MECHANICAL ENGINEERING (MENG), BACHELOR OF SCIENCE

At Dunwoody College of Technology, the Mechanical Engineering bachelor's degree prepares students to enter the field of engineering ready to be a productive member of an engineering team from day one. Graduates can find employment in a variety of industries, including product design, research and development, heating ventilation and air conditioning (HVAC), consulting engineering, medical devices, and manufacturing.

Students learn how to apply engineering principles to the design of mechanical, thermal, and fluid systems. Students also learn to work collaboratively in a team environment and use software tools current in the field. The curriculum is project-integrated so that theoretical engineering principles are reinforced and experienced through hands-on creation and problem-solving.

Arts & Sciences courses help students understand the core mathematical and scientific principles, which are the foundation of engineering theory and provide students with the communication and critical thinking skills required to succeed in the profession.

All students complete a two-semester senior design project.

Accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org (https://www.abet.org/), under the general criteria and the Mechanical Engineering program criteria.

Credential Earned: BS
Length of Program: 4 years (8 semesters)
Classes Offered: Day
Available Starts: Fall Semester
Accreditation: Accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the general criteria and the Mechanical Engineering program criteria.

Program Outcomes

- EAC 1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- EAC 2: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- EAC 3: An ability to communicate effectively with a range of audiences.
- EAC 4: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- EAC 5: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- EAC 6: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- EAC 7: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Degree Requirements

Code	Title	Credits
General Requirements		
CHEM2110	Chemistry with Lab	4
MATH1811	Calculus I	4
MATH1821	Calculus II	4
MATH2260	Probability & Statistics	4
MATH2810	Multi-Variable Calculus	4
MATH2820	Linear Algebra & Differential Equations	4
PHYS1800	Physics I with Lab	4
PHYS1820	Physics II with Lab	4
SPCH1000	Speech	3
SSCI1100	Introduction to Macro & Micro Economics	3
WRIT2010	Technical Writing	3
Humanities Electives		3
Social Science Elective		3
Technical Requirements		
ENGR1110	Introduction to Engineering	3
MENG1110	Engineering Drawings & 3D Design	4
ENGR1221	Electrical Circuits & Automation w/ Lab	4
MENG1210	Machining for Engineers Lab	2
MENG1220	Machining for Engineers	2
ENGR2210	Mechatronics with Lab	2
ENGR1210	Introduction to Programming	3
MENG1230	Statics	3
MENG3111	Design for Manufacturability with Lab	3
MENG2240	Mechanics of Materials	3
MENG3130	Thermodynamics	4
MENG2230	Dynamics	3
ENGR3120	Engineering Economics	2
MENG3140	Materials Science	3
MENG3230	Fluid Mechanics	3
MENG4111	Control of Dynamic Systems w/ Lab	4
ENGR4110	Engineering Ethics	2
MENG3250	Heat Transfer	3
MENG3212	Measurements and Lab	4
MENG3241	Machine Design & Failure Analysis	3
MENG4141	Senior Design I	3
ENGR4120	Principles of Quality, Lean Mfg & DOE	3
MENG4211	Heat Transfer Applications & HVACR w/Lab	4
MENG4240	Senior Design II	4
MENG4130	Finite Element Analysis	3
Total Credits		**124**

Courses

Descriptions

ENGR1110 | Introduction to Engineering | Lecture (3 Credits)
Explore major topics in Engineering. Provides a pathway to success in the School of Engineering programs, including time management, industry software, study skills, teamwork skills, internship availability and career opportunities.

MENG1110 | Engineering Drawings & 3D Design | Lecture/Laboratory (4 Credits)
Create 3D solid models and assemblies using SolidWorks. Interpret engineering prints; create detail and assembly drawings according to standards. Use freehand drawing as a graphical communication tool.

ENGR1221 | Electrical Circuits & Automation w/ Lab | Lecture/Laboratory (4 Credits)
Apply PLCs and electronic components to design and troubleshoot automated industrial equipment. Topics include AC and DC motors, programming, sensors, and basic circuit analysis techniques for design, analysis, and programming of control systems.
Prerequisite(s): MATH1821

MENG1210 | Machining for Engineers Lab | Laboratory (2 Credits)
Employ metalworking techniques using typical shop equipment including mills, lathes, grinders, saws, and drills. Utilize hand tools to prep stock and finish edges.
Corequisite(s): MENG1220

MENG1220 | Machining for Engineers | Lecture (2 Credits)
Use theory and understanding of machining operations to plan work to create parts efficiently.
Prerequisite(s): MENG1110 Or MDES1110
Corequisite(s): MENG1210

ENGR2210 | Mechatronics with Lab | Lecture/Laboratory (2 Credits)
Analyze electrical and mechanical systems such as drives, sensors, control systems, data presentation, and communication in the context of mechatronics. Different motive forces are utilized, control systems implemented, and operating environment challenges presented. Course content is applied to real-world projects.

