8436
DESIGN DRAFTING ESSENTIALS 2 (11A)

30S/30E/30M

A Design Drafting Course

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Course Description

Design Drafting Essentials 2 is intended for students wishing to specialize in architectural/engineering design drafting.

Curriculum content focuses on architectural/engineering design drafting. Students will present their design solutions to others. The emphasis will be on project-based activities.

Topics include the following:

- freehand sketching
- principles of design
- drafting standards
- materials and processes
- computer modelling
- architectural/engineering concepts
- architectural plan and elevation drawing
- engineering multi-view drawings

The course includes an emphasis on safety, employability skills, career development, sustainability, and new and emerging technologies in design drafting.

Cross-curricular learning outcomes, which include those in design drafting math, science, and the interpretation of technical documents, are to be integrated into the course.

The learning outcomes are organized by Technology Fundamentals (F), Technology Skills (S), and Professional Practice (P) strands. For instructional purposes, the sequence of learning outcomes and the learning outcomes included in each unit of study can vary based on the projects within the course.

Goal 1: Solve problems using the **design process**.

GLO 1.1: Define design problems.

SLO 11A.F.1.1.1	Describe a structured model to solve basic problems.
SLO 11A.F.1.1.2	Identify design problems (e.g., original or re-engineered design).
SLO 11A.S.1.1.1	Use a structured model to solve architectural/ engineering problems.

GLO 1.2: Research and analyze verbal and numeric **information** for design solutions.

SLO 11A.F.1.2.1 Identify basic architectural design principles (e.g., work triangle, bathroom design, circulation).

SLO 11A.F.1.2.2 Identify engineering design principles (e.g., physical properties, fits, mechanical principles).

SLO 11A.F.1.2.3 Identify factors (e.g., materials, cost, manufacturing processes) that influence design.

SLO 11A.F.1.2.4 Discuss sustainability as it relates to architectural/engineering design (e.g., materials, processes).

SLO 11A.F.1.2.5 Discuss universal design.

SLO 11A.F.1.2.6 Discuss aesthetic principles in architectural/engineering design.

SLO 11A.S.1.2.1 Incorporate architectural design principles (e.g., work triangle, bathroom design, circulation) into design solutions.

SLO 11A.S.1.2.2 Incorporate engineering design principles (e.g., physical properties, fits, mechanical properties) into design solutions.

SLO 11A.S.1.2.3 Research information to solve design problems.

SLO 11A.S.1.2.4 Include sustainable concepts in architectural/engineering designs.

SLO 11A.S.1.2.5 Include universal design in architectural/engineering solutions.

GLO 1.3: Synthesize information and ideas to create design solutions.

SLO 11A.F.1.3.1 Identify influences that can impact the decision-making process for architectural/engineering design solutions.

SLO 11A.F.1.3.2 Identify techniques used for 2-D, isometric, and perspective sketching.

SLO 11A.S.1.3.1 Select design solutions based on provided architectural/engineering criteria and related research.

SLO 11A.S.1.3.2 Create freehand sketches to solve architectural and engineering design problems.

Goal 2: **Communicate** design solutions.

GLO 2.1: Prepare **computer models** of design solutions.

SLO 11A.F.2.1.1 Describe the function of computer models (e.g., visualization, model to working drawing, assembly).

SLO 11A.F.2.1.2	Define basic geometric construction principles (e.g., cylindrical, tangential, concentric, ogee).
SLO 11A.F.2.1.3	Identify architectural components and materials, including foundation systems, roofs, and structural members.
SLO 11A.F.2.1.4	Identify engineering features of parts and assemblies (e.g., cylinders, fillets, chamfers, holes, threaded and through holes, countersink, counterbore, spot face, basic fasteners).
SLO 11A.F.2.1.5	Explain how flat patterns are used in 3-D product manufacturing (e.g., packaging).
SLO 11A.S.2.1.1	Create and use a computer model for visualization, to develop a working drawing, and to verify component assembly.
SLO 11A.S.2.1.2	Apply basic geometric construction principles (e.g., cylindrical, tangential, concentric, ogee).

GLO 2.2: Prepare working and presentation drawings and documents.

