The University of Cincinnati

Masters of Engineering Degree
Program Schedule

Curriculum
The curriculum in the Master of Engineering Program is structured to provide a foundation of advanced engineering topics while allowing students flexibility to meet their specific educational objectives. The Master of Engineering requires a minimum of 30 semester hours including:

- **Program core courses** taken by all Master of Engineering students
- **Track required courses** from the discipline of interest (number of credit hours required depends upon the discipline)
- **Elective courses** depth or interdisciplinary focus depending on student educational objectives (number of credit hours available depends upon the discipline)
- **Capstone project** demonstrates applications of skills and synthesis of knowledge

Each individual program has flexibility on setting appropriate track requirements. The following pages describe the course requirements for each of the program options provided.

**MEng Program Options**

- Aerospace Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Environmental Engineering
- Material Science Engineering
- Mechanical Engineering

**Advisors**

- Aerospace Engineering: Jeff Johnson, ERC 680, jeffrey.johnson@ucmail.uc.edu
- Biomedical Engineering: G.A. Rassati, Baldwin 765C, gian.rassati@uc.edu
- Chemical Engineering: Stephen Thiel, ERC 501J, stephen.thiel@uc.edu
- Civil Engineering: G.A. Rassati, Baldwin 765C, gian.rassati@uc.edu
- Computer Engineering: Fred Annexstein, Old Chem 811B, annexsfs@ucmail.uc.edu
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- Electrical and Computer Engineering: Dominic Boccelli, ERC 742, dominic.boccelli@uc.edu
- Environmental Engineering: Donglu Shi, Rhodes 493, donglu.shi@uc.edu
- Materials Science: Eugene Rutz, Rhodes 635, eugene.rutz@uc.edu
- Mechanical Engineering: Eugene Rutz, Rhodes 635, eugene.rutz@uc.edu
Core Curriculum
The core curriculum is required of all Master of Engineering students, regardless of which track they pursue. The core provides skills in the effective practice of engineering recognizing that for experienced practitioners, effectiveness includes technical skills, project and task management skills, and interpersonal skills. Students are required to take 1 course from the Project / Task Management set and 1 course from the Interpersonal set. Additional courses from these areas can be taken as elective courses.

Project / Task Management Development (1 required)
MECH6074 Quality Control Fall & Spring  On Line
ENGR6014 Eng Project Management Fall & Spring
AEEM6067 Entrepreneurship and Tech Law Spring
AEEM6099 System Eng & Analysis Spring
CVE 6044 Construction Law Fall
ENGR 7025 Product & Process Quality Fall
EECE 6032 Software Test and QA (CS majors)

Interpersonal Skill Development (1 required)
ENGR6002 Management of Professionals Fall & Spring
ENGR6050 Fundamentals of Leadership Fall & Spring
CVE 6038 Leadership / Decision Making Spring
ENGR6010 Effectiveness in Tech Orgs Fall & Spring  On Line
OLHR8029 Individual Behavior in the Workplace Fall
OLHR6050 Teams
OLHR 8090 Strategic Leadership
MGMT7014 Leadership & Organizations with permission

Other courses that fit the core requirements may be available. Check with the MEng advisor in your program to verify if another course fulfills the core course requirements.

Capstone
Each master’s degree student is required to undergo an individual evaluation process at the end of his or her program. For the Master of Engineering program we refer to this as a capstone experience. For the Master of Engineering program this experience is expected to be around the general topic of application of engineering principles since the MEng is focused on the practice of engineering rather than research or the generation of new knowledge. The capstone experience provides a mechanism to demonstrate a synthesis of knowledge and the application of advanced concepts learned in the program.

With the Program advisor’s approval, students can choose: 1) to complete a project, 2) an MEng capstone evaluation, 3) to perform an internship or 4) to prepare a written paper under the supervision of the advisor. If students choose the capstone evaluation, this is a 0 credit hour option and students will need an additional course in order to meet the credit hour requirements for the degree. This MEng capstone evaluation can be written or oral, as deemed appropriate by each Program.
MEng Graduate Program Curriculum  
Aerospace Engineering

The Aerospace Engineering and Engineering Mechanics Masters of Engineering degree is meant to be extremely flexible so as to meet the needs of prospective students. The coursework requirements are:

MEng Core Courses – 2 courses

Fundamental AEEM Courses - at least 4 courses selected from available graduate courses in the track. The following are typically available:

