THE UNIVERSITY OF BRITISH COLUMBIA Experiential Learning Hub Faculty of Applied Science

# MANUFACTURING ENGINEERING Industry Guide

## Introduction

Manufacturing Engineering is one of the newest engineering programs at UBC – making the career prospects exciting as well. Often you may also see 'Industrial Engineering' listed as university programs, which is synonymous with 'Manufacturing Engineering'. The job scope typically focuses on the design, development, and implementation of manufacturing processes, equipment, and systems to optimize production efficiency and quality.

Manufacturing engineers work in various industries such as automotive, aerospace, electronics, medical devices, consumer goods, and more. The range of industries for manufacturing is vast. Just look around you – everything you see is manufactured!

This document is meant to provide an overview of the industries and companies that manufacturing engineers may work for. This is not a comprehensive list, as it would be impossible to fully capture all potential career paths for manufacturing engineers. The descriptions of each industry provided below are generalized! The information here has been gathered through personal experience, discussion with UBC MANU alumni, and online research. They may not necessarily apply to every company in that industry.

Key Areas of Study:

 Production Planning, Manufacturing Processes, Robotics and Automation, Supply Chain Management, Quality Control, Lean Manufacturing, Additive Manufacturing (3D Printing), Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), Materials Science, Industrial Safety, Ergonomics, Machine Tool Design, Sustainability in Manufacturing, Process Optimization, Operations Research, Industrial Robotics, Advanced Manufacturing Technologies, Data Analytics in Manufacturing, Smart Manufacturing, Manufacturing Systems Integration

## Industries

Manufacturing Engineering plays a pivotal role across a wide array of industries that drive global production and innovation. In the automotive sector, manufacturing engineers streamline production lines to deliver efficient, high-quality vehicles. The aerospace industry relies on them to implement advanced manufacturing techniques for creating precision components. Electronics manufacturing benefits from their expertise in developing streamlined processes for producing complex devices. In healthcare, they contribute to the production of medical devices and equipment that adhere to stringent safety and quality standards. The consumer goods sector depends on manufacturing engineers to enhance productivity and sustainability in mass production. Additionally, industries like renewable energy, robotics, and heavy machinery rely heavily on manufacturing engineers to innovate and improve manufacturing systems. These diverse applications highlight the versatility and impact of manufacturing engineering across the modern industrial landscape.

## Industries

### ENGINEERING CONSULTING

Engineering consulting in manufacturing involves applying specialized expertise to solve complex production and process challenges for client companies. These consulting firms are often highly specialized, utilizing proprietary tools, patented methodologies, and deep industry knowledge to deliver innovative solutions. Manufacturing engineering consultants play a critical role in optimizing production processes, enhancing efficiency, and implementing advanced manufacturing techniques.

This career path allows manufacturing engineers to work across a variety of industries, including aerospace, automotive, electronics, consumer goods, and more. Consultants may focus on productivity enhancements, Six Sigma process optimization, or sustainability improvements in production lines. The versatility of manufacturing engineering ensures consulting opportunities in virtually any goods-producing industry.

#### ESSENTIAL SKILLS:

- Process Optimization and Workflow Analysis
- Knowledge of Lean Manufacturing and Six Sigma
- Project Management and Collaboration
- Advanced Analytical and Problem-Solving Skills
- Technical Proficiency in Manufacturing Systems and Tools
- Communication and Client Management

#### POSITIONS:

- Entry Level: Junior Consultant, Junior Manufacturing Engineer
- Mid-level: Process Improvement Consultant, Manufacturing Systems Engineer
- Senior: Senior Manufacturing Consultant, Lead Process Engineer, Industrial Optimization Specialist

### **PROCESS ENGINEER**

Process engineers specialize in designing, implementing, and optimizing manufacturing and production processes to enhance efficiency, quality, and sustainability. They focus on analyzing workflows, identifying inefficiencies, and developing data-driven solutions to improve performance and reduce costs. By leveraging their expertise, process engineers ensure that systems operate at peak efficiency, minimizing waste and downtime.

Collaboration is a key aspect of the role, as process engineers work closely with cross-functional teams, including production, quality, and maintenance, to ensure seamless integration of new processes and ongoing improvements. Their contributions are vital for maintaining operational excellence in industries ranging from automotive and electronics to pharmaceuticals and consumer goods.

