

Engineering Technical Standards

INVESTIGATE THE FIELD OF ENGINEERING TO ADDRESS THE NEEDS OF A GLOBAL SOCIETY **ENG1.0**

- 1 Define the disciplines of engineering (types of engineers) (i.e., chemical, civil, electrical, mechanical, agricultural, industrial, aeronautical, software, biomedical, etc.)** **ENG1.1**
- 2 Recognize that engineers solve a wide range of problems involving innovation, cost reduction, and more efficient/effective processes** **ENG1.2**
- 3 Describe the specialties/areas of training that may lead to jobs/careers (i.e., transportation, construction, research and development, analytical design, disaster management, waste management, environmental, automation and robotics, etc.)** **ENG1.3**
- 4 Explore emerging fields in engineering and challenges to future work and future life [i.e., drones, electric cars, autonomous cars, AI, IoT, Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), Additive Manufacturing (AM), Smart City design, Automation, Machine Learning (ML), M2M (Machine-to-Machine), H2M (Human-to-Machines), etc.]** **ENG1.4**
- 5 Analyze the societal, environmental, legal, and ethical responsibilities of engineers (e.g., Engineering Code of Ethics, economic, political, sustainability, and community health and safety)** **ENG1.5**
- 6 Determine the skills and education required to enter engineering careers (i.e., aptitude for math and science; complex problem solving, critical thinking and decision-making; interpreting plans, schematics, and blueprints; communication skills to influence and convey facts with specificity, etc.)** **ENG1.6**

CREATE ENGINEERING SOLUTIONS BY APPLYING A STRUCTURED PROBLEM-SOLVING/DECISIONMAKING PROCESS **ENG2.0**

- 1 Identify the problem** **ENG2.1**
- 2 Develop a problem statement based on facts, research, and experience** **ENG2.2**
- 3 Explore possible issues or options to the problem** **ENG2.3**
- 4 Select the best solution within the constraints and criteria** **ENG2.4**
- 5 Develop a prototype or model to test the selected solution** **ENG2.5**
- 6 Implement the solution** **ENG2.6**

7 Evaluate the solution, and revise or repeat if necessary (i.e., Are there other solutions, better solutions, or cheaper solutions? etc.) ENG2.7

8 Document and report all results ENG2.8

APPLY MATHEMATICAL LAWS AND PRINCIPLES RELEVANT TO ENGINEERING TECHNOLOGY ENG3.0

1 Use basic mathematical functions and tools (i.e., Google Sheets, Excel, graphing calculator, etc.) ENG3.1

2 Use data collection and analysis to display data and verify its accuracy ENG3.2

3 Display data graphically using diagrams and working drawings ENG3.3

4 Use statistical measures of a central tendency (mean, median, and mode) as needed in the structured problem-solving process ENG3.4

5 Use mathematical models including algebraic, geometric, trigonometric, and calculus relationships to solve, analyze, and design solutions ENG3.5

6 Generate manually and electronically mathematical solutions and evaluate their validity ENG3.6

7 Use English and Metric systems of measurement ENG3.7

APPLY SCIENTIFIC LAWS AND PRINCIPLES RELEVANT TO ENGINEERING TECHNOLOGY ENG4.0

1 Use the relationship among energy, work, and power to solve a variety of problems involving mechanical, fluid, electrical, and thermal systems ENG4.1

2 Use Newton's Laws of Motion to analyze static and dynamic systems with and without the presence of external forces ENG4.2

3 Use the laws of conservation of energy, charge, and momentum to solve a variety of problems involving mechanical, fluid, electrical, and thermal systems ENG4.3

4 Analyze relevant properties of materials used in engineering projects [i.e., chemical, environmental, mechanical (tension, compression, torque), electrical, physical, etc.] ENG4.4

APPLY TECHNOLOGY AND TOOLS TO ENGINEERING SOLUTIONS ENG5.0

1 Explain the concepts of precision, accuracy, and tolerance as they relate to measurement tools (i.e., micrometers, dial indicator, digital calipers, etc.) ENG5.1

2 Use measurement devices such as calipers, oscilloscopes, and digital multimeters to gather data for analysis ENG5.2

3 Verify the calibration status of measurement tools (i.e., quality control, test, and retest, etc.) ENG5.3

4 Use software tools to solve, model, analyze, and/or design solutions to engineering problems (i.e., SOLIDWORKS, AutoCAD, On-shape, Fusion360, Google Sheets, Excel, etc.) ENG5.4

5 Identify hazards, risks, and incidents related to tools and equipment ENG5.5

6 Practice safe use of tools, machines, equipment, and materials (i.e., OSHA, SDS sheets, PPE, etc.) ENG5.6

7 Review fabrication methods to create potential solutions to engineering problems (e.g., 3D printing, injection molding, woodworking, and welding) ENG5.7

APPLY COMMUNICATION SKILLS TO ENGINEERING PROJECTS ENG6.0

1 Apply technical writing skills and use visual aids to present critical information in reports (i.e., results/outcomes, conclusions, future work recommendations, etc.) ENG6.1

2 Utilize the three stages of oral presentation (e.g., planning, practicing, and presenting) ENG6.2

3 Apply communication skills, including listening skills, with project teams, project managers, clientele, and/or contractors ENG6.3

4 Explain the importance of multiculturalism in creative and professional decision-making (e.g., better decisions based on different views, perspectives, ideas, and proposals; fosters critical thinking, analysis, and collaboration) ENG6.4

APPLY PROJECT MANAGEMENT TOOLS AND TECHNIQUES TO ENGINEERING SOLUTIONS ENG7.0

1 Determine the tools, materials, manpower, and money allocation required to manage the project ENG7.1

2 Utilize time-management techniques (e.g., prioritizing and planning, creating goals, scheduling, advocating, and taking action) ENG7.2

3 Organize and maintain work using project management tools (e.g., Gantt Chart, AGILE, Kanban, Waterfall model, dashboards, task lists, project reports, and time sheets) ENG7.3

4 Schedule daily/weekly meetings to check status of the project and to deal with any constraints and obstacles to the project ENG7.4

5 Document and present project results/outcomes as appropriate ENG7.5

6 Analyze the project from various perspectives (i.e., sustainability, political, economic, health and safety perspectives, etc.) ENG7.6
