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\*\*EE Technical Electives (must be 500-level courses). Courses recommended as electrical engineering technical electives are listed below (each course is 3 credit hours):

EE 503 Power Electronics  
EE 511 Introduction to Communication Systems  
EE 512 Digital Communication Systems  
EE 513 Audio Signals and Systems  
EE 517 Advanced Electromechanics  
EE 518 Electric Drives  
EE 522 Antenna Design  
EE 523 Microwave Circuit Design  
EE 525 Numerical Methods and Electromagnetics  
EE 527 Electromagnetic Compatibility  
EE 531 Alternative and Renewable Energy Systems  
EE 532 Smart Grid: Automation and Control of Power Systems  
EE 533 Advanced Power System Protection  
EE 535 Power Systems: Generation, Operation and Control  
EE 536 Power System Fault Analysis and Protection  
EE 537 Electric Power Systems I  
EE 538 Electric Power Systems II  
EE 539 Power Distribution Systems  
EE 543 Solar Cell Devices and Systems for Electrical Energy Generation  
EE 546 Electric Power System Fundamentals  
EE 560 Semiconductor Device Design  
EE 566 Engineering Optics  
EE 567 Introduction to Lasers and Masers  
EE 568 Fiber Optics  
EE 569 Electronic Packaging Systems and Manufacturing Processes  
EE 571 Feedback Control Design  
EE 572 Digital Control of Dynamic Systems  
EE 582 Hardware Description Languages and Programmable Logic  
EE 584 Introduction of VLSI Testing and Design  
EE 585 Fault Tolerant Computing  
EE 586 Communication and Switching Networks  
EE 587 Microcomputer Systems Design  
EE 588 Real-Time Computer Systems  
EE 589 Advanced VLSI  
EE 599 Topics in Electrical Engineering (Subtitle required)

# Materials Engineering

## College of Engineering

### Freshman Year

First Semester	Hours
EGR 101 Engineering Exploration I § †.....	1
EGR 102 Fundamentals of Engineering Computing.....	<b>CS 1124</b> ...2
CHE 105 General College Chemistry I*.....	<b>CHEM 1055</b> ...4
CHE 111 General Chemistry I Laboratory*.....	<b>CHEM 1055</b> ...1
CIS/WRD 110 Composition and Communication I*Δ.....	3
MA 113 Calculus I*.....	<b>MATH 1304</b> ...4
<b>Second Semester</b>	
EGR 103 Engineering Exploration II § †.....	2
CIS/WRD 111 Composition and Communication II Δ.....	3
MA 114 Calculus II*.....	<b>MATH 1324</b> ...4
PHY 231 General University Physics*.....	<b>PHYS 2115</b> ...4
PHY 241 General University Physics Laboratory*.....	<b>PHYS 2115</b> ...1
UK Core – Social Sciences.....	3

### Sophomore Year

First Semester	Hours
MSE 201 Materials Science.....	3
MSE 202 Materials Science Laboratory.....	1
MA 213 Calculus III*.....	<b>MATH 2144</b> ...4
CHE 107 General College Chemistry II*.....	<b>CHEM 1065</b> ...3
CHE 113 General Chemistry II Laboratory*.....	<b>CHEM 1065</b> ...2
EM 221 Statics.....	3
<b>Second Semester</b>	
MSE 301 Materials Science II.....	3
MSE 351 Materials Thermodynamics.....	3
MA 214 Calculus IV.....	<b>MATH 2084</b> ...3
PHY 232 General University Physics.....	<b>PHYS 2125</b> ...4
CHE 236 Survey of Organic Chemistry.....	3

### Junior Year

First Semester	Hours
MSE 401G Metal and Alloys.....	3
MSE 404G Polymeric Materials.....	3
CME 200 Process Principles.....	3
EM 302 Mechanics of Deformable Solids.....	3
STA 381 Engineering Statistics – A Conceptual Approach.....	3
UK Core – Humanities.....	3
<b>Second Semester</b>	
MSE 402G Electronic Materials and Processing.....	3
MSE 403G Ceramic Engineering and Processing.....	3
MSE 407 Materials Laboratory I ∞.....	3
MSE 535 Mechanical Properties of Materials.....	3
PHY 361 Principles of Modern Physics.....	3

