Advanced Technology Framework:
Advanced Manufacturing in Semiconductors
Three-Year Breakdown

This three-year curriculum framework is a general outline and can be further customized based on the school's resources, available equipment, and the expertise of the instructors. It is also essential to align the curriculum with the specific standards and requirements of your school district.

Year 1:

1. Introduction to Technology and Advanced Manufacturing
   - Overview of advanced manufacturing processes and their significance.
   - Introduction to semiconductors and their role in technology.
   - Understanding the basics of the Internet of Things (IoT) and its applications in advanced manufacturing.

2. Computing Systems and Networks
   - Introduction to computer hardware components and their functions.
   - Understanding network topologies, protocols, and security.
   - Basics of operating systems and software installation.

3. Raspberry Pi Programming
   - Introduction to Raspberry Pi and its applications.
   - Learning programming languages such as Python to control and interact with Raspberry Pi.
   - Engaging in hands-on projects utilizing Raspberry Pi.

4. Introduction to Micro-credentials
   - Recognizing the importance of micro-credentials in the technology industry.
   - Introduction to industry-recognized micro-credentials by Cisco, CompTIA, Certiport, etc.
   (in alignment with particular district credentials).
   - Exploring diverse pathways and certifications available in the field of semiconductors and advanced manufacturing.

5. Industrial Electricity I (PMMI)
   - Introduction to electrical principles and safety in an industrial setting.
   - Learning about electrical systems, circuits, and components.
   - Understanding troubleshooting techniques and preventive maintenance related to electrical systems.

Year 2:

1. Semiconductors and Integrated Circuits
   - In-depth study of semiconductors, including band theory and doping.
   - Understanding the fabrication process for integrated circuits.
   - Exploring various types of semiconductor devices and their applications.

2. Internet of Things (IoT) and Advanced Manufacturing
   - Delving deeper into the concept of IoT and its applications in advanced manufacturing.
   - Understanding the communication protocols utilized in IoT systems.
   - Analyzing real-world case studies and actively participating in IoT projects.

3. Computer-Aided Design (CAD)
   - Introduction to CAD software and its applications in advanced manufacturing.
   - Learning both 2D and 3D modeling techniques.
   - Applying design principles and implementing best practices for manufacturing purposes.

4. Advanced Semiconductor Technologies
   - In-depth examination of advanced semiconductor materials and fabrication techniques.
   - Exploring emerging technologies such as nanotechnology and quantum computing.
   - Understanding the challenges faced and future trends in semiconductor manufacturing.

5. OSHA 10 General Industry Certification
   - Acquiring knowledge of workplace safety regulations and best practices.
   - Understanding the identification of hazards, risk assessment, and implementing preventive measures.
   - Preparing for the OSHA 10 General Industry certification exam.

Year 3:

1. Advanced Manufacturing Processes and Automation
   - Exploring advanced manufacturing techniques, including additive manufacturing and robotics.
   - Understanding process optimization and the role of automation in manufacturing.
   - Analyzing case studies and actively participating in hands-on projects.

2. Project- and Challenge-Based Learning
   - Engaging in project-based learning to apply the knowledge and skills acquired throughout the curriculum.
   - Solving real-world problems related to semiconductors and advanced manufacturing.
   - Fostering creativity, critical thinking, and teamwork skills.

3. Online Tools and Resources for Advanced Manufacturing
   - Exploring a variety of online tools and software used in advanced manufacturing processes.
   - Learning simulation and modeling software for process optimization.
   - Understanding data analysis and visualization techniques relevant to manufacturing.

4. Advanced Networking and Cybersecurity
   - In-depth study of advanced networking concepts and protocols, and their applications.
   - Understanding network security principles and implementing best practices.
   - Exploring cybersecurity threats and strategies for prevention.

5. Capstone Project
   - Undertaking a comprehensive capstone project that integrates knowledge from all areas of the curriculum.
   - Demonstrating problem-solving, critical-thinking, and presentation skills.
   - Showcasing the practical application of advanced manufacturing and semiconductor concepts.

The provided curriculum map serves as a general outline and can be further tailored to meet the specific needs and requirements of the school, district, and students. To ensure effective monitoring and evaluation of student progress, goals need to be SMART: specific, measurable, achievable, relevant, and time-bound.

Unit 1: Introduction to Technology and Advanced Production

Instructional Objectives:
1. Introduce students to the realm of advanced production and its significance in contemporary industries.
2. Familiarize students with the fundamentals of semiconductors and their role in technology.
3. Provide an overview of the Internet of Things (IoT) and its applications in advanced production.

Student Learning Targets:
1. Identify crucial concepts and processes related to advanced production.
2. Define semiconductors and elucidate their importance in various technological applications.
3. Describe the fundamental principles and components of the IoT.

SMART Goals:
1. By the culmination of this unit, students will be capable of explaining the significance of advanced production in modern industry.
2. Students will display an understanding of semiconductors and their role in technology by successfully completing a quiz with a score of 80% or higher.
3. Through a group project and presentation, students will be able to identify IoT applications in advanced production.

Unit 2: Computing Systems and Networks

Instructional Objectives:
1. Introduce students to the components and functions of computing systems.
2. Develop an understanding of network topologies, protocols, and security.
3. Familiarize students with operating systems and software installation.

Student Learning Targets:
1. Identify and describe the key components of a computing system.
2. Explain different network topologies and protocols, and their significance in data communication.
3. Demonstrate the ability to install and configure software on an operating system.

