

ITT Technical Institute

IE1215

Basic Industrial Engineering Graphics

Onsite and Online Course

SYLLABUS

Credit hours: 4.5


Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisite: IE1110 Introduction to Industrial Engineering Technology or equivalent

Course Description:

This course examines methods of documenting the engineering of a product in process planning and production planning. Topics include introduction to design, design using CAD, geometric construction, sketching, lettering, lines, 3D drawing, orthographic projection, auxiliary views, dimensioning and tolerancing, tolerance and fit, assembly and exploded assembly models, thread, fastener, springs, bill of material, documentation and working drawings, and parametric modeling. Students also study how to read engineering drawings and produce a bill of material for a product.



COURSE SUMMARY

COURSE DESCRIPTION

This course examines methods of documenting the engineering of a product in process planning and production planning. Topics include introduction to design, design using CAD, geometric construction, sketching, lettering, lines, 3D drawing, orthographic projection, auxiliary views, dimensioning and tolerancing, tolerance and fit, assembly and exploded assembly models, thread, fastener, springs, bill of material, documentation and working drawings, and parametric modeling. Students also study how to read engineering drawings and produce a bill of material for a product.

MAJOR INSTRUCTIONAL AREAS

1. Visual Thinking
2. Freehand Sketching
3. Projections and Pictorial Views
4. Digital Simulation Tools

COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Utilize the graphic language to communicate design ideas.
2. Create technical drawings with typical drawing instruments and drafting equipment and demonstrate basic drafting, linework, and lettering skills.
3. Create both two- and three-dimensional sketches.
4. Explain the relationship between three dimensional objects, multiview drawings, and isometric drawings and demonstrate their proper construction techniques.
5. Describe the engineering design process.
6. Apply proper dimensioning practice according to the American National Standards Institute (ANSI) and demonstrate Geometric Dimensioning and Tolerancing (GD&T) as a design language for size, shape, and geometric characteristics of manufactured parts.
7. Demonstrate the techniques required to create orthographic projections, section and auxiliary views, and various pictorial drawings.

8. Create drawings of gears and cams and describe how they are dimensioned.
9. Identify different types of removable fasteners and demonstrate how they are notated on engineering drawings.
10. Describe the procedures for constructing and managing a set of technical drawings.

COURSE OUTLINE

MODULE 1: INTRODUCTION TO ENGINEERING DESIGN

COURSE LEARNING OBJECTIVES COVERED

- Utilize the graphic language to communicate design ideas.
- Describe the engineering design process.

TOPICS COVERED

- Engineering Design Process
- Concurrent Engineering
- Technical Reports

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapter 1.	No	3 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled “Traditional Engineering Versus Concurrent Engineering.”	Yes	1.5 hr
Lab: Complete the lab titled “Communicating Design Ideas.”	Yes	N/A
Project: Read and begin the project.	No	2 hr

Total Out-Of-Class Activities: 8.5 Hours

MODULE 2: 2D AND 3D SKETCHING

COURSE LEARNING OBJECTIVES COVERED

- Create technical drawings with typical drawing instruments and drafting equipment and demonstrate basic drafting, linework, and lettering skills.
- Create both two- and three-dimensional sketches.
- Demonstrate the techniques required to create orthographic projections, section and auxiliary views, and various pictorial drawings.

TOPICS COVERED

- Sketching Tools and Materials
- Sketching Techniques
- Planar Projections
- Pictorial Views

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapters 2 and 3.	No	5.5 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled “Importance of Freehand Sketching.”	Yes	N/A
Exercise: Submit the exercise titled “Sketching Isometric and Oblique Projections.”	Yes	3 hr
Lab: Complete the lab titled “Creating 2D and 3D Sketches.”	Yes	N/A
Project: Continue work on Project Part 1.	No	2 hr

Total Out-Of-Class Activities: 12.5 Hours

MODULE 3: WORKING WITH VIEWS

COURSE LEARNING OBJECTIVES COVERED

- Explain the relationship between three dimensional objects, multiview drawings, and isometric drawings and demonstrate their proper construction techniques.
- Demonstrate the techniques required to create orthographic projections, section and auxiliary views, and various pictorial drawings.

TOPICS COVERED

- Multiviews
- Auxiliary Views
- Section Views

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapters 4 and 5.	No	5.5 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled “Multiview Projection Characteristics.”	Yes	N/A
Exercise: Submit the exercise titled “Working with Views.”	Yes	4 hr
Lab 1: Complete the lab titled “Sketching Multiviews and Isometric Views.”	Yes	N/A
Lab 2: Complete the lab titled “Sketching Auxiliary and Section Views.”	Yes	N/A
Project: Continue work on Project Part 1.	No	2 hr

Total Out-Of-Class Activities: 13.5 Hours

MODULE 4: DIMENSIONING AND TOLERANCING

COURSE LEARNING OBJECTIVES COVERED

- Apply proper dimensioning practice according to the American National Standards Institute (ANSI) and demonstrate Geometric Dimensioning and Tolerancing (GD&T) as a design language for size, shape, and geometric characteristics of manufactured parts.
- Describe the procedures for constructing and managing a set of technical drawings.

