# Industrial and Technology Education Subject Matter Requirements

Complete the matrix below by including links to course syllabi. Within each subdomain include direct links to supporting evidence addressing the subject matter requirement. These links must go directly the point in the syllabus where the subject matter requirement is addressed. Only submissions meeting this requirement will be sent to a team for review. Submissions not meeting this requirement will be returned to the institution.

## Domains for Industrial and Technology Education

| **Domain 1. Nature of Technology** | **Syllabi, Coursework, Assignments, Assessments** |
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| **1.1 Innovation and Design**   1. Demonstrate an understanding of the engineering design process (e.g., defining a problem, using research techniques, communicating solutions, analyzing and optimizing solutions). 2. Understand the product life cycle (e.g., prototypes, transition to production, evaluating product success). 3. Demonstrate an understanding of how to use technological processes and systems to arrive at solutions to real-world problems. 4. Demonstrate an understanding of current technological methods and processes to meet the needs of new and emerging fields and technologies (e.g., robotics, artificial intelligence, biotechnology, nanotechnology). 5. Demonstrate an understanding of factors that influence design form (e.g., color theory, layout, aesthetics, juxtaposition, dimension). 6. Demonstrate an understanding of factors that influence design function (e.g., purpose, practicality, ergonomics, utility). |  |
| **1.2 Careers and Employability Skills**   * + 1. Demonstrate an understanding of industrial and technology career opportunities (including postsecondary opportunities) and career paths.     2. Understand skills, knowledge, responsibilities, attitudes, and aptitudes associated with industrial and technology careers.     3. Demonstrate an understanding of workplace dynamics and structures (e.g., teaming, development of interpersonal and leadership skills, human resource and human efficiency development, Secretary's Commission on Achieving Necessary Skills [SCANS]). |  |
| **1.3 Safety and the Environment**   1. Demonstrate an understanding of health and safety procedures needed for laboratory and workplace settings. 2. Understand the safe and proper use and maintenance of tools and equipment. 3. Demonstrate an understanding of safety regulations (e.g., OSHA regulations) and procedures (e.g., use of MSDS, handling of hazardous waste), including emergency procedures. 4. Demonstrate an understanding of the safe design and management of laboratory facilities and planning of safe laboratory activities. 5. Demonstrate an understanding of environmental issues (e.g., water pollution, air pollution, noise pollution, health hazards) associated with the development and use of technology and technological systems (i.e., power and energy, communication and information, manufacturing, and construction). 6. Understand procedures and techniques for selecting, maintaining, and repairing technological systems to ensure a safe environment. |  |
| **1.4 Society and Globalization**   1. Understand the history and evolution of technology. 2. Identify and analyze the positive and negative influences of technology on communities and society (e.g., air pollution, land use, environmental impact). 3. Analyze factors (e.g., cultural, economic) that influence innovation and the development of technology. 4. Demonstrate an understanding of the relationship between technological literacy and technical skills. 5. Demonstrate an understanding of legal and ethical issues related to technology (e.g., copyright, liability, intellectual property, patents). |  |
| **1.5 Independent and Integrated System Model**   1. Demonstrate an understanding of systems and subsystems in terms of input, process, output, and feedback. 2. Identify and analyze the resources needed to develop and support technological systems. 3. Demonstrate an understanding of control systems and their use in technological systems. 4. Demonstrate an understanding of project and product management. |  |
| **1.6 Integration with Other Academic Disciplines**   * + 1. Use appropriate mathematical concepts (e.g., algebra, trigonometry, statistics, geometry) to analyze data and solve problems.     2. Use a variety of communication skills (e.g., technical writing, schematics, flowcharts, verbal communication) to convey information.     3. Use appropriate scientific concepts (e.g., Newton's laws, ideal gas law, chemical reactions) to analyze and solve problems.     4. Demonstrate an understanding of the interactions between technology and the humanities, culture, and political sciences. |  |

