

North Dakota Graphic Communications Education

Content Standards

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North Dakota Department of Career and Technical Education

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Adapted from the GAERF 2010 Graphic Arts Education and Research Foundation/SkillsUSA Standards, gaerf@npes.org, PrintEd Competencies.

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This set of standards was sent electronically to all North Dakota Graphic Communication teachers for comment.
After two months of comments and edits, the final document has been approved.

Career and Technical Education Standards Introduction

Mission

The mission of the State Board for Career and Technical Education (CTE) is to work with others to provide all North Dakota citizens with the technical skills, knowledge, and attitudes necessary for successful performance in a globally competitive workplace.

Vision

The State Board for Career and Technical Education (CTE) is committed to providing career awareness, work readiness skills, occupational preparation, and retraining of workers throughout the state. Career and technical education will span all educational levels, providing youth with exploration opportunities and the foundation skills needed to enter the world of work while providing adults with skills needed to enter, re-enter, or advance in the workforce.

Goal

North Dakota Career and Technical Education's goal is to create a competitive and knowledgeable work force. This is accomplished through a variety of educational program areas that are organized to prepare students for careers in their chosen fields, to take leadership roles, and balance their multiple roles in life. CTE programs prepare students with the knowledge and skills to make informed career choices, to integrate and apply academic concepts, to prepare for successful participation in a global society, and to engage in lifelong learning.

Standards Development Process

Standards development is a multi-phase process. Existing and/or industry standards are the basis for the North Dakota Program Standards. A team of expert secondary and postsecondary teachers, business and industry representatives, and the state program supervisor draft the standards document. Once the document is finalized, the State Board for Career and Technical Education approves and adopts the standards.

Course Frameworks are also developed by the writing team. A framework includes a brief overview of the course content, topical units of study, and identifies the standards recommended for inclusion within the course. The frameworks are tailored to prepare young people for the opportunities in North Dakota. School Districts will use the frameworks as a guide for developing curriculum that reflects local needs.

Key Principles of Career and Technical Education

We believe that Career Technical Education:

1. Draws its curricula, standards, and organizing principles from the workplace.

The workplace provides the context, objectives, and organizing constructs for instruction and assessment. The workplace also defines the standards of performance necessary, including those required for academic, technical, and employability skills.

2. Is a critical and integral component of the total educational system, offering career-oriented benefits for all students.

CTE classes offer educational benefits to students pursuing careers requiring specific technical skills as well as providing a strong foundation for those pursuing a traditional four-year (or more) degree.

3. Is a critical and integral component of the workforce development system, providing the essential foundation for a thriving economy.

Preparation of a well-prepared, qualified workforce requires solid academics, good work ethics, and specific technical skills as well as the ability to communicate, work with others, solve problems, and use information. CTE contributes directly to this preparation by providing a curriculum tied to specific workplace requirements.

4. Maintains high levels of excellence supported through identification of academic and workplace standards, measurement of performance (accountability), and high expectations for participant success.

Career Technical Education is committed to continuous improvement, attention to industry certification, and the development of highly qualified teachers.

5. Is robust and flexible enough to respond to the needs of the multiple educational environments, customers, and levels of specialization.

CTE involves a large and complex delivery system that (1) integrates career exploration, (2) provides effective tools for organizing all curricula, (3) facilitates the teaching and use of technology, (4) is integrated into the total learning experience, (5) enhances the learning of academic subjects, (6) teaches broad occupational skills, (7) includes all aspects of the industry, (8) teaches how to balance family and work responsibilities, (9) provides job-specific training, (10) is offered at multiple levels of the educational continuum, and (11) is delivered through a variety of educational environments.

Table of Contents

Publication Availability.....	2
State Board Members.....	3
State TITH Education Staff.....	4
Introduction to CTE Standards.....	5
Principles of Career and Technical Education.....	6
Table of Contents.....	7
Industry Overview.....	8
Environmental Health, Safety, and First Aid.....	9
Digital File Preparation.....	10
Image Capture.....	10
Color Theory.....	11
Digital File Output.....	11
Press Operations (Offset and Digital)	12
Bindery Operations.....	12
Measurement.....	13
Basic Math.....	13
Job Application and Interpersonal Skills.....	14
Advertising and Design (Commercial)	15
Digital File Preparation (Commercial)	18
Digital File Output (Commercial/Graphic)	22
Digital Production Printing (Graphic)	24
Offset Press Operations (Graphic)	27
Screen Printing Technology (Graphic)	29
Binding and Finishing (Graphic)	31
Career Ready Practices.....	33

Standard 1	Industry Overview	
Topic 1.1	The History of Graphic	
Student Competencies		
	1.1.1	Understand the evolution and purpose of graphic design.
	1.1.2	Identify and list print markets and types of print businesses.
Topic 1.2	The Printing Process	
Student Competencies		
	1.2.1	Identify and describe the major printing processes: relief, flexography, gravure, lithography, screen (porous) printing, and digital.
	1.2.2	List the advantages and disadvantages of each major printing process.
	1.2.3	List typical products produced by each major process.
	1.2.4	Show a typical business flow of printing from initial concept to finished product.
Topic 1.3	Careers	
Student Competencies		
	1.3.1	Identify these major occupations in the graphic communications industry.
	1.3.2	Identify basic salary/wage expectation ranges.
	1.3.3	Identify the types of major companies that employ people with graphic communications skills.
	1.3.4	Identify major printing industry associations.
Topic 1.4	Print Security	
Student Competencies		
	1.4.1	Define counterfeiting and copyright laws

