

RENTON SCHOOL DISTRICT NO. 403

CAREER AND LIFE SKILLS EDUCATION

COMPUTER AIDED DESIGN AND DRAFTING 1 - 6

Curriculum Guide

Approved by Board of Directors: March 27, 2002

If you have special needs which require this document to be provided in an alternative format, please contact the school principal (or program director) or Kay Hermann, ADA/509 Compliance Coordinator, 425.204.2421, 300 S.W. 7th St., Renton, WA 98055-2307.

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A PHILOSOPHY OF EDUCATION FOR THE RENTON PUBLIC SCHOOLS

A basic function and duty of a free society is the education of its children, youth and adults.

It is the responsibility of the schools to provide each student with the opportunities necessary to develop the scholarship, skills and attitudes which will enable the student to achieve mental, physical, emotional and social maturity.

Further, each student should, as a result of the school experience, be able to make decisions and to accept responsibility for those decisions.

POLICY: 6001

ADOPTED: February 3, 1977

Renton School District No. 403

Renton, Washington

Renton School District #403 recognizes the need for every graduate to have acquired job entry skills or at least to possess a level of knowledge and skills permitting continued training after high school.

RENTON SCHOOL DISTRICT NO. 403
GENERAL INSTRUCTIONAL GOALS
Policy 6010

The Renton School District fosters an educational process which helps all students achieve at their highest potential.

The Renton School District:

LEARNING

- Offers a curriculum which prepares our students for the future.
- Emphasizes that diversity contributes positively to the individual and to the community
- Provides learning experiences matched to the needs, interests, and abilities of our diverse student population.
- Extends learning opportunities beyond the school.

INSTRUCTION

- Offers a variety of high quality instructional resources and services to students, staff, and community.
- Supports multiple instructional strategies.
- Provides resources and opportunities for continuing professional development of our staff.
- Conducts ongoing evaluations of our instructional programs
- Maintains safe and inviting facilities that are conducive to learning.

COMMUNITY

- Creates partnerships which involve students, parents, staff and other community members and organizations.
- Promotes effective communication.
- Values and encourages development of a spirit of community service.
- Respects the rights and responsibilities of all.

As a result of the educational process in Renton, students will understand and apply:

Language skills including reading, writing and communication, with opportunities to learn world languages.

Mathematics skills including concepts, procedures, problem solving, reasoning, and mathematical language.

Science skills including concepts, principles, and the scientific process.

Social studies skills, concepts, and processes--emphasizing history, geography, economics, international perspectives, multiculturalism, and participatory democracy.

Arts and humanities skills, concepts, and processes to create, perform, solve problems and respond effectively.

Health and physical education skills, concepts, and processes to promote lifelong physical, mental and social well being.

In order to strengthen the above curricular areas, Renton students will understand and apply:

Thinking skills including the ability to--gather and analyze information, think logically, critically and creatively, integrate experience and knowledge in making reasoned judgments, and solve problems.

Career and life skills necessary for successful and responsible participation in family, work and community.

Technological skills to support learning, problem solving, and communication.

Skills necessary to be a lifelong learner and a contributor to the general welfare and the quality of life for all.

EVALUATION: The Renton School District regularly reviews, evaluates and modifies these General Instructional Goals to meet the changing needs of students, staff and community

RENTON SCHOOL DISTRICT #403

CAREER AND LIFE SKILLS EDUCATION GOALS

GOAL 1: PROVIDE HIGH QUALITY CAREER AND LIFE SKILLS EDUCATION PROGRAMS AND SERVICE

Objectives:

- A. Assure that students completing Career and Life Skills Education programs have technical and behavioral competencies and basic skills sufficient to succeed in the workplace or higher education.
- B. Establish course and/or program transferability and articulation processes among K-12, community and technical colleges, private schools, colleges and universities, industry, apprentice-related training, and military training.
- C. Establish and regularly review standards for all Career and Life Skills Education programs.
- D. Evaluate Career and Life Skills Education programs based on standards, objectives, placements, job performance, costs, and community/industry acceptance.
- E. Utilize global, national, state, regional, and local data and advisory committee recommendations to identify appropriate curriculum and course offerings, program standards that meet the need of families, communities, business and industry.
- F. Provide facilities, equipment and instructional programs which meet the needs of a changing workplace.
- G. Revise or discontinue these programs that no longer meet the needs of students, business, labor, industry, and/or the community.
- H. Provide qualified instructors and administrators for Career and Life Skills Education based on relevant certification standards.
- I. Develop and utilize competency-based curricula for Career and Life Skills Education programs.

GOAL 2: CONTRIBUTE TO THE ECONOMIC DEVELOPMENT OF THE STATE

Objectives:

- A. Facilitate cooperation between public and private sector entities.
- B. Establish new Career and Life Skills Education programs based on existing and projected employment needs/demands and entrepreneurial opportunities.
- C. Work cooperatively with the public and private sectors, economic development organizations, labor, and educational institutions to provide creative, targeted programs that meet the needs of youth in economically depressed areas.
- D. Provide family life education programs that serve to strengthen families and contribute to the effectiveness of workers in managing their consumer and family roles and in their careers.
- E. Strengthen management skills for those seeking employment in worker owned and managed businesses.
- F. Create a stronger working partnership with Team Washington and other economic agencies and the associate development organizations.

GOAL 3: ASSURE ALL INDIVIDUALS EQUAL ACCESS TO CAREER AND LIFE SKILLS EDUCATION PROGRAMS, SERVICES, AND ACTIVITIES

Objectives:

- A. Provide Career and Life Skills Education programs, services, and activities that are free from racial, socio-economic, age, ethnic or sex bias, discrimination or stereotyping.
- B. Provide access to barrier-free Career and Life Skills Education programs.
- C. Actively recruit under-represented groups to all aspects of Career and Life Skills Education.
- D. Provide supportive services which promote entrance and success in Career and Life Skills programs.