#### ESSENTIAL SKILLS:

- Process Design and Optimization
- Data Analysis and Troubleshooting
- Knowledge of Manufacturing Systems
- Lean and Six Sigma Methodologies
- Collaboration and Teamwork
- Problem-Solving and Critical Thinking

#### POSITIONS:

- Entry Level: Junior Process Engineer, Process Development Engineer
- Mid-level: Process Optimization Engineer, Manufacturing
   Process Engineer
- Senior: Lead Process Engineer, Process Improvement Manager, Senior Manufacturing Engineer

### MANUFACTURING ENGINEER

Manufacturing engineers focus on designing, developing, and implementing efficient manufacturing processes and systems to optimize productivity, quality, and cost-effectiveness. They play a crucial role in analyzing existing workflows, identifying areas for improvement, and developing innovative solutions to enhance production performance.

Collaboration is central to the role, as manufacturing engineers work with cross-disciplinary teams, including design, quality, and supply chain, to ensure seamless integration of systems and processes. They are also responsible for evaluating and selecting equipment, materials, and technologies to meet production goals and sustainability standards. Manufacturing engineers operate across industries, making their expertise essential to modern production environments.

Essential Skills:

- Process Design and Optimization
- Knowledge of Manufacturing Technologies and Systems
- CAD/CAM Proficiency
- Materials Selection and Evaluation
- Project Management
- Collaboration and Communication Skills

Positions:

- Entry Level: Manufacturing Engineer, Junior Process
  Engineer
- Mid-level: Senior Manufacturing Engineer, Industrial Engineer
- Senior: Lead Manufacturing Engineer, Process
  Development Manager, Manufacturing Systems Manager

## Industries

### QUALITY ENGINEER

Quality engineers are essential in ensuring that products and processes meet established quality standards and customer expectations. They design, implement, and monitor quality control systems to maintain high standards in both manufacturing and production. By analyzing data and identifying trends, they proactively address quality issues and develop corrective actions to prevent recurrence.

Collaboration is a key component of the role, as quality engineers work with design, manufacturing, and production teams to integrate quality assurance throughout the product lifecycle. Their efforts ensure that products are reliable, compliant with regulations, and meet both organizational and customer requirements.

### **ESSENTIAL SKILLS:**

- Quality Assurance and Control Methods
- Statistical Process Control (SPC)
- Root Cause Analysis and Problem Solving
- Knowledge of ISO Standards (e.g., ISO 9001)
- Proficiency in Quality Tools (e.g., Six Sigma, FMEA)
- · Attention to Detail and Analytical Thinking

#### POSITIONS:

- Entry Level: Quality Engineer, Quality Assurance Specialist
- · Mid-level: Senior Quality Engineer, Process Quality Fngineer
- · Senior: Lead Quality Engineer, Quality Manager, Continuous Improvement Manager

### **AUTOMATION ENGINEER**

Automation engineers specialize in designing, developing, and implementing automation systems to enhance manufacturing efficiency, productivity, and cost-effectiveness. They identify opportunities for automation, develop tailored solutions, and oversee the integration of automated systems into production processes. Their work involves programming, configuring, and testing systems to ensure seamless and reliable operation.

A key focus for automation engineers is ensuring that systems comply with safety and regulatory standards while maintaining high performance. Collaboration is critical, as they work with multidisciplinary teams to optimize processes and troubleshoot automation challenges. Automation engineers are pivotal in driving innovation and enabling smarter, more efficient manufacturing operations.

### **ESSENTIAL SKILLS:**

- Programming and Control System Design (e.g., PLCs)
- Knowledge of Robotics and Mechatronics
- Process Optimization and System Integration
- Troubleshooting and Problem Solving

Safety and Regulatory Compliance

#### **POSITIONS:**

- Entry Level: Automation Engineer, Control Systems Engineer
- Mid-level: Senior Automation Engineer, Robotics Engineer
- · Senior: Lead Automation Engineer, Automation Systems Manager, Industrial Automation Specialist

### **INDUSTRIAL ENGINEER**

Industrial engineers specialize in designing, analyzing, and optimizing complex systems and processes to enhance efficiency, productivity, and cost-effectiveness in manufacturing and other industries. By leveraging data analysis, modeling, and workflow evaluation, they identify bottlenecks and implement solutions to improve operational performance.

Industrial engineers collaborate with production teams, supply chain managers, and other stakeholders to ensure that processes run smoothly and meet organizational goals. Their expertise spans across industries, where they focus on streamlining operations, reducing waste, and improving overall system effectiveness, making them key contributors to business success.

