ENGINEERING MECHANICS, B.S.

The Department of Engineering Physics administers the B.S., M.S., and Ph.D. degrees in engineering mechanics. The B.S. degree in engineering mechanics may be accompanied by an option in aerospace engineering (http://guide.wisc.edu/undergraduate/engineering/engineering-physics/engineering-mechanics-bs/engineering-mechanics-aerospace-engineering-bs/) (formerly named astronauts).

Engineering mechanics is the scholarly term for the study of forces and the resulting deformations, accelerations, motions, vibrations and other action that they cause. As such, engineering mechanics forms the foundation of a degree in aerospace, mechanical or civil engineering, and it is fundamental to important parts of biomedical engineering, chemical engineering, materials science, and other engineering disciplines. Hence, a degree in engineering mechanics provides a broad scientific background which enables its graduates to tackle challenging problems in most fields of engineering. The curriculum emphasizes the basic sciences—mathematics, computer science, physics and the engineering sciences—fluid dynamics, thermodynamics, mechanics, materials science, and electrical engineering. Although the degree program is entitled engineering mechanics at UW–Madison, the program is most comparable to aerospace engineering and mechanical engineering programs at various universities across the United States. However, internationally, this field is more commonly known as “mechanics” rather than “mechanical engineering” or “aerospace engineering.” A few select universities in the United States offer programs that are similar to UW–Madison’s engineering mechanics program under titles such as “engineering science” or “theoretical and applied mechanics.”

The objective of the program is to provide the student with a broad background in the fundamental physical sciences and applied mathematics, coordinated with both theoretical and applied engineering methods and experimental techniques. This type of educational background will give the student the degree of versatility necessary for dealing with the variety and complexity of modern technological problems as well as the ability to adapt to the rapidly changing needs and interests of industry, government, and society.

An education in engineering mechanics provides many advantages. First, the foundation offered by a degree in mechanics allows our graduates to more easily interact with co-workers on interdisciplinary teams including chemists, physicists, and mathematicians. Second, many industrial organizations prefer engineers that have a broad, fundamental scientific background rather than a narrow view of just one discipline. Third, and probably most important, great changes have taken place in science and engineering during recent years. Among the most important of these have been the rapid diffusion of scientific knowledge and disciplines into engineering, the increasing use of analytical and computer methods for the solution of practical problems, the need for a better understanding of the properties and behavior of materials, and the increasing need for engineers who can adapt known methods to new situations and develop new experimental and analytical methods. By focusing on core competency in physics and applied mathematics, the engineering mechanics degree prepares students for these challenges.

The required courses taken early in the curriculum are intended to give students a fundamental background in mathematics, science, and engineering. In addition to developing versatility through exposure to important concepts in various scientific fields, the required courses allow students to identify areas of interest. With the relatively large number of elective credits available in the latter part of the program, students may either continue to follow a general program or may prefer to concentrate elective courses in such areas as stress analysis and structural mechanics, dynamics and vibrations, aerodynamics and flight mechanics, experimental mechanics, applied mathematics, materials science, geological engineering, biomechanics, aerospace mechanics, mechanical systems analysis, etc.

Engineering mechanics graduates are sought by most industries and governmental agencies including in particular those participating in the newly developing areas of engineering such as space technology, performance of new structural materials, and so on. Their work often involves participation in design, research and development projects where the problems are sufficiently complex or unusual that their solutions require engineers with (1) a thorough understanding of the fundamentals of engineering, (2) advanced education in the established experimental and analytical methods, and (3) the ability to develop new experimental and analytical methods to attack problems for which standard methods, formulas, and materials have not yet been developed. The program also provides excellent preparation for graduate study in a variety of related disciplines.

ENGINEERING MECHANICS AND NUCLEAR ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

The faculty recognize that our graduates will choose to use the knowledge and skills they have acquired during their undergraduate years to pursue a wide variety of career and life goals and we encourage this diversity of paths. Regarding the Engineering Mechanics program, we initially expect graduates will begin their careers in fields that utilize their knowledge, education and training in solid mechanics, fluid mechanics and dynamics/vibration in a variety of jobs in mechanical, aerospace, manufacturing and other engineering fields. Similarly, regarding the Nuclear Engineering program, we initially expect graduates will begin their careers in fields that utilize their knowledge, education and training in the interaction of radiation with matter as it applies to power generation, health and medical physics, security and safeguards and other engineering fields.

Whatever path our graduates choose to pursue, our educational objectives for the nuclear engineering and engineering mechanics programs are to allow them to:

1. Exhibit strong performance and continuous development in problem-solving, leadership, teamwork, and communication, initially applied to nuclear engineering or engineering mechanics, and demonstrating an unwavering commitment to excellence.
2. Demonstrate continuing commitment to, and interest in, his or her training and education, as well as those of others.
3. Transition seamlessly into a professional environment and make continuing, well-informed career choices.
4. Contribute to their communities.