Layout (F)

SLO 11A.F.2.2.1	Identify components (e.g., title blocks, border, sheet sizes, sheet layout, architectural scales) of an architectural drawing.
SLO 11A.F.2.2.2	Identify the components (e.g., title block information, border with zones, view arrangements, parts lists, projection symbol) of an engineering drawing.
SLO 11A.F.2.2.3	Identify architectural symbols (e.g., walls, doors, windows, foundation systems, roofs, structural members, stairs, materials) for floor plans and elevation drawings.
SLO 11A.F.2.2.4	Identify engineering symbols (e.g., cylinders, fillets, chamfers, holes, threaded and through holes, countersink, counterbore, spot face, basic fasteners) for orthographic, auxiliary, and section drawings.

Line Work (F)

SLO 11A.F.2.2.5	Identify architectural line types (e.g., object, hidden, centre, construction, extension, dimension, break, section lines) and their intended uses (e.g., walls, doors, windows, foundation systems, roofs, structural members, stairs, materials).

SLO 11A.F.2.2.6 Identify engineering line types (e.g., object, hidden, centre, construction, extension, dimension, leader, section, break, cutting plane, phantom, fold lines) and their intended uses (e.g., cylinders, fillets, chamfers, holes, threaded and through holes, countersink, counterbore, spot face, basic fasteners, flat patterns).

Dimensioning and Annotating (F)

SLO 11A.F.2.2.7 Differentiate between basic architectural and engineering dimensioning standards.

SLO 11A.F.2.2.8 Differentiate between basic architectural and engineering notes and annotations.

Layout (S)

SLO 11A.S.2.2.1 Use architectural drawing components (e.g., title blocks, border, sheet sizes, sheet layout, architectural scales, revision columns).

SLO 11A.S.2.2.2 Use engineering drawing components (e.g., title block information, border with zones, view arrangements, parts lists, projection symbols).

SLO 11A.S.2.2.3 Create floor plans and elevation drawings using architectural symbols (e.g., walls, doors, windows, foundation systems, roofs, structural members, stairs, materials).

SLO 11A.S.2.2.4 Create orthographic, primary auxiliary, and section drawings (e.g., full, half, offset section views) of parts and assemblies using engineering symbols.

SLO 11A.S.2.2.5 Create a flat pattern drawing for a 3-D object (e.g., packaging).

SLO 11A.S.2.2.6 Include materials notes in drawings.

SLO 11A.S.2.2.7 Combine orthographic, section, auxiliary, detail, and isometric drawings into a set of fabrication (working) drawings.

Line Work (S)

SLO 11A.S.2.2.8 Select and use line types for architectural and engineering applications based on standards.

Dimensioning and Annotating (S)

SLO 11A.S.2.2.9 Apply placement, styles, and rules of dimensioning following dimensioning standards.

SLO 11A.S.2.2.10 Apply the placement, style, size of text, and leaders for notes and abbreviations following standards.

Goal 3: Use appropriate **materials and processes** of building/ manufacturing.

GLO 3.1: Describe **materials** used in design solutions.

SLO 11A.F.3.1.1	Describe the properties of materials used in design solutions.
SLO 11A.S.3.1.1	List materials used in design solutions.

GLO 3.2: Describe **building/manufacturing processes** used in design solutions.

SLO 11A.F.3.2.1	Identify basic construction processes (e.g., wall and floor thickness) for residential designs.
SLO 11A.F.3.2.2	Identify basic manufacturing processes (e.g., machining, casting) for engineering designs.
SLO 11A.F.3.2.3	Identify re-engineering concepts (e.g., improving function and form, adapting to a different function).

Goal 4: **Present** design solutions.

GLO 4.1: **Plan and organize presentations** of design solutions.

SLO 11A.F.4.1.1	Differentiate between architectural and engineering presentation methods.
SLO 11A.S.4.1.1	Follow presentation methods for design solutions (e.g., oral, written, graphic, physical or digital 3-D model).

GLO 4.2: Use presentation production methods.