GOAL 4: PROVIDE/UTILIZE AN INTEGRATED STATE PLANNING PROCESS

Objectives:

- A. Involve business, industry, agriculture, labor and other governmental and educational agencies in the planning processes at the state and local levels to ensure that establishment of delivery objectives and budget priorities.
- B. Identify instructional area/programs based on demand, placements, training needs, program costs, and follow-up.
- C. Utilize local, regional, state, national and global employment data, trends and advisory committees/organizations in identifying program offerings.

GOAL 5: PROVIDE AND MARKET CAREER AND LIFE SKILLS EDUCATION

Objectives:

- A. Increase public awareness, understanding, and acceptance of Career and Life Skills Education.
- B. Actively involve students, parents, community leaders, legislators, labor representatives, business organizations, industry, representatives, and other decision-makers from state and local arenas in Career and Life Skills Education program events and issues.

GOAL 6: PROVIDE INDIVIDUALS WITH CAREER DEVELOPMENT PROGRAMS AND EXPERIENCES

Objectives:

- A. Provide career orientation, exploration, occupational information, self-appraisal, and educational planning.
- B. Provide instruction in job search, job retention and job change skills and further education pursuits.
- C. Assure that Career and Life Skills Education programs encompass demands of today's workplace and include attitudinal, employability, leadership, basic interpersonal, and job specific skills.

GOAL 7: ASSURE A QUALITY STAFF DEVELOPMENT PROGRAM

Objectives:

- A. Provide appropriate channels for advisory committee recommendations in the program and policy-making process.
- B. Provide in-service training opportunities for local advisory committee members.
- C. Provide in-service training for administrators and Career and Life Skills instructors regarding the effective use of advisory committees.

RENTON SCHOOL DISTRICT NO.403
Renton, Washington
CAREER AND LIFE SKILLS EDUCATION

Renton School District #403 operates a comprehensive Career and Life Skills Education Program through its four comprehensive high schools and two alternative programs. The district also participates in two countywide Tech Prep consortia with local community and technical colleges. This partnership allows students to earn college credit while still enrolled in high school programs. Secondary and post-secondary curricula are coordinated and students master and achieve skills, concepts, and technical competencies in high school that articulate with college programs. Students earn credit towards high school graduation and college technical programs at their home high schools.

The focus has changed in recent years from an emphasis on only job preparation to one of career exploration and exposure. While skill development and employment readiness is still a primary goal, emphasis has been placed on career exploration, career pathway preparation, and post-secondary articulation.

The **Family and Consumer Science Education Program** is offered at Hazen, Lindbergh, Renton, and Black River High Schools. The program is comprised of the following: Careers in Education; Careers with Children; Child Development; Creative Foods/Nutrition; Family Health; Health Club; Independent Living; Interior Design/Living Environments; Personal Choices; Teen Parenting/Grads; and American Sign Language. School district and community sites provide applied work-based learning opportunities for program students.

The **Business Education Program** is offered in the District's three comprehensive high schools and at the Sartori Learning Center. The program consists of technical business related classes sequentially arranged into a course of instruction leading to a Certificate of Proficiency or Mastery to facilitate job placement or post secondary articulation. These courses are as follows: Accounting 1-4; Business Communications; Business Connections 1-2; Business Connections Work Experience 1-2; Business Law; Computer Program Design 1-2; Electronic Math Applications; Introduction to Information Technology; Information Technology 1-2; Information Technology-Project Management; Information Technology–Multimedia; Principles of Business; Recordkeeping; and Web Site Development 1. The Business Connections Work-based Learning component provides actual related job experience through workstations in the community. Business programs are often arranged and blocked with language arts programs to support program integration and technology use in the writing process.

A comprehensive **Workbased Learning Program** is offered in all of the facilities in the Renton School District. This program couples on-the-job experience and related classroom training to prepare students for employment during and beyond high school. The **Marketing Education Program** which offers Introduction to Marketing, Advanced Marketing, Marketing-Entrepreneurship, Marketing Education Seminar 1-2, Exploration of Travel and Tourism, and Introduction to Travel and Tourism/Hospitality, and **Diversified Occupations Programs** provide

students the opportunity to combine related classroom instruction and paid work experience to earn high school credit. These programs assist and support students as they make the transition from school to work. **Volunteer experiences**, **Internships**, **Job Shadows**, and **Service Learning** are also strong components of this community based applied experiences.

The community also plays a vital role in other programs offered through the Renton School District. The **Health Careers/ Sciences Program and Athletic Trainer/Sports Medicine Program** are reliant on clinical training stations and coordinated work experiences for students through local convalescent centers, nursing facilities, and community hospitals. This program is offered to all students in the Renton School District but operates only at Hazen High School.

Technology Education Programs are offered at all three comprehensive high school facilities and the Sartori Education Center. These programs are often integrated with the Science and Math departments to support applied learning and the development of technical skills and competencies for all students. Courses in this department are: Automotive Service Technician 1-2; Computer Aided Design and Drafting 1-6; Computer Graphics 1-8; Construction Technology 1-2; Fundamentals of Networking Technology I-4; Jewelry Manufacturing 1-2; Light Duty Mechanics and Related Careers 1-2; Materials Science and Technology 1-2; Manufacturing Technology 1-2; Power and Energy 1-2; Principles of Technology 1-2; Principles of Technology-Robotics 3-4; Video Production 1-2; and Building Maintenance and Related Careers 1-2.

