

**Computer Aided Drawing and Design 4
Capstone Course in Drafting and Design**

**AUGUST 2008
COURSE NUMBER 769**

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Purpose:

Computer Aided Drawing and Design 4 seeks to expand student's ability to communicate through a formal system of symbols (technical drawing), as well as to expand technical skills as they relate to the subject area.

High Point Regional High School's curriculum and instruction are aligned to the State's Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

Method of Instruction:

The curriculum is addressed through a series of teacher guided lessons and demonstrations. The instructor will seek to engage students in drawing assignments meant to reinforce concepts critical to efficiency in technical drawing communication.

General Objectives:

At the conclusion of this curriculum, students will be able to:

- Prepare technical drawings in accordance to formal technical drawing rules
- Communicate through the use of manually generated two dimensional and three-dimensional representations.
- Communicate through the use of computer generated two and three-dimensional drawings.
- Define and utilize a variety of drawing styles.
- Simplify drawing technique through hand drawing and computer aided drawing.

Standards Targeted Throughout The Curriculum**New Jersey Core Curriculum Content Standards and Cumulative Progress****Indicators**

- Use geometric models to represent real-world situations and objects and to solve problems using those models (e.g., use Pythagorean Theorem to decide whether an object can fit through a doorway). (NJ CCCS 4.2 ,A,#1)
- Understand and use the concept of significant digits. (NJ CCCS 4.2 ,D,#1)
- Choose appropriate tools and techniques to achieve the specified degree of precision and error needed in a situation. (NJ CCCS 4.2 ,D,#2)
- Create and use representations to organize, record, and communicate mathematical ideas. (NJ CCCS 4.5,E,#1)
- Apply mathematics in practical situations and in other disciplines. (NJ CCCS 4.5,C,#4)
- Learn mathematics through problem solving, inquiry, and discovery. (NJ CCCS 4.5,A,#1)

- Draw perspective views of 3D objects on isometric dot paper, given 2D representations (e.g., nets or projective views). (NJ CCCS 4.2,A,#2)
- Apply the properties of geometric shapes. (NJ CCCS 4.2,A,#3)
- Re-evaluate personal interests, abilities, and skills through various measures including self assessments. (NJ CCCS 9.1,A,#1)
- Assess personal qualities that are needed to obtain and retain a job related to career clusters. (NJ CCCS 9.1,B,#1)
- Select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings. (NJ CCCS 9.1,B,#3)
- Explore and reflect on ideas while hearing and focusing attentively. (NJ CCCS 3.4,A,#1)
- Listen to, summarize, make judgments, and evaluate. (NJ CCCS, 3.4,B,#1)
- Recognize that creators of media and performances use a number of forms, techniques, and technologies to convey their messages. (NJ CCCS 3.5,C,#3)

Standards of Technological Literacy from the Technology for All Americans Project (TFAA)

- In order to be able to comprehend other problem-solving approaches, students should learn that not all problems are technological, and not every problem can be solved using technology. (TFAA #10, K)
- As part of learning how to use and maintain technological products and systems, students should be able to use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate. (TFAA #12, P)
- As part of learning how to use and maintain technological products and systems, students should be able to document processes and procedures and communicate them to different audiences using appropriate oral and written techniques. (TFAA #12, L)
- In order to select, use, and understand information and communication technologies, students should learn that information and communication systems can be used to inform, persuade, entertain, control, manage, and educate. (TFAA #17, N)
- In order to select, use, and understand information and communication technologies, students should learn that information and communication systems allow information to be transferred from human to human, human to machine, machine to human, and machine to machine. (TFAA #17, M)
- In order to select, use, and understand information and communication technologies, students should learn that there are many ways to communicate information, such as graphic and electronic means. (TFAA #17, P)
- In order to select, use, and understand information and communication technologies, students should learn that technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic

images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. (TFAA #17, Q)

New Jersey Core Curriculum Content Standards for Technological Literacy

- Produce a multimedia project using text, graphics, moving images and sound. (NJ CCCS 8.1,A,#4)
- Discuss and/or demonstrate the capability of emerging technologies and software in the creation of documents. (NJ CCCS 8.1,A,#7)
- Evaluate the potential and implications of contemporary and emerging computer applications for personal, social, lifelong learning, and workplace needs. (NJ CCCS 8.1,B,#1)
- Identify new technologies, and other organizational tools to use in personal, home, and/or work environments for information retrieval, entry, and presentation. (NJ CCCS 8.1,B,#7)
- Create and manipulate information independently and/or collaboratively to solve problems, to design and to develop products. (NJ CCCS 8.1,B,#10)
- Use a computer assisted design (CAD) system in the development of an appropriate design solution. (NJ CCCS 8.2,A,#4)
- Analyze the factors that influence design of products, systems and environments. (NJ CCCS 8.2,C,#2)
- Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication. (NJ CCCS 8.2,C,#3)

Unit 1- CADD Review & Expectations- Time- 5 days

Goal:

- For students to realize the role and importance of drawing skills to a variety of careers.