TOPICS COVERED

- Dimension Terminology
- Dimension Techniques
- Tolerance

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapters 6 and 7.	No	6.5 hr
Lesson: Study the lesson for this module.	No	2 hr
Discussion: Participate in the discussion titled “Metric Versus English Unit Dimensions.”	Yes	1.5 hr
Exercise: Submit the exercise titled “Dimensioning Rules.”	Yes	3 hr
Lab: Complete the lab titled “Applying Dimensioning Techniques.”	Yes	N/A
Project: Submit Project Part 1.	Yes	3 hr

Total Out-Of-Class Activities: 16 Hours

MODULE 5: NOTATING ENGINEERING COMPONENTS

COURSE LEARNING OBJECTIVES COVERED

- Create drawings of gears and cams and describe how they are dimensioned.
- Identify different types of removable fasteners and demonstrate how they are notated on engineering drawings.

TOPICS COVERED

- Gears
- Cams
- Removable Fasteners

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapters 8–10.	No	5 hr
Reading: ITT Tech Virtual Library> Basic Search> Richards, Keith L. (2013), <i>Design Engineer's Handbook> Chapters 12 and 13.</i>	No	3 hr
Reading: ITT Tech Virtual Library> Basic Search> Padfield, C. (1998), Automotive fasteners. <i>Advanced Materials & Processes, 154(4), 49.</i>	No	1 hr
Lesson: Study the lesson for this module.	No	2 hr
Exercise: Submit the exercise titled "Sketching Bolts."	Yes	2 hr
Lab 1: Complete the lab titled "Drawing Gears and Cams."	Yes	N/A
Lab 2: Complete the lab titled "Sketching Removable Fasteners."	Yes	N/A
Project: Begin work on Project Part 2.	No	2 hr
Final Exam: Prepare for the final exam.	No	5 hr

Total Out-Of-Class Activities: 20 Hours

MODULE 6: FINAL EXAM AND E-PORTFOLIO

COURSE LEARNING OBJECTIVES COVERED

- Utilize the graphic language to communicate design ideas.
- Create technical drawings with typical drawing instruments and drafting equipment and demonstrate basic drafting, linework, and lettering skills.
- Create both two- and three-dimensional sketches.
- Explain the relationship between three dimensional objects, multiview drawings, and isometric drawings and demonstrate their proper construction techniques.
- Describe the engineering design process.
- Apply proper dimensioning practice according to the American National Standards Institute (ANSI) and demonstrate Geometric Dimensioning and Tolerancing (GD&T) as a design language for size, shape, and geometric characteristics of manufactured parts.
- Demonstrate the techniques required to create orthographic projections, section and auxiliary views, and various pictorial drawings.
- Create drawings of gears and cams and describe how they are dimensioned.
- Identify different types of removable fasteners and demonstrate how they are notated on engineering drawings.
- Describe the procedures for constructing and managing a set of technical drawings.

TOPICS COVERED

- Technical Drawings
- Construction Techniques
- Parts of Working Drawings

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Leake, J. M. & Borgerson J. L., Chapters 12 and 13.	No	4 hr
Lesson: Study the lesson for this module.	No	2 hr
Project: Submit Project Part 2.	Yes	3 hr
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 9 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Exercise	20%
Lab	30%
Project	20%
Discussion	10%
Final Exam	20%
TOTAL	100%

GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0))	90–100%
B+ (3.5))	85–89%
B (3.0))	80–84%
C+ (2.5))	75–79%
C (2.0))	70–74%
D+ (1.5))	65–69%
D (1.0)	60–64%

)	
F (0.0)	<60%

LEARNING MATERIALS AND REFERENCES

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

Leake, J. M., & Borgerson, J. L. (2013). *Engineering design graphics: Sketching, modeling, and visualization (2nd ed.)*. Hoboken, NJ: Wiley.

RECOMMENDED RESOURCES

- Books and Professional Journals
 - Bertoline, G. (2011). *Fundamental graphics communication*. Glencoe, IL: McGraw Hill.
- Professional Associations
 - American Design Drafting Association
 - American Society of Mechanical Engineering
- Other References
 - Dodgson, M., Gann, D., & Salter, A. (2005). *Think, play, do: Technology, innovation, and organization*. New York, NY: Oxford University Press.
 - Eilam, E. (2005). *Reversing: Secrets of reverse engineering*. Hoboken, NJ: Wiley.
 - Jordan, J. A., & Michel, F. (2000). *Next generation manufacturing: methods and techniques*. Hoboken, NJ: Wiley.

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as freehand sketching exercises and use of AutoCAD software to draft and communicate industrial designs. Your progress will be regularly assessed through a variety of assessment tools including exercises, labs, discussions, a project, and a final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)