Standard 2	Environmental Health, Safety, and First Aid	
Topic 2.1	Environmental Health, Safety, and First Aid	
Student Competencies		
	2.1.1	Identify location(s) and describe proper use of fire safety equipment in the facility.
	2.1.2	List safety rules involving flammable liquids.
	2.1.3	List the steps to be taken in case of injury in the lab.
	2.1.4	Identify location(s) of first aid kit(s) and eye wash station(s).
	2.1.5	Read and interpret Material Safety Data Sheets (MSDS).
	2.1.6	Describe protective safety equipment, if needed (e.g., gloves, goggles, ear plugs, lab dress, etc.).
	2.1.7	Describe appropriate safety procedures to follow when operating equipment.
	2.1.8	Pass a general lab safety test.
	2.1.9	Identify approved methods for disposing of waste materials.
	2.1.10	Read, interpret, and follow instructions on warning labels.
	2.1.11	Identify the safety color code.

Standard 3	Digital File Preparation	
Topic 3.1	Digital File Preparation	
Student Competencies		
	3.1.1	Identify professional software applications and uses (Creative Suite, e.g., Photoshop, Illustrator, InDesign)
	3.1.2	Describe the disadvantages of using office/home-based software for professional graphic purposes.
	3.1.3	Describe the difference between a raster image and a vector graphic image.
	3.1.4	List advantages/disadvantages of removable storage media.
	3.1.5	Explain the difference between supplying PDF files versus native files for print.
	3.1.6	Identify various file formats and their extensions: .doc; .qxd; .pdf; .tif; .eps; .rtf; .raw; .jpg; .bmp; .txt; .indd; .psd; .ai; .pub; .html; .gif; .xls; .zip; .dmg; .png; .dng.
	3.1.7	Explain the purpose of a thumbnail sketch, rough layout and comprehensive proof.

Standard 4	Image Capture	
Topic 4.1	Image Capture	
Student Competencies		
	4.1.1	Explain basic scanning hardware.
	4.1.2	Explain basic digital camera hardware.
	4.1.3	Explain and identify the difference between line art and continuous tone originals.

Standard 5	Color Theory	
Topic 5.1	Color Theory	
Student Competencies		
	5.1.1	Explain additive and subtractive color theory.
	5.1.2	Explain the effect of lighting on color perception.
	5.1.3	Explain the effect of the surrounding environment on color perception.
	5.1.4	Explain the significance of standard viewing conditions in the graphic communications industry. Pantone matching system.
	5.1.5	Explain the influence of the substrate on color reproduction.

Standard 6	Digital File Output	
Topic 6.1	Digital File Output	
Student Competencies		
	6.1.1	Explain and describe trapping and why it is necessary.
	6.1.2	Explain the purpose of proofing.
	6.1.3	Explain the difference between hard and soft proofs.
	6.1.4	Explain digital platemaking equipment for offset plates.
	6.1.5	Explain the difference between static output and variable output.
	6.1.6	Explain the process of creating digital output from a computer file.

Standard 7	Press Operations (Offset and Digital)	
Topic 7.1	Press Operations (Offset and Digital)	
Student Competencies		
	7.1.1	Identify basic safety press procedures.
	7.1.2	Identify basic press systems.
	7.1.3	List and describe quality control devices for press (color bars, densitometer, etc.).

Standard 8	Bindery Operations	
Topic 8.1	Bindery Operations	
Student Competencies		
	8.1.1	Describe the differences between, and the advantages/disadvantages of: in-line; off-line; and, near-line finishing.
	8.1.2	List basic paper types, weights, grades and classifications commonly used in the printing industry.
	8.1.3	Explain operational and safety features of a paper cutter.
	8.1.4	Identify grain direction of paper, and explain its importance.

Standard 9	Measurement	
Topic 9.1	Measurement	
Student Competencies		
	9.1.1	Measure linear dimensions for printing materials in inches and fractions of inches.
	9.1.2	Measure type in points and line length in picas.
	9.1.3	Measure original images for reduction and enlargement using various methods to determine the percentage for final reproduction.

Standard 10	Basic Math	
Topic 10.1	Basic Math	
Student Competencies		
	10.1.1	Solve addition of whole number problems—two and three digits.
	10.1.2	Solve addition of fraction problems.
	10.1.3	Solve addition of decimal problems—two and three digits.
	10.1.4	Solve subtraction of whole number problems—two and three digits.
	10.1.5	Solve subtraction of fraction problems.
	10.1.6	Solve subtraction of decimal problems—two and three digits.
	10.1.7	Solve multiplication of whole numbers—two and three digits.
	10.1.8	Solve multiplication of decimal problems—two and three digits.
	10.1.9	Solve division of whole number problems—two and three digits.
	10.1.10	Solve various problems that require dividing a given dimension in half.
	10.1.11	Solve division of decimal problems—two and three digits.