Integrated instruction has been the focus of the Career and Life Skills instructional team for the past several years and the results can be seen throughout the program in each of the secondary schools. Several programs have been launched and are operating very successfully in all of the secondary sites. While these programs qualify for vocational funding, the district has made the commitment to operate them in collaboratively with a related academic instructor. These **Applied Vocationally Approved Programs** are titled: Applied Communications; Applied Mathematics; Material Science Technology; and Principles of Technology.

Renton School District has made a commitment to provide vocational training and job preparation opportunities for Special Needs students in addition to mainstreaming them, when appropriate. In order to have enough students to allow several offerings, the district has entered into interdistrict cooperative agreements with surrounding districts to accept students on a space available basis. There are four such **special programs**: **Building Maintenance** operates at the Sartori Learning Center and the **Career Ladders/Community Classroom** is offered at Valley Medical Center. The **Horticulture/Landscape Design 1-2 Program** is operated at Black River High School and **Health Careers** section is located at Hazen High School.

The District is also a partner in the Vocational/Special Education consortium of King County School Districts. The primary purpose of this participation is to make Career and Life Skills Education more accessible to persons with disabilities, provide additional inservice opportunities to all instructors and support to vocational instructors as they provide applied learning opportunities to special needs students.

RENTON SCHOOL DISTRICT NO. 403
CAREER AND LIFE SKILLS EDUCATION

MISSION STATEMENT

The mission of career and life skills education in the Renton School District #403 is to prepare all learners for successful roles in families, careers and communities.

THREE BELIEFS

A. Beliefs about individual needs

1. All learners have unique gifts and talents and can be successful.
2. All learners must develop self-esteem and personal confidence for productive roles in society.
3. All learners need to have and attain personal and career goals, arising from a lifespan approach to personal growth and career development.

B. Beliefs about society's expectations

1. All learners must be prepared to become ethical, responsible and contributing world citizens.
2. All learners must adapt to change and participate in lifelong learning.
3. All learners must prepare for family roles and to balance work and family responsibilities.
4. All learners must develop essential creative/critical thinking, problem solving and communication skills.
5. All learners must value and have an appreciation for diversity in their schools, communities and workplaces.
6. All learners must recognize the impact of productive work on our economy.

C. Beliefs about systems that care for and support learners

1. All learners must have equitable access to a quality education.
2. All learners deserve to participate in learning systems where programs are mutually reinforcing and interdependent and where learning is related to life applications.
3. All learners must discover that school is part of a broader set of community resources they must access for learning and for achieving success in life.
4. All school programs must be developed in cooperative with family, business, labor and community representatives.

5. All staff must be accountable to ensure that all learners have the opportunity to establish and reach their goals.

COMPUTER AIDED DESIGN AND DRAFTING
Washington State Essential Academic Learning Requirements

COMPUTER AIDED DESIGN AND DRAFTING This Career and Life Skills course meet the Washington State Essential Academic Learning Requirements.						
Course Component	Art	Communication	Mathematics	Science	Writing	Reading
A. Orientation to Class (semester 1)						
Unit 1. Course Orientation						x
Unit 2. Department Standards and Policies						x
Unit 3. Career Awareness	x			x	x	x
B. Manual Drafting (semester 1)						
Unit 4. Technical sketching	x	x	x	x		
Unit 5. Preparing to draw with instruments	x		x		x	
Unit 6. Learning to draft	x		x		x	x
Unit 7. Dimensioning and Lettering	x		x	x	x	x
Unit 8. Multi-view Drawings	x	x		x	x	x
Unit 9. Axonometric Drawings	x	x	x	x		x
Unit 10. Working Drawings	x	x	x	x	x	x
C. Introductory CAD, (semester 2)						
Unit 11. Computer Aided Design and Drafting Graphical Environment Basics			x			x
Unit 12. Introduction to drawing lines	x		x		x	x
Unit 13. Development of curved Lines	x		x		x	x
Unit 14. Using Built-In Help					x	x
Unit 15. Introduction to Coordinate Systems	x		x		x	x
Unit 16. Using Object Snap					x	
Unit 17. Drawing Horizontal/Vertical lines	x		x		x	
Unit 18. Helpful Drawing Construction Aids	x		x		x	

(continued)

COMPUTER AIDED DESIGN AND DRAFTING This Career and Life Skills course meet the Washington State Essential Academic Learning Requirements.						
Course Component	Art	Communication	Mathematics	Science	Writing	Reading
D. Advanced Computer Aided Drafting (semester 3-4)						
Unit 19. Altering and Adding Objects					X	X
Unit 20. Moving and Duplicating Objects	X		X		X	X
Unit 21. The ARRAY Command	X		X	X	X	X
Unit 22. Modifying and Maneuvering			X		X	X
Unit 23. Layers and Linetypes	X	X	X		X	X
Unit 24. Basic Dimensioning	X	X	X		X	X
Unit 25. Heavy Lines and Solid Objects	X	X	X	X	X	X
Unit 26. Dressing the Drawings	X	X			X	X
Unit 27. Introduction to 3D Modeling	X	X	X	X	X	X
Unit 28. Intermediate 3D Modeling	X	X	X	X	X	X
Unit 29. Advanced 3D Modeling	X	X	X	X	X	X
E. Computer Aided Architecture (semester 5-6)						
Unit 30. Computer Aided Architecture	X					X
Unit 31. Computer File Management		X	X	X	X	X
Unit 32. Setting up the Floor Plan	X		X		X	X
Unit 33. Drawing Notes and Dimensions	X	X	X	X	X	X
Unit 34. Foundations			X		X	X
Unit 35. Roofs	X		X		X	X
Unit 36. Doors and Windows	X		X		X	X
Unit 37. Cabinets	X		X		X	X
Unit 38. Electrical Items				X	X	X
Unit 39. Thee Dimensional Views and Cross Sections	X	X	X		X	X
Unit 40. Materials List		X	X		X	X
Unit 41. Printing and Plotting	X	X	X		X	X

COMPUTER AIDED DESIGN AND DRAFTING

History

This course traditionally was called Drafting and focused on manual “board style” mechanical drafting techniques. The content was considered part of the old Industrial Arts curriculum. With the introduction and widespread use of computers in industry and business applications, the profession of drafting has changed significantly to include computer aided drafting, design, and related skills.