### Senior Year

First Semester	Hours
MSE 408 Materials Laboratory II.....	3
MSE 436 Material Failure Analysis.....	3
MSE 470 Application of Materials Engineering to Design Problems.....	1
MSE 585 Materials Characterization Techniques.....	3
EE 305 Electrical Circuits and Electronics.....	3
Technical Elective [1].....	3
<b>Second Semester</b>	
MSE 480 Materials Design.....	3
MSE 538 Metals Processing.....	3
Technical Elective [1].....	3
UK Core – Citizenship - USA.....	3
UK Core – Global Dynamics.....	3

\*Courses are required for Engineering Standing. A cumulative UK GPA of at least 2.5 and successful completion of all pre-major courses. Successful completion of the following courses with at least a 2.5 GPA: CHE 105, CHE 107, CHE 111, CHE 113, CIS 110/WRD 110, MA 113, MA 114, MA 213, PHY 231, and PHY 241. Completion of MSE 201 with a grade of C or better. If a course is repeated, the best grade will be used for calculation of GPA in the above listed courses.

Δ Students taking ENG 101 (FYS 1002 or WRC 2314) and ENG 102 should also complete COM 252, COM 281, or COM 287.

§ Transfer students will take EGR 215, Introduction to the Practice of Engineering for Transfer Students, in place of EGR 101 and EGR 103.

† Students must complete both EGR 101 and EGR 103 to fulfill the UK Core Arts and Creativity requirement. Transfer students may satisfy the UK Core Arts and Creativity requirement by taking EGR 215.

[1] Technical Electives - total of 6 credit hours and must be chosen. Technical electives are to be selected from a technical discipline, with approval from the Director of Undergraduate Studies. At least 3 credit hours must come from a course with a MSE prefix. MSE 395 (research) may count for one elective, but not both. Recommended technical electives include but are not limited to: MSE 395, 506, 531, 552, 554, 556, 569, 599; BME 488; CHE 580; CME 542, 599; MA 322, 422, 432G; ME/MFS 503

∞ Graduation Composition and Communication Requirement (GCCR) course.

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# Mechanical Engineering

## College of Engineering

### Freshman Year

First Semester	Hours
EGR 101 Engineering Exploration I § † *	1
EGR 102 Fundamentals of Engineering Computing*	CS 1124...2
CIS/WRD 110 Composition and Communication I*	3
MA 113 Calculus I*	MATH 1304...4
PHY 231 General University Physics*	PHYS 2115...4
PHY 241 General University Physics Laboratory *	PHYS 2115...1
<b>Second Semester</b>	
EGR 103 Engineering Exploration II § † *	2
MA 114 Calculus II *	MATH 1324...4
CIS/WRD 111 Composition and Communication II Δ	3
CHE 105 General College Chemistry I*	CHEM 1055...4
UK Core ¶ – Social Sciences	3

### Sophomore Year

First Semester	Hours
MA 213 Calculus III*	MATH 2144...4
PHY 232 General University Physics*	PHYS 2125...4
PHY 242 General University Physics Laboratory*	PHYS 2125...1
EM 221 Statics*	3
ME 205 Computer Aided Engineering Graphics	3
Guided Elective	
or	
UK Core ¶ – Humanities	3
<b>Second Semester</b>	
ME 220 Engineering Thermodynamics I	3
ME 251 Introduction to Materials and Manufacturing Processes	3
MA 214 Calculus IV	MATH 2084...3
EM 313 Dynamics	3
Guided Elective or	
UK Core* – Humanities	
Guided Elective or	
UK Core* – Statistical Inferential Reasoning.	
Recommended:	
STA 210 Making Sense of Uncertainty:	
An Introduction to Statistical Reasoning or	
STA 381 Engineering Statistics – A Conceptual Approach	3

\*Courses required for Engineering Standing. A cumulative UK GPA of at least 2.5 and successful completion of all pre-major courses. Successful completion of the following courses with at least a 2.5 GPA: CHE 105, CIS 111/WRD 111, EGR 101, EGR 102, EGR 103 (or EGR 215 in lieu of EGR 101 and EGR 103), EM 221, MA 113, MA 114, MA 213, PHY 231, PHY 241, PHY 232, and PHY 242 and a C or better in each course. If a course is repeated, the best grade will be used for calculation of GPA in the above listed courses.