SLO 11A.F.4.2.1	Identify the elements (e.g., rationale, functionality, research) of a design brief.
SLO 11A.F.4.2.2	Identify the techniques for creating floor plans, elevations, and 3-D views from digital 3-D models.
SLO 11A.F.4.2.3	Identify the techniques to create 3-D physical models.
SLO 11A.S.4.2.1	Create design briefs to support architectural design solutions.
SLO 11A.S.4.2.2	Create design briefs to support engineering design solutions.
SLO 11A.S.4.2.3	Create floor plans and elevations from 3-D computer models.
SLO 11A.S.4.2.4	Create orthographic and isometric views from 3-D computer models.
SLO 11A.S.4.2.5	Create physical models.

GLO 4.3: Present/defend design solutions.

SLO 11A.F.4.3.1	Identify elements (e.g., clear and concise communication, appearance and dress, enunciation and volume) of effective presentations.
SLO 11A.F.4.3.2	Identify competitions related to design drafting.
SLO 11A.S.4.3.1	Present design solutions to an audience (e.g., peer, teacher) and reflect on feedback.

Goal 5: Describe and apply the common **tools and equipment** used in design drafting.

GLO 5.1: Describe and use **drawing and modelling tools and equipment**.

SLO 11A.F.5.1.1	Identify basic sketching tools and media.
SLO 11A.F.5.1.2	Identify physical modelling tools (e.g., scissors, knives, saws).
SLO 11A.F.5.1.3	Identify basic measuring devices (e.g., rulers, tape measures, engineering, architectural, and metric scales, calipers).
SLO 11A.S.5.1.1	Use sketching tools and media.
SLO 11A.S.5.1.2	Use basic physical modelling tools (e.g., scissors, knives, saws, tape measures, calipers).

GLO 5.2: Describe and use **computer hardware and equipment**.

SLO 11A.F.5.2.1	Identify basic requirements for a CADD workstation.
SLO 11A.F.5.2.2	Identify the uses of basic input devices (e.g., cameras, scanners) related to design.
SLO 11A.F.5.2.3	Identify the uses of basic output devices (e.g., printers, plotters) related to design.
SLO 11A.S.5.2.1	Operate input devices (e.g., digital camera, scanner).
SLO 11A.S.5.2.2	Operate output devices (e.g., printers, plotters).

GLO 5.3: Describe and use **software**.

SLO 11A.F.5.3.1	Differentiate between industry standard architectural and engineering CADD software.
SLO 11A.F.5.3.2	Identify basic features in office- and design-related software.
SLO 11A.F.5.3.3	Identify information communication technologies (e.g., RSS feeds, blogs, technical websites, discussion boards) related to design drafting.

SLO 11A.S.5.3.1 Use industry standard architectural and engineering CADD software.

SLO 11A.S.5.3.2 Use basic features in office- and design-related software.

SLO 11A.S.5.3.3 Manage project data using CADD software.

SLO 11A.S.5.3.4 Manage and organize project files.

SLO 11A.S.5.3.5 Use and manipulate digital images, at a basic level, to obtain and record information (e.g., portfolio collection, research).

SLO 11A.S.5.3.6 Use information communication technologies (e.g., RSS feeds, blogs, technical websites, discussion boards) related to architectural/engineering design drafting.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** that relate to design drafting.

GLO 6.1: Describe and apply **mathematical concepts** as they relate to design drafting.

SLO 11A.F.6.1.1 Demonstrate an understanding of the metric and imperial systems of measurement.

SLO 11A.F.6.1.2 Add, subtract, multiply, and divide fractions and decimals.

SLO 11A.F.6.1.3 Identify the buildable levels of precision used in architectural and engineering drawings.

SLO 11A.F.6.1.4 Identify equivalent forms of fractions (e.g., $\frac{1}{8}" = \frac{2}{16}"$, lowest common denominator).

SLO 11A.F.6.1.5 Identify standard drafting scales (e.g., relationship between ratios and fractions).

SLO 11A.F.6.1.6 Recognize when numbers must have the same units before they can be calculated.

SLO 11A.F.6.1.7 Identify symbols related to imperial measurement (e.g., 2'-3").

SLO 11A.F.6.1.8 Relate the Cartesian coordinate system to CADD.

