The University of Cincinnati

Masters of Engineering Degree

Program Schedule 2019-2020

**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)
* **MEng Seminar (some programs ONLY)** steps to maximize success in the program
* **Capstone** 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 and Advisors**

|  |  |  |  |
| --- | --- | --- | --- |
| **Program** | **Advisor** | **Office** | **email** |
| Additive Manufacturing | Jay Kim | 598 Rhodes | jay.kim@uc.edu |
| Aerospace Engineering | Jongguen Lee | 484 ERC | lee3jn@ucmail.uc.edu |
| Aerosystems Operations  | Jongguen Lee | 484 ERC | lee3jn@ucmail.uc.edu |
| Artificial Intelligence | Marc Cahay | 812 Rhodes | Marc.Cahay@uc.edu |
| Biomedical Engineering | Doug Mast | 501 ERC | doug.mast@uc.edu |
| Chemical Engineering  | Steve Thiel | ERC 501J | stephen.thiel@uc.edu |
| Civil Engineering | GA Rassati | Baldwin 765C  | gian.rassati@uc.edu |
| Computer Engineering | Frank Zhou | 838 Rhodes | xuefu.zhou@uc.edu |
| Computer Science | Frank Zhou | 838 Rhodes | xuefu.zhou@uc.edu |
| Electrical Engineering | Frank Zhou | 838 Rhodes | xuefu.zhou@uc.edu |
| Environmental Engineering  | Dion Dionysiou | 780 ERC | dionysdd@ucmail.uc.edu |
| Materials Science | Donglu Shi | Rhodes 493 | donglu.shi@uc.edu |
| Mechanical Engineering | Eugene Rutz | 665C Baldwin | eugene.rutz@uc.edu |
| Robotics and Intelligent Autonomous Systems | Ou Ma | 720 Rhodes | Ou.Ma@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 may be taken as elective courses.

**Project / Task Management Development (1 required)**

MECH 6074 Quality Control Fall & Spring ***On Line***

ENGR 6014 Eng Project Management Fall & Spring

AEEM 6067 Entrepreneurship and Tech Law Spring

AEEM 6099 System Eng & Analysis Spring

CVE 6044 Construction Law (Civil Eng majors) Fall

ENGR 7025 Product & Process Quality Fall (not offered every year)

EECE 6032 Software Test and QA (CS majors) Fall

ENGR 6025 Lean Six Sigma Spring

CVE 6079 Engineering Data Analysis Fall (not offered every year)

MECH 6050 Occupational Safety Fall

ENGR 6040 Management of Innovation Spring

**Interpersonal Skill Development (1 required)**

ENGR 6050 Fundamentals of Leadership Fall & Spring

ENGR 6010 Effectiveness in Tech Orgs Fall & Spring ***On Line***

OLHR 8029 Individual Behavior in the Workplace Fall

OLHR 6050 Teams Spring

OLHR 8090 Strategic Leadership Some years

MGMT 7014 Leadership & Organizations Fall & Spring (with permission)

ENGR 6012 Innov. & Design Thinking Fall & Spring

ENTR 7082 Special Topics in Entrepreneurship Fall / Spring (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.

Each program (track) decides which options to offer students. All programs do not offer the same options. Depending on the program, 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**

**Additive Manufacturing MEng Curriculum**

**MEng Core Courses** – 2 courses

**Required Additive Manufacturing courses** - select at least 2 of the 3 courses listed:

MECH 6079C Intro to Additive Manufacturing  Fall

MECH 6023  CAD for Manufacturing  Spring

MECH 7080 Metal Additive Manufacturing Spring

Potential new course in Computational Methods for Additive Manufacturing

**Elective Courses** – select at least 4 courses from the following:

AEEM 6001 Advanced Strength of Materials Fall

MECH 6020 Intro to Adv. Manufacturing Fall

MECH 6023 CAD for Manufacturing Spring

MECH 6069 DFMA Spring

MECH 6071 Adv Design for Manufacturing Fall

MECH 6077 Micro and Nano Manufacturing Fall

MECH 6078 Introduction to Big Data Analytics Spring

MECH 7014 Elasticity Spring

AEEM 7052 FEM (Pre Req. AEEM6001 or Equiv.)