**FALL**
- AEEM 6001 Adv Strength of Materials
- AEEM 6022 Optimal Control
- AEEM6041 Comp Flow and Thermodynamics
- AEEM6076 Modeling Complex Systems
- AEEM 7027 Non-Destructive Test
- AEEM 7035 Physics of Gases
- AEEM 7050 Turbomachinery Flow
- AEEM 7074 Adv Finite Elem Method
- AEEM8030 Advanced Propulsion
- EGFD 7041 Viscous Flow and Heat Transfer
- EGFD 7051 Nu Meth Aero Fluid Mech

**SPRING**
- AEEM6012 TURBINE COMBUSTIION
- AEEM6093 ADV. FLIGHT MECH.
- AEEM6095 ASTRODYNAMICS
- AEEM6096 FUZZY CONTROL SYS
- AEEM6099 SYS ENG ANALYSIS
- AEEM7028 ULTRASONIC NDE
- AEEM7050 TURBOMACHINERY FLOW

Capstone Project – 1 course

*With permission of their advisor, students may select some of their elective credit hours in areas outside of Aerospace Engineering. Independent studies or projects in advanced topics may also be arranged.*
MEng Graduate Program Curriculum
Biomedical Engineering

**BME MEng Core Courses (one course from each category – need minimum of 6 Cr Total)**

*Project / Task Management Development Courses (1 required)*
- Advanced Medical Device Design (BME 7020) 3 F
- Medical Device Life Cycle Engineering (BME 7010) 3 S
- Quality Control (MECH 6074) 3 F, S (On Line)
- Eng Project Management (ENGR 6014) 3 F & S
- Technology Law (EGFD 6067) 3 S

*Interpersonal Skill Development Courses (1 required)*
- Management of Professionals (ENGR 6002) 3 F, S
- Fundamentals of Leadership (ENGR 6050) 3 F, S
- Effectiveness in Technical Organizations (ENGR 6010) 3 F, S (On Line)

*In these course categories, the student can petition for other courses to be included, but will require approval of the MEng Advisor.*

**BME MEng Track Courses (Need at least 12 cr total)**

*Medical Device Innovation & Entrepreneurship (MDIEP) Track Courses*
- Biomechanical Design of Implantable Devices (BME 7011) 3 F
- Advanced Medical Device Design (BME 7020) 3 F
- Medical Device Life Cycle Engineering (BME 7010) 3 S

Note: MDIEP Track can be combined with any of the other tracks (T/E Biomech, or Imaging)

*Tissue Engineering and Biomechanics Track Courses:*
- Joint Biomechanics and Measurement Methods (BME 6024) 3 S
- Functional Tissue Engineering (BME 6030) 3 S
- Tissue Biomechanics (BME 7021) 3 F
- Independent Study in Biomechanics (BME 8020) 3 F,S,U
- Independent Study in Tissue Engineering (BME 8030) 3 F,S,U
- Molecular and Cellular Biology (GNTD 7001) 3 F
- Biomechanical and Physiological Aspects 2 F
  of Muscular Activity (OSE 7044C)

*Medical Imaging Track Courses:*
- MR Imaging and Spectroscopy (BME 6011) 3 F
- Biomedical Signal and Image Processing (BME 6012) 3 F
- Biomedical Ultrasound (BME 6050) 3 S
- Advanced Topics in Magnetic Resonance Imaging (BME 7012) 3
- Independent Study in Medical Imaging (20 BME 8010) 3 F,S,U
- Diagnostic Radiological Imaging Physics (MP 9050) 3 F

**BME MEng Electives (Need at least 6 cr total from the following)**

*General Medical Sciences Courses:*
- Human Gross Anatomy (ANAT 8071C ) 4-10 U
- Scientific Integrity & Research Ethics (BE 7067) 1 U
Biology of Cancer (CB 8080) 3 S
Molecular and Cellular Biology (GNTD 7001) 3 F
Biochemistry and Cellular Signaling (GNTD 7002) 3 F
Human Physiology (MCP 6000) 4 F
Brain and Behavior I (NS 8041) 4-10 S
Brain and Behavior II (NS 8061) 4-10 F

Mathematics Courses
Biostatistics in Research (BME 7061) 3 F,S
Advanced Statistical Methods in Biomedical Res. (BME 8064) 3
Introduction to Biostatistics (BE 7022) 3 F
Computational Fluid Dynamics (EGFD 6037C) 4 S
Numerical Analysis (MATH 6006) 3 F
Partial Differential Equations and Fourier Analysis (MATH 6007) 3 S
Applied Probability and Stochastic Processes (MATH 6008) 3 F
Mathematical Programming (MATH 6015) 3 S
Applied Ordinary Differential Equations (MATH 6051) 3 S
Scientific Computation (MATH 8011) 3
Mathematical Physics (PHYS 7001) 4 F

In addition to the above courses, these can come from any graduate level engineering, science, medicine, business, or law course that is relevant to the student's career goals as determined via discussion with the Graduate Program MEng advisor, and approved accordingly by the advisor. E.g if Medical Device Innovation is chosen as the Track area combined with T/E Biomech, then electives can be selected from the Imaging Courses. All elective choices need approval of the MEng Program Director.