	10.1.12	Solve decimals to percent conversion problems.
	10.1.13	Solve percent to decimal conversion problems.
	10.1.14	Solve basic ratio and proportion problems.
	10.1.15	Solve basic linear measurement problems.
	10.1.16	Solve basic type calculation problems.
	10.1.17	Solve basic liquid measurement problems.
	10.1.18	Solve basic paper cutting calculations.
	10.1.19	Solve word problems that require an understanding of estimating.

Standard 11	Job Application and Interpersonal Skills	
Topic 11.1	Job Application and Interpersonal Skills	
Student Competencies		
	11.1.1	Describe work ethics that should be exhibited by employees in the graphic communications industry.
	11.1.2	Demonstrate how to locate job listings through a variety of sources (e.g., Internet, job boards, help wanted ads, job fairs, agencies, etc.).
	11.1.3	Read and interpret the content of want ads and job postings.
	11.1.4	Write a personal resume that includes three references.
	11.1.5	Write a cover letter to obtain a job in the graphic communications industry.
	11.1.6	Read and complete an employment application form.
	11.1.7	Describe ways to prepare for a successful job interview.
	11.1.8	Prepare for a job telephone interview by participating in a mock interview conducted by a teacher, parent, or another student.
	11.1.9	Describe the reasons for job interview follow-up.
	11.1.10	Write a letter or email to follow-up a job interview.
	11.1.11	Evaluate an employment benefits package.
	11.1.12	Compare job opportunities to include wages, benefits, and employment responsibilities.
	11.1.13	Participate in Skills USA Professional Development Program.

Standard 12	Advertising and Design (Commercial)	
Topic 12.1	Orientation	
Student Competencies		
	12.1.1	Demonstrate keyboard typing proficiency, use of a digital dictionary, spell checker, automatic hyphenation, and keyboard shortcuts.
	12.1.2	Define removable storage media.
	12.1.3	Write a resume that includes three references.
	12.1.4	Create an electronic portfolio.
	12.1.5	Demonstrate knowledge of copyright, ethics, and intellectual property rights.
12.2	Type	
	12.2.1	Illustrate x-height; mean-line; base-line; ascenders; descenders; serifs; leading; and, their roles in measuring and designing with type.
	12.2.2	Illustrate caps; lowercase; uppercase; small caps; and, ligatures.
	12.2.3	Define dingbats; bullets; rules; glyphs; symbols; and, their uses in publications.
	12.2.4	Distinguish between display (headline) type and body (text) type by their point sizes, styles, and uses.
	12.2.5	List the major typefaces/font families and their uses.
	12.2.6	Explain letter spacing; tracking; kerning; baseline shift; and, horizontal scale.
	12.2.7	Demonstrate the type arrangements: flush left–ragged right; flush right–ragged left; centered; justified; force justified; and, widows and orphans.
12.3	Page Layout	
	12.3.1	Select appropriate page layout software for a given job.
	12.3.2	Set text with appropriate margins; formatting; gutters; and, proper leading.
	12.3.3	Prepare a series of hand drawn sketches or computer generated layouts incorporating appropriate marks (i.e., gutters, register marks, trim marks, fold lines, etc.).
	12.3.4	Design and produce a document using desired fonts; styles; margins; indents; tabs; and, colors.
	12.3.5	Proofread and edit using common editing marks. Make corrections/adjustments to copy on screen.

	12.3.6	Create multiple page documents using text blocks; graphics; frames; and, headings using drop caps and wrap-a-rounds (run-a-rounds).
	12.3.7	Create documents using grids; templates; master pages; paragraph style sheets; and, character style sheets.
	12.3.8	Repurpose files for a print project for use in web design, and demonstrate appropriate file formats for web development.
	12.3.9	Demonstrate the proper procedures for printing a black/white proof or a color proof to a laser or inkjet printer.
	12.3.10	List the advantages/disadvantages of hard proofing versus soft proofing.
	12.3.11	Preflight and package a native file.
	12.3.12	Export a print-ready Portable Document Format (PDF) using page layout software.
	12.3.13	Identify trim size; bleed size; and, live area of a project.
	12.3.14	Locate examples of ad sizes from publications (full page, half-page, and quarter-page ads).
	12.3.15	Demonstrate an understanding of file formats (ai; .jpg; psd; gif, tif; indd; pdf, etc.), file organization, and file naming conventions.
	12.3.16	Demonstrate various United States Postal Service (USPS) design constraints and provide resources for more information on USPS requirements.
12.4	Image Capture	
	12.4.1	Capture digital images using a scanner and digital camera.
	12.4.2	Demonstrate appropriate scanner/program operations for line artwork and continuous tone in both black/white and color.
	12.4.3	Identify high/low resolution images and describe the uses of each.
	12.4.4	Download a digital image from a stock photography website or CD.
	12.4.5	Scale a raster image using the proper settings in order to maintain the appropriate resolution for print or web.
	12.4.6	Edit a raster image by using color correction; tone control; cropping; and, scaling, etc.
	12.4.7	Demonstrate an understanding of additive and subtractive color, i.e., Red-Green-Blue (RGB) and Cyan-Magenta-Yellow-Key/black (CMYK)
12.5	Digital Illustration	
	12.5.1	Demonstrate an understanding of the differences between raster and vector files.
	12.5.2	Use the appropriate graphics program to create a design or logo using manipulated type (rotated, circled, extended, tints and fills, etc.).
	12.5.3	Create or trace drawings/photographs using a vector illustration program.

