) – sequential record of steps as if machining the part<br>Revolved features - Revolve (R)<br>Symmetrical Features – Circular patterns and rectangular patterns<br>Centerlines and diametric dimensions<br>Inventor Assignment #4 |
| 5 | Dimensioning<br>Sketching Assignment #4 | Chapters 7, 9, 11<br>Work planes – XY, YZ, ZX work planes, offset work planes<br>Swept features – two sketches required (path and profile)<br>Inventor Assignment #5 |
| 6 | Dimensioning<br>Tolerance<br>Fasteners<br>Sketching Assignment #5 | Chapter 5 – Parametric Constraint Fundamentals<br>Parametric modeling – capturing the design intent of the user through geometric constraints, dimensional constraints, and parametric relations.<br>Fully constrained parts, Auto Dimension, fixing points, driven dimensions<br>Parametric relations – dimension variables & equations, viewing dimension variables<br>Inventor Assignment #6 |
| 7 | Sectional views<br>Sketching Assignment #6 | Chapter 12 – Assembly Modeling – Putting It All Together<br>Creating multiple parts, selecting the base part, placing parts, editing parts<br>Assembly constraints - 4 types: mate, angle, tangent, insert<br>Degrees of freedom, moving and rotating components, exploded views<br>Assembly drawings – parts lists, materials, iProperties, balloons<br>Inventor Assignment #7 (two week assignment) |
| 8 | Test (Weeks 1-6) | No Inventor lecture. Continue work on Inventor Assignment #7 |
| 9 | Sectional views<br>Sketching Assignment #7 | Mass properties of solids. Center of gravity, volume, density, weight, moments of inertia, etc. Mass properties for each part and for the assembly. Viewing the center of gravity (symbol). Available materials in Inventor. Specifying new types of materials.<br>Inventor Assignment #8 |
| 10 | Auxiliary views<br>Sketching Assignment #8 | Sectional views and auxiliary views.<br>Full sections, half-sections, aligned sections, offset sections. Editing sectional views.<br>Inventor Assignment #9 |
| 11 | MatLab lecture #1<br>MatLab Assignment #1 | MatLab environment; windows in MatLab, Vectors and scalars, Variable names<br>Expressions in MatLab, Order of Operations, Functions<br>Formatting, clearing the screen, clearing memory, Re-executing commands<br>Work on MatLab Assignment #1, Work on team projects |
| 12 | MatLab lecture #2<br>MatLab Assignment #2 | Scripts files (.m files), Changing the current directory, Input command, formatting outputs, Writing MatLab programs<br>Work on MatLab Assignment #2, Work on team projects |
| 13 | MatLab lecture #3<br>MatLab Assignment #3 | Dot operations, Tables and graphs, Formatting<br>Work on MatLab Assignment #3, Work on team projects |
| 14 | MatLab lecture #4<br>MatLab Assignment #4 | Conditional control: branching structures, Relational and logical operators<br>Work on MatLab Assignment #4, Work on team projects |
| 15 | MatLab lecture #5<br>MatLab Assignment #5 | Iterative Structures; ***for*** loops, Work on MatLab Assignment #5<br>Team Presentations, Team Assessment |
| 16 | No final exam | Team Final Report Due |

# General Information

## TCC College and Student Handbook

Students are responsible for being aware of the policies, procedures, and student responsibilities contained within the current edition of the Tidewater Community College Catalog and Student Handbook. Students should familiarize themselves with the College's policies regarding misconduct and inclement weather policies found in the Student Handbook.

## Last Day to Withdraw Without Academic Penalty

You may withdraw from a course without academic penalty during the first 60% of a session and receive a grade of "W"(withdrawal). The last day to withdraw without academic penalty is **March 20, 2009**. After that date, the student will receive a failing grade of "F" or "U". Exceptions to this policy may be made ONLY when initiated by the instructor and approved by the division dean; ONLY if you are able to document mitigating circumstances; and ONLY if you were making satisfactory progress in the course. **Students are advised to discuss attendance irregularities with the instructor. Do not simply stop attending. Failure to properly complete the withdrawal procedure may result in the assignment of "F" or "U" grades to your permanent record.**

## Disability Services Statement

Disabilities Services of Tidewater Community College provides students, faculty, and staff programmatic and physical access in a supportive atmosphere and in accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act of 1990. In appreciation of the unique talents and needs of students with disabilities and chronic health issues, Disabilities Services further provides an array of services designed to enhance all educational experiences. *Students with disabilities or chronic health problems are encouraged to identify themselves to a Disability Services [DS] Counselor as early as possible. DS Counselors are on all campuses. Students with documented disabilities may qualify for academic accommodations such as more time on tests, sign language interpreting or Braille.*

## Emergency Procedures

In the event of a bomb threat, tornado, or fire, students and staff may be asked to evacuate the building or move to a secure location within the building. Evacuation routes for movement to an external location or to a shelter within the building are posted at the front of the room. Students should review the maps and make sure that the exit route and assembly location for the building are clearly understood. If you have a disability that may require assistance during an evacuation, please let your faculty know at the end of the first class.

## Cheating

College rules state that a student may be subjected to disciplinary action for academic cheating, plagiarism, or assisting in cheating or plagiarism. Disciplinary penalties include college dismissal or suspension. In addition, cheating, plagiarism, or assisting such activity is a most serious form of academic misconduct, and will in the sole discretion of the faculty member result in a grade of F on the work or for the course. A single act of cheating may subject a student to both a failing grade in the course, and student disciplinary action perhaps involving suspension or dismissal from TCC.