



WHAT IS A MECHANICAL ENGINEER?



MP0398



ASME International

What is a Mechanical Engineer?

Mechanical engineering plays a dominant role in enhancing safety, economic vitality, enjoyment and overall quality of life throughout the world. Mechanical engineers are concerned with the principles of force, energy and motion. The men and women who work as mechanical engineers are professionals with expert knowledge of the design and manufacture of mechanical systems and thermal devices and processes. Some examples of products and processes developed by mechanical engineers include engines and control systems for automobiles and aircraft, electric power generation plants, lifesaving medical devices and consumer products ranging from air conditioners to personal computers and athletic equipment. They also design the machines that mass-produce these products. Virtually every aspect of life is touched by mechanical engineering. If something moves or uses energy, a mechanical engineer was probably involved in its design or production.

An Evolving Profession

The explosive development and expansion in computer technology has literally changed the face of mechanical engineering. The drawing board has given way to computer-aided-design (CAD), and sophisticated computational software tools have enabled mechanical engineers to develop efficient solutions to complex technical problems. For example, the emerging high-tech field of nanotechnology is attracting mechanical engineers to design ultra-miniature machines and tiny implantable medical devices that navigate the human body searching for disease and damaged tissue. Also, the growing concern for the planet and the quality of life for future generations have spurred continuing efforts by mechanical engineers to design resource-efficient and recyclable products and develop equipment and processes to clean-up existing environmental problems and prevent their reoccurrence.

These technologies and a host of others will have an impact on lives in the 21st century, and their development and refinement require the skills, intuition and creative ability of mechanical engineers. At the same time, mechanical engineers are expected to understand and convey the real-world consequences of technology development alternatives to decision-makers and the public.

Toward a Career in Mechanical Engineering

Mechanical engineering is a profession requiring specific skills. These skills are acquired through education, training and experience. Throughout high school, students must enroll in certain courses as preparation for acceptance into engineering programs at a college or university. A solid foundation in mathematics, science and the language arts is critical. Strong mathematics preparation includes algebra, geometry, trigonometry and calculus. Chemistry, biology and physics form the basic science foundation. Ability in oral and written communications is important to success in mechanical engineering studies, and courses in mechanical or computer-aided drafting/drawing and other technology-related subjects can help students begin to understand the important practicalities of technological projects.

Students can enhance their studies and enrich the overall learning experience by entering science and technology fairs and design competitions, and by joining clubs or career groups devoted to engineering and science. Some clubs sponsor day trips and similar excursions to companies, laboratories and industrial facilities, where students can meet engineers in actual work environments.



Alex Burkat
Principal Mechanical Engineer
Disney Imagineering,
Glendale, CA

"I'm a mechanical engineer working for Walt Disney. My job is to design rides for Disney theme parks. One of the first rides I worked on was

Splash Mountain at Disneyland. The ride was just finished at the time I was hired, and I was drafted to debug it and improve certain components and add certain features to it. Sometimes I take my kids to Disneyland. They know that I worked on some attractions and I did this or that ...it's very satisfying to see your things actually built and working."

College for the Mechanical Engineering Student

While mechanical engineering programs may vary in specific content and detail, they are linked by a common educational philosophy. The programs provide a broad-based education with a concentration on fundamentals and basic laws as the major tools required for the professional practice of mechanical engineering. Graduates are expected to have the ability to work professionally, as individuals and in teams, in both the thermal and mechanical systems areas, including the design, manufacture and control of such systems. Moreover, they are expected to understand the ethical, legal, and societal implications of their work.

Mathematics is a fundamental language of the engineering program. Students also gain extensive integrated laboratory, computer and design experiences. The design experience emphasizes synthesis, computer applications and problem solving. Communications, teamwork and practical hands-on experience with various product design processes are also important elements of the program. Internships, co-op semesters and participation in ASME Student Section activities are strongly encouraged as means to gain exposure to engineering practice.

Those seeking to pursue a mechanical engineering degree in the United States should look for a college curriculum accredited by ABET (Accreditation Board for Engineering and Technology). There are approximately 265 college and university mechanical engineering degree programs accredited by ABET. In other countries, look toward polytechnic and university programs that are recognized by governmental education authorities and by the professional organization of mechanical engineers in that country.



Lori Laird
Biomedical Engineer
Guidant Corporation,
Santa Clara, CA

"We develop tools that assist surgeons. Doctors will come in and they'll tell you, 'we're having difficulty with this type of surgery and we'd like to develop a better way to do it.'

So immediately we say, 'okay, how can we develop a product to do this?'"

Where Mechanical Engineers Work

Employment prospects for mechanical engineers are strong, particularly where local economies are growing. In the United States, for example, the profession is growing by 16 percent, or 35,000 jobs annually, which is a rate of growth expected to continue to the year 2006.