ENGR1210 | Introduction to Programming | Lecture/Laboratory (3 Credits)
Examine and implement computational problem-solving strategies using computer languages to solve engineering problems. Develop algorithms and translate solutions into computer programs. Distinguish differences in programming languages and software tools with applicability to different types of problem solutions. Apply modular design and clear documentation for efficient problem solving.

MENG1230 | Statics | Lecture (3 Credits)
Identification, recognition and calculations associated with forces acting on rigid bodies at rest. Use vector analysis to analyze concurrent forces, non-concurrent forces, friction forces, centroids and moments.
Prerequisite(s): MATH2810

MENG3111 | Design for Manufacturability with Lab | Lecture/Laboratory (3 Credits)
Introduction to common manufacturing processes, with emphasis on the principles of design for each process. Processes include: sheet metal forming, casting, welding, and plastic fabrication. Design and create parts using common manufacturing processes, such as casting, injection molding, and sheet metal forming processes.
Prerequisite(s): MENG1210 And MENG1220

MENG2240 | Mechanics of Materials | Lecture (3 Credits)
Discover how materials behave under load including deformation under various loading profiles. Apply concepts to design of mechanical members such as a beams, shafts, columns, and other load bearing devices.
Prerequisite(s): MENG1230

MENG3130 | Thermodynamics | Lecture (4 Credits)
Introduction to thermodynamic analysis which provides a foundation for subsequent thermoscience courses, e.g. fluid dynamics, heat transfer, HVACR. Application of the laws of thermodynamics to the analysis of power and refrigeration cycles is a main focus.
Prerequisite(s): PHYS1800 And MATH1821

MENG2230 | Dynamics | Lecture (3 Credits)
Theory and calculations associated with kinematics and kinetics of particles, systems of particles and rigid bodies. Analyze the application of Newton's laws to the planar motion of rigid bodies.
Prerequisite(s): MENG1230 And MATH2820

ENGR3120 | Engineering Economics | Lecture (2 Credits)
Economic analysis of engineering decisions under uncertainty. Concepts include time value of money, cash flow estimation, rate of return analysis, net present value estimation, and asset evaluation. Applications include comparing different project alternatives accounting for heterogeneity in cost, revenue, taxation, depreciation, inflation, and risk.

MENG3140 | Materials Science | Lecture (3 Credits)
Identify different types of materials, their properties, and appropriate uses. Processes that change material properties include: alloy composition, heat treatment, coatings, and other modifications.
Prerequisite(s): CHEM2110

MENG3230 | Fluid Mechanics | Lecture (3 Credits)
Introduction to fluid statics and mechanics; laminar and turbulent flow with associated calculations. Applications to industry are used in problems.
Prerequisite(s): MATH2810, MATH2820, MENG3130, And MENG2240

MENG4111 | Control of Dynamic Systems w/ Lab | Lecture/Laboratory (4 Credits)
Introduction to the fundamentals of controls, covering foundational controls theory (first and second order system response, transfer functions, and design of control systems). Analyze the response of dynamic systems, and then apply these techniques, using a PID control, to the control of real world engineering systems. Possible applications include fluid power, heat transfer, and mechanical systems.
Prerequisite(s): MENG2230 And MATH2820

ENGR4110 | Engineering Ethics | Lecture (2 Credits)
Interpret the connection between personal morality, the role of engineers and engineering in society, and relationship to one's employer. Case studies involving conflicts within these roles are reviewed and evaluated.

MENG3250 | Heat Transfer | Lecture (3 Credits)
Examine the fundamentals of heat transfer modes, including conduction, convection, and radiation. Calculations for each mode are included.
Prerequisite(s): MATH2820 And MENG3130

MENG3212 | Measurements and Lab | Lecture/Laboratory (4 Credits)
Apply principles of physical measurements and error analysis to evaluate mechanical measurements. Create prints that include callouts for standards of accuracy using ASME/ANSI geometric dimensioning and tolerance standards. Use lab metrology equipment to assess the geometric dimensions and tolerances of parts, and to perform other measurements such as temperature, pressure, and flow.
Prerequisite(s): MATH2260

MENG3241 | Machine Design & Failure Analysis | Lecture (3 Credits)
Discussion of failure modes. Evaluate components for protection against failure from low cycle fatigue, high cycle fatigue, ductile overload, corrosion. Selection of common machine elements (bearings, gears, springs, etc.) and basic analysis is developed.
Prerequisite(s): MENG2240

MENG4141 | Senior Design I | Practicum (3 Credits)
Student design teams execute a two semester design project to solve a real world problem. Application of the design process, underlying science, and application of concepts and tools gained in the curriculum are necessary. Application of project management principles and tools. To be taken within 48 credits of graduation or with instructor approval.
Prerequisite(s): MENG2240 And MENG3111