### ESSENTIAL SKILLS:

- Process Optimization and Workflow Design
- Data Analysis and Operations Research
- Knowledge of Lean Manufacturing and Six Sigma
- · Supply Chain and Logistics Management
- Project Management

#### POSITIONS:

- Entry Level: Industrial Engineer, Operations Analyst
- Mid-level: Process Improvement Engineer, Systems Engineer
- · Senior: Lead Industrial Engineer, Operations Manager, Industrial Systems Consultant

## Industries

## MATERIALS ENGINEER

Materials engineers focus on selecting, developing, and evaluating materials to be used in manufacturing processes. They research and test the properties of materials to ensure they meet the necessary quality, safety, and performance standards for specific applications. By understanding the characteristics of various materials, they help optimize product design and manufacturing efficiency.

Collaboration is key, as materials engineers work closely with design, production, and quality teams to ensure that materials are used effectively, cost-efficiently, and sustainably. They play a vital role in the development of new materials and processes that improve product performance and longevity, making their expertise essential in diverse industries, ranging from aerospace to consumer goods.

### ESSENTIAL SKILLS:

- Materials Selection and Testing
- Knowledge of Material Properties and Behavior
- Failure Analysis and Troubleshooting
- Research and Development
- CAD and Simulation Software Proficiency

### POSITIONS:

- Entry Level: Materials Engineer, Materials Analyst
- Mid-level: Senior Materials Engineer, Materials
   Development Specialist
- Senior: Lead Materials Engineer, Materials Science Manager, R&D Materials Engineer

## **Technical Skills**

### CORE SKILLS

COMPUTER-AIDED DESIGN & MA

(CAD/CAM)

& MANUFACTURING

Expertise in using CAD tools (e.g., SolidWorks, AutoCAD, CATIA) for designing parts and assemblies and CAM software for generating machining and manufacturing instructions.

### AUTOMATION & ROBOTICS

Knowledge of automation systems, robotics, and programmable logic controllers (PLCs) for optimizing production lines and increasing manufacturing efficiency.

### QUALITY CONTROL & ASSURANCE

Skills in statistical process control (SPC), non-destructive testing (NDT), and quality management systems (e.g., ISO 9001) to ensure consistent product standards and compliance with regulations.

### MATERIAL SCIENCE

Understanding the properties, processing, and applications of materials, including metals, polymers, ceramics, and composites, with a focus on their behavior under various manufacturing conditions.

### SUPPLY CHAIN & OPERATIONS MANAGEMENT

Familiarity with supply chain principles, inventory management, and logistics to streamline the flow of materials, components, and products from suppliers to customers.

### THERMODYNAMICS & HEAT TRANSFER

Knowledge of thermodynamics and heat transfer principles applied to manufacturing processes such as welding, extrusion, and heat treatment.

### INDUSTRIAL SAFETY & ERGONOMICS

Awareness of workplace safety standards (e.g., OSHA) and ergonomic practices to ensure safe and efficient operations for workers in manufacturing environments.

### DATA ANALYTICS & PROCESS OPTIMIZATION

Application of data-driven decision-making and tools such as statistical analysis, predictive modeling, and IoT integration to optimize manufacturing processes and reduce downtime.

## SOFTWARES AND TOOLS

### COMPUTER-AIDED DESIGN (CAD) TOOLS

- SolidWorks, AutoCAD, CATIA, Creo: Industrystandard tools for creating detailed 3D models, assemblies, and 2D drawings for parts and systems.
- Fusion 360: An all-in-one tool for CAD, CAM, and CAE, suitable for design, simulation, and manufacturing workflows.

### COMPUTER-AIDED MANUFACTURING (CAM) TOOLS

- Mastercam, HSMWorks: Tools for generating machining instructions and tool paths for CNC manufacturing.
- EdgeCAM: Software for advanced machining and postprocessing operations.

### SIMULATION & FINITE ELEMENT ANALYSIS (FEA)

- ANSYS, Abaqus, COMSOL: Tools for structural, thermal, and fluid simulations to evaluate designs under real-world conditions.
- MATLAB/Simulink: For numerical analysis, control system simulation, and process optimization.

### MANUFACTURING EXECUTION SYSTEMS (MES)

- DelmiaWorks, Plex: Software for monitoring and controlling production processes in real time.
- SAP MES: For integrating manufacturing processes with enterprise-level planning systems.

## How to get Involved

- Engineering Design Teams
- ECE Undergraduate Student Society
- <u>EUS</u>
- UBC Clubs
- Personal Projects
- <u>UBC Work Learn Program</u>

## Other Resources

- <u>SME</u>
- <u>About your degree Manufacturing</u>