Department of Engineering



Grace College and Theological Seminary Catalog 2023-2024

Department of Engineering

Faculty Full-time Faculty

Fred A. Wentorf, Ph.D.; Department Chair David C. Winyard, Sr., Ph.D.

Part-time Instructors Mearlin Bixler Steven Humphrey Nolan Jones David Ray Eugene Seiman

Grace College offers the Bachelor of Science in Mechanical Engineering (BSME) degree. The BSME program prepares graduates for entry into the workforce with the engineering skills to solve the everincreasing challenges of improving the quality of life, of improving our infrastructure and security, of application and utilization of energy production, or contributing to the design of revolutionary new technologies. This degree is accredited by ABET, the premiere engineering accreditation agency for engineering programs.

The program benefits from its location orthopedic capital of the w s filling the classroom and laboratories with experts in their fields to educate and mentor our students, relevant work experience that is only five minutes from campus (in addition to more diverse experience opportunities in nearby locations like Rt. Wayne), industry-based senior projects, and research projects that are relevant to the real-world. This interaction is facilitated by an engaged advisory council of industry experts and growing group of industry leaders that support the program.

Department Purpose

to rigorously educate the next generation of Christian engineers by using thorough theoretical training, hands-on learning, and relevant work experience to prepare them to work in the engineering industry and serve the needs of the world.

Specifically, our program educational objective is to prepare graduates for the practice of engineering at the professional level and:

- 1. Apply their mechanical engineering education to solve technical problems and make the world a better place through service.
- 2. Maintain the curiosity that drives lifelong learning and allows for the flexibility to adapt to the fast-moving 21st century engineering world.

- 3. Fulfill their calling in life through engineering practice, continuing education, and community involvement.
- 4. Serve as ambassadors for the engineering profession and Grace College in word and deed.

In sum, Grace College

ADMISSION REQUIREMENTS

Bachelor of Science in Mechanical Engineering (BSME):

Since engineering is a demanding field of study, the department has established its own elevated admission standards. Enrollment in studies leading to a Bachelor of Science in Mechanical Engineering (BSME) degree is open to students meeting the following requirements:

Minimum high school GPA of 3.0 and top half of graduating class Standardized test scores (only ONE is required)

• ACT composite score of at least 21, with at least 23 in the math section

• SAT minimum combined score of 1060 in the math and reading sections, and at least 560 in the math section

Alternatively, the Department of Engineering Chair can admit individual students based on a transcript review and personal interview. The requirement for standardized tests may be waived under the alternative transcript review and interview admission process.

COURSE DESCRIPTIONS

ENGINEERING FUNDAMENTALS

MEG 1000 Engineering Service

This course will allow the student to perform actual service using their engineering skills before graduation. These service activities could include a variety tasks including helping with engineering education in the surrounding school systems, performing engineering work for non-profits, or other ways to make the world a better place using their growing engineering skills. Faculty approval is needed

Zero hours.

MEG 1200 Introduction to Mechanical Engineering

This course will give an overview of the mechanical engineering profession, introduce key skills used in engineering, including problem solving, the design process, and quickly give an overview of Mechanical engineering sciences, including an introduction into basic statics and free-body diagrams. Hands-on laboratory activities, such as 3D printing, digital scanning, and mechanical tensile testing, will also be performed in this course to give the students a well-rounded engineering introduction. Four hours.

MEG 1400 Introduction to Programming in MATLAB

This course will begin with an introduction to basic programming including programming structure, variables, and loops. In this course, programming will be used to perform mechanical functions using various equipment. This course will also include an introduction to numerical methods for solving engineering problems. Prerequisite: MAT 1230/1240. Two hours.

MEG 1900 Engineering Modeling and Tolerancing

This course will teach graphical communication for engineers starting with the fundamentals of engineering drawings, then work significantly on 3D model creation, and end with an introduction to geometric dimensioning and tolerancing. Emphasis is placed on developing the skills needed for mechanical engineering design. Each student will design their own part or mechanism based on given design inputs. This project will be built in MEG 1950. Three hours.