Note: Not all courses are taught every year. Students should use this curriculum sheet as a guide, and check Onestop prior to enrollment every semester to ensure that the course being considered is actually offered in that semester. This requires careful planning and students should start early to develop their program of study with the MEng program advisor.
A total of at least 30 semester credit hours are required for an MEng degree in Civil Engineering. Of these, 3 credit hours can be counted for the Capstone Project, if available. Students in the Civil Engineering program can choose between a targeted program that provides significant depth and a program that adds breadth within the practice of Civil Engineering. Students seeking to strengthen their area of expertise can choose either a focus on Infrastructure Design (with emphasis on Structures or Geotechnical) or on Infrastructure Systems (with emphasis on Construction, Pavements, or Transportation). Note that some courses are only offered in even years or in odd years, thus in some cases a minimum of three semesters will be necessary to fulfill all requirements.

Students who have taken any of the 6000 level courses listed herein as part of their undergraduate degree at the University of Cincinnati will identify suitable substitutes in consultation with their academic advisor.

The total number of credit hours taken as independent study and/or project courses may not exceed 6.

**MEng Core Courses – 2 courses**

*Project / Task Management Development (one required)*

- MECH6074 Quality Control  
  Fall Online
- ENGR6014 Eng Project Management  
  Spring
- AEEM6067 Entrepreneurship and Tech Law  
  Spring
- AEEM6099 System Eng & Analysis  
  Spring
- CVE 6044 Construction Law  
  Fall
- OM 7011 Management of Operations  
  Fall

*Interpersonal Skill Development (one required)*

- ENGR6002 Management of Professionals  
  Fall
- ENGR6050 Fundamentals of Leadership  
  Fall/Spring
- ENGR6010 Effectiveness in Tech Orgs  
  Fall/Spring Online
- OLHR6050 Teams  
  Fall
- MGMT7014 Leadership & Organizations  
  Fall

**Final Comprehensive Examination OR Capstone Project – 1 course**

Take a final comprehensive examination (0 semester credit hours) OR, if an advisor is available, work on a Capstone Project (3 semester credit hours) that represents the synthesis of what was learned during the formal classwork.
Civil Engineering Depth Programs – Required Classes

**Option 1 - Structures**
CVE 7011  Structural Mechanics  Fall
CVE 7012  Finite Element Analysis  Spring
CVE 7081  Theory and Design of Concrete Structures I  Fall 2017
CVE 7085  Metal Structures Theory and Design I  Fall 2016
CVE 7088  Structural Dynamics  Fall

**Option 2 - Geotechnical**
CVE 7011  Structural Mechanics  Fall
CVE 7061  Consolidation and Settlement (Must have CVE 476)  Fall
CVE 7062  Soil Shear Strength and Slope Stability  Spring

Take two of the following courses:
CVE 6081  Foundation Engineering  Fall
CVE 7081  Theory and Design of Concrete Structures I  Fall 2017
CVE 7085  Metal Structures Theory  Fall 2016

In addition students must complete three of the following
CVE 6082  Reinforced Concrete Design of Shallow Foundations  Spring
CVE 6063  Principles of Pavement Engineering  Spring
GEOL 7001C  Geomorphic Processes  TBA
GEOL 6004  Glacial Geology  TBA

**Option 3 – Construction**
CVE 6044  Construction Law  Fall
CVE 6042  Sustainable Construction and LEED  Fall
CVE 6036  Value Engineering and Constructability  Fall

**Option 4 – Pavements**
CVE 7010  Risk and Reliability  Spring
CVE 6063  Principles of Pavement Engineering  TBD
CVE 6067  Advanced Pavement Engineering  TBD

Two courses from structures, geotechnical, construction, or transportation areas.

**Option 4 - Transportation**
CVE 6022C  Traffic Control and Signal System Design  Spring 2018
CVE 6010C  Advanced Traffic Engineering, or  Fall 2016
CVE 6024  Highway Engineering and Traffic Safety  Fall 2016
CVE 6012  Travel Demand Forecasting and Environmental Analysis  Fall 2017
CVE 6008  Transportation Planning and System Evaluation  Spring 2017

Civil Engineering Breadth Program – Required Classes

CVE 7010  Risk and Reliability  TBA
Two courses from structures and/or geotechnical areas
Two courses from construction and/or traffic area
Elective Courses:

With permission of their advisor, students may select some of their elective credit hours in areas outside of Civil Engineering. Independent studies or projects in advanced topics may also be arranged, for a maximum of 6 semester credit hours total. Note that some of the courses listed below have prerequisite courses.