	12.5.4	Create or edit images in a raster based program using layers; transparencies; layer modes; masks; and, selections, etc.
	12.5.5	Create a spot color illustration or logo using Pantone Matching System® (PMS) or other color matching system, and view or print separations.
12.6	Design Principles	
	12.6.1	Identify the basic principles of design (i.e., unity; contrast; proportions; balance; emphasis; and, rhythm).
	12.6.2	Identify the basic elements of design (i.e., line; shape; direction; size; texture; value; and, color).
	12.6.3	Create thumbnails and rough drafts by sketching. Use markers or colored pencils to show color.
	12.6.4	Pitch a concept to demonstrate an understanding of the relationship between message; color; typography; images; and, layout.
	12.6.5	Brainstorm keywords for a design concept based on customer need and target audience.
	12.6.6	Demonstrate an understanding of color theory by describing primary, secondary, and tertiary colors including hue, tint, value and shade, and the effect of light and distance on color.
	12.6.7	Critique a layout to determine if it meets the customer's needs, and suggest improvements.
	12.6.8	Demonstrate an understanding of corporate identity including how branding affects consumer recognition.
	12.6.9	Demonstrate an understanding of color relationships (complimentary, analogous, monochromatic, etc.).
	12.6.10	Create a storyboard to demonstrate a time-based concept.

Standard 13	Digital File Preparation (Commercial)	
Topic 13.1	Orientation	
Student Competencies		
	13.1.1	Read and interpret production information on job docket/ticket.
	13.1.2	Identify and list the basic principles of design (i.e., unity, contrast, page proportions, balance, etc.)
	13.1.3	Identify and explain line images and appropriate resolutions.
	13.1.4	Identify and explain continuous tone/halftone images and appropriate resolutions.
	13.1.5	Identify basic process color principles and methods of reproduction.
	13.1.6	Define PostScript.
	13.1.7	Describe the use of each of the following: word processing, illustration, image editing, and page layout software.
	13.1.8	Demonstrate keyboard typing proficiency.
	13.1.9	Prepare a series of hand-drawn sketches or computer-generated layouts incorporating appropriate marks (i.e., gutters, register marks, fold lines, etc.)
	13.1.10	Describe the types and procedures for using removable storage media.
	13.1.11	Describe the use of File Transfer Protocol (FTP) in transferring files from one computer to another.
	13.1.12	Define preflighting and its purpose.
	13.1.13	Preflight a native file using application preflight software and/or a manual checklist.
	13.1.14	Preflight a Portable Document Format (PDF) file using application preflight software and/or a manual checklist.
	13.1.15	Define computer-to-plate, computer-to-press, and variable data printing.
13.2	Type	
	13.2.1	Measure type in points using the appropriate tools.
	13.2.2	Explain x-height, mean-line, baseline, ascenders, descenders, leading, and their roles in measuring and designing with type.
	13.2.3	Explain the use of caps, lowercase, uppercase, small caps, ligatures, and glyphs.
	13.2.4	Define the use of glyphs in publications.

	13.2.5	Distinguish between display (headline) type and body (text) type by their point sizes and type styles.
	13.2.6	List the basic type style classifications and their uses.
	13.2.7	Describe the appropriate use of type family members (e.g., bold, italic, Roman, etc.)
	13.2.8	Explain letter spacing, tracking, and kerning of type characters.
	13.2.9	Explain typographic ems and ens and their associated dashes.
	13.2.10	Define the use of type arrangements, e.g., flush left–ragged right, flush right–ragged left, centered, and justified.
	13.2.11	Explain the differences between TrueType, Postscript Type 1, and Open Type fonts.
	13.2.12	Demonstrate or explain the proper use of loading, displaying and organizing fonts using a font management software application.
13.3	Page Layout	
	13.3.1	Select professional software for page layout.
	13.3.2	Demonstrate the use of a digital dictionary and spell checker.
	13.3.3	Demonstrate proper line and page breaks including hyphenation, widows and orphans.
	13.3.4	Demonstrate a functional knowledge of computer menus, shortcut keys, and palettes in page layout software.
	13.3.5	Demonstrate text alignment (flush left, flush right, center), vertical justification (top, center, bottom justified), and object alignment and distribution.
	13.3.6	Demonstrate use of basic proofreading marks.
	13.3.7	Demonstrate the proper setup of a new document including facing pages, page size and orientation, columns, margins, bleeds, and slugs.
	13.3.8	Apply appropriate paragraph formatting to text (indents, spaces before and after, drop caps, etc.).
	13.3.9	Place or get text from a word processed document.
	13.3.10	Design and produce a document using specified typefaces, sizes, leading, margins, indents, tabs, and colors.
	13.3.11	Identify appropriate professional software for inputting words, creating illustrations, editing images, and laying out pages.
	13.3.12	Follow proofreading instructions to correct documents on screen.
	13.3.13	Place or get images.
	13.3.14	Demonstrate cropping images.
	13.3.15	Create a two-sided, three-panel brochure using graphics and text.
	13.3.16	Create a multi-page document using master pages, automatic folios, paragraph style sheets, levels of headings, sidebars, text inset, masthead, text, and graphics.

