**ENGINEERING MANAGEMENT**

**Engineering Management**

The four-year Bachelor of Science degree program in Engineering Management (EGM) prepares students for eventual leadership responsibilities in technological environments. Traditional paths for EGM graduates include project management, project engineering, process management, new product development, manufacturing management, new product development processes, quality control, and reliability analysis.

The EGM program integrates the engineering disciplines of electrical and mechanical engineering with business. Flexibility exists for the student to develop concentrations in Information Systems or Entrepreneurship, for example. This program is attractive to companies seeking graduates who are well rooted in engineering fundamentals, yet who are broadly interested in technology, competitive markets, and business development. Wilkes University does not maintain professional accreditation for the Engineering Management degree.

The EGM program demands careful academic program planning by the student with his or her faculty advisor to assure a clear and well-planned program configured realistically to the student's interests and needs.

The Master of Science degree in Engineering Management (MSEG) is also available. This degree program is described in the Graduate Bulletin.

**Engineering Management Major - Required Courses and Recommended Course Sequence**

### First Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MTH-111</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>CHM-117</td>
<td>Intro Chem Lab for Engineers</td>
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<tr>
<td>CHM-118</td>
<td>Chemistry for Engineers</td>
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<tr>
<td>ME-180</td>
<td>CADD Lab</td>
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<tr>
<td>ENG-101</td>
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<td>FYF-101</td>
<td>First-Year Foundations</td>
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### Second Semester

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<tr>
<td>MTH-112</td>
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<tr>
<td>PHY-201</td>
<td>General Physics I</td>
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<tr>
<td>EGR-140</td>
<td>Scientific Programming</td>
<td>3</td>
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<tr>
<td>EGR-200</td>
<td>Introduction to Materials Science</td>
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<td>Distribution Requirement</td>
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### Third Semester

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<tr>
<td>MTH-211</td>
<td>Intro. to Differential Equations</td>
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<tr>
<td>PHY-202</td>
<td>General Physics II</td>
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<tr>
<td>EE-211</td>
<td>Electrical Circuits and Devices</td>
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<td>EE-283</td>
<td>Electrical Measurements Lab</td>
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<tr>
<td>ME-231</td>
<td>Statics</td>
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### Fourth Semester

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<td>EC-102</td>
<td>Principles of Economics</td>
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<tr>
<td>ME-232</td>
<td>Strength of Materials</td>
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<tr>
<td>EGR-214</td>
<td>Linear Systems</td>
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<tr>
<td>MTH-150</td>
<td>Statistics or BA/EC 319 Economic Statistics</td>
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<tr>
<td>ACC-161</td>
<td>Intro. to Financial Accounting</td>
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<td>EGR-222</td>
<td>Mechatronics</td>
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### Fifth Semester

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<tr>
<td>MKT-321</td>
<td>Marketing or EC-101 Princ. of Economics</td>
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<tr>
<td>MGT-351</td>
<td>Management of Organizations</td>
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<tr>
<td>ME-335</td>
<td>Engineering Modeling &amp; Analysis</td>
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<tr>
<td>BA-335</td>
<td>Law &amp; Business or ACC-162 Managerial Accounting &amp; Decision Making</td>
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### Sixth Semester

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<tr>
<td>EGR-399</td>
<td>Cooperative Education* or Technical Electives**</td>
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<td>EGR-201</td>
<td>Professionalism and Ethics</td>
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<td>EGM-321</td>
<td>Quantitative Analysis &amp; Programming Methods</td>
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<tr>
<td>FIN-341</td>
<td>Managerial Finance</td>
<td>3</td>
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<tr>
<td>EGM-320</td>
<td>Engineering Project Management and Analysis</td>
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</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>
**Technical electives may be chosen from any advisor approved math, science, or engineering course numbered 200 or above to satisfy a concentration requirement.

*Consult with the Cooperative Education Coordinator to determine availability and proper scheduling of the Cooperative Education experience.

**Engineering Management Minor**

A 21-credit Engineering Management (EGM) minor is a special curriculum established to offer critical business and technical management skills for engineering majors. These courses are normally not taken by typical engineering students in the design disciplines. The following courses are required:

EGM 320 - Engineering Project Management
EC 102 - Principles of Economics II
EGM 321 - Quantitative Analysis and Programming Methods
EGM 336 - Engineering and Management Models

*BA 335 - Law and Business or *FIN 341 - Managerial Finance

Additionally, six elective credits must be completed from the following courses (EGR 399 - Cooperative Education (or equivalent); EGM 398 - Engineering Project Decision Process; *BA 335 - Law and Business or *FIN 341 - Managerial Finance.

*The courses shown will count as "technical electives" for Division of Engineering and Physics students only when completing an EGM Minor or by special permission of the Department Chair. Other majors must consult their respective Chair for classification of these electives.

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**EGM. ENGINEERING MANAGEMENT**

**EGM-320. ENGINEERING PROJECT MANAGEMENT AND ANALYSIS**

**Credits:** 3


**Pre-Requisites**

Junior standing in engineering.