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<th>Course Title</th>
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<td>CVE6010C</td>
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<td>CVE6011</td>
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<td>CVE6012</td>
<td>Travel Demand Forecasting and Environmental Analysis</td>
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<td>CVE6021</td>
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<td>CVE6024</td>
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<td>CVE6036</td>
<td>Value Engineering and Constructability</td>
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<tr>
<td>CVE6037</td>
<td>Construction Financing &amp; Strategy Planning</td>
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<td>CVE6038</td>
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<td>CVE6041</td>
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<td>CVE6046</td>
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<td>CVE6081</td>
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<td>CVE6082</td>
<td>Reinforced Concrete Design of Shallow Foundations</td>
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<td>CVE6085</td>
<td>Advanced Structural Analysis</td>
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<td>CVE7014</td>
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<td>CVE7020C</td>
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<td>CVE7021</td>
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<td>CVE7061</td>
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<td>CVE7062</td>
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<td>CVE7074</td>
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<td>CVE7076</td>
<td>Intelligent Transportation Systems: Integrated Planning and Technologies</td>
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<td>CVE7081</td>
<td>Theory and Design of Concrete Structures I</td>
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<td>CVE7082</td>
<td>Design of Concrete Structures II (CVE7081 prerequisite)</td>
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<tr>
<td>CVE7085</td>
<td>Metal Structures Theory and Design I</td>
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<tr>
<td>CVE7086</td>
<td>Metal Structures Theory and Design II (CVE 7085 prerequisite)</td>
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<tr>
<td>CVE7088</td>
<td>Structural Dynamics</td>
</tr>
<tr>
<td>CVE7089</td>
<td>Earthquake Engineering</td>
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MEng Graduate Program Curriculum
Chemical Engineering

The Chemical Engineering Masters of Engineering degree is meant to be extremely flexible so as to meet the needs of prospective students. The coursework requirements are:

MEng Core Courses – 2 courses

Track Required Courses – 4 courses
CHE 6040 Advanced Thermodynamics Fall
CHE 6043 Adv Transport Phenomenon I Fall
CHE 6044 Transport Phenomenon II Spring
CHE 7077 Chemical Reactor Design Spring

Capstone Project – 1 course

Elective Courses – courses
CHE 6045C Transp. Phenom Modelling & Anal Spring
CHE 6057 Fuel Cells Spring
CHE 6059 Inorganic Membranes Fall
CHE 6076 Colloid Science Spring
CHE 6096 Env. Catalysis & Reaction Eng Fall

With permission of their advisor, students may select some of their elective credit hours in areas outside of Chemical Engineering. Independent studies or projects in advanced topics may also be arranged.
MEng Graduate Program Curriculum  
Computer Engineering

The Computer Engineering Masters of Engineering is focused around several distinct tracks. The coursework requirements for the tracks are:

**General Computer Engineering**
The General Computer Engineering track is focused on development of foundational competencies in the computer engineering field. Courses in the general computer engineering track are designed to provide a strong foundation in both hardware and software development.

**Required Courses:**
1. EECE 6010 Database Management 3 Credits (Fall or Spring)  
2. EECE 6029 Introduction to Operating systems 3 Credits (Fall or Spring)  
3. EECE 6080 Introduction to VLSI Design 4 Credits (Fall)  
4. EECE 7095 Introduction to Computer Architecture 3 Credits (Fall)

**Elective Courses** (Choose 2 from the following List):
1. CS 6026 Formal Methods 3 Credits (Fall or Spring)  
2. CS 6033 Artificial Intelligence 3 Credits (Fall or Spring)  
3. EECE6038 Advanced Microsystem Design 3 Credits (Fall or Spring)  
4. CS 6043 Computer Networking 3 Credits (Fall or Spring)  
5. EECE 6083 Compiler Theory and Practice 3 Credits (Fall or Spring)  
6. CS 7081 Advanced Algorithms 3 Credits (Fall or Spring)

**Embedded Systems**
An embedded system combines customized hardware and software to carry out a specific set of tasks. Every day we benefit from many embedded systems in our cars, in medical devices, in consumer electronics, and in smart home appliances. New applications for embedded systems are constantly being developed. Embedded systems developers must pay particular attention to safety, reliability, and security in the products they design. The Embedded Systems track prepares students to work in this exciting and constantly evolving sub discipline of Computer Engineering