Δ Students taking ENG 101 (FYS 1002 or WRC 2314) and ENG 102 should also complete COM 252, COM 281, or COM 287.

§ Transfer students will take EGR 215, Introduction to the Practice of Engineering for Transfer Students, in place of EGR 101 and EGR 103.

† Students must complete both EGR 101 and EGR 103 to fulfill the UK Core Arts and Creativity requirement. Transfer students may satisfy the UK Core Arts and Creativity requirement by taking EGR 215.

¶ To be selected from UK Core courses in consultation with the academic advisor.

\*\*Graduation Composition and Communication Requirement (GCCCR) course.

\*\*\*Mathematics Elective – choose one course from approved list.

††Technical Electives – choose 9 hours from approved list.

### Junior Year

First Semester	Hours
EM 302 Mechanics of Deformable Solids	3
EE 305 Electrical Circuits and Electronics	3
ME 330 Fluid Mechanics	3
ME 340 Introduction to Mechanical Systems	3
WRD 204 Technical Writing**	3
<b>Second Semester</b>	
ME 310 Engineering Experimentation I	3
ME 321 Engineering Thermodynamics II	3
ME 325 Elements of Heat Transfer	3
ME 344 Mechanical Design	3
Mathematics Elective***	3

### Senior Year

First Semester	Hours
ME 411 ME Capstone Design I	3
ME 311 Engineering Experimentation II	3
ME 440 Design of Control Systems	3
ME 501 Mechanical Design with Finite Element Methods	
or	
ME 590 Computational Fluid Dynamics	3
Technical Elective††	3
<b>Second Semester</b>	
ME 412 ME Capstone Design II	3
Technical Elective††	3
Technical Elective††	3
UK Core* – Citizenship - US	3
UK Core* – Global Dynamics	3

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# Mechanical Engineering • 2

## Mathematics Elective Hours

Choose one course from the following:

MA 320 Introductory Probability.....	MATH3134...3
MA 321 Introduction to Numerical Methods.....	3
MA 322 Matrix Algebra and Its Applications.....	MATH2204...3
MA 416G Introduction to Optimization.....	3
MA 432G Methods of Applied Mathematics I.....	3
MA 433G Introduction to Complex Variables.....	3
MA 481G Differential Equations.....	3
STA 381 Engineering Statistics – A Conceptual Approach.....	3

