Course Number & Name: ENR 103 Engineering Graphics and Introduction to CAD

Credit Hours: 2.0  Contact Hours: 3.0  Lecture: 1.0  Lab: 2.0  Other: N/A

Prerequisites: Grades of “C” or better in ENR 100 and MTH 092

Co-requisites: None  Concurrent Courses: None

Course Outline Revision Date: Fall 2010

Course Description: This course covers the fundamentals of engineering graphics including the drawing of orthographic, isometric, and auxiliary projections. Other topics include scaling, sectioning, dimensioning, and drawing documentation. This course uses the latest release of computer-aided design (CAD) software commonly used in industry to introduce students to CAD interface, structure, and commands.

Course Goals: Upon successful completion of this course, students should be able to do the following:

1. explain and apply the basics of blueprint reading, preparation and detailing of technical drawings, drawing scale, title block, revision block, additional notes, etc.;
2. utilize free-hand sketching and basic drafting instruments in geometric construction;
3. employ shape description and drawing preparation techniques of multi-view orthographic projection and 3D visualization using isometric, oblique, and perspective views created via instrumental drafting techniques;
4. apply shape description and drawing preparation techniques through the creation of parametric 3D solid models using Inventor software in order to prepare detailed drawings which contain all necessary dimensions and annotations, including geometric dimensioning & tolerancing (GD&T); and
5. use additional shape description tools of sectioning, auxiliary, detail, break, and broken-out views to complete shape description in order to create the assembly of many components of the design object and generate exploded assembly and bill of materials.

Measurable Course Performance Objectives (MPOs): Upon successful completion of this course, students should specifically be able to do the following:

1. Explain and apply the basics of blueprint reading, preparation and detailing of technical drawings, drawing scale, title block, revision block, additional notes, etc.:
   1.1 examine actual working drawings from industry;
   1.2 break down a blueprint into shape and size description and additional annotations; and
   1.3 determine how blueprints are prepared and detailed based on ANSI standards
Measurable Course Performance Objectives (MPOs) (continued):

2. Utilize free-hand sketching and basic drafting instruments in geometric construction:
   
   2.1 *identify and describe the use of basic drafting instruments including scales, triangles, T-squares, compasses, protractors, etc.;*
   
   2.2 *employ basic drafting instruments to complete several drawings; and*
   
   2.3 *explain and employ engineering and architectural drawing scales as necessary*

3. Employ shape description and drawing preparation techniques of multi-view orthographic projection and 3D visualization using isometric, oblique, and perspective views created via instrumental drafting techniques:

   3.1 *prepare several geometric shape description exercises which include complete lettering; and*
   
   3.2 *complete isometric and oblique views of objects given standard orthographic views*

4. Apply shape description and drawing preparation techniques through the creation of parametric 3D solid models using Inventor software in order to prepare detailed drawings which contain all necessary dimensions and annotations, including geometric dimensioning & tolerancing (GD&T):

   4.1 *create parts and drawings in Inventor and dimension the drawings; and*
   
   4.2 *complete drawings with specific geometric dimensioning and tolerancing*

5. Use additional shape description tools of sectioning, auxiliary, detail, break, and broken-out views to complete shape description in order to create the assembly of many components of the design object and generate exploded assembly and bill of materials:

   5.1 *generate standard views and sectional, auxiliary, detail, broken-out, and break views;*
   
   5.2 *detail individual parts of the assembly, show exploded view, etc.; and*
   
   5.3 *add bill of materials to the final assembly drawing*

**Methods of Instruction:** Instruction will consist of lectures/reviews, demonstrations, exercises/projects, and individual CAD work.

