

# Manufacturing and Design

Manufacturing and design are foundational to the realization of all mechanical systems. Effective design processes help engineers translate customer needs and requirements into marketable products and systems. Developing in-depth understanding of manufacturing processes enables engineers to realize their products faster, cheaper, and with enhanced functionality. This thrust allows students to obtain a concentration in manufacturing and design as a basis for graduate study and practice in all areas of product development and mechanical systems design.

## Industry Applicability

This certificate program area is appropriate to prepare mechanical engineers for jobs in industry that deal with one or more of the following:

- Design of products and mechanical systems
- Fabrication of mechanical systems and interactions between manufacturing and design
- Additive manufacturing (3D printing)
- Engineering entrepreneurship
- Design for under-served communities

## Selected Examples

1. *Design of products and mechanical systems*: The design of mechanical systems is central to many engineering roles in the energy, aerospace, automotive, and biomedical industries. Challenges include creative concept generation, collaborative teaming, computer-aided design and simulation, and design for manufacturing/assembly/sustainability. Engineers with excellent product development skills will continue to raise the level of innovation in these fields.
2. *Advanced manufacturing, including additive manufacturing (3D printing)*: The manufacturing industry is rapidly transitioning towards greater levels of automation, direct digital design and manufacturing, and customized products. Engineers with in-depth knowledge of conventional and advanced manufacturing

processes are well-positioned to shorten product development cycles, improve product quality, and realize unprecedented levels of customization.

3. *Engineering entrepreneurship*: Successful engineering entrepreneurs must be fluent in product development, including generating creative ideas that fulfill new or existing customer needs and converting those ideas into marketable products.
4. *Engineering for under-served communities*: Modern product development has focused primarily on typical customers in developed economies. New products and services are needed to address life-threatening challenges associated with hunger, hygiene, resource depletion, climate change, and displaced populations worldwide. Even in fully developed economies, products often under-serve customers with physical, mental and other challenges. Design and manufacturing skills are needed to identify and address these gaps in product development

**Faculty Mentors:**

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**Elective Courses (select four)**

- M E 336, Materials Processing
- M E 359, Materials Selection
- M E 350, Machine Tool Operations for Engineers
- M E 350R, Robot Mechanism Design
- ME 371D, Medical Device Design and Manufacturing
- ME374C Combustion Engine Processes
- M E 374D, Automotive Engineering Laboratory
- M E 375K, Production Engineering Management
- ME 376N, High Throughput Nanopatterning
- M E 365E, Engineering Entrepreneurship
- M E 368C, Additive Manufacturing
- ORI 370, Statistical Methods in Manufacturing
- M E 379M, Theory/Design of Mechanical Measurement
- M E 374E, Racecar Engr & Proj Management
- E S 277K, Proj Dev Underserved Commty (PUC, 2 semesters)
- M E 355K, Engineering Vibrations
- M E 377K Projects in Mechanical Engineering

For course descriptions visit the [University Catalog](#).

## **Related Programs**

Humanitarian Engineering (Certificate Program), Design Strategies (Bridging Disciplines Program)