ENGR4120 | Principles of Quality, Lean Mfg & DOE | Lecture (3 Credits)
Investigate several quality conventions used to reduce waste, improve quality, decrease production times, and improve customer satisfaction. Topics include statistics, control charts, process capability, and Design of Experiments (DOE).
Prerequisite(s): MATH2260

MENG4211 | Heat Transfer Applications & HVACR w/Lab | Lecture/ Laboratory (4 Credits)
Apply heat transfer theory to common industrial devices. Analyze HVACR and other applications. Hands-on testing of heat transfer devices includes heat, ventilation, and air conditioning systems.
Prerequisite(s): MENG3250

MENG4240 | Senior Design II | Capstone (4 Credits)
Continuation of Senior Design I projects. Final deliverables are submitted, project is presented and closed out. Presentations are open to students, faculty, and the public in a symposium format.
Prerequisite(s): MENG4140

MENG4130 | Finite Element Analysis | Lecture (3 Credits)
Finite element modeling using both manual and software simulation analysis. Topics include two- and three-dimensional elements along with applications in solid mechanics, heat transfer and fluid mechanics.
Prerequisite(s): MATH2820 And MENG2240

MATH1811 | Calculus I | Lecture (4 Credits)
The fundamental tool used by engineers and scientists to determine critical measurements, such as maximums, minimums and allowable rates of change. Utilize multiple methods in the calculation and application of limits, derivatives, transcendental functions, implicit differentiation and related rates.
General Education: Mathematics

MATH1821 | Calculus II | Lecture (4 Credits)
The fundamental tool used by engineers and scientists to determine critical measurements such as the area under curves, the volumes within complex geometries, and for describing functions as an infinite series. Computer software enables the application of the definite integral, the fundamental theorem of calculus, applications of integration, and numerical methods of integration.
Prerequisite(s): MATH1811 Or MATH1812
General Education: Mathematics

MATH2260 | Probability & Statistics | Lecture (4 Credits)
Introduction to probability and statistics with applications. Topics include: basic combinatorics, random variables, probability distributions, hypothesis testing, confidence intervals, and linear regression.
Prerequisite(s): MATH1810, Or MATH1811, Or MATH1812
General Education: Mathematics

MATH2810 | Multi-Variable Calculus | Lecture (4 Credits)
Differentiate and integrate functions of two and three variables. Apply differentiation and integration techniques to physical sciences and engineering. Explore the theorems of Green and Stokes.
Prerequisite(s): MATH1820 Or MATH1821
General Education: Mathematics

MATH2820 | Linear Algebra & Differential Equations | Lecture (4 Credits)
Introduction to Linear Algebra, including vector spaces and linear mappings between such spaces. Explore solution methods for ordinary differential equations, qualitative techniques; includes matrix methods approach to systems of linear equations and series solutions.
Prerequisite(s): MATH1821 Or MATH1820
General Education: Mathematics

PHYS1800 | Physics I with Lab | Lecture/Laboratory (4 Credits)
Introduction to mechanics using differential calculus as a foundation. Topics include kinematics and dynamics of linear motion, static equilibrium, the conservation of energy and momentum, mechanics of solids and fluids, and thermodynamics. The laboratory portion incorporates experimentation, instrumentation, and graphical tools to verify calculations in motion, mechanics and thermodynamics.
Prerequisite(s): MATH1810 Or MATH1811
General Education: Physical Sciences with Lab

PHYS1820 | Physics II with Lab | Lecture/Laboratory (4 Credits)
An introductory calculus-based course in electromagnetic fields and their applications. Topics include: Coulomb's and Gauss' Law, electric fields and potentials, electrical and magnetic properties of matter, Ampere's and Faraday's laws, elementary DC and AC circuits, Maxwell's equations, and electromagnetic waves.
Prerequisite(s): MATH1821, Or MATH1820, And PHYS1800
General Education: Physical Sciences with Lab

SSCI1100 | Introduction to Macro & Micro Economics | Lecture (3 Credits)
Fundamental economic issues and theories are explored through discussion and research. Current events, policy perspectives, and case studies are used to process and apply economics to everyday life.
General Education: Social Sciences

SPCH1000 | Speech | Lecture (3 Credits)
Introduction to public speech making; purpose and organization, audience analysis and response, verbal and non-verbal clues.
General Education: Communications

WRIT2010 | Technical Writing | Lecture (3 Credits)
Technical writing applications are studied for format, style, voice, and point of view; considered for purpose, audience, and subject. Critical thinking and developed expertise are employed to analyze, interpret, evaluate, summarize and generate various technical documents, individually and within teams.
General Education: Communications