| **Domain 2. Power and Energy** | **Syllabi, Coursework, Assignments, Assessments** |
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| **2.1 Processes**   1. Demonstrate an understanding of power generation processes (e.g., geothermal, nuclear, solar, fossil fuel, fuel cell). 2. Apply scientific principles of work, power, energy, and efficiency to analyze energy transformations. 3. Demonstrate an understanding of processes for energy storage (e.g., dams, flywheels, batteries). 4. Solve problems using mathematical concepts related to power and energy (e.g., Ohm's law, Pascal's law, moment of inertia, time, distance, velocity). 5. Apply concepts of power and energy to analyze a variety of technological systems (e.g., mechanical, fluid, electrical, thermal). |  |
| **2.2 Systems**   1. Understand safety principles, safety regulations, and safety engineering. 2. Describe and analyze systems that convert energy from one form to another (e.g., engines, generators, actuators). 3. Describe components and analyze characteristics of power control systems (e.g., brakes, valves, switches, circuit breakers). 4. Understand power transmission systems (e.g., gears, cams, parallel and series circuits, pulleys, pumps). 5. Demonstrate knowledge of the architecture and infrastructure associated with land, sea, aerospace, and intermodal transportation systems (e.g., rapid transit, shipping lanes, highways, locks, flight patterns). |  |
| **2.3 Resources**   1. Demonstrate an understanding of renewable (e.g., solar, wind, biomass) and nonrenewable (e.g., fossil, nuclear, chemical) energy sources. 2. Demonstrate an understanding of the uses and properties of materials (e.g., fuels, lubricants, conductors). 3. Demonstrate an understanding of a variety of power and energy tools and equipment (e.g., multimeter, torque wrench, dynamometer). |  |

| **Domain 3. Information and Communication** | **Syllabi, Coursework, Assignments, Assessments** |
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| **3.1 Design Processes**   * + 1. Demonstrate an understanding of design documentation (e.g., blueprints, mock-ups, storyboards, schematics).     2. Apply practical design concepts (i.e., form and function) to solve problems in communication.     3. Understand computer design (e.g., hardware, software).     4. Demonstrate an understanding of drawing and drafting principles (e.g., lettering, Multiview drawing, dimensioning). |  |
| **3.2 Systems**   1. Apply knowledge of imaging and image production (e.g., photographic, electronic, print). 2. Analyze characteristics of telecommunication systems. 3. Analyze characteristics of broadcast communication systems. 4. Understand processes (e.g., preproduction, production, distribution) for developing multimedia systems. |  |
| **3.3 Resources**   1. Demonstrate an understanding of the materials (e.g., media, electronic components), tools (e.g., test equipment, software, hand tools), and equipment (e.g., hardware, imaging equipment) used in information and communication systems. 2. Understand strategies for the effective use of information resources (e.g., data banks, subject matter experts, search engines). 3. Demonstrate an understanding of communication systems architecture and infrastructure (e.g., analog systems, digital systems, mainframes, client servers, network architecture). 4. Understand criteria for the selection of appropriate materials, tools, and equipment used in information and communication systems. |  |
| **3.4 Security and Privacy**   * + 1. Understand physical security systems (e.g., locks, access control, motion detectors, surveillance, intrusion detection).     2. Understand electronic security systems (e.g., access and permissions, passwords, user IDs, roles of administrators and end users, encryption).     3. Demonstrate an understanding of principles related to security compliance procedures (e.g., personal responsibility, job function, need-to-know basis, ethical and legal). |  |

| **Domain 4. Project and Product Development** | **Syllabi, Coursework, Assignments, Assessments** |
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| **4.1 Engineering Principles**   1. Understand the project and product design process (e.g., needs assessment, product analysis, prototyping, production design, design for manufacturing). 2. Understand safety principles, safety regulations, and safety engineering. 3. Understand a variety of mathematical concepts and applications (e.g., measurement, tolerance, financial calculations) for product development. 4. Understand principles of data collection, communication, and analysis (e.g., sampling, graphical representations, statistical measures). |  |
| **4.2 Manufacturing and Construction Processes**   1. Understand processes involved in manufacturing (e.g., casting, forming, shaping, finishing, assembling, packaging). 2. Understand project (e.g., building trades, multimedia, transportation) construction processes. 3. Understand manufacturing and construction codes, regulations, and industry guidelines (e.g., OSHA, zoning, building codes, Environmental Impact Reports). 4. Understand the role of research and development in manufacturing and construction enterprises. 5. Understand operations management (e.g., cost estimation, decision making, capacity planning). |  |
| **4.3 Resources**   * + 1. Demonstrate an understanding of the proper identification, selection, use, and maintenance of tools and equipment (e.g., hand tools, power tools, measurement instruments).     2. Demonstrate an understanding of the identification, selection, and use of materials (e.g., wood, metals, plastics, composites, polymers).     3. Demonstrate an understanding of the supply chain and its components (e.g., vendors, just-in-time). |  |
| **4.4 Quality Assurance**   1. Understand principles and procedures of product testing (e.g., source, in-process, final inspection). 2. Demonstrate an understanding of strategies for obtaining and responding to customer feedback. 3. Demonstrate knowledge of the development and purpose of industry standards such as Institute of Electrical and Electronics Engineers (IEEE), International Organization for Standardization (ISO), and American National Standards Institute (ANSI). 4. Understand the principles of total quality management (TQM). 5. Identify principles and strategies of change management (e.g., software version numbers, building codes, change orders). |  |