

PROGRAM CONCENTRATION:
CAREER PATHWAY(S):
COURSE TITLE:

Engineering & Technology
Engineering Graphics & Design
Introduction to Engineering
Drawing and Design

Introduction to Engineering Drawing and Design is a foundation course that serves as an introduction to the drafting and design field and is a prerequisite to all other courses in the Engineering Drawing and Design program. Emphasis is placed on safety, geometric construction, fundamentals of Computer-Aided Drafting, and multi-view drawings. Students learn drafting techniques through the study of geometric construction at which time they are introduced to computer-aided drafting and design. The standards are aligned with the drafting and design standards in the Georgia's technical colleges, thus helping students qualify for advanced placement should they continue their education at the postsecondary level. Further, the standards are aligned with the national standards of the American Design Drafting Association (ADDA). Students who successfully complete this and other drafting courses should be prepared to take the Drafter Certification Examination from the ADDA. Competencies for the co-curricular student organization, SkillsUSA and/or TSA, are integral components of both the core employability skills standards and the technical skills standards. SkillsUSA and/or TSA activities should be incorporated throughout instructional strategies developed for the course.

CAREER DEVELOPMENT

ENGR-IED-1. Students will identify the disciplines related to engineering drawing and design professions.

- a. Identify the professional and/or trade associations related to the engineering drawing and design profession.
- b. Identify areas of specialization and related occupations within the engineering drawing and design profession.
- c. Identify the employment opportunities in the engineering drawing and design profession.
- d. Match engineering drawing and design occupational job titles with qualifications and responsibilities.
- e. Identify education and training required to work in the various engineering drawing and design careers.

ACADEMIC STANDARDS:

SCSh9. Students will enhance reading in all curriculum areas.

ELA9W3. The student uses research and technology to support writing.

ELA9RL5. The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10C1. The student demonstrates understanding and control of the rules of the English language, realizing that usage involves the appropriate application of conventions and grammar in both written and spoken formats.

ADDA: Employability skills

TOOLS, EQUIPMENT & SYSTEMS

Students will apply appropriate skills to work safely, operate correctly, and maintain tools, equipment, and consumables in the drafting lab.

ENGR-IED-2. Students will demonstrate the knowledge and skills to properly use the tools and equipment safely in the drafting lab.

- a. Maintain workstation and storage area.
- b. Demonstrate and incorporate proper use of ergonomics in the drawing lab.
- c. Follow class and lab rules.

ACADEMIC STANDARDS:

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

ADDA: Fundamental computer skills
Employability skills

ENGR-IED-3. Students will demonstrate the correct operation and maintenance of all drafting tools.

- a. Demonstrate the correct operation and maintenance of T-square, parallel bar, and/or drafting machine.
- b. Identify and demonstrate the correct use of a compass, irregular curve, templates, scales, and other drafting tools needed to produce a drawing.
- c. Demonstrate plotting procedures, including layout, scale, view, and file.

ACADEMIC STANDARDS:

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

MM1P3. Students will communicate mathematically.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

ADDA: Fundamental drafting skills
Basic lab skills

Basic CADD skills

ENGR-IED-4. Students will demonstrate the proper management of drawing consumables.

- a. Demonstrate the use of pencils, pointers, erasers, shields, pens, and ink.
- b. Use correct lead selection to produce drawings.
- c. Demonstrate proper care and use of a drawing reproduction machine.
- d. Identify and use the proper type of media.

ACADEMIC STANDARDS:

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

ADDA: Basic CADD skills
Fundamental drafting skills

ENGR-IED-5. Students will demonstrate the knowledge and skills of computer operations.

- a. Initialize start up and shut down available on a CAD system.
- b. Demonstrate definitions and procedures for file management techniques: copying, deleting, finding, saving, and renaming, based on operating/applications systems.
- c. Demonstrate the procedure for the preparation and use of external storage/media on operating systems.
- d. Use an on-line help tutorial based on the application system.
- e. Demonstrate the ability to open a drawing data file and create a drawing.
- f. Identify and use all major components of hardware associated with a CAD system.

ACADEMIC STANDARDS:

ELA11LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions.

ADDA: Fundamental computer skills

PRE-DRAFTING

Students will understand technical sketching, lettering, scale usage, and line types used to prepare technical drawings.

ENGR-IED-6. Students will create technical freehand sketches.

- a. Demonstrate orthographic, pictorial, schematic, and diagram sketches.

ACADEMIC STANDARDS:

MM1P5. Students will represent mathematics in multiple ways.

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

ADDA: Fundamental drafting skills

ENGR-IED-7. Students will demonstrate proper lettering techniques.

- a. Demonstrate vertical and inclined lettering.
- b. Create text using appropriate annotation commands, orientation, style, size, and placement in CAD.

ACADEMIC STANDARDS:

MM1P1. Students will solve problems (using appropriate technology).

ADDA: Fundamental drafting skills

ENGR-IED-8. Students will demonstrate the use of proper line types.

- a. Demonstrate the ability to perform a drawing setup, e.g., sheet size, border, and title block.
- b. Control entity properties by layer, color, and line type.
- c. Demonstrate the use of the alphabet of lines.

ACADEMIC STANDARDS:

MM1P1. Students will solve problems (using appropriate technology).

ADDA: Basic CADD skills

ENGR-IED-9. Students will demonstrate the ability to read and draw using the proper scale.

- a. Demonstrate the ability to measure using the architect's scale, engineer's scale, and metric scale.
- b. Select proper drawing scale.

ACADEMIC STANDARDS:

SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

ADDA: Fundamental drafting skills
SINGLE VIEW DRAWING

ENGR-IED-10. Students will create and dimension single view drawings while applying geometric construction.

- a. Produce geometric shapes such as straight lines, geometric angles, plane figures, circles and arcs, and irregular geometric figures.
- b. Apply geometric construction techniques to problems.
- c. Draw problems that show construction procedure.
- d. Apply correct dimensioning procedures.
- e. Apply the symmetrical features of a center line to its proper size and location.
- f. Demonstrate multiple construction techniques (including lines, conics, circles, splinters, arcs, and polygons) given size, orientation, and location specifications.
- g. Use fundamental CAD commands to create drawings.

ACADEMIC STANDARDS:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

MM4G1. Students will understand the properties of circles.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

MM1P5. Students will represent mathematics in multiple ways.

ADDA: Fundamental drafting skills

MULTIVIEW DRAWING

ENGR-IED-11. Students will use orthographic projection to create and dimension multiview drawings.

- a. Explain and apply nominal size, basic size, tolerance, unilateral tolerances, bilateral tolerances, fit, actual fit, clearance fit, interference fit, transition fit, allowance, maximum material limit, minimum material limit, basic-hole system, and basic-shaft system.
- b. Draw an object that is described with two views.

- c. Draw an object that is described with three views.
- d. Select proper drawing scale, views, and layout.
- e. Draw an object that has an inclined surface.
- f. Draw an object containing circles and arcs.
- g. Change view, view names and multiview views.
- h. Create orthographic projections utilizing the necessary views.

ACADEMIC STANDARDS:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

MM4G1. Students will understand the properties of circles.

MM1P4. Students will make connections among mathematical ideas and to other disciplines.

MM1P5. Students will represent mathematics in multiple ways.

ADDA: Fundamental drafting skills

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic

standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.