

# MECHANICAL ENGINEERING EXPLAINED

## PART II: EDUCATIONAL OPPORTUNITIES

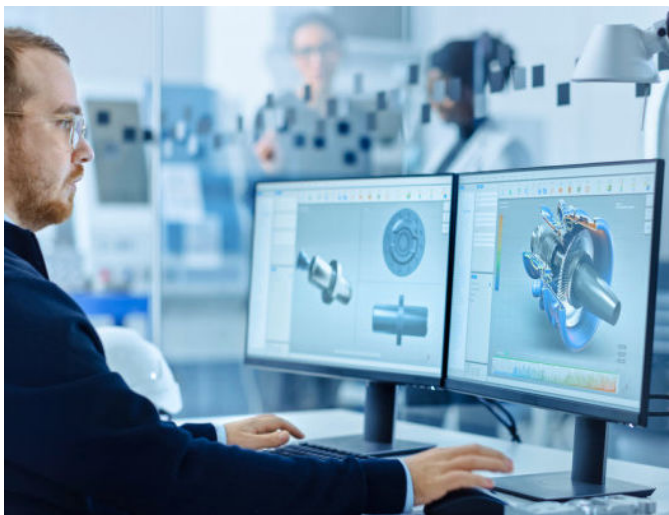


## Atil Arora and Ayush Gupta

A 12th-grade student interested in Mechanical Engineering may find this the beginning of an exciting academic journey. Subjects like mechanics, thermodynamics, and materials science will become toolkits. Topics in 12th-grade physics prepare you for Mechanical Engineering. Some of these topics are.

1. Mechanics
2. Thermodynamics & Heat Transfer
3. Fluid Mechanics
4. Materials Science
5. Kinetic Theory of Gases
6. Nuclear Physics

Students aspiring to pursue mechanical engineering must learn these physics topics. This knowledge helps them grasp more complex concepts in their engineering classes. These topics provide the necessary background. They help students understand the principles behind mechanical systems. They also cover the materials used to make these systems and the energy they use in mechanical engineering.



Mechanical engineering is a broad field that offers numerous opportunities across various industries. Here are some potential career paths for mechanical engineers:

- Robotics, Automation, and Mechatronics
- Research, Design and Development, and Testing
- Energy and Power
- Manufacturing
- Automobile
- Automation and Control



Mechanical engineering is usually studied at universities and engineering schools or colleges. Students can enroll in undergraduate programs after qualifying examination, 12th-grade for most of the universities and colleges.

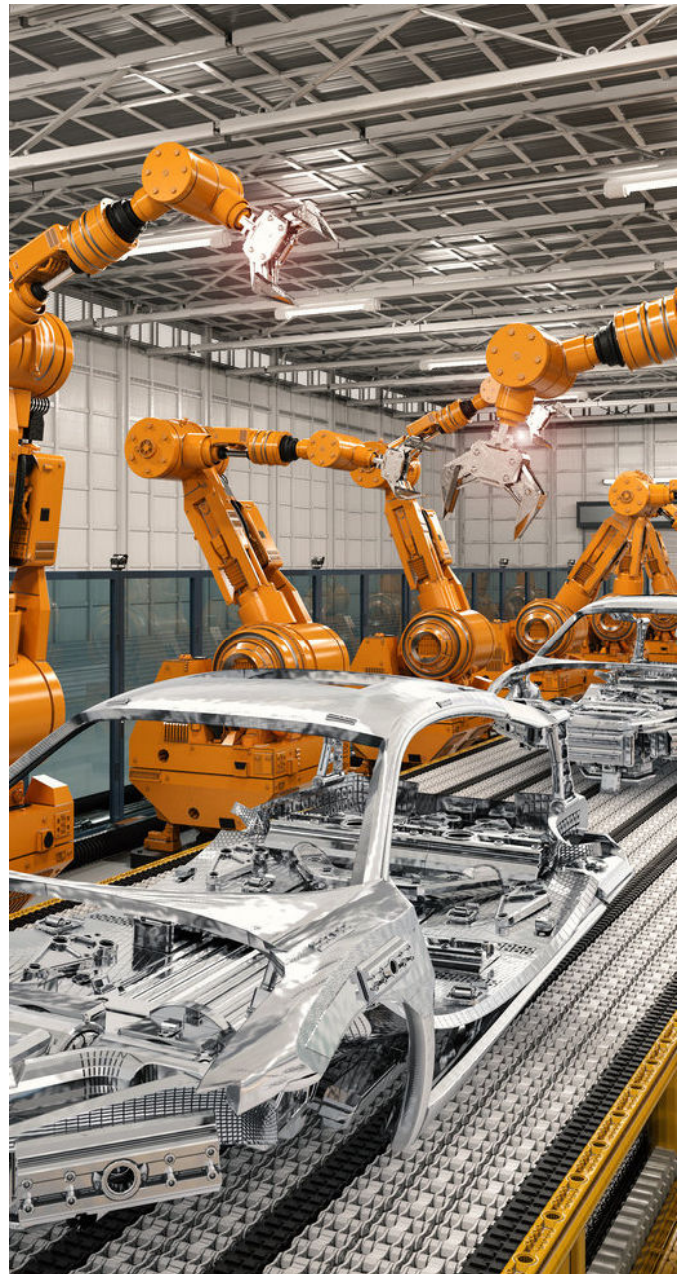
Undergraduate Program (Bachelor's Degree): B. Tech. / B.E.