	13.3.17	Create a document that includes tables.
	13.3.18	Create a document using tints, reverses and manipulated type.
	13.3.19	Produce a multi-colored flyer that includes at least two spot colors and output separations.
	13.3.20	Demonstrate soft proofing using an appropriate profile and explain why it is used.
	13.3.21	Make a hard copy proof with appropriate printer marks.
	13.3.22	Upon completion of a job, demonstrate how to preflight, proof (hard and soft), package, and create an output-appropriate PDF.
13.4	Image Capture	
	13.4.1	Identify the difference between continuous tone images, halftone images, and line art.
	13.4.2	Identify the basic components and uses of flatbed scanner hardware.
	13.4.3	Describe uses and limitations of basic scanner software.
	13.4.4	Explain the various components and settings (aperture, shutter speed, image resolution, white balance, etc.) of a digital camera.
	13.4.5	Capture digital images using a scanner and digital camera.
	13.4.6	Demonstrate appropriate scanner/program operations for line artwork.
	13.4.7	Demonstrate appropriate scanner/program operations for continuous tone color and grayscale images.
	13.4.8	Transfer images from a camera and scanner to a host computer.
	13.4.9	Describe what an International Color Consortium (ICC) profile is and its use.
	13.4.10	Demonstrate how to convert Red-Green-Blue (RGB) images in Cyan-Magenta-Yellow-Key/black (CMYK) using various ICC profiles.
	13.4.11	Demonstrate saving scanned images into an appropriate file format.
	13.4.12	Given an image, determine whether it is high or low resolution.
	13.4.13	Explain the image resolution requirements for various uses (screen/web versus press).
	13.4.14	Download a digital image from a stock photography web site or compact disc (CD) and resize according to specifications provided.
	13.4.15	Using bitmap editing software, retouch, crop, make modifications, color corrections, and levels adjustments to prepare an image to print correctly on a printing press.

13.5	Illustration	
	13.5.1	Demonstrate a functional knowledge of computer menus, shortcut keys, and palettes in illustration software.
	13.5.2	Create a single color vector graphic.
	13.5.3	Create a vector graphic using tints, fills, and color.
	13.5.4	Create a vector graphic using manipulated type.
	13.5.5	Trace a bitmap drawing and convert to a vector.
	13.5.6	Edit an existing piece of vector art.
13.6	PDF	
	13.6.1	Explain why the Portable Document Format (PDF) is an integral part of the printing industry.
	13.6.2	Explain the difference between a PDF and native application files.
	13.6.3	List the advantages and disadvantages of PDF.
	13.6.4	Explain the various methods used to create PDFs.
	13.6.5	Create a PDF from a native application file.
	13.6.6	Describe the differences between the PDF standards (such as PDF/x-3, press quality PDF, etc.)
	13.6.7	Describe why some PDFs are not appropriate for print production.
	13.6.8	Demonstrate how to make minor corrections to a PDF file.

Standard 14	Digital File Output (Commercial/Graphic)	
Topic 14.1	Orientation	
Student Competencies		
14.1.1		Read and interpret production information on job docket/ticket.
14.1.2		Identify safety considerations in computer-to-plate and direct-to-digital press.
14.1.3		Read and interpret material safety datasheets Material Safety Data Sheets (MSDS).
14.1.4		Define preflighting and file repair.
14.1.5		List common digital file problems in a native file and a Portable Document Format (PDF).
14.1.6		Repair a native file and PDF that exhibits basic file problems.
14.1.7		Define trapping as it relates to prepress.
14.1.8		Describe the various software options for creating digital traps.
14.1.9		Demonstrate the proper trap to apply to a digitally created page using page layout, illustration, and/or trapping software.
14.1.10		Define various imposition styles such as work and turn, work and tumble, sheetwise, multiple up, and perfecting.
14.1.11		Demonstrate how to send, manage and impose an electronic file using digital imposition software.
14.1.12		Create a folding dummy for a 16-page job with proper pagination, folds, and guides.
14.1.13		Explain why calibration is important for digital output devices.
14.1.14		Output a multicolor digital file to direct-to-plate system, digital inkjet printer, laser printer or digital press.
14.1.15		Identify digital direct-to-plate system materials and plate types.
14.1.16		List the considerations in selecting the correct plate making procedures and materials (paper, polyester, metal) for a given job.
14.1.17		Identify basic digital proofing systems and materials.
14.1.18		Output a file to a digital color proofing device.
14.1.19		Discuss and demonstrate soft proofing software.
14.1.20		Define computer-to-plate technology.
14.1.21		Describe the technology used in laser-generated output devices.