**Required Courses:**
1. EECE 6017C, Embedded Systems 4 Credits (Fall)  
2. EECE 6029, Operating Systems 3 Credits (Fall)  
3. EECE 6038C, Advanced Microsystem Design 4 Credits (Spring)  
4. EECE 7095, Introduction to Computer Architecture 3 Credits (Spring)

**Elective Courses** (Choose 2 from the following List):
1. EECE 6007, Biomedical Microsystems 3 Credits (Fall)  
2. EECE 6015C, Instrumentation & Industrial Control 3 Credits (Spring)  
3. EECE 6032, Software Testing and Quality Assurance 3 Credits (Spring)  
4. EECE 7017C, Trustworthy Embedded Systems 4 Credits (Spring)  
5. CS 6027, Requirements Engineering 3 Credits (Fall)  
6. CS 6097, Intro to Wireless and Mobile Networking 3 Credits (Spring)
Computer Engineering - VLSI Design
The VLSI Design track is focused on preparing students for jobs in the integrated circuit design industry. Students take a core set of courses to learn skills associated VLSI chip design, layout and testing. Student can then supplement this core knowledge with electives in areas related to computer architecture, wireless systems, embedded systems design, signal processing or software development. NOTE: This track requires significant background in computer programming. Students must have a demonstrated strength in computer programing using an object oriented programming language such as C++ in order to be accepted into this track.

Required Courses:
1. EECE 6080 Introduction to VLSI Design 4 credits (Fall)
2. EECE 6082 VLSI Design for Test and Power 4 credits (Spring)
3. EECE 6086 VLSI Design Automation 4 credits (Spring)

Elective Courses (Choose 2 from the following List):
1. EECE 6017C Embedded Systems 4 credits (Fall)
2. EECE 6024 Introduction to Digital Signal Processing 3 credits (Fall)
3. EECE 6026 Introduction to Communication Systems 3 credits (Fall)
4. EECE 6032 Software Testing and Quality Assurance 3 credits (Spring)
5. EECE 6038C Advanced Microsystems 4 credits (Spring)
6. EECE 7095 Introduction to Computer Architecture 3 credits (Fall)

Computer Engineering - Cyber Security
The Cyber Security track focuses on the development of technical skills necessary to address challenges of securing cyberspace and digital life. This track is designed to address the growing needs of companies, governments and organizations of professionals to manage the challenges of security in the cyberspace.

Required Courses:
1. CS-6055 Cyber Defense Overview 3 credits (Fall)
2. CS-6021 Mathematical Logic 3 credits (Fall)
3. CS-6056 Security Vulnerability Assessment 3 credits (Spring)
4. CS-7038 Malware Analysis 3 credits (Spring)

Elective Courses (Choose 2 from the following List):
1. CS-6065 Introduction to Cloud Computing 3 credits (Spring)
2. CS-6053 Network Security 3 credits (Fall)
3. CS-6097 Wireless and Mobile Networking 3 credits (Spring)
4. EECE-7095 Introduction to Computer Architecture 3 credits (Spring)
5. EECE-6017C Embedded Systems 4 credits (Fall)
6. EECE-6038C Advanced Microsystem Design 4 credits (Spring)

Computer Engineering - Data Science
The data science track focuses on analytical techniques and algorithms, including data mining, to extract meaningful insights by processing large data sets efficiently. Students acquire hands-on experience with relevant software tools, languages, data models, and environments.

Required Courses:
1. CS 6052 Intelligent Data Analysis 3 credits (Fall)
2. CS 6054 Information Retrieval 3 credits (Fall)
3. CS 6065 Introduction to Cloud Computing 3 credits (Spring)
4. EECE 8075 Data Warehousing and Mining 3 credits (Spring)

**Elective Courses** (Choose 2 from the following List):
1. CS 6033 Artificial Intelligence 3 credits (Fall)
2. CS 6037 Machine Learning 3 credits (Fall)
3. CS 6051 Big Data: Eng, Arch, Security 3 credits (Spring)
4. CS 6068 Parallel Computing 3 credits (Spring)
5. CS 6025 Data Encoding 3 credits (Spring)
6. CS 7054 Data Science for Bioinformatics

**MEng Core Courses – 2 courses**

**Capstone Project – 1 course**

*With permission of their advisor, students may select some of their elective credit hours in areas outside of Computer Engineering. Independent studies or projects in advanced topics may also be arranged.*
MEng Graduate Program Curriculum
Computer Science

The Computer Science Masters of Engineering degree is focused around several distinct tracks. The coursework requirements for the tracks are:

**General Computer Science**
The General Computer Science track is focused on on development of foundational competencies in the computer science field. Courses in the general computer science track are designed to provide a strong foundation in software development and computer system analysis.