SLO 11A.S.6.1.1 Use architectural units (imperial) and formats of measurement.

SLO 11A.S.6.1.2 Use engineering units (metric) and formats of measurement.

SLO 11A.S.6.1.3 Apply ratios (e.g., scale drawing, roof slope, tapers).

SLO 11A.S.6.1.4 Extract architectural and engineering data using measuring devices (e.g., rulers, tape measures, scales, calipers).

SLO 11A.S.6.1.5 Calculate the length and area of buildings and individual rooms.

SLO 11A.S.6.1.6	Calculate distance, area, volume, and mass for engineered products.
SLO 11A.S.6.1.7	Convert between metric and imperial linear units.
SLO 11A.S.6.1.8	Set CADD units to the appropriate precision.

GLO 6.2: Read, interpret, and communicate information.

SLO 11A.F.6.2.1	Differentiate between research and evaluation techniques.
SLO 11A.F.6.2.2	Identify sources of technical information (e.g., building code, span tables, fastener tables).
SLO 11A.S.6.2.1	Gather and select information from oral, visual, material, print, or electronic sources.
SLO 11A.S.6.2.2	Read and interpret information from text, tables, charts, and graphs.
SLO 11A.S.6.2.3	Communicate using the language and terminology of architectural and engineering design drafting.

GLO 6.3: Understand **scientific concepts** as they apply to design drafting.

SLO 11A.F.6.3.1	Identify the factors that influence architectural and engineering material use (e.g., strength, density, combustibility, buoyancy).
SLO 11A.F.6.3.2	Describe strengths of shapes.
SLO 11A.F.6.3.3	Appreciate the relationship between the model/drawing and physical object.
SLO 11A.S.6.3.1	Manipulate materials and shapes to assess their strengths.

Goal 7: Demonstrate an awareness of **sustainability** as it pertains to design drafting.

GLO 7.1: Understand the impact of architectural/engineering design on the **environment**.

SLO 11A.F.7.1.1	Appreciate the impact of sustainable practices on the environment.
SLO 11A.F.7.1.2	Identify environmental sustainability factors that influence architectural and engineering design solutions.
SLO 11A.S.7.1.1	Incorporate environmental sustainability factors in architectural and engineering design solutions.

GLO 7.2: Describe the impact of architectural/engineering design on **human health and well-being**.

SLO 11A.F.7.2.1 Appreciate the impact of sustainable practices on human health and well-being.

SLO 11A.F.7.2.2 Identify sustainability factors that influence human health and well-being in architectural and engineering design solutions.

SLO 11A.S.7.2.1 Incorporate human health and well-being sustainability factors in architectural and engineering design solutions.

GLO 7.3: Recognize the **economic impact** of sustainable practices in architectural/engineering design.

SLO 11A.F.7.3.1 Appreciate the impact of sustainable practices on the economy.

SLO 11A.F.7.3.2 Identify economic sustainability factors that influence architectural and engineering design solutions.

SLO 11A.S.7.3.1 Incorporate economic sustainability factors in architectural and engineering design solutions.

Goal 8: Understand the **evolution** of design drafting, including its **technological progression and emerging trends**.

GLO 8.1: Describe the **evolution of design drafting, including its technological progression and emerging trends**.

SLO 11A.F.8.1.1 Describe the emerging technologies related to the tools, equipment, and materials of design drafting.

SLO 11A.F.8.1.2 Describe the emerging trends (e.g., societal changes, styles) in architectural design.

SLO 11A.F.8.1.3 Identify historical architectural design styles.

SLO 11A.F.8.1.4 Identify historical design and manufacturing methods.

Goal 9: Follow the **ethical and legal standards** in design drafting.

GLO 9.1: Incorporate the local and national **building codes and standards as well as manufacturing and engineering standards** into designs.

SLO 11A.P.9.1.1	Discuss the need for standards and codes in design drafting.
SLO 11A.P.9.1.2	Produce technical drawings to CAN/CSA, ISO, and ANSI standards.
SLO 11A.P.9.1.3	Follow building codes to create floor plans and elevations.
SLO 11A.P.9.1.4	Identify the standards related to architectural and engineering working drawing view selection, placement, and modification (e.g., removal of unnecessary hidden lines, addition of centre line, partial views).
SLO 11A.P.9.1.5	Appreciate that drawings are legal and contractual.