	14.1.22	List the considerations in imaging related to the characteristics of paper and other printing substrates (e.g., foil, plastic).
	14.1.23	Describe the effect of dot gain or loss on the reproduction system.
	14.1.24	Describe the difference between undercolor removal (UCR) and gray component replacement (GCR).
	14.1.25	Explain the differences between a densitometer, plate reader, and spectrophotometer, and when you use each.
	14.1.26	Describe process control procedures necessary for successful digital file output.
	14.1.27	Identify and describe direct imaging technologies on press.
	14.1.28	Describe the use of plate scanning and ink key presetting technologies.
	14.1.29	Explain International Cooperation for Integration of Processes in Prepress, Press, and Postpress (CIP4) and Job Definition Format (JDF) and how it is used in the production of a job.
	14.1.30	Observe computer-to-plate operations at a commercial printing plant (live or virtual).

Standard 15	Digital Production Printing (Graphic)	
Topic 15.1	Orientation	
Student Competencies		
	15.1.1	Define digital printing. Include a description of electrophotography (EP), ink-jet, ion or electron charge deposition, magnetography, thermal transfer, thermal dye sublimation and electro-coagulation.
	15.1.2	Describe the types of jobs that use one, two, four or more color digital printing.
	15.1.3	Describe a print-based digital workflow process. Include customer requirements, job/program type (static or variable), design, cost, turn-around time, content (images and illustrations, text and numbers), preflighting, digital proofing, color management, press makeready, output, finishing, shipping and verification of receipt or action.
	15.1.4	Describe the submission of a job through a web browser portal.
	15.1.5	Define a Raster Image Processor (RIP), and discuss its functionality, differences and significance in a digital printing workflow.
	15.1.6	List and define the types of file formats that can be sent to a RIP.
	15.1.7	List the advantages/disadvantages of using certain types of file formats (source files, postscript, post RIP'd, Portable Document Format (PDF)).
	15.1.8	Define proofing within a digital printing workflow.
	15.1.9	Compare digital printing to offset printing by comparing/contrasting the advantages/disadvantages of each one.
	15.1.10	Describe the types of proofing within a digital printing workflow.
	15.1.11	Describe the differences between colorants used in digital printing versus offset lithography.
	15.1.12	Describe the differences in substrates intended for offset printing versus digital printing.
	15.1.13	Explain the importance of paper grain direction as it relates to digital printing and finishing.
	15.1.14	Identify substrate-related print quality issues as they relate to digital printing.
	15.1.15	Given a particular digital printing process, describe the advantages/disadvantages of using a pre-printed shell.
	15.1.16	Given a particular digital printing process, identify basic subsystems of a digital press.

15.1.17	Given a particular digital printing process, explain the importance of proper environmental conditions required for digital printing.
15.1.18	Given a particular digital printing process, identify safety considerations for digital press operations.
15.1.19	Explain the importance of proper environmental conditions required for digital printing.
15.1.20	Identify safety considerations for digital press operations.
15.1.21	Given a specific operating system (Apple Macintosh computer [MAC] and/or a Personal Computer [PC]), print driver and a digital printing system (RIP and Engine), estimate production costs for a digital press.
15.1.22	List and define the skills required to be a digital output specialist, manager of a digital printing operation and a seller of digital printing output capabilities.
15.1.23	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), demonstrate proper paper handling.
15.1.24	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), describe and demonstrate the operational procedures for planning and executing a job by demonstrating the ability to read and interpret production information on a job docket/ticket, maintaining a checklist, queuing a job, and demonstrating proper calibration.
15.1.25	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), send a job to a RIP.
15.1.26	Given a specific digital printing system (RIP and Engine), release a job from the RIP (queue) to a digital press.
15.1.27	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), print a black-and-white or process color job on uncoated paper.
15.1.28	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), print a black-and-white or process color job on coated paper.
15.1.29	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), print and finish a saddle-stitched booklet (via in-line, near-line and/or off-line method).
15.1.30	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), print and finish a perfect-bound booklet (via in-line, near-line and/or off-line method).
15.1.31	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), perform preventative maintenance procedures on the digital press.
15.1.32	Define variable data printing.
15.1.33	Give specific examples of variable data printing products.
15.1.34	Compare and contrast the production considerations of a variable data job compared to a static job.

	15.1.35	Using personalization and database software and text/graphics for a specific client, create a variable data printing job.
	15.1.36	Given a specific operating system (MAC and/or PC), print driver and a digital printing system (RIP and Engine), print and finish a variable data print job.

Standard 16	Offset Press Operations (Graphic)	
Topic 16.1	Orientation	
Student Competencies		
	16.1.1	Read and interpret production information on job docket/ticket.
	16.1.2	Explain how an offset lithographic plate works.
	16.1.3	Identify and demonstrate safe work habits in press operations.
	16.1.4	Identify basic systems and parts of an
	16.1.5	offset press.
	16.1.6	Describe the attributes of sheet-fed, web-fed, stream-fed, and perfecting presses.
	16.1.7	Identify the printing processes used in the press segment of the printing workflow.
	16.1.8	Identify basic paper types, sizes, and weights.
	16.1.9	Determine grain direction of paper and explain the importance of proper grain direction when running the press, including folds and scoring.
	16.1.10	Handle and jog paper stock (wire/felt, watermarks, and carbonless sequence).
	16.1.11	Locate paper weight, coating, and sizes on a ream, box, or skid.
	16.1.12	Describe the importance of paper conditioning prior to running the press.
	16.1.13	Demonstrate and correct paper problems prior to running the press.
	16.1.14	Compare offset ink types and uses including oil-based, rubber-based, soy-based, and Ultraviolet (UV).
	16.1.15	Identify ink ingredients.
	16.1.16	Identify causes of ink problems and suggest appropriate solutions.
	16.1.17	Explain the purpose of using spray powder on an offset press.
	16.1.18	Explain the purpose of an infrared dryer on an offset press.
	16.1.19	Describe the procedure for mixing and testing custom colored inks.
	16.1.20	Explain the purpose and use of fountain solution and fountain solution additives.
	16.1.21	Mix fountain solutions using appropriate ratios and demonstrate understanding and use of monitoring techniques.
	16.1.22	Perform make-ready steps for paper handling.

