PATHWAY TO LEARNING ENGINEERING

Siemens Manufacturing and Automation

A secondary or post-secondary school course featuring NX X Essentials and the TIA Portal

Technical content standards

Engineering design process

- Maintain an engineering notebook for research, prototype creation, documentation and daily reflections
- Apply engineering design and problem solving as an iterative process incorporating science, mathematics and engineering to convert resources to meet a design solution
- Communicate design solutions using effective technical writing skills, including correct spelling, proper grammar and accurate technical vocabulary
- Prepare a quantitative plan for completing a project
- Assume leadership responsibility for collaborative team actions and decisions related to completing a project
- Evaluate the needs and costs of resources necessary to complete a project
- Prepare and communicate model documentation to include details such as product analysis, size, materials, assembly details, installation and service requirements

Reverse engineering

- Apply design principles that accommodate disassembly and resource recovery
- Research and apply current business practices that lead to new product development or improvement of products or procedures, including rapid deployment and development to be faster to market

- Analyze the design attributes of an existing product by disassembling it into its parts, use precision measurement tools to create sketches and drawings of the parts, identify the materials and processes used in manufacturing and create a new and improved design
- Use convergent modeling to capture data and rapidly create new parts to fit existing scans
- Collaborate with teams to combine models and parametrically create solutions
- Use rapid prototyping/additive manufacturing (AM) to create complex parts designed in a computer-aided design (CAD) system

Design for manufacturing

- Apply the principles of design for manufacturing, enabling the efficient and effective production of products
- Develop a logical argument for selecting the tools, machines and labor necessary to produce finished goods from raw materials
- Create a strategy to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs and the use of water and other natural resources
- Create a plan for protecting the safety, health and welfare of people engaged in the manufacturing environment
- Create technical drawings that have proper dimensional tolerances and limits so components can fit as designed
- Use the right instruments to make precision measurements required by plan specification to achieve required dimensions, shapes, location of centers, parallel surfaces and other component attributes
- Understand and apply statistical process control (SPC) to measure quality control
- Research and apply knowledge of material properties to product design and development

Design for assembly

- Apply engineering component design to align assembly
- Create a management plan that includes quality: planning, control, assurance and improvement for an advanced manufacturing environment
- Research, construct and evaluate a plan for an assembly line or work cell

Computer numeric control of machines

- Apply Cartesian coordinates to create toolpaths for machine tools
- Research and apply proper cutting tool speeds, feeds and directions for manufacturing
- Create simple numeric control (NC) part programs using a text editor or a computer-aided manufacturing (CAM) package
- Analyze NC part program files to find and correct errors
- Analyze part geometry to select cutting tools and fixture devices to create a part using a CNC machine
- Edit the tool library of a CNC machine program to establish tool offset values

Applying CAM software to problem solutions

- Design and prepare 3D models for generating a toolpath
- Set up a CAM package by editing the material and tool libraries
- Generate tool paths from a CAD program and edit NC part program files to find and correct errors

Automation with programmable logic controllers

- Design and analyze an electrical system to efficiently convert, transform and transmit electricity
- Research and specify electrical devices necessary to provide power
- Apply machine control systems, sensory feedback and information processing to increase manufacturing productivity
- Use flow charts and diagrams to apply logic in the design of control programs

Applying logic software to create solutions

- Design a system of elements that manages power to conduct a task involving defined movement
- Design a control system to vary the speed and performance of a motor by using feedback from the system to optimize efficiency

- Formulate a system to use data collection and analysis to improve product quality and provide confidence the product will satisfy design requirements
- Design and analyze the application of machine control systems, sensory feedback and information processing to increase manufacturing productivity

Pneumatics design and control

- Construct systems that efficiently use a liquid or gas under pressure to generate, transmit and control power
- Design an integrated system of machines, machine tools, jigs, fixtures, instruments and control programs to produce parts
- Use jigs, fixtures, drill guides, gauges and other manufacturing and assembly tools
- Research, construct and evaluate a plan for an assembly line or work cell
- Identify systems, subsystems and typical components of an automated manufacturing operation
- Apply the necessary safety precautions associated with a fully automated system

Business of manufacturing

- Research and categorize the activities that a business conducts to make discoveries that can either lead to the development of new products or procedures, or to improve existing products or procedures
- Research and evaluate the new approaches to rapidly developing and deploying products that save time and is more efficient
- Review and evaluate the benefits of a plan for an assembly line or work cell
- Create a strategy to increase efficiency and decrease waste by receiving inventory just-in-time (JIT) for the production process to reduce costs and use of natural resources
- Evaluate the use of a production organization, planning and resources, both human and capital, as well as regulatory requirements, to efficiently bring a product to market
- Create a management plan including quality: planning, control, assurance and improvement for an advanced manufacturing environment
- Create a plan for protecting the health and safety of the people engaged in a manufacturing environment

Career awareness and development

- Analyze the educational requirements, skills and abilities required for professionals in the referenced career fields
- Research the job outlook, demand for new employees and salary ranges for the referenced careers

Siemens Digital Industries Software
siemens.com/software

Americas
1 800 498 5351

Europe
00 800 70002222

Asia-Pacific
001 800 03061910

For additional numbers, click here.

85988-D4 3/25 C