**Required Courses:**
1. EECE 6010 Database Management 3 credits (Fall and Spring)
2. EECE 6029 Introduction to Operating systems 3 credits (Fall and Spring)
3. CS 6033 Artificial Intelligence 3 credits (Fall)
4. CS 7081 Advanced Algorithms 3 credits (Fall and Spring)

**Elective Courses** (Choose 2 from the following List):
1. CS 6037 Machine Learning 3 credits (Fall)
2. CS 6052 Intelligent Data Analysis 3 credits (Fall)
3. CS 6043 Computer Networking 3 credits (Fall)
4. CS 6053 Network Security 3 credits (Fall)
5. CS6060 Computer Graphics 3 credits (Spring)
6. CS6068 Parallel Computing 3 credits (Spring)

**Computer Science - Cyber Security**
The Cyber Security track focuses on the development of technical skills necessary to address challenges of securing cyberspace and digital life. This track is designed to address the growing needs of companies, governments and organizations of professionals to manage the challenges of security in the cyberspace.

**Required Courses:**
1. CS-6055 Cyber Defense Overview 3 credits (Fall)
2. CS-6021 Mathematical Logic 3 credits (Fall)
3. CS-6056 Security Vulnerability Assessment 3 credits (Spring)
4. CS-7038 Malware Analysis 3 credits (Spring)

**Elective Courses** (Choose 2 from the following List):
1. CS-6065 Introduction to Cloud Computing 3 credits (Spring)
2. CS-6053 Network Security 3 credits (Fall)
3. CS-6097 Wireless and Mobile Networking 3 credits (Spring)
4. EECE-7095 Introduction to Computer Architecture 3 credits (Spring)
5. EECE-6017C Embedded Systems 4 credits (Fall)
6. EECE-6038C Advanced Microsystem Design 4 credits (Spring)

**Computer Science - Data Science**
The data science track focuses on analytical techniques and algorithms, including data mining, to extract meaningful insights by processing large data sets efficiently. Students acquire hands-on experience with relevant software tools, languages, data models, and environments.
Required Courses:
1. CS 6052 Intelligent Data Analysis 3 credits (Fall)
2. CS 6054 Information Retrieval 3 credits (Fall)
3. CS 6065 Introduction to Cloud Computing 3 credits (Spring)
4. EECE 8075 Data Warehousing and Mining 3 credits (Spring)

Elective Courses (Choose 2 from the following List):
1. CS 6033 Artificial Intelligence 3 credits (Fall)
2. CS 6037 Machine Learning 3 credits (Fall)
3. CS 6051 Big Data: Eng, Arch, Security 3 credits (Spring)
4. CS 6068 Parallel Computing 3 credits (Spring)
5. CS 6025 Data Encoding 3 credits (Spring)
6. CS 7054 Data Science for Bioinformatics 3 credits (Spring)

MEng Core Courses – 2 courses

Capstone Project – 1 course

With permission of their advisor, students may select some of their elective credit hours in areas outside of Electrical Engineering. Independent studies or projects in advanced topics may also be arranged.
MEng Graduate Program Curriculum
Electrical Engineering

The Electrical Engineering Masters of Engineering degree is focused around several distinct tracks. The coursework requirements for the tracks are:

**Advanced Materials, Devices and Microsystems**
The Advanced Materials, Devices and Microsystems track aims to prepare students for jobs in industries focused on the advanced materials, nanoelectronic devices, and microelectromechanical systems (MEMS) for health. Students take a core set of courses to learn skills associated with semiconductor fabrication, MEMS, and advanced devices. Students can then supplement this core knowledge with electives in areas related to microfabrication, quantum systems, thermoelectric systems, optical systems, or electromagnetic systems.

**Required Courses:**
1. EECE6007 Biomedical Microsystems 3 credits (Fall)
2. EECE6008 Fundamentals of MEMS 3 credits (Fall)
3. EECE6018 Microfab of Semiconductor Devices 3 credits (Fall)
4. EECE7026 BioChips and Lab-on-Chips 3 credits (Spring, even years)
   EECE7032 BioSensors and Bioelectronics 3 credits (Spring, odd years)

**Elective Courses (Choose 2 from the following List):**
1. EECE6022C Quantum Systems 3 credits (Fall)
2. EECE6041C Microfabrication Lab 3 credits (Spring)
3. EECE6048C Optics for Engineers 3 credits (Fall)
4. EECE6088 Principles of VLSI Devices 3 credits
5. EECE7023 Thermoelectric Energy Conversion Devices 3 credits (Spring)
6. EECE7011 Electromagnetic Systems 3 credits (Spring)

**Systems Engineering**
The Systems Engineering track is focused on preparing students for jobs in modeling, designing, analyzing and optimizing electrical or physical systems with a broad array of applications. Students take a core set of courses to learn skills associated with systems theory, systems design and modeling. Students can then supplement this core knowledge with expertise in areas related to communications, signal and image processing, instrumentations, control, simulations and electric machines and drives etc. NOTE: This track requires students have the necessary breadth and depth of knowledge in mathematics including differential equations, linear algebra, probability and statistics in order to be accepted into this track. Students are also expected to have completed the undergraduate courses in signal and systems.