**Outcomes Assessment:** Test and exam questions are blueprinted to course objectives. Checklist rubrics are used to evaluate the exercises/projects and course portfolio for the presence of course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

**Course Requirements:** All students are required to:

1. Maintain regular attendance.
2. Complete homework assignments and exercises/projects on time.
3. Sit for all tests and exams as scheduled.
**Methods of Evaluation:** Final course grades will be computed as follows:

<table>
<thead>
<tr>
<th>Grading Components</th>
<th>% of final course grade</th>
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</thead>
<tbody>
<tr>
<td>Exercises/Projects and Course Portfolio</td>
<td>10 – 20%</td>
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<tr>
<td>Exercises/projects and the portfolio consist of drawings which will be graded for content and for timeliness. Drawings will show evidence of the extent to which students meet course objectives.</td>
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<tr>
<td>2 or more Tests (dates specified by the instructor)</td>
<td>45 – 60%</td>
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<td>Tests will show evidence of the extent to which students meet course objectives, including but not limited to identifying and applying concepts and executing correct drawings neatly and completely.</td>
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<tr>
<td>Final Exam (comprehensive)</td>
<td>25 – 30%</td>
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<td>The same objectives apply as with tests, but it is anticipated that students will provide increased evidence of synthesizing a combination of concepts.</td>
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**Note:** The instructor will provide specific weights, which lie in the above-given ranges, for each of the grading components at the beginning of the semester.

**Academic Integrity:** Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College. Academic dishonesty includes, but is not limited to, the following:

- plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information;
- cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
- interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
- fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions. Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

**Student Code of Conduct:** All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time for all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.
**Course Content Outline:** based on the text *Introduction to Engineering Graphics and CAD*, by H Assadipour; published by Yafa Educational, Montclair, NJ, 2010.

<table>
<thead>
<tr>
<th>Class Sessions (80 minutes)</th>
<th>Content/Topics</th>
</tr>
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</table>
| 1                           | **INTRODUCTION TO BLUEPRINT READING**  
*Shape description and size description*  
*Drawing scale, title block, revision block, and additional annotations* |
| 2                           | **FREE-HAND SKETCHING/LETTERING**  
*Introduction to drafting instruments* |
| 3                           | **GEOMETRIC CONSTRUCTIONS WITH INSTRUMENTS**  
*Exercises on geometric constructions* |
| 4                           | **WORKING WITH DRAFTING INSTRUMENTS AND SCALES**  
*Exercises on using the scales* |
| 5                           | **GEOMETRIC CONSTRUCTIONS WITH INVENTOR SOFTWARE** |
| 6                           | **INTRODUCTION TO MULTI-VIEW ORTHOGRAPHIC PROJECTIONS**  
*Inventor and sketching exercises* |
| 7                           | **INTRODUCTION TO 3D VISUALIZATION**  
*Inventor and sketching exercises* |
| 8 – 10                      | **DIMENSIONING**  
*Dimensioning exercises using Inventor* |
| 11                          | **DIMENSIONING WITH TOLERANCES**  
*Tolerancing exercises using Inventor* |
| 12                          | **Test #1** |
| 13                          | **DIMENSIONING WITH GEOMETRIC TOLERANCES**  
*Tolerancing exercises using Inventor* |
| 14                          | **INTRODUCTION TO SECTIONING**  
*Sectioning exercises using Inventor* |
| 15                          | **MORE ON SECTIONAL VIEWS**  
*Full, half, offset, aligned, and broken-out views* |
| 16 – 17                     | **AUXILIARY VIEWS**  
*Auxiliary view exercises using Inventor* |
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| 18 – 19                     | **DETAIL VIEWS**  
**Detail view exercises using Inventor** |
| 20                          | **Test #2**      |
| 21                          | **BREAK VIEWS**  
**Break & detail view exercises using Inventor** |
| 22                          | **DISCIPLINE-SPECIFIC PROJECTS**  
**Sample AutoCAD projects in surveying and mapping** |
| 23                          | **MORE ON MAPPING AND SURVEYING**  
**Constructing a site plan** |
| 24                          | **DISCIPLINE-SPECIFIC PROJECTS**  
**Completing a floor plan for an office space project** |
| 25 – 26                     | **DISCIPLINE-SPECIFIC PROJECTS**  
**Electronic circuit board project** |
| 27                          | **CREATING ASSEMBLIES**  
**Assembly project consisting of base, swivel, nut & bolt** |
| 28                          | **CREATING A BILL OF MATERIALS (BOM)** |
| 29                          | **Course Review** |
| 30                          | **Final Exam** on all course material covered |