To get a job at the starting level, you need a bachelor's degree in mechanical engineering or mechanical engineering technology that takes four years to complete.

As per ABET, a globally recognized body for accreditation of engineering programs, the curriculum for a mechanical engineering must include

1. principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations);
2. applications of these topics to modeling, analysis, design, and realization of physical systems, components or processes;
3. coverage of both thermal and mechanical systems; and
4. in-depth coverage of either thermal or mechanical systems.

Students can verify the abet.org requirements vis-à-vis the program structure, faculty and facility offered by the institute in which they are seeking admission. It is also advisable to compare the program offered by the prospective institute with the model curriculum published by apex regulating body AICTE available on its official website <https://www.aicte-india.org/>



**Duration:** 4 years.

**Credits:** Varies but often around 150-180 credits.

**Assessment Methods:** Assessments include in-semester and end-semester examinations, assignments, laboratory work, and projects.

**Internships:** Students often undertake internships during summer breaks to gain practical experience.

Entrance exam for undergraduate admission in mechanical engineering in reputed institutes are

- Joint Entrance Examination Main (JEE Main)
- Joint Entrance Examination Advanced (JEE Advanced)



Mechanical engineering is a broad field that requires a mix of hard and soft skills. Here are some of the critical skills needed for a mechanical engineer:

**Technical Skills:** Besides technical knowledge, mechanical engineers develop problem-solving and analytical skills that are applicable across various industries. They learn to use computer-aided design (CAD) software, simulation tools, and experimental techniques to bring their ideas to life and validate their solutions.

**Engineering Design (CAD Tools):** Proficiency in CAD software, such as AutoCAD and SolidWorks, is fundamental to mechanical engineering. It allows engineers to create detailed 2D and 3D models of mechanical components and systems.

**Thermodynamics:** Understanding the principles of thermodynamics is crucial, especially when dealing with engines, power plants, and HVAC systems. It helps optimize efficiency and plays a vital role in heat transfer analysis.

**Mechanical Analysis (FEA and CFD):** Mechanical analysis skills are indispensable for evaluating the structural integrity of components and systems. Finite Element Analysis (FEA) enables engineers to simulate and analyze stress and strain distributions.

**Soft Skills:** Problem-solving, Communication, Interpersonal Skills. In addition to these skills, a strong foundation in core engineering principles, including mechanics, materials science, and fluid dynamics, is essential. Staying updated with the latest engineering technologies and methodologies is crucial for success in this ever-evolving field.



In next issue (part III) we will explore contribution of Mechanical Engineer in various fields

**Atil Arora is Managing Partner, Centre Head and Head of Physics Department at FIITJEE INDORE. Engineer by qualification, he is well versed figure of education firmament and have been constantly mentoring the students for JEE and various other competitive examination for more than 23 years. atil.arora@fiitjee.com**

**Ayush Kumar Gupta is a skilled mechanical engineer with a B.Tech and an M.Tech from NIT Rourkela. He used to work for BPCL as a Mechanical Engineer. Ayush has passed the GATE exam. He has also done well in competitive exams for Scientist B roles at ISRO and DRDO. His excellent academic and work background shows his dedication to doing well. Ayush stands out in the field of mechanical engineering and research. ayush.gupta39112@fiitjee.com**