**EGM-321. QUANTITATIVE ANALYSIS AND PROGRAMMING METHODS**

**Credits:** 3

Discussion of various quantitative analysis and optimization methodologies. Analytical numerical approaches are used in solving linear and nonlinear optimization problems. Emphasizes the development of ability in analyzing problems, solving problems by using software, and post solution analysis.

**Pre-Requisites**

Junior standing in engineering or consent of the instructor.

**EGM-336. ENGINEERING AND MANAGEMENT MODELS**

**Credits:** 3

Discussion of the techniques in and the art of modeling practical problems encountered by engineers and managers.

**Pre-Requisites**

Junior standing in engineering or consent of the instructor.

**EGM-391. SENIOR PROJECTS I**

**Credits:** 1

Design and development of selected projects in the various fields of engineering under the direction of a staff member. Technical as well as economic factors will be considered in the design. A detailed progress report is required.

**Pre-Requisites**

Senior standing in engineering, EMG-320

**EGM-392. SENIOR PROJECTS II**

**Credits:** 2

Design and development of selected projects in the field of engineering management under the direction of a staff member. Technical as well as economic factors will be considered in the design. A professional paper to be presented and discussed in an open forum is required.

**Pre-Requisites**

EGM-391
**PHY. PHYSICS**

**PHY-198-298-398. TOPICS IN PHYSICS**  
**Credits:** variable  
Selected topics in the field of physics. These may include one or more of the following: astronomy; geophysics; biophysics; nuclear power and waste; relativity; quantum mechanics; semi-conductors; cryogenics; health physics. May be repeated for credit.

**Pre-Requisites**  
Varies with topic studied.

**PHY-395-396. INDEPENDENT RESEARCH**  
**Credits:** 1 - 3  
Independent study and research for advanced students in the field of physics under the direction of a staff member. A research paper at a level significantly beyond a term paper is required.  
**Pre-Requisites**  
Senior standing and approval of the department chairperson.

**PHY-105. CONCEPTS IN PHYSICS**  
**Credits:** 3  
Basic concepts of physical science, including the scientific method, will be studied. Theories, laws, and experiments from mechanics, electricity and magnetism, thermodynamics, optics, and atomic and nuclear physics may be included. Viewpoints will be classical and modern, including quantum and relativistic. Class meets for four hours per week: two hours of lecture and one two-hour lab each week.  
[Click here for course fees.]  
**Pre-Requisites**  
No previous background in either science or college-level mathematics is required.

**PHY-170. CONCEPTS IN PHYSICS AND CHEMISTRY**  
**Credits:** 4  
An overview of Classical Mechanics, Thermodynamics, and the elementary principles of modern physics, including selected topics in basic chemistry and applications to human health. Emphasis is placed on basic physical and chemical principles and on algebraic calculations, scaling, units conversions, Cartesian graphing, acid and base reactions, and numerical problem solving. Three hours of demonstration and lecture, one hour of recitation, and two hours of lab per week.  
[Click here for course fees.]  
**Pre-Requisites**  
Previous courses in chemistry, algebra, and geometry.

**PHY-171. PRINCIPLES OF CLASSICAL AND MODERN PHYSICS**  
**Credits:** 4  
An introductory course designed to promote and understanding of the more important fundamental laws and methods of mechanics and electricity and magnetism. Laboratory work to emphasize basic principles and to acquaint the student with measuring instruments and their use, as well as the interpretation of experimental data. Three hours of demonstration and lecture, one hour of recitation, and two hours of lab per week. Co-requisite: MTH-111  
[Click here for course fees.]  
**Co-Requisites**  
PHY-174

**PHY-174. APPLICATION OF CLASSICAL AND MODERN PHYSICS**  
**Credits:** 4  
An introductory course designed to promote an understanding of the more important fundamental laws and methods of heat, optics, and modern physics. Laboratory work to emphasize basic principles and to acquaint the student with measuring instruments and their use, as well as the interpretation of experimental data. Three hours of demonstration and lecture, one hour of recitation, and two hours of lab per week. Co-requisite: MTH-111  
[Click here for course fees.]  
**Pre-Requisites**  
PHY-201

**PHY-201. GENERAL PHYSICS I**  
**Credits:** 4  
A thorough grounding in the concepts, principles, and laws of mechanics, thermodynamics, and wave motion. Instruction by demonstration and lecture, recitation, problem solving, and experimental work. Three hours of demonstration and lecture, one hour of recitation, and two hours of lab per week. Co-requisite: MTH-111  
[Click here for course fees.]  
**Pre-Requisites**  

**PHY-202. GENERAL PHYSICS II**  
**Credits:** 4  
Electricity and magnetism, optics and light. Three hours of demonstration and lecture, one hour of recitation, and two hours of lab per week.  
[Click here for course fees.]  
**Pre-Requisites**  
PHY-201.