MEG 1950 Industrial Machining and Measurements

This course will begin with machine shop safety and then teach the processes of running a manual mill and lathe and other common machining tools. Students will use these new skills to build their device that was designed in MEG 1900. The second portion of the course will focus on measurements of parameters key to design and manufacturing. Prerequisite: MEG 1900. Three hours.

MEG 2000 Engineering Internship

This course will include journaling, self and manager assessments, and other activities during an internship working as a professional engineer. One hour.

MEG 2800 Kinematics and Linkage Design

Study of the kinematics and kinetics of machines and mechanisms. Topics will include displacement, velocity, and acceleration analysis of linkage and cam mechanisms by graphical and analytical methods. Also covered are synthesis of mechanisms, gears, and gear trains. Design projects are normally required. Prerequisites: MAT 2280 and MEG 2200. Three hours.

MEG 2900 Machine Component Design

Review of stress/strain and force/deflection relationships. Introduction to static and dynamic failure theories. Discussion of design and selection of some machine elements. Design projects are normally required. Prerequisite: MEG 2100. Three hours.

MEG 3100 Experimental Methods and Sensors

This lecture and lab course will develop a basic understanding of the use of common engineering sensors in experimental and design applications. Introduction to sensors for the measurement of temperature, pressure, stress/strain, position and flow is accompanied by application of sensor signals including signal conditioning, filtering, and acquisition and processing. Experimental planning and execution fundamentals are covered as well as data analysis and statistical evaluation of experimental data. Computer based acquisition and analysis methods are directly experienced by hands on lab work. Prerequisite: MEG 2400. Three hours.

MEG 3200 Control Systems

This course will present the following concepts: basic elements of continuous-time signals and systems; differential equation models of systems; Fourier series and Fourier transforms; system response to periodic inputs; Laplace transforms; transfer functions and stability analysis. The final project typically involves design and tuning of an electromechanical and/or electrohydraulic motion control system. Prerequisites: MEG 1400, MEG 2400, and MAT 2280. Three hours.

MEG 3300 Advanced Manufacturing

This course will introduce different advanced manufacturing methods and introduce the students to ONC machining. Tools will be introduced that can be used to analyze and improve manufacturing processes. Prerequisite: MEG 1950. Two hours.

MEG 3400 Introduction to Finite-Element Analysis

Introduction to linear and nonlinear programming, and numerical techniques for solving mechanical problems. Introduction to finite-element analysis and optimization to engineering design using commercial software such as ANSYS Prerequisites: MEG 2300 and MEG 29

ENGINEERING SCIENCE

MEG 2100 Statics and Mechanics of Materials

This course combines statics and mechanics of materials into one course. The statics subjects covered include; force and moment vectors, equivalent systems, trusses, frames, and machines, equilibrium of particles and rigid bodies, static friction, centroids and moments of inertia. The mechanics of materials section teaches the concepts of stress and strain in engineering

: analysis of

axial, shear, flexural, and torsional stresses; combined stress; shear and moment distribution in beams; and deformation of structural members. Co-requisites: PHY 2240/2250 and MAT 1250. Four hours.

TECHNICAL ELECTIVES

MEG 3010, 3020, 3030 Special Topics in Engineering

Study of advanced subjects in engineering science and practice. May involve intermediate or advanced study of prerequisite introductory courses. Topics may vary from one semester to the next based on student interests and the availability of qualified faculty. Prerequisite: junior or senior standing in engineering or instructor permission. One to three hours, repeatable.

MEG 3500 Orthopedic Biomechanics

The human musculoskeletal system will be investigated and then evaluated as a mechanical system. Experimental data and research documents will be used to solve different biomechanical problems. An introduction to orthopedic implant science will also be included. Prerequisite: MEG 2900. Three hours.

MEG 3600 Robotics

This course provides an overview of robot mechanisms, dynamics, and intelligent controls. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors. Training and certification on a KUKA 6-axis educational robot will be included in this course. Prerequisites: MEG 2800, MEG 3100, and MEG 3200. Three hours.