In response to the growing use and development of computers in industry, the Computer Technology Department began to incorporate Computer Aided Drafting skills into the overall Drafting curriculum. During the past few years, the program has changed its principle focus from manual drafting to the teaching of Computer Aided Drafting.

The staff and their respective advisory committee began to meet and review the program curriculum guide during the 2000-01 school year. Over the past several months, they have revised and validated instructional materials and activities to support business and industry practices and standards.

This program will offers students the opportunity to develop valuable skills applicable to other academic areas, enhance future career choices, and provide a foundation for a variety of life applications.

COMPUTER AIDED DESIGN AND DRAFTING

Program Goals

The Renton Computer Aided Design & Drafting Program will:

1. Develop positive attitudes in students toward themselves through their relationships with industry and technology;
2. Establish and maintain a safe learning environment and develop student safety awareness;
3. Develop rational thinking processes that underlie technical problem solving in graphical communication;
4. Develop fundamental skills in manipulating materials, tools and equipment; and gathering, organizing and communicating technical information;
5. Provide for the reinforcement of study and academic skills taught in other areas of the curriculum such as mathematics and language arts;
6. Provide opportunity for the student to acquire an understanding of the relationship of technology to everyday living and various occupations;
7. Provide curriculum opportunities for both college and vocationally oriented students;
8. Provide for the development of reading skills required for decoding and comprehending printed technical materials;
9. Build student's self-confidence and positive attitude through successful and challenging experiences;
10. To understand how drafting and design are used as a means of communication for industry, education, and personal use;
11. To learn basic techniques and standard of Manual Drafting and Computer Aided Design; and
12. To learn to solve problems and express ideas using manual and Computer Aided Design and Drafting techniques.

COMPUTER AIDED DESIGN AND DRAFTING

Scope and Sequence

Computer Aided Design and Drafting 1 & 2 (First year):

Unit 1: Orientation to the Class

The purpose of the orientation is to acquaint the students with the course requirements, Department standards and policies, and general career possibilities in the Drafting and Design fields.

A. Course Orientation

- Prerequisites
- Course Description
- Lab Fee/Materials
- Course Content
- Student Expectations
- Grading Criteria

B. Department Standards and Policies

- Safety
- Cheating
- Attendance
- Tardies
- Make-Up Assignments
- Electronic Devices
- Food and Drink
- Standard Grading System

C. Career Awareness

- Requirements
- Opportunities
- Selection
 - Organization
 - Leadership
 - Responsibility
 - Reliability
 - Teamwork

Unit 2: Manual Drafting

The overall purpose of Manual Drafting is to educate the students in manual drafting techniques that lead to skillfully generated technical drawings. Manual Drafting is also

important in obtaining visualization skills which will compliment subsequent computer specific learning in the Computer Aided Drafting area.

A. Technical Sketching-Technical sketching is a way of developing ideas in the planning stage and communicating them to others quickly.

- Content
 - Purpose of technical sketching
 - Sketching equipment
 - Pencils and erasers
 - Surfaces
 - Sketching techniques
 - Freehand sketching
 - Using a grid
- Required skills
 - To sketch in proportion, not to scale
 - To make lines bold and with character
 - To letter clearly
 - To make figures clearly
 - To explain ideas with sketches
 - To make changes in drawings with sketching
- Projects
 - Grid drawings
 - Accuracy and measurement exercises
 - Freehand sketches

B. Preparing to draw with instruments-Present the equipment and procedures used in making a technical drawing with instruments.

- Content
 - Drawing equipment and how it is used
 - T-square
 - Drawing boards
 - Drawing pencils
 - Erasers
 - Drafting surfaces
 - Miscellaneous Tools
- Skills
 - To line up and fasten the drawing paper on the board with the T-square
 - To select the proper pencils for drawing
 - To keep pencils sharp
 - To layout borders and title blocks
 - To keep drawings neat and clean
 - To letter
- Projects
 - Dimensioning and accuracy

C. Learning to draft-A technical drawing should skillfully present the essential information concerning the object involved. This skill is gained by properly using drafting equipment.

- Content
 - Scales
 - Alphabet of lines and line quality
- Skills
 - To use scales to make measurements
 - Architect's scale
 - Engineer's scale
 - Decimal scale
 - Metric scale
 - To make measurements accurately
 - To use the T-square and triangles in making lines
 - Straight lines
 - Parallel lines
 - Perpendicular lines
 - Inclined lines
 - To use compasses to draw circles and arcs
 - To use French curves to draw irregular curves
 - To use templates to save time
 - To make drawings accurate, legible, and neat
 - To develop good drawing habits and techniques
- Projects
 - Use protractor, compass, French curve, etc.
 - Use of architect, engineer and other scales

D. Dimensioning and Lettering-The value of a drawing to give complete information about an object depends upon dimensions and notes to give the description of the object's size. The description of the shape and size together gives complete information about the object.