**PHY-203. MODERN PHYSICS**  
**Credits:** 3  
Modern physics including the experimental basis, concepts, and principles of atomic and nuclear physics. Three hours of demonstration and lecture per week.  
**Pre-Requisites**  
PHY-202.

**PHY-206. MODERN PHYSICS LAB**  
**Credits:** 1  
Experiments leading to the development of relativity and quantum theory to reinforce abs expand upon the learning of fundamental concepts in EM theory, relativity, statistical mechanics, quantum mechanics, solid state physics, and nuclear physics.  
[Click here for course fee.]  
**Pre-Requisites**  
PHY-202.

**Co-Requisites**  
PHY-203
PHY-214. MODELING OF PHYSICAL SYSTEMS
Credits: 3
Modeling of various problems in physical, chemical, biological, and environmental sciences, particularly physical dynamical systems; includes application of ordinary differential equations, and Laplace, Fourier, and Z transforms to continuous and discrete processes, matrix mechanics and eigenvalue problems, statistics and probability, random processes and distribution functions. Two hours of lecture and two hours of laboratory per week.
Click here for course fee.
Pre-Requisites
MTH-211, EGR-140 or CS-125

PHY-311. THERMODYNAMICS & STATISTICAL MECHANICS
Credits: 3
This course focuses on the laws of thermodynamics and other thermodynamic concepts including entropy, free energy, equilibrium, and fluctuations as well as their pivotal role in physics and other scientific disciplines. Topics in statistical mechanics will be covered including partition functions, ensembles, kinetic theory, and phase transitions. Three hours of lecture per week.
Pre-Requisites
PHY-203 and MTH-211.

PHY-312. ANALYTICAL MECHANICS
Credits: 3
Employs advanced mathematical tools to study applications in complex mechanical systems. It offers an advanced differential reformulation of Newton's laws to study dynamical systems in multiple dimensions, conservative force fields, damped and driven oscillations, two-body problem, central forces and planetary motion, and the rotational dynamics of rigid bodies. Additionally, the course delivers a thorough grounding on the calculus of variations, Lagrange's formalism and Hamiltonian mechanics, all being the essential foundations for the development of modern physics (relativity, quantum mechanics, and quantum field theory). Three hours of lecture per week.
Pre-Requisites
PHY-202 and MTH-211.

PHY-314. QUANTUM MECHANICS
Credits: 3
This course presents an intermediate level of Quantum Mechanics using the abstract formulation of linear vector spaces in the Dirac formalism. Topics covered include: spin, addition of angular momentum, scattering and bound particles, the harmonic oscillator, two-body problem and central potential wells in 3D, H-atom and H-like atoms, time-independent perturbation theory, identical particles and the He-atom. In addition to the foundations of Quantum Mechanics, the course offers a selection of advanced and modern topics like entanglement and quantum teleportation. Three hours of lecture per week.
Pre-Requisites
PHY-203, CHM-115, MTH-211, and MTH-212.

PHY-374. IMAGING IN BIOMEDICINE
Credits: 3
This course will cover different aspects of imaging important to medicine and biomedicine including optical microscopy, scanning probe microscopy, scanning electron microscopy, magnetic resonance, ultrasound X-ray, nuclear radiation, microwave and electro-/magneto-encephalographic techniques as well as image processing. Three hours of lecture and three hours of lab per week.
Click here for course fee.
Pre-Requisites
PHY-201 & PHY-202 or PHY-171 & PHY-174, MTH-112.

PHY-377. BIOPHYSICS
Credits: 3
This course presents an overview of the important physical principles governing the behavior of cells and macromolecules. Upper-level mathematics that are useful to understand these phenomena are introduced in a way that is comprehensible to biology majors lacking background beyond basic calculus. In addition to the physical models governing the most ubiquitous molecular and cellular processes, the physics behind the most common experimental techniques used in biology, bioengineering, and biophysics are covered. Three hours of lecture and two hours of lab per week.
Pre-Requisites
PHY-201 & PHY-202 or PHY-171 & PHY-174, MTH-112.

PHY-391. SENIOR PROJECT I
Credits: 1
Students will plan and execute a research project in the field of physics or at the intersection of physics and another related discipline. Projects can be theoretical, experimental or both and can include the design of unique experiments and simulations. A detailed progress report and presentation are required. Students pursuing a dual degree or double major may be eligible to combine this project with the capstone project of another program (subject to the approval of their advisors in both programs).
Click here for course fee.
Pre-Requisites
Senior standing in Physics

PHY-392. SENIOR PROJECT II
Credits: 2
Students will plan and execute a research project in the field of physics or at the intersection of physics and another related discipline. This is a continuation of PHY 391. A professional paper and progress report are required. Students will present the results of their work in an open-forum. Students pursuing a dual degree or double major may be eligible to combine this project with the capstone project of another program (subject to the approval of their advisors in both programs).
Click here for course fee.
Pre-Requisites
PHY-391