**Subtotal: Mathematics Elective..... 3**

## Technical Electives Hours

Choose 9 hours from the following:\*

ME 380 Topics in Mechanical Engineering (Variable Topics).....	3
ME 395 Independent Work in Mechanical Engineering.....	1-3
ME 416 Automotive Painting Technology.....	3
ME 417 Sheet Metal Forming.....	3
ME 418 Automotive Assembly and Quality Control.....	3
ME 501 Mechanical Design with Finite Element Methods.....	3
ME/MFS 503 Lean Manufacturing Principles and Practices.....	3
ME/MFS 505 Modeling of Manufacturing Processes and Machines.....	3
ME/MSE 506 Mechanics of Composite Materials.....	3
ME/MFS 507 Design for Manufacturing.....	3
ME 510 Vibro-Acoustic Design in Mechanical Systems.....	3
ME/MFS 511 Machining of Materials and Applications.....	3
ME/MFS 512 Manufacturing Systems.....	3
ME 513 Mechanical Vibrations.....	3
ME 514 Computational Techniques in Mechanical System Analysis.....	3
ME 515 Rotordynamics of Turbomachinery.....	3
ME 516 Systems Engineering.....	3
ME/EE/MFS 526 Lean Operations Management I.....	3
ME 527 Applied Mathematics in the Natural Sciences I.....	3
ME 530 Gas Dynamics.....	3
ME 531 Fluid Dynamics I.....	3
ME 532 Advanced Strength of Materials.....	3
ME 542 Kinematic Synthesis of Mechanisms.....	3
ME 548 Aerodynamics of Turbomachinery.....	3
ME 549 Power Generation.....	3
ME/MFS/CME/MSE 554 Chemical and Physical Processing of Polymer Systems.....	3
ME/EE/MSE 555 Introduction to Micro-/Nano- Electromechanical Systems.....	3
ME/MFS/CME/MSE 556 Introduction to Composite Materials.....	3
ME 560 Engineering Optics.....	3
ME 563 Basic Combustion Phenomena.....	3
ME 565 Scale Modeling in Engineering.....	3
ME/EE/MSE 570 Fundamentals of Nanoelectric Devices and Materials.....	3
ME/BAE 580 Heating, Ventilating and Air-Conditioning.....	3
ME/BAE/EGR/MFS/EE 583 Industrial Energy Utilization and Assessment.....	3
ME 585 Fourier Series and Boundary Value Problems.....	3
ME 590 Applied CFD and Numerical Heat Transfer.....	3
ME 599 Topics in Mechanical Engineering (Subtitle required).....	3
MFS 599 Topics in Manufacturing Systems Engineering (Subtitle required).....	3

## Non-ME Technical Electives

BAE 502 Modeling of Biological Systems.....	3
BAE 515 Fluid Power Systems.....	3
BAE 516 Control of Off-Road Vehicles.....	3
BME 440 Introduction to Biomedical Signal Processing.....	3
BME 472 Human Biomechanics.....	3
BME 473 Fundamentals of Biofluid Mechanics.....	3
BME 488 Introduction to Biomaterials.....	3
BME 532 Modeling of Physiological Systems.....	3
BME 540 Biomedical Instrumentation.....	3
BME 550 Introduction to Biomedical Imaging.....	3
BME 571 Mechanical Modeling of Human Motion.....	3
BME 573 Cell Mechanics and Mechanobiology.....	3
BME 579 Neural Engineering: Merging Engineering with Neuroscience.....	3
EGR 523 Concepts, Assessment Tools and Methods in Sustainable Power and Energy.....	3
EGR 537 Numerical Analysis.....	3
EGR 540 Power Economics and Public Policy.....	3
EGR 542 Electric Power Generation Technologies.....	3
EGR 546 Electric Power System Fundamentals.....	3
EGR 553 Environmental Consequence of Energy Production.....	3
MFS 509 Leadership for a Lean Enterprise.....	3
MFS/MNG 520 Industrial Automation and Control.....	3
MFS 525 Organizational Learning for Lean Manufacturing.....	3
MFS 581 Quality Control.....	3
MFS 599 Topics in Manufacturing Systems Engineering (Subtitle required).....	3
MSE 201 Materials Science.....	3
MSE/CME 552 Automotive Plastics.....	3

\*A minimum of 6 credit hours (two courses) must have an ME prefix or be cross-listed as an ME course. A maximum of 3 credit hours (one course) may be chosen from technical electives with prefixes other than ME. Exceptions only with the approval of the Director of Undergraduate Studies.