**Required Courses:**
1. EECE6019 Probability and Random Processes 3 credits (Fall)
2. EECE7033 Linear Systems Theory 3 credits (Fall)
3. EECE6036 Intelligent Systems 3 credits (Spring)
4. EECE7065 Complex Systems and Networks 3 credits (Spring)

**Elective Courses (Choose 2 from the following List):**
1. EECE6016C Electric Machines and Drives 4 credits (Fall)
2. EECE6024 Introduction to Digital Signal Processing 3 credits (Fall)
3. EECE6042 Digital Image Processing 3 credits (Fall)
4. EECE6026 Introduction to Communication Systems 3 credits (Spring)
5. EECE6015C Instrumentation and Industrial Control 4 credits (Spring)
6. EECE6043 Optimization methods and models 3 credits (Fall)

**Electrical Engineering - VLSI Design**

The VLSI Design track is focused on preparing students for jobs in the integrated circuit design industry. Students take a core set of courses to learn skills associated VLSI chip design, layout and testing. Student can then supplement this core knowledge with electives in areas related to computer architecture, wireless systems, embedded systems design, signal processing or software development. NOTE: This track requires significant background in computer programming. Students must have a demonstrated strength in computer programming using an object oriented programming language such as C++ in order to be accepted into this track.

**Required Courses:**
1. EECE 6080 Introduction to VLSI Design 4 credits (Fall)
2. EECE 6082 VLSI Design for Test and Power 4 credits (Spring)
3. EECE 6086 VLSI Design Automation 4 credits (Spring)

**Elective Courses (Choose 2 from the following List):**
1. EECE 6017C Embedded Systems 4 credits (Fall)
2. EECE 6024 Introduction to Digital Signal Processing 3 credits (Fall)
3. EECE 6026 Introduction to Communication Systems 3 credits (Fall)
4. EECE 6032 Software Testing and Quality Assurance 3 credits (Spring)
5. EECE 6038C Advanced Microsystems 4 credits (Spring)
6. EECE 7095 Introduction to Computer Architecture 3 credits (Fall)

**MEng Core Courses – 2 courses**

**Capstone Project – 1 course**

*With permission of their advisor, students may select some of their elective credit hours in areas outside of Computer Engineering. Independent studies or projects in advanced topics may also be arranged.*
MEng Graduate Program Curriculum
Environmental Engineering or Environmental Science

In order to graduate with a Master of Engineering degree with specialization in Environmental Engineering, the student has to successfully complete 30 cr hr of courses including at least 2 Fundamental courses and 1 Design course.

MEng Core Courses (4-8 cr hr)

Track Required Courses (10 – 15 cr hr)
Minimum of Two Fundamental courses and
Minimum of One Design course

Capstone Project (1 – 4 cr hr)
Elective Courses (3 – 10 cr hr)

Fundamental Courses - at least 2 courses to be selected from the following

Fall Semester
ENVE 6000/6001 Applied Biology for Engineered Systems (3/2 cr hr)
ENVE 6047 Chemical Principles of Environmental Systems (4 cr hr)
ENVE 6053 Physical Principles of Environmental Systems (3 cr hr)
ENVE 6071C Aerosol Science and Engineering (4 cr hr)

Spring Semester
ENVE 6046 Biological/Microbiological Principles of Environmental Systems (4 cr hr)

Design Courses - at least 1 course to be selected from the following

Fall Semester
ENVE 6026 Environmental/Hydrologic System Analysis (3 cr hr)

Spring Semester
CVE 6090 Engineering Hydrology (3 cr hr)
ENVE 6054 Physical/Chemical Processes for Water Quality Control (4 cr hr)
ENVE 6055 Biological Processes for Water Quality Control (3 cr hr)
ENVE 6064 Air Resources Management (3 cr hr)

Elective Courses

Fall Semester
ENVE 6014 Solid Waste Management (3 cr hr)
GEOG 6071C Introduction to Geographic Information Systems (3 cr hr)