- Content
 - The purpose of dimensions and notes
 - The lines and symbols used in dimensioning and notes
 - The weight and spacing of lines used for dimensions and notes
 - The placement of dimensions on a drawing
 - Guidelines for lettering and fractions
 - Vertical capital letters, numbers, and fractions
- Skills
 - To use dimensions as a way of providing measurements
 - To make the lines and symbols used in dimensions
 - To use notes as a way of giving explanatory information
 - To provide the appropriate dimensions in the right places
 - To dimension basic shapes and features

- To make guidelines
- To make numbers and letters on a drawing neatly
- To make lettering the proper size
- To provide sufficient space between letters and between words
- To place names and titles in suitable positions on a drawing
- Projects
 - Simple Architectural drawing with Plan and Elevation Views

E. Multi-view Drawings-A multi-view drawing is a logical arrangement of orthographic views of an object, shown on a two-dimensional sheet of paper. The function of a multi-view drawing is to describe an object in enough detail and clarity to allow people to correctly interpret it. These views must show the three dimensions; width, height, and depth.

- Content
 - Definition and purpose of three-view drawings
 - To use box construction in visualizing and drawing the object
 - Method of describing objects by using views
 - The technique of making a three-view orthographic drawing
 - The alphabet of lines
 - The “order” of producing a good drawing
- Skills
 - To visualize the views
 - To draw those views which show the important details of the object
 - To place the views of an object in their proper relation to one another
 - To group the views in the center of a space with sufficient space between them
 - To use hidden lines
- Projects
 - Various multi-view drawings of industrial/mechanical objects
 - Various multi-view drawings of common everyday objects

F. Axonometric Drawings-An axonometric drawing is a pictorial drawing which shows three sides of the object. Pictorial drawings are also called technical illustrations. Pictorial drawings enable a person without technical training to understand the object being presented. The principle focus is on isometric drawings constructed using three axes, one of which is vertical, and the other two drawn to the right and left at an angle of 30 degrees to the horizontal.

- Content
 - The definition and purpose of isometric drawings
 - Isometric lines
 - Steps in making an isometric drawing
- Skills
 - To use box construction in visualizing and drawing the object

- To make all measurements on isometric lines
- To make all measurements true length
- To center an isometric drawing in a given space
- To make isometric lines vertical and at a 30 degree angle
- To omit hidden lines
- To locate include surfaces by offset measurements along isometric lines

- Projects
 - Simple isometric drawings of common mechanical objects
 - Simple isometric drawing of an architectural object

G. Working Drawings-A working drawing is any drawing used to give information for the purpose of manufacture or construction of an item or structure. The simplest form of working drawings is the detail drawing. The detail drawing is a drawing of a single part and provides all the information needed to make it. The drawing of completely assembled construction of parts is called an assembly drawing. The assembly drawing shows the way parts go together and the appearance of the construction as a whole.

- Content
 - The definition and purpose of working drawings
 - The steps in making working drawings
 - The selection of necessary views
 - The choice of suitable scales
 - The arrangement of sheets to allow sufficient space for all necessary information
 - The necessary dimensions and notes
 - The title block
- Skills
 - To produce a simple detail drawing
 - To produce a simple assembly drawing
 - To produce a pleasing appearance
 - To make the best use of space available
 - To present the information in sufficient clarity and detail to ensure correct interpretation of the drawing
- Projects
 - Three view architectural drawing(s), complete with dimensions and notes
 - Three view mechanical drawing(s), complete with dimensions and notes

Unit 3: Computer Aided Design and Drafting

The object of an Introduction to Computer Aided Design and Drafting is to educate the students in the basics of computer aided drafting techniques and provide a basis for further study in Computer Aided Drafting

A. Computer Aided Design and Drafting Graphical Environment Basics. This unit provides an understanding of the purpose of the components found in the graphics screen and the NEW, OPEN, SAVE, SAVE AS, and Quit commands.

- Content
 - The definition and purpose of the graphic drawing area
 - Opening program , making changes, and saving results
- Skills
 - To understand and use NEW, OPEN, SAVE, SAVE AS and Quit commands
- Projects
 - Rearrange and proper docking of toolbars

B. Introduction to drawing lines-This unit provides an understanding of the purpose of the application of the LINE, MULTIPLE, POLYGON, and RECTANGLE commands.

- Content
 - Introduction to the Line command via the toolbar
 - Creation of simple mouse drawn polygons

- Skills
 - To use the Line to draw simple shapes

- Projects
 - Simple common objects using the Line command

C. Development of curved lines-Application of CIRCLE, ARC, ELLIPSE, and DONUT commands

- Content
 - Introduction to the CIRCLE, ARC, ELLIPSE, and DONUT command via the toolbar
 - Creation of simple mouse drawn objects
- Skills
 - To use the CIRCLE, ELLIPSE, ARC and other commands to draw simple shapes
- Projects
 - Simple common objects using LINE, POLYGON, and ELLIPSE

D. Using Built-In HELP-To object Help when using commands

- Content
 - Introduction to the use of content sensitive HELP and UNDO command
- Skills
 - To use the built-in HELP to obtain information on how to use commands which are not fully understood
 - To become familiar with the UNDO command as a way to recover from simple input errors
- Projects
 - Learn to use HELP by looking up commands not previously used
 - Draw an object and use UNDO to see how it can recover from mistakes

E. Introduction to Coordinate Systems-Entering coordinates via the keyboard using the absolute, relative, polar, and direct distance methods.