16.1.23	Perform make-ready of the inking system.
16.1.24	Perform make-ready of the dampening system.
16.1.25	Perform make-ready of the printing unit.
16.1.26	Print a single color one-sided job.
16.1.27	Print a single color properly registered two-sided job. Indicate gripper and guide sides.
16.1.28	Print a single color properly registered job on carbonless stock (two-parts or three parts).
16.1.29	Print a single color job on envelopes.
16.1.30	Print a job on heavy stock.
16.1.31	Describe sheetwise, work-and-turn, and work-and-tumble jobs, and how they differ.
16.1.32	Print a two-sided job using one of the following methods: sheetwise, work-and-turn, or work-and-tumble.
16.1.33	Explain the purpose of registration, crop, and bleed marks.
16.1.34	Explain the major functions of a densitometer as a quality control device.
16.1.35	Print a multicolor job with register marks and color bars. Maintain accurate registration and monitor ink density.
16.1.36	Print a multicolor, two-sided job.
16.1.37	Demonstrate the use of flags to count sheets during a pressrun.
16.1.38	Perform roller care and maintenance of inking and dampening systems.
16.1.39	Demonstrate ink roller, dampener roller, and cylinder pressure settings on a press.
16.1.40	Install a blanket and explain follow-up procedures.
16.1.41	Demonstrate proper wash-up techniques for the inking system, dampening system, and cylinders.
16.1.42	Demonstrate a proper color wash.
16.1.43	Identify problems inherent in printing heavy solid work on a duplicator press.
16.1.44	Estimate small offset press labor costs to include make-ready, running and clean-up.
16.1.45	Estimate ink and paper costs.
16.1.46	Observe offset press operations in a commercial printing plant either on site or online via a virtual tour.
16.1.47	Explain procedures for daily, weekly, and monthly maintenance on a press; explain importance of recording this information in a log.
16.1.48	Perform basic press maintenance and record the information in a log.

Standard 17	Screen Printing Technology (Graphic)	
Topic 17.1	Frames and Screen Preparation	
Student Competencies		
	17.1.1	Choose appropriate frame size for the job.
	17.1.2	Choose appropriate mesh thread count for the job.
	17.1.3	Choose appropriate mesh type for the job.
	17.1.4	Attach fabric on fixed and/or retensionable systems.
	17.1.5	Make adjustments to correct for fabric elongation or extension.
	17.1.6	Measure fabric tension with a tension meter.
	17.1.7	Abrade and degrease the screen.
	17.1.8	Dry the screen using appropriate screen drying systems.
	17.1.9	Choose appropriate type of emulsion for the job.
	17.1.10	Apply emulsion using appropriate methods.
17.2	Stencil Systems	
	17.2.1	Prepare a stencil design.
	17.2.2	Assemble digital layout components and consider color trapping if necessary.
	17.2.3	Develop required image elements including text, graphics, and quality control targets.
	17.2.4	Generate a composite proof for a job.
	17.2.5	Generate appropriate color separation proofs for a job.
	17.2.6	Produce full color proof to match job ticket specs.
	17.2.7	Generate film positive(s).
	17.2.8	Align positives and expose stencil.
	17.2.9	Wash out image area of stencil.
	17.2.10	Evaluate stencil quality.
17.3	Print Production	
	17.3.1	Load screen onto printing machine.

	17.3.2	Select appropriate squeegee for the job.
	17.3.3	Choose appropriate type of ink for the job.
	17.3.4	Confirm ink color specifications with job specs.
	17.3.5	Prepare ink and apply to screen.
	17.3.6	Align screen(s) for proper registration.
	17.3.7	Set appropriate off contact to control image quality.
	17.3.8	Load and align substrate on printing machine.
	17.3.9	Apply correct squeegee pressure to bring screen into contact with substrate.
	17.3.10	Operate printing machine and verify printing quality.
	17.3.11	Complete production run according to job specs.
	17.3.12	Check color register and make adjustments as needed.
	17.3.13	Dry or cure printed objects using appropriate equipment.
	17.3.14	Organize or package finished product according to job specs.
17.4	Clean-up Process	
	17.4.1	Remove and clean squeegee(s).
	17.4.2	Dry and store squeegee(s).
	17.4.3	Remove ink; store or dispose of ink as specified by Material Safety Data Sheets (MSDS).
	17.4.4	Clean additional auxiliary equipment as needed.
	17.4.5	Remove frame from press and take to screen washout area.
	17.4.6	Use personal protection safety equipment.
	17.4.7	Select/use appropriate chemistry and washout equipment to remove stencil.
	17.4.8	Inspect screens to ensure they are reusable.
	17.4.9	Complete any additional cleaning procedures to ensure usability.
	17.4.10	Properly store screen.