Behavioral Objectives:

Students will be able to:

- Define the terms: graphic communication, spoken language, writing, technical graphics, and technical drawing.
- Identify occupations that require the ability to read and understand graphic information such as drawings, charts, and diagrams.
- Evaluate the importance of technical graphics to a real world problem.
- Explain the importance of spatial cognition to people in today's world.
- Classify drawings and models into similar categories.

Unit 2- Technical Sketching- Time 20 days

Goal:

- For students to gain skills necessary to become proficient in sketching and design based work.

Behavioral Objectives:

Students will be able to:

- Identify the tools, paper, and drawing styles common to drafting.
- Imitate lettering exercises according to recommended practices.
- Demonstrate proper sketching techniques
- Identify and construct the basic linetypes
- Combine drafting tools to draw incrementally angled lines.

Unit 3- Orthographic Projection-Time 30 days

Goal:

- For students to develop their ability to accurately read and manually construct orthographic and isometric drawings.

Behavioral Objectives:

Students will be able to:

- Define Orthographic Projection.
- Examine an Isometric drawing in order to complete a three view Orthographic Projection.
- Define dimension terminology.
- Summarize the role of title blocks to the related drafting fields.
- Demonstrate an understanding of the ANSI dimension rules.
- Define ANSI and ASME.
- Construct orthographic projection assignments.
- Demonstrate good drafting techniques.

Unit 4- 3-D modeling - Time 30 days

Goal:

- For students to develop skills necessary to drafting communication through the use of a Computer Aided Design system.

Behavioral Objectives:

Students will be able to:

- Utilize 4 coordinate input formats: relative, polar, absolute and mouse.
- Define the term workspace.
- Illustrate dimensioning techniques.
- Utilize 3-D modeling techniques to effectively communicate technical drawing information.
- Simplify toolbars to fit a user's unique needs.
- Imitate the method of creating and recalling a block.
- Construct an orthographic drawing.

Unit 5- Orthographic Generation from 3-D Modeling - Time 25 days

Goal:

- For students to develop skills necessary to efficiently construct orthographic Drawings from 3-D computer models.

Behavioral Objectives:

Students will be able to:

- Demonstrate an understanding of classifying drafting principals as they relate to orthographic drawing
- Utilize drafting tools and knowledge to complete Orthographic construction
- Utilize an array of CAD commands
- Utilize CAD systems to create a orthographic construction.
- Evaluate the efficiency of a Computer Aided Design system.
- Identify linstyles of the ANSI Alphabet of Lines.
- Utilize CAD layers (linestyles) to represent ANSI linetypes.

Unit 6- Sectional Drawings-Time 20 days

Goal:

- For students to develop efficiency and understanding of sectional drawings.

Behavioral Objectives:

Students will be able to:

- Identify the different types of Sectional Drawings: full section, half section and offset section.
- Examine the efficiency of the sectional drawing style for graphic representation and design.
- Examine the cutting plane of an isometric drawing to construct a full section view.
- Utilize the hatch command in a CAD system for full section construction.

Unit 7- 3-D Prototyping- Time 20 days

Goal:

- For students to generate 3-D physical models of their computer generated 3-D models.

Behavioral Objectives:

Students will be able to:

- Utilize proper drawing techniques to generate a 3-D model and prototype that model using rapid prototyping techniques.
- Generate typed descriptions of the solutions that are within the design requirements.
- Describe fields and careers related to 3-D prototyping, and how these concepts relate to engineering and other fields.

Unit 8- Animation- Time 25 days

Goal:

For students to generate and animate a three-dimensional object using a CAD and animation program.

Behavioral Objectives:

Students will be able to:

- Utilize CAD software to generate a three-dimensional object of their product.
- Utilize Animation software to animate the three-dimensional object.

Assessment:

The assessment of student progress in the objectives cited on the previous pages will be primarily by, but not limited to, the following criteria:

Drawings	40%
Class Participation	40%
Tests/quizzes	20%

Mid Term and Final Exam modified 2008

Homework, Extra Credit Policy:

Homework will not be accepted late. Extra credit will be given from time to time for extra effort or successful mastery of the behavioral objectives.

Special Course Policies:

A typical week in this course includes teacher guided instruction and demonstration. Students will also given time to complete assignments alone or in groups.

Periodic evaluation of objectives and this curriculum guide:

Rewrite in 2013

Lab/ Classroom set up and special needs:

The recommended maximum class size is 22 students.

- Computer workstations loaded with: CAD software, and Animation software.
- Drafting tools
- Drafting supplies
- Overhead projector
- Printer

Supplementary Readings and Instructors Bibliography:

- Grabowski, Ralph. Using AutoCAD 2005 Basics. (Thomson Delmar Learning, Clifton Park, New York.) 2005. ISBN 1-4018-8385-0.
- Bertoline, Gary and Eric Wiebe. Technical Graphics Communications. (McGraw-Hill, Burr Ridge, Illinois.) 2003. ISBN 0-07-119925-x.
- Walker, John. Exploring Drafting. (Goodheart-Wilcox, Tinley Park, Illinois.) 2003. ISBN 1-59070-178-x.

Web pages that support learning:

- <http://usa.autodesk.com>
- <http://www.adda.org/>
- <http://www.caddigest.com>

