Indiana Department of Education
Academic Standards Course Framework

WELDING TECHNOLOGY I

Welding Technology I includes classroom and laboratory experiences that develop a variety of skills in oxy-fuel cutting and Shielded Metal Arc welding. This course is designed for individuals seeking careers in Welding, Technician, Sales, Design, Research or Engineering. Emphasis is placed on safety at all times. OSHA standards and guide lines endorsed by the American Welding Society (AWS) are used. Instructional activities emphasize properties of metals, safety issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing through projects and exercises that teach students how to weld and be prepared for college and career success.

- DOE Code: 5776
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: None
- Credits: 2-3 credits per semester, 2 semesters maximum, maximum of 6 credits.
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit:
    - Ivy Tech
        - INDT 114- Introductory Welding
        - WELD 108- Shielded Metal Arc Welding I
    - Vincennes University
        - WELD 101- Oxy-Acetylene Welding
        - WELD 103-Gas Metal Arc Welding

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Content Standards

Domain – Workplace Competency

Core Standard 1 Students establish appropriate workplace behaviors and characteristics to prepare for completion of further education in welding training programs.

Standards

WTI-1.1 Allocate the appropriate resources for task completion

WTI-1.2 Demonstrate effective interpersonal skills

WTI-1.3 Develop leadership skills

WTI-1.4 Establish positive relationships with people from diverse backgrounds

WTI-1.5 Research, analyze, and use data for work assignments

WTI-1.6 Apply effective critical thinking, decision making, and problem-solving techniques

WTI-1.7 Select and use appropriate tools and technology

WTI-1.8 Implement quality assurance measures and safeguards

WTI-1.9 Follows verbal instructions to complete work assignments

WTI-1.10 Follows written instructions to complete work assignments

WTI-1.11 Demonstrate effective listening and speaking skills

WTI-1.12 Perform appropriate mathematical calculations correctly

WTI-1.13 Exhibit a responsible work ethic

WTI-1.14 Demonstrate accepted standards for ethical behavior

WTI-1.15 Perform housekeeping duties

WTI-1.16 Prepares time or job cards, reports or records

Domain – Career Development

Core Standard 2 Students apply and adapt appropriate personal and professional skills to effectively manage welding careers.

Standards

WTI-2.1 Establish a personal career goal and develop objectives for achieving the goal

WTI-2.2 Evaluate employment and career pathway opportunities related to established career interest(s)

WTI-2.3 Create a continuing education plan that identifies further education and training options

WTI-2.4 Prepare for exams leading to certifications recognized by business and industry

WTI-2.5 Develop skills needed to enter the workforce

WTI-2.6 Evaluate resources that keep workers current in the career field

WTI-2.7 Demonstrate skills and attitudes needed for lifelong learning

WTI-2.8 Apply effective money management strategies

Domain – Safety and Health in Welding

Core Standard 3 Students integrate proper safety procedures in class activities and projects to meet professional and governmental standards.

Standards

WTI-3.1 Apply safe practices according to American National Standards Institute safety standards

WTI-3.2 Utilize proper safe operation practices in work area

WTI-3.3 Demonstrates proper use and inspection of ventilation equipment

WTI-3.4 Demonstrates proper Hot Zone operation

WTI-3.5 Select proper procedures actions for working in confined spaces

WTI-3.6 Demonstrates proper use of precautionary labeling and MSDS information

WTI-3.7 Demonstrates proper inspection and operation of equipment used for each welding and thermal cutting process used

Domain – Drawing and Welding Symbol Interpretation

Core Standard 4 Students interpret technical drawings and documents to perform welding processes to specifications.

Standards

WTI-4.1 Analyze and interpret blueprints

WTI-4.2 Interprets basic elements of a drawing or sketch

WTI-4.3 Interprets welding symbol information

WTI-4.4 Fabricates parts from a drawing or sketch

Domain – Manual and Mechanized Oxyfuel Cutting

Core Standard 5 Students create sound manual and automatic oxyfuel cuts on materials to meet industry standards.

Standards

WTI-5.1 Perform manual and automatic oxyfuel gas cutting

WTI-5.2 Performs safety inspections of manual oxy fuel gas cutting (OFC) equipment and accessories

WTI-5.3 Makes minor external repairs to manual OFC equipment and accessories

WTI-5.4 Sets up for manual OFC operations on carbon steel

WTI-5.5 Operates manual OFC equipment on carbon steel

WTI-5.6 Performs straight, square edge cutting operations in the flat position on carbon steel

WTI-5.7 Performs shape, square edge cutting operations in the flat position on carbon steel

WTI-5.8 Performs straight, bevel edge cutting operations in the flat and position on carbon steel

WTI-5.9 Performs scarfing and gouging operations to remove base and weld metal, in flat and horizontal positions on carbon steel

WTI-5.10 Performs safety inspections of mechanized OFC equipment and accessories

WTI-5.11 Makes minor external repairs to mechanized OFC equipment and accessories

WTI-5.12 Sets up for mechanized OFC operations on carbon steel

WTI-5.13 Operates mechanized OFC equipment on carbon steel

WTI-5.14 Performs straight, square edge cutting operations in the flat position on carbon steel using mechanized OFC

WTI-5.15 Performs straight, bevel edge cutting operations in the flat position on of carbon steel using mechanized OFC

WTI-5.16 Examines tacks, root passes, intermediate layers, and completed welds

Domain – Shielded Metal Arc Welding

Core Standard 6 Students execute appropriate Shielded Metal Arc welds on a variety of industrial metal to meet industry standards.

Standards

WTI-6.1 Apply Shielded Metal Arc Welding (SMAW) welding process fundamentals to actual lab experiences

WTI-6.2 Set up for SMAW operations on carbon steel

WTI-6.3 Operate SMAW equipment on carbon steel

WTI-6.4 Make fillet welds in all positions on carbon steel

WTI-6.5 Make groove welds in all positions on carbon steel

WTI-6.6 Pass SMAW welder performance qualification test (2G and 3G, uphill, limited thickness test plates) on carbon steel

Domain – Welding Inspection and Testing

Core Standard 7 Students evaluate various weld stages to meet inspection criteria.

Standards

WTI-7.1 Examine cut surfaces and edges of prepared base metal parts

WTI-7.2 Examine tacks, intermediate layers, and completed welds

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.

11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain

unresolved.

Integration of Knowledge and Idea

11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

11-12.WT.1 Write arguments focused on *discipline-specific content*.

11-12.WT.2 Write informative/explanatory texts, including technical processes.

11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

11-12.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources,

using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectivity to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation

11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.