# Mining Engineering

## College of Engineering

### Freshman Year

#### First Semester

	Hours
CHE 105 General College Chemistry I*	CHEM 1055...4
CIS/WRD 110 Composition and Communication I*Δ	3
EGR 101 Engineering Exploration I § †	1
EGR 102 Fundamentals of Engineering Computing	CS 1124...2
MA 113 Calculus I*	MATH 1304...4

#### Second Semester

CIS/WRD 111 Composition and Communication IIA	3
EGR 103 Engineering Exploration II § †	2
MA 114 Calculus II*	MATH 1324...4
PHY 231 General University Physics*	PHYS 2115...4
PHY 241 General University Physics Laboratory (PHYS 2115)	
or	
CHE 111 General Chemistry I Laboratory ¶	CHEM 1055...1
UK Core – Social Sciences	3

### Sophomore Year

#### First Semester

	Hours
EES 220 Principles of Physical Geology	4
EM 221 Statics	3
MA 213 Calculus III*	MATH 2144...4
MNG 201 Mining Engineering Fundamentals	3
PHY 232 General University Physics	PHYS 2125...4

#### Second Semester

EES 230 Fundamentals of Geology I	3
EM 302 Mechanics of Deformable Solids	3
MA 214 Calculus IV	MATH 2084...3
MNG 291 Elements of Mine Design	3
MNG 303 Deformable Solids Laboratory	1
MNG 322 Mine Safety and Health Management and Processes	2
MNG 331 Explosives and Blasting	2

### Junior Year

#### First Semester

	Hours
EM 313 Dynamics	3
MNG 211 Mine Surveying	2
MNG 301 Minerals Processing	3
MNG 335 Introduction to Mine Systems Analysis†	3
MNG 463 Surface Mine Design	3
UK Core – Humanities	3

#### Second Semester

CE 341 Introduction to Fluid Mechanics	4
MNG 311 Electrical Circuits and Mining Machinery	3
MNG 371 Professional Development of Mining Engineers ∞	3
MNG 435 Mine Systems Engineering and Economics	3
MNG 551 Rock Mechanics	4

### Senior Year

#### First Semester

	Hours
MNG 332 Mine Plant Machinery	3
MNG 341 Mine Ventilation	3
MNG 351 Underground Mine Design	3
MNG 591 Mine Design Project I	1
UK Core – Citizenship - USA	3

#### Second Semester

BAE 535/MNG 535 Environmental Control System Design and Reclamation	3
MNG 592 Mine Design Project II (UK Core – Arts and Creativity)	3
Minerals Processing Technical Elective[1]	3
Technical Elective**	3
UK Core – Global Dynamics	3

\*Courses are required for Engineering Standing. A cumulative UK GPA of at least 2.5 and successful completion of all pre-major courses. Successful completion of the following courses with at least a 2.5 GPA: CIS 110/WRD 110, CHE 105, MA 113, MA 114, MA 213, and PHY 231. If a course is repeated, the best grade will be used for calculation of GPA in the above listed courses.

Δ Students taking ENG 101 (FYS 1002 or WRC 2314) and ENG 102 should also complete COM 252, COM 281, or COM 287.

§ Transfer students will take EGR 215, Introduction to the Practice of Engineering for Transfer Students, in place of EGR 101 and EGR 103.

† Students must complete both EGR 101 and EGR 103 to fulfill the UK Core Arts and Creativity requirement. Transfer students may satisfy the UK Core Arts and Creativity requirement by taking EGR 215.

¶ Students only required to take one lab. Consult with advisor.

[1] The Minerals Processing Technical Elective is to be chosen between MNG 575, Coal Preparation Design, and MNG 580, Mineral Processing Plant Design.

∞ Graduation Composition and Communication Requirement (GCCCR) course.

†† MNG 335 satisfies the Statistical Inferential Reasoning requirement in the UK Core.

\*\*Courses recommended as technical electives are listed below. These courses must be chosen with the approval of the student's advisor to ensure that the curriculum includes sufficient engineering design content.

**Technical Electives:** Students are required to select their technical elective from the departmental courses listed below:

- MNG 511 Mine Power System Design
- MNG/MFS 520 Industrial Automation and Control
- MNG 531 Advanced Blast Design and Technology
- MNG 541 Computer Design of Mine Ventilation Systems

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MNG 555 Advanced Geomechanics I  
MNG 561 Mine Construction Engineering I  
MNG 575 Coal Preparation Design  
MNG 580 Mineral Processing Plant Design  
MNG 585 Applied Surface Chemistry  
MNG 599 Topic in Mining Engineering