Standard 18	Binding and Finishing (Graphic)	
Topic 18.1	Orientation	
Student Competencies		
	18.1.1	Read and interpret production information on job docket/ticket.
	18.1.2	Identify and demonstrate proper safety considerations when working with bindery equipment.
	18.1.3	Practice safe work habits when working with bindery equipment.
	18.1.4	Describe how to change the blade and perform preventive maintenance on an automatic paper cutter.
	18.1.5	Estimate the cost of materials and production for performing various bindery operations.
	18.1.6	Identify basic hand tools, equipment, and materials in bindery operations.
	18.1.7	Demonstrate proper paper handling and storage procedures.
	18.1.8	Demonstrate basic paper jogging techniques.
	18.1.9	Demonstrate basic paper counting techniques: measure by ream marker, weight, caliper, or other methods.
	18.1.10	Demonstrate knowledge of paper types related to their grain direction, cutting, folding and binding characteristics.
	18.1.11	Calculate basic paper cuts from a parent sheet, considering job requirements and grain direction.
	18.1.12	Describe how to use and set up programmable cutters.
	18.1.13	Make accurate paper cuts using a mechanized paper cutter.
	18.1.14	Demonstrate how to check the squareness of stock.
	18.1.15	Collate sets in proper sequence.
	18.1.16	Prepare folding dummies for commonly used impositions.
	18.1.17	Define folding terminology and list different folding techniques.
	18.1.18	Demonstrate the use of folding equipment to produce a single fold, an accordion fold, and a gate fold.
	18.1.19	Describe and identify the uses of right angle folding, knife folding, buckle folding, and combination folding.
	18.1.20	Demonstrate the use of folding equipment to produce a right-angle fold job.
	18.1.21	Demonstrate and properly use folding equipment to produce a high-folio lip signature and a low-folio lip signature and describe the advantages of both.
	18.1.22	Describe tipping in procedures.

	18.1.23	Demonstrate the use of folding equipment to perforate and score.
	18.1.24	Demonstrate and perform preventative maintenance on a folder.
	18.1.25	Describe and identify in-line finishing systems.
	18.1.26	Describe and identify off-line finishing systems.
	18.1.27	Produce correctly made pads of paper.
	18.1.28	Describe the fundamentals and applications of saddle stitching and perfect binding.
	18.1.29	Produce side and saddle stitched/stapled products.
	18.1.30	Identify spiral binding and wire binding equipment and products.
	18.1.31	Describe the case binding process.
	18.1.32	Identify packaging and shrink wrap equipment and materials.
	18.1.33	Identify specialty bindery processes: foil stamping, embossing, die cutting, and thermography.
	18.1.34	Identify common production problems encountered in the bindery area.
	18.1.35	Describe and identify basic mailing equipment.
	18.1.36	Demonstrate an understanding of United States Postal Service (USPS) standards (sizes and mail class rates).
	18.1.37	Observe a commercial bindery operation (live or virtual).

Career Ready Practices

1. Act as a Responsible and Contributing Citizen and Employee

Career-ready individuals understand the obligations and responsibilities of being a member of a community and demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them, think about the near-term and long-term consequences of their actions, and seek to act in ways that contribute to the betterment of their teams, families, community, and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

2. Apply Appropriate Academic and Technical Skills

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications and make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

3. Attend to Personal Health and Financial Well-Being

Career-ready individuals understand the relationship between personal health, workplace performance, and personal well-being; they act on that understanding to regularly practice health diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

4. Communicate Clearly, Effectively, and with Reason

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice and organization and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

5. Consider the environmental, social, and economic impacts of decisions

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organizations and the environment. They are aware of and utilize new technologies, understandings, procedures, materials and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and profitability of the organization.

6. Demonstrate creativity and innovation

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

7. Employ valid and reliable research strategies

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices, or inform strategies. They use a reliable research process to search for new information and evaluate the validity of sources when considering the use and adoption of external information or practices. They use an informed process to test new ideas, information, and practices in their workplace situation.

8. Utilize critical thinking to make sense of problems and persevere in solving them

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur, quickly take action to address the problem, thoughtfully investigate the root cause of the problem prior to introducing solutions, and carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

9. Model integrity, ethical leadership, and effective management

Career-ready individuals consistently act in ways that align to personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the direction and actions of a team or organization, and they apply insights into human behavior to change others' actions, attitudes, and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morale, and organizational culture.

10. Plan education and career path aligned to personal goals

Career-ready individuals take personal ownership of their own educational and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience, and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the educational and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

11. Use technology to enhance productivity

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology, being proficient with ubiquitous technology applications. They understand the inherent risks, personal and organizational, of technology applications, and they take actions to prevent or mitigate these risks.

12. Work productively in teams while using cultural/global competence

Career-ready individuals positively contribute to every team whether formal or informal. They apply an awareness of cultural differences to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.