AEEM 7054 Adv. FEM (Pre Req. 7052) Fall

MECH 7090 Conduction Heat Transfer

MECH 7091 Convection Heat Transfer

MTEN 6010 Physical property of solids Fall

MTEN 6034 Physics of polymer processing Spring

MTEN 6070 Phase Transformation Spring

MTEN 6097 Mechanical behavior of solids Fall

MTEN 6025C Fundamentals of Polymer Science Spring

MTEN 7010C Advanced Materials Techniques Fall

AEEM6099 Systems Engineering Analysis Spring

**Capstone** – complete 1 of the 3 capstone experiences:

AEEM 8060 Master of Engineering Capstone Project

MECH 9011 Master of Engineering Capstone Project

MTEN 8060 Master of Engineering Capstone Project

**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 6003 Analytical Dynamics

AEEM 6011 Combustion

AEEM 6041 Comp Flow and Thermodynamics

AEEM 6076 Modeling Complex Systems

AEEM 6092 Advanced Aircraft Performance

AEEM 6096 Fuzzy Logic

AEEM 6098 Unmanned Aircraft Systems

AEEM 7027 Non-Destructive Test

AEEM 7028 Ultrasonic NDE

AEEM 7050 Turbomachinery Flow

AEEM 7074 Adv Finite Elem Method

AEEM 8030 Advanced Propulsion

EGFD 7041 Viscous Flow and Heat Transfer

EGFD 7051 Nu Meth Aero Fluid Mech

SPRING

AEEM 6012 Gas Turbine Combustion

AEEM 6015 Modern Control

AEEM 6093 Adv Flight Mechanics

AEEM 6095 Astrodynamics

AEEM 6099 Systems Engineering Analysis

AEEM 7052 Finite Element Analysis

AEEM 7065 Aeroacoustics I

EGFD 6037 Computational Fluid Dynamics

Capstone– 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**

**Aero Systems and Operations (AESOP)**

Collaborative program between the University of Cincinnati and the University of Bordeaux

**MEng Core Courses – 2 courses taken in Fall Semester**

**Track Courses – 6 courses**

1st Semester – University of Cincinnati

AEEM 6101 Introduction to Aero Systems & Operations – Required

Choose Technical Specialty:

* Aeronautical Engineering – two courses (6 credits)
* Mechanical Engineering – two courses (6 credits)
* Electrical / Computer Engineering – two courses (6 credits)
* Computer Science - – two courses (6 credits)

2nd Semester – University of Bordeaux

Airworthiness – required

Maintenance Program Planning – required

Chose one from the following list:

* Maintenance, Repair and Overhaul
* Continuous Airworthiness
* Reliability

Chose one of the three modules and take the courses from that module:

***1. Structural Maintenance Module***

Regulations, documentation and maintenance of work site organization

Maintenance and repair structure

Non-destructive test (NDT)

***2. Avionics Maintenance Module***

Regulations, documentation and maintenance of work site organization

Avionics maintenance and repair systems

Avionics Test Bench

***3. Propulsion Systems Maintenance***

Regulations, documentation and maintenance of work site organization

Maintenance of turbomachinery

Aerofan engine test bench

**Capstone–**  Independent research funded at UBx/IMA or summer internship at one of IMA’s industrial partner. 4 credits in the spring semester.

**MEng Graduate Program Curriculum**

**Architectural Engineering**

The Architectural Engineering Master of Engineering program provides advanced analysis and modeling skills in areas of building systems, building construction and structural systems. Students select a concentration of either: 1) Building Structures, 2) Building Systems and Energy or 3) Building Construction.

**MEng Core Courses – 2 courses**

**Track Courses** – take at least 12 credits from one concentration

Building Structures Concentration

CVE 7081 Theory and Design of Concrete Structures

CVE 7085 Metal Structures Theory and Design I

CVE 6058 Design of Wood Structures

CVE 6059 Design of Masonry Structures

CVE 6011 Advanced