GLO 9.2: Describe the **ethical expectations** of designers.

SLO 11A.P.9.2.1	Appreciate the legal implications of ethical design.
SLO 11A.P.9.2.2	Appreciate the ethical responsibilities of producing accurate design drafting documents.

Goal 10: Demonstrate a knowledge of and ability to recognize and apply appropriate **health and safety** requirements and practices to maintain a safe workplace.

GLO 10.1: Demonstrate an awareness of **rights, responsibilities, and safety procedures** for specific tools, equipment, and working environments.

SLO 11A.P.10.1.1	Demonstrate and value safe work practices and procedures.
SLO 11A.P.10.1.2	Follow proper classroom practices (e.g., keep work area clean and organized, avoid horseplay, clean keyboards with sanitizer), which help protect the safety and health of students and staff.
SLO 11A.P.10.1.3	Demonstrate ergonomically correct procedures to avoid injury (e.g., stress, strain).
SLO 11A.P.10.1.4	Demonstrate personal responsibility for health and safety.
SLO 11A.P.10.1.5	Demonstrate the safety features of tools and equipment.
SLO 11A.P.10.1.6	Follow emergency evacuation procedures.

SLO 11A.P.10.1.7 Use appropriate aids to minimize risk of injury.

SLO 11A.P.10.1.8 Use appropriate personal protective equipment.

SLO 11A.P.10.1.9 Locate first aid stations and fire extinguishers.

GLO 10.2: Describe **health and safety laws and regulations**.

SLO 11A.P.10.2.1 Describe the reporting process for injuries.

SLO 11A.P.10.2.2 Identify WHMIS symbols and terminology, and follow WHMIS guidelines, including the location of MSDS sheets.

SLO 11A.P.10.2.3 Comply with health and safety legislation and practices.

Goal 11: Demonstrate **employability skills** required in design drafting.

GLO 11.1: Demonstrate fundamental **employability skills**.

SLO 11A.P.11.1.1 Describe the importance of employability skills in school, work, and daily life.

SLO 11A.P.11.1.2 Listen and ask questions to clarify problems and instructions.

SLO 11A.P.11.1.3 Locate, gather, and organize design drafting information using appropriate technology and information systems.

SLO 11A.P.11.1.4 Assess situations and identify problems and possible solutions.

GLO 11.2: Demonstrate **personal management** skills.

SLO 11A.P.11.2.1 Demonstrate interest, initiative, and effort.

SLO 11A.P.11.2.2 Manage time to complete tasks/projects within stated time frames.

SLO 11A.P.11.2.3 Demonstrate accountability for own actions and for the actions of one's team.

SLO 11A.P.11.2.4 Respond constructively to changes.

SLO 11A.P.11.2.5 Demonstrate a willingness to learn continuously.

SLO 11A.P.11.2.6 Appreciate the need for continuous learning in technologically dependent occupations.

GLO 11.3: Demonstrate **teamwork** skills.

SLO 11A.P.11.3.1 Be respectful toward, open to, and supportive of the thoughts, opinions, and contributions of others in a group.

SLO 11A.P.11.3.2 Contribute information and skills to achieve the goals of a group.

SLO 11A.P.11.3.3 Contribute willingly to classroom/shop learning activities.

SLO 11A.P.11.3.4 Accept assistance from and offer it to others.

Goal 12: Describe **career opportunities** in design drafting.

GLO 12.1: Describe **post-secondary opportunities** related to design drafting.

SLO 11A.P.12.1.1 Identify post-secondary paths and articulation opportunities for design drafting (e.g., requirements, educational institutions, programs).

GLO 12.2: Describe **career opportunities** available in design drafting across industries.

SLO 11A.P.12.2.1 Explore architectural/engineering careers related to design drafting.

GLO 12.3: Create, maintain, and present a **portfolio**.

SLO 11A.P.12.3.1 Collect architectural/engineering samples for a design drafting portfolio.