SMART Goals:
1. By the culmination of this unit, students will be able to identify and describe the functions of various components of a computing system.
2. Students will demonstrate an understanding of network protocols and topologies by successfully establishing a small network and resolving connectivity issues.
3. Students will install and configure software on an operating system and document the process in a step-by-step guide.

Unit 3: Raspberry Pi Programming

Instructional Objectives:
1. Introduce students to Raspberry Pi and its applications.
2. Teach programming languages, such as Python or Lynx, for controlling and interacting with Raspberry Pi.
3. Engage students in hands-on projects utilizing Raspberry Pi.

Student Learning Targets:
1. Describe the applications and capabilities of Raspberry Pi in various projects.
2. Write and execute Python programs to control and interact with Raspberry Pi.
3. Apply programming skills to complete hands-on projects using Raspberry Pi.

SMART Goals:
1. By the culmination of this unit, students will be able to explain the applications and capabilities of Raspberry Pi.
2. Students will demonstrate proficiency in writing and executing Python programs for Raspberry Pi by successfully completing a programming assignment with a score of 80% or higher.
3. Students will complete a hands-on project using Raspberry Pi and present their work to the class. **Unit 4:**

Industrial Electricity I (PMMI)

Instructional Objectives:
1. Introduce students to electrical principles and safety in an industrial setting.
2. Teach about electrical systems, circuits, and components.
3. Provide an understanding of electrical troubleshooting techniques and preventive maintenance.

Student Learning Targets:
1. Explain basic electrical principles and safety practices in an industrial environment.
2. Identify and describe electrical systems, circuits, and components.
3. Apply troubleshooting techniques and preventive maintenance procedures to electrical systems.

SMART Goals:
1. By the culmination of this unit, students will be able to explain electrical principles and safety practices in an industrial setting.
2. Students will demonstrate knowledge of electrical systems and components by successfully completing a labeling exercise with a score of 80% or higher.
3. Students will apply troubleshooting techniques to diagnose and resolve electrical issues in a simulated industrial scenario.

Possible Credentials:
   ● Cisco Certified IoT Specialist
   ● CompTIA A+
   ● CompTIA IT Fundamentals (ITF+)

   Possible Projects:
   ● Building a basic IoT device using Raspberry Pi
   ● Designing and constructing a network of IoT devices
   ● Developing an IoT solution for a real-world problem

Basic Level:

1. Introduction to Technology and Advanced Manufacturing
   - Understand the fundamentals of advanced manufacturing processes and their significance in modern industries.
   - Explore the role of semiconductors in various technological applications.
   - Introduction to the Internet of Things (IoT) and its impact on advanced manufacturing.

2. Computing Systems and Networks
   - Learn about the basic components and functions of computing systems.
   - Understand network topologies, protocols, and security in the context of advanced manufacturing.
   - Explore the basics of operating systems and software installation.

3. Raspberry Pi Programming
   - Introduction to Raspberry Pi and its applications in advanced manufacturing.
   - Learn programming languages such as Python and Lynx to control and interact with Raspberry Pi.
   - Engage in hands-on projects and exercises using Raspberry Pi.

Intermediate Level:

1. Semiconductors and Integrated Circuits
   - Explore the principles of semiconductors, including band theory and doping.
   - Understand the fabrication process for integrated circuits.
   - Learn about different types of semiconductor devices and their applications in advanced manufacturing.

2. Internet of Things (IoT) and Advanced Manufacturing
   - Dive deeper into the concept of IoT and its applications in advanced manufacturing processes.
   - Understand the communication protocols used in IoT systems and their role in industrial settings.
   - Explore real-world case studies and projects related to IoT implementation in manufacturing.

3. Industrial Electricity I (PMMI)
   - Introduction to electrical principles and safety in an industrial environment.
   - Learn about electrical systems, circuits, and components commonly found in advanced manufacturing facilities.
   - Understand electrical troubleshooting techniques and preventive maintenance practices.

4. Computer-Aided Design (CAD)
   - Introduction to CAD software and its applications in advanced manufacturing design.
   - Learn 2D and 3D modeling techniques for creating detailed designs.
   - Explore design principles and best practices for manufacturing processes.

Advanced Level:

1. Advanced Semiconductor Technologies
   - Study advanced semiconductor materials and fabrication techniques used in cutting-edge technologies.
   - Explore emerging technologies such as nanotechnology and quantum computing and their impact on semiconductor manufacturing.
   - Understand the challenges and future trends in semiconductor research and development.

2. Project- and Challenge-Based Learning
   - Engage in hands-on projects and challenges that integrate knowledge and skills acquired throughout the curriculum.
   - Apply critical-thinking, problem-solving, and teamwork skills to solve complex real-world problems in the field of advanced manufacturing.
   - Foster creativity and innovation in the design and execution of projects.

3. Online Tools and Resources for Advanced Manufacturing
   - Explore a variety of online tools and software used in advanced manufacturing processes.
   - Learn simulation and modeling software for process optimization and design validation.
   - Understand data analysis and visualization techniques for manufacturing process improvement.

4. OSHA 10 General Industry Certification
   - Gain knowledge of workplace safety regulations and best practices in an industrial setting.
   - Understand hazard identification, risk assessment, and preventive measures to ensure a safe working environment.
   - Prepare for the OSHA 10 General Industry certification exam to demonstrate competency in industrial safety practices.