- Content
 - Absolute method of entering commands
 - Relative method of entering commands
 - Polar method of entering commands
- Skills
 - To use the above distance methods to accurately draw simple objects of a given size
- Projects
 - Simple objects that are annotated with dimensional and notational information

F. Using OBJECT SNAP-This unit covers the powerful OBJECT SNAP capability and shows how to change the settings associate with this command

- Content
 - Application of the OBJECT SNAP feature
- Skills
 - To employ OBJECT SNAP to facilitate object creation accuracy
- Projects
 - Creation of objects requiring snagging of midpoints, endpoints or the use of other appropriate SNAP mode settings

G. Drawing Horizontal/Vertical lines-Application and control of the ORTHO feature

- Content
 - Application of the ORTHO feature
- Skills
 - To use the ORTHO feature to limit line directionality to either vertical or horizontal
- Projects
 - Creation of simple objects requiring both vertical and horizontal lines

H. Helpful Drawing construction aids-Assists user during layout and construction objects

- Content
 - Application of the GRID, SNAP, XLINE, and RAY commands
- Skills
 - To use these aids when creating a drawing during layout and placement of objects
- Projects
 - Orthographic drawing views of common objects

Computer Aided Drafting and Design 3 & 4 (Second Year)

Unit 4: Advanced Computer Aided Drafting

The objective of Advanced Computer Aided Drafting is to introduce students to the world of computer aided drafting as practiced in the workplace. This includes mechanical, architectural, structural, and electrical working drawings. In addition, 3 dimensional wireframe and surface models are created using computer modeling NURBS.

A. Altering and Adding Objects

Practice the use of CHAMFER, BREAK, FILLET, and OFFSET commands

- Content
Application of the CHAMFER, BREAK, FILLET, and OFFSET features.
- Skills
To employ CHAMFER, BREAK, FILLET, and OFFSET commands to refine the final shape of objects.
- Projects
Creation of simple drawings requiring parallel lines (building foundation), rounded corners (welding fillet), line breaks (gasket) and other objects to practice the above commands.

B. Moving and Duplicating objects

Application of the CHANGE, MOVE, COPY, and MIRROR commands

- Content
Application of the MOVE, COPY, CHANGE or MIRROR commands.
- Skills
To use MOVE, COPY, CHANGE or MIRROR to make straightforward changes to a drawing in a fast and efficient manner.
- Projects
Modification of simple drawings requiring objects to be relocated, duplicated, or otherwise changed in size. Use of the MIRROR command involves copying portions of objects that have symmetry about some axis.

C. The ARRAY command

Creation of rectangular and polar arrays

- Content
Review of the MIRROR command and introduction to the ARRAY command.
- Skills
To use the MIRROR and ARRAY commands to create simple rectangular and polar arrays using simple object structures.
- Projects
Example projects include creation of an electronic circuit board with several rows of chips to creation of a bicycle rim or snowflake pattern using the polar ARRAY command.

D. Modifying and Maneuvering

Application of the STRETCH, SCALE, ROTATE, TRIM, EXTEND, and LENGTHEN commands

- Content
 - Application of the STRETCH, SCALE, ROTATE, TRIM and EXTEND commands.
 - Skills
 - To use the STRETCH, SCALE, ROTATE, TRIM and EXTEND commands to make simple modifications to existing object structures.
 - Projects
 - Example projects include extending the length of a house and rotating it on the lot to align with “true” North. Other projects include changing the size of a simple TV remote control unit using the SCALE command.
- E. Layers and Linetypes
- Application of layers and linetypes
- Content
 - Applying computer aided design and drafting layers and linetypes features.
 - Skills
 - To use and modify template files containing multiple layers.
 - Projects
 - Example projects include creating a house with multiple floors, adding and/or modifying lines which a “hidden”, “continuous” or colored and changing the linetype scale to be consistent with the drawing scale.
- F. Basic dimensioning
- Application of computer aided design and drafting basic dimensioning capabilities
- Content
 - Application of computer aided design and drafting basic dimensioning capabilities.
 - Skills
 - To set up a drawing to have the correct style of dimensions (decimal, engineering, architectural, etc.) and to correctly apply dimension lines in a variety of different object orientations.
 - Projects
 - Adding dimensions to objects containing lines oriented vertically, horizontally or on an incline. Adding radius, diameter or angular dimensions to various objects.
- G. Heavy Lines and Solid Objects
- Application of TRACE, SOLID, and FILL Commands
- Content
 - Application of TRACE, SOLID, and FILL commands.
 - Skills
 - To use the TRACE, SOLID, and FILL commands to create thick lines and solid-filled areas on a drawing.
 - Projects

Examples include enhancing the looks of a house elevation draw or creating the circuit paths on a printed circuit board.

H. Dressing the Drawings

Application of the HATCH, BATCH, and SKETCH commands

- Content
Application of the HATCH, BATCH, and SKETCH commands.
- Skills
To use the above commands to enhance the quality and clarity of a drawing while avoiding overuse of these commands to limit overall drawing storage size.
- Projects
Projects include use of HATCH or BATCH to create cross sections of parts, applying hatch patterns to show material types or for producing object silhouettes.

I. Introduction to Computer Modeling

This unit introduces the basic computer modeling commands and menu items including navigation tools, shaded preview, render and other object manipulation tools.

- Content
Model Shading, Object Rotation, Panning & Zooming, Object Dragging
- Skills
Familiarization with basic command set and ability to navigate screens
- Projects
Use “first model” tutorial containing 5 primitive objects. Objects are manipulated to create a 3D castle.

J. Intermediate Computer Modeling

This unit introduces the intermediate level object manipulation involving rotations, object scaling and reconfigured viewport layouts.

- Content
Scale, Rotate, Undo, Repeat, Multiple Selection commands
- Skills
Ability to set various viewport layouts, undo mistakes, rotate objects, scale objects in multiple directions.
- Projects
Use “second model” tutorial 3D tutorial containing 6 objects to create “fantasy” architecture of student’s choice.