Industrial sectors in which mechanical engineers have traditionally made substantial contributions include aerospace, automotive, chemical, computer and electronics, construction, consumer products, energy, engineering consulting and government. In addition, the medical and pharmaceutical industries present exciting opportunities for mechanical engineers to join forces with the life sciences. Even the entertainment industry relies heavily on mechanical engineers for special effects and amusement park equipment.

The vast majority of this work is done in thousands of companies ranging from large multi-nationals to small, local firms. Job functions and responsibilities range from product and production design engineering and systems design to power plant operations, quality control and project management. With experience and further education, some mechanical engineers move into legal or management positions that build upon their scientific and technical skills and expertise. Others choose the path of scholarly research and teaching. The work of the mechanical engineer is diverse and worldwide, and the careers of mechanical engineers are marked by an important common factor - continuous learning.



Caecilia Gotama
Associate Partner and
Project Manager
Syska & Hennessy,
Los Angeles, CA

"There are engineers who become lawyers, there are engineers who become doctors, and there are lots of engineers, like myself,

who are still involved in engineering but acting as consultants. So there are a lot of opportunities out of engineering school."

Lifelong Learning and Becoming Part of the Profession

One engineer's new product is another engineer's new tool. Mechanical engineers are in the business of advancing the technological state of the art and are doing so at a rapid pace and on a global scale.

The analytical and critical thinking and problem-solving skills that result from an engineering education will serve throughout one's life. However, to remain competent and competitive throughout one's career, the mechanical engineer must continuously learn about, and use, new developments in the field. Every project, promotion and job change produces new learning demands. To stay abreast of new developments in the field, mechanical engineers enroll in graduate courses and read technical books, codes, papers, magazines and journals. They attend short courses, take on-line courses, and participate in workshops and conferences.

ASME and other professional societies play an important role in providing these types of learning opportunities for engineers. Engineers who are active in professional societies gain a competitive edge, enhance their knowledge and technical expertise, and acquire leadership skills. To get an early start in the profession, once you enroll at the college or university of your choice, join the 24,000 mechanical engineering student-members of ASME and become active in the ASME Student Section on campus.



Norris Allman
Senior Supervising
Test Engineer
PSE&G of New
Jersey

"...people are judged by what they know more than their friendships or what school they went to. It's a technical

business... if you're technically competent, you'll do very well."



Melinda Cecacci
Aerospace Technologist/
Propulsion Systems
Engineer
NASA Johnson
Space Center,
Houston, TX

"I am doing a job that is an opportunity of a lifetime.

The work that has given me

the most pride was the program involving the first joint docking of the Mir and the Space shuttle. At NASA, I work with a team of flight controllers, and they come from a wealth of different backgrounds. We have math majors, we have engineers from electrical to civil to mechanical to chemical. We have physics majors, scientists. All different kinds of people come here. So we draw on a wealth of knowledge, which is great. It adds to the effectiveness of how we do our jobs."



The annual FIRST (For Inspiration and Recognition of Science and Technology) Competition teams high school students with engineers from companies to build robots which compete against one another in sports-like events.



Beth Lemen
Site Operations
Manager, P & G
Pharmaceuticals
Procter & Gamble,
Cincinnati, OH

"I think mechanical engineering is a great career. You've learned to analyze data and analyze and

solve problems. You work in group settings, so you've learned team dynamics and how to work with people."

Guidance Materials

CD-ROM (New!)

Careers for Mechanical Engineers

Part of the Sloan Foundation Career Cornerstone CD-ROM Series, the disk is a storehouse of interviews and information on virtually every facet of mechanical engineering careers, from the early preparation, to the initial job search, to the challenges and choices that shape a rewarding career. ASME Order No. VH47CD \$39.95

Videos

CareerPath: Mechanical Engineering

For engineering and high school students, this video features a look at the jobs of 18 mechanical engineers. The video takes the viewer through typical workdays. Find out what engineers believe to be the most important aspects of their education and working life. Learn how they handled the transition from education to their careers. ASME Order No: VH4710. (\$24.95), 27 min.

The Mothers of Invention

For middle and high school students, this video shows significant technical accomplishments of women, minorities, and children throughout American history and up to the present day. See famous inventions, some of which are still used in homes and businesses. The package includes a teacher's guide and poster. ASME Order No: 490490 (\$25.00), 10 min.

Engineering Is for Everyone

For elementary grades, a video and teaching kit demonstrate that math and science are fun and interesting. Follow along as a young narrator and her friends work on various projects. The kit includes a teacher's guide, suggested projects and a poster. ASME Order No: VX0191 (\$19.95), 12 min.

Brochures, Booklets, and Other Resources

Mechanical Engineering A-Z

For elementary school ages, a cheerful brochure that shows everyday items that are produced by mechanical engineers. ASME Order No: MP0491 (Free)

Mechanical Engineering and Mechanical Engineering Technology: Which Path Will You Take?

For high school and college ages, this brochure describes and contrasts two related career paths available to those interested in mechanical engineering. ASME Order No: MP4998 (Free)

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