Spring Semester
ENVE 6044 Environmentally Conscious Engineering (3 cr hr)
ENVE 6058 Environmental Instrumentation (3 cr hr)
ENVE 6068C Bioprocess Engineering and Renewable Energy (3 cr hr)
ENVE 6094 Probability and Estimation Methods for Engineering Systems (3 cr hr)
With permission of their advisor, students may select some of their elective credit hours in areas outside of Environmental Engineering; typical courses come from Arts & Science and DAAP. Independent studies or projects in advanced topics may also be arranged.
## MEng Graduate Program Curriculum
### Materials Science or Metallurgical Engineering

The Master of Engineering consists of two tracks: Materials Science or Metallurgical Engineering. For either track the following general requirements apply:

### MEng Core Courses – 2 courses

Fundamental Materials Science Courses - at least 4 courses selected from available graduate courses in the track. The following are typically available:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTEN6010L</td>
<td>Physical Prop of Solids</td>
<td>Fall</td>
</tr>
<tr>
<td>MTEN6012C</td>
<td>Nano Materials Eng</td>
<td>Spring</td>
</tr>
<tr>
<td>MECH6013</td>
<td>Smart Structures</td>
<td>Fall</td>
</tr>
<tr>
<td>MTEN6025C</td>
<td>POLYMER PROCESSING</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6042</td>
<td>COMPOSITE MATERIALS</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6047</td>
<td>ELEC OPT PROP CER</td>
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<tr>
<td>MTEN6049</td>
<td>Mag, Diel and Sensor Properties</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6060</td>
<td>Corrosion</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6070</td>
<td>Phase Transitions</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6085</td>
<td>Coatings</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN6090</td>
<td>MOLECULAR MODELING</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN 7010C</td>
<td>Adv Materials Tech</td>
<td>Fall</td>
</tr>
<tr>
<td>MTEN7032</td>
<td>Polymer Analysis &amp; Char</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN7035</td>
<td>Advanced Thermodynamics</td>
<td>Fall</td>
</tr>
<tr>
<td>MTEN7048</td>
<td>DIFFRACTION THEORY</td>
<td>Spring</td>
</tr>
<tr>
<td>MTEN7079</td>
<td>DEFECT IN SOLID</td>
<td></td>
</tr>
<tr>
<td>MTEN7094</td>
<td>Fund of Polymer Science</td>
<td>Fall</td>
</tr>
</tbody>
</table>

### Capstone Project – 1 course

With permission of their advisor, students may select some of their elective credit hours in areas outside of Materials Science / Metallurgical Engineering. Independent studies or projects in advanced topics may also be arranged.
MEng Graduate Program Curriculum
Mechanical Engineering

The Mechanical Engineering Master of Engineering curriculum allows the flexibility for students to choose from a combination of courses to complete the Track & Elective credit hours requirement. For students who wish to specialize in a particular area, suggested courses oriented toward the available areas of specialization are given below. However, students do not need to specialize.

**MEng Core Courses – 2 courses**

**Capstone Project – 1 course**

**Track / Elective Courses – 7 courses**

Primary areas of specialization within Mechanical Engineering are:

- Structural Dynamics and Vibro-Acoustics
- System Dynamics and Controls
- Solid Mechanics
- Design and Manufacturing
- Thermal-Fluids Engineering

The following are typically available:

**FALL**

- AEEM6001 Advanced Strength of Materials
- MECH6013 Smart Structures
- MECH6020 Intro Adv manufacturing Processes
- MECH6031 Intro to Robotics
- MECH6035 Intelligent Systems
- MECH6050 Occupational Safety Engineering
- MECH6060 Applied Fast Fourier Transforms
- MECH6066 Acoustics
- MECH6071 Advanced DFM
- MECH6074 Quality Control
- MECH6075 Production Planning & Control
- MECH6077 Micro & Nano Manufacturing
- MECH6081 Modeling Materials
- MECH6095 Thermal Energy Storage
- MECH6097 HVAC Design I
- MECH7002 Reliability Eng and Design
- MECH7011 Math Meth for Decision making in Eng Systems
- MECH7012 Elasticity I
- MECH7023 Thermoelectric energy Conv
- MECH7054 Boundary Element Methods
- MECH7062 System Dynamic analysis
- MECH7067 Roterdynamics
- MECH7096 Viscous Fluid Flow
- EGFD7041 Viscous Flow and Heat Transfer

**SPRING (subject to change)**

- MECH6004 Monte Carlo Methods
- MECH6011 Computational Design
- MECH6023 CAD for Manufacturing
With permission of their advisor, students may select some of their elective credit hours in areas outside of Mechanical Engineering or EGFD. Independent studies or projects in advanced topics may also be arranged.