K. Advanced Computer Modeling

This unit covers selection of object groups, cursor constraint to ortho, mirror objects, and moving objects in one or two directions at once.

- Content
Ortho, Move, Mirror, Group Select
- Skills
Ability to move, group and mirror objects to build simple combined shapes.
- Projects
Use “third model” 3D tutorial containing 7 objects to create a three dimensional name with these building blocks.

Computer Aided Drafting and Design 5 & 6 (Third Year)

A. Computer Aided Architecture

The objective of Computer Aided Architecture is to introduce students to the world of architecture as practiced in the workplace. Students become familiar with a three dimensional (3D) architectural software program. 3D programs are designed to allow architects and other construction professionals to produce computer generated two dimensional and three dimensional construction drawings rapidly.

Unit 27. 3D Architecture Program Overview. Learning what the program can do for the Design and Construction professional.

- Contents
Familiarization with File, Edit, Build, Options, 3D, Window menu and basic toolbars
- Skills
How to use menus and toolbars
- Projects
Modification of a simple floor plan using 2D and 3D menus and toolbars

Unit 28. Computer File Management. A blank floor plan is automatically created when computer aided architecture starts. Saving plans, creating backup files, transferring plans, and closing views require a solid understanding of the program.

- Contents

Familiarization with items under File menu (Open, Save, Export, Import, Delete, Restore, Exits, etc.)

- Skills
Using File Save command, making backup files and transferring plans within the file hierarchy.
- Projects
Use of a simple floor plan to practice file management skills.

Unit 29. Setting up the Floor Plan. Settings for units of measure need to be established. In addition, wall types, materials, cabinets, and door and window types need to be identified. Finally and most important of all, a viable floor plan must be skillfully laid out.

- Contents
Dimensional Units, Computer Aided Drafting Blocks, Defaults
- Skills
Establishment of “Default” settings, Create Library Objects and new Master settings
- Projects
Creation of various library object such as casework, simple furniture and appliances.

Unit 30. Drawing Notes and Dimensions. Identifying rooms, selecting the correct wall types, adding interior and exterior dimensions, and identifying floor heights for multiple story buildings are necessary at this stage of creating a set of working drawings.

- Contents
Technical Specifications, Dimensioning, Informational notes, Symbols
- Skills
Setting up interior and exterior dimensions, proper use of notes and symbols
- Projects
Begin to setup a complete set of “realistic” working drawings

Unit 31. Foundations. Footings, piers, and slabs must be generated. Technical input from Geotechnical and Civil Engineers is interpreted, leading to correctly sized building foundation elements.

- Contents
Stepped Footings, Pad and Pier Footings, Standard Footings
- Skills
Calculating various foundation Footing Sizes, interpret Geotechnical data
- Projects

Calculate Footing size for application to “realistic” working drawing set above

Unit 32. Roofs. A wide variety of roof styles is available to the building designer. Roof shape, pitch, and overhang dimensions must be identified.

- Contents
Roof type variations (Gable, Hip, Mansard, Saltbox, Shed, etc), Pitch and Roof Design Aesthetics, and structural design issues.
- Skills
Sizing roof elements based on vertical and horizontal loading factors
- Projects
Calculate Roof size and framing configuration for application to “realistic” working drawing set above

Unit 33. Doors and Windows. Identifying correct door and window sizes and locating them precisely in the walls is needed at that stage.

- Contents
Standard, Sliding, Pocket, Garage and Bi-fold doors
Standard, bay, box, bow, clerestory windows and associated trim work
- Skills
Select doors and windows based on aesthetics and building code considerations
- Projects
Calculate Door and window configurations and schedules for application to “realistic” working drawing set above.

Unit 34. Cabinets. Base and wall supported cabinet styles are selected and fit into place. Selection of accessories and appliances are added with careful customer coordination.

- Contents
Custom and Standard Counter Tops, Cabinetry Finish Materials and Accessories
- Skills
Be able to identify suitable finishes based on customer specified budgetary limitations.
- Projects
Select cabinetry and appliances based on “real world” customer constraints for application to working drawing set above.

Unit 35. Electrical Items. An electrical plan is developed showing the location of all electrical items, such as lights, switches, outlets, smoke detectors, heating vents, etc. Basic wiring diagrams show circuits and individual switch locations.

- Contents
Electrical Symbol Library, Common Electrical and Standard Building Codes
- Skills
Use appropriate commands to create symbol libraries. Make electrical floor plan and diagrams; incorporate electrical notes and specifications as required.
- Projects
Add electrical floor plan, diagrams, notes and specifications to working drawing set above.

Unit 36. Three Dimensional Views and Cross Sections. As the plan is created in two dimensions, a 3D model should also be made. Perspective views, cross sections, elevations and isometric overviews can be quickly generated. A 3D “walkthrough” can be made and played back, allowing the customer to accurately view the final product.

- Contents
Cross Section and Elevation views, Isometric Overviews, Perspective Cameras
- Skills
Displaying and Suppressing Items in 3D views, Generating 3D Rendered views, Using Perspective Cameras, Editing a view window.
- Projects
Create Cross Sections and Elevation views for above drawing set. Create 3D Overview and “walkthrough” for assisting customer in project visualization.

Unit 37. Materials List. A materials list is a “database” which keeps the records of the supplier, price, code, builder comment, etc for use throughout the project lifespan. A spreadsheet is typically generated, listing each kind of material item needed to construct the building.

- Contents
Master List of Materials, Cost Estimating Software, Spreadsheets
- Skills
Use Cost Estimating software to create Bill of Materials list in Industry recognized format.
- Projects

Add supplier and price information to create computer aided architecture generated Bill of Materials list for above project drawing set.

Unit 38. Printing and Plotting. Printing accurately and consistently is vital to the successful production of working drawings. Before printers may be used, software must be properly configured to achieve the desired output results.

- Contents
Printer Setup, Printing to Scale, Printing fro Layouts
- Skills
Printing to a variety of Plotting Devices, Plotting/Printing to Scale,
Troubleshooting Printer problems (caused by incorrect settings)
- Projects
Print multiple drawing sizes with appropriate section scales and title block information for the above project drawing set.

COMPUTER AIDED DESIGN AND DRAFTING
Evaluation

The evaluation of student in Computer Aided Drafting will be accomplished through the following criteria:

- Quality and completion of work
- Timeliness of meeting deadlines
- Class participation
- Attendance, attitude, conduct, effort
- Work habits and organization
- Written exams
- Demonstration of competencies
- Group and individual projects
- Safety

COMPUTER AIDED DESIGN AND DRAFTING

Instructional Materials

Text:

Applying AutoCAD, Jerry Wohlers
Manual Drafting – TBA

Reference books:

Architecture – Chief Architect for Windows, Advanced Relational Technology Inc
Three Dimensional Modeling-Rhinoceros, NURBS Modeling for Windows, Robert
McNeel & Associates

Software/Hardware:

Pentium class computers utilizing the Windows NT operating system
Printing/Output Equipment
 8.5 x 11" size color inkjet printer(s)
 11" x 17" size color or black & white inkjet printer
 36" roll/sheet, wide-body color plotter
CAD drafting application program: AutoCAD
CAD architectural design application program: Chief Architect
Three Dimensional Computer Modeling Software: Rhino

Manual Drafting Equipment/Supplies:

18" x 24" Drafting Boards
Manual T-Squares
Triangles, compasses, protractor, and other miscellaneous tools

COMPUTER AIDED DESIGN AND DRAFTING
Leadership and Vocational Plan

LEADERSHIP AREAS:	STUDENTS WILL:	VOCATIONAL ASPECTS:	INTEGRATED INTO CURRICULUM:
<p><u>Area 1: Introduction to Leadership</u> Students will develop an understanding and demonstrate the knowledge for the purpose of student leadership in vocational education.</p>	<ul style="list-style-type: none"> *Discuss the purpose of developing personal and group leadership skills *Determine the skills that will help me function in family, community and work settings 	<ul style="list-style-type: none"> *Identify leadership skills required for career advancement and job acquisition 	<ul style="list-style-type: none"> *Classroom activities should involve student initiative, responsibility, and organization *Participate in V.I.C.A. at Regional and National levels
<p><u>Area 2: Personal Qualities</u> Students will demonstrate personal qualities necessary to function in a family, community and work setting</p>	<ul style="list-style-type: none"> *Determine the importance of values and goals *Identify short and long term goals *Write down necessary steps to carry out goals *Describe how personal values are reflected in work ethics 	<ul style="list-style-type: none"> *Identify strategies to acquire career success in this field *Identify how to best prepare for college education in this field 	<ul style="list-style-type: none"> *Determine the personal qualities and skills required of someone in a technical position *Research the personal qualities required to someone to succeed in today's marketplace *Write a report showing opportunities available in the workplace
<p><u>Area 3: Interpersonal Skills</u> Students will become aware of and demonstrate interpersonal skills needed to function in a global society</p>	<ul style="list-style-type: none"> *Demonstrate how to work cooperatively with others *Provide for positive role models in actions, behaviors & attitudes in stressful situation *Identify and write down goals for self *Determine whether goals are conceivable, achievable, and measurable *Write down necessary steps to carry out each goal *Manage and resolve positive stress and adversity in the setting 	<ul style="list-style-type: none"> *Develop an awareness of correct interpersonal skills and how they influence the work environment 	<ul style="list-style-type: none"> *When inappropriate behavior is observed, have students write a report detailing steps to avoid conflict and inappropriate behavior
<p><u>Area 4: Communication Skills</u> Students will be able to</p>	<ul style="list-style-type: none"> *Students will actively "listen" and carry out signed and oral 	<ul style="list-style-type: none"> *Prepare drawings and projects to industry standards 	<ul style="list-style-type: none"> *Group work presentations and reports

COMPUTER AIDED DESIGN AND DRAFTING
Leadership and Vocational Plan

communicate effectively in the community and work situations	instructions *Will prepare formal and informal written materials		*Reports *Answers on written tests
<u>Area 5: Community</u> Students will develop an understanding and demonstrate a knowledge of how to work effectively in the community and work situations	*Recognize the values of the CADD field	*Must work cooperatively with other groups in community, job shadows, and internships	*Field trips *Survey of local businesses in use of CAD
<u>Area 6: Personal and Technology Resources</u> Students will be able to utilize personal and technological resources to make decisions in the drafting profession	*Research and identify the use of technological tools	*Use of computers for research and internet project assistance	*Use computers for preparation of project presentations and oral presentations
<u>Area 7: Group Dynamics</u> Students will demonstrate organizational skills in large and small group situations.	*Understand team skills *Develop group facilitation skills *Conduct an effective small group meeting	*Job shadow with local businesses that employ drafters	*Students participate in group brainstorming on topic and present results *Groups must communicate without use of speech
<u>Area 8: Employability Skills</u> Students will understand and demonstrate effective employability skills	*Identify behaviors to establish successful working relationship *Identify means of dealing with conflict resolution in the workplace *Identify and demonstrate proper work ethics	*College articulation requirement *Industry skill competencies *Industry recognized certification or exams	*Conduct research in careers that employ drafters *Create resume and cover letter *Prepare thank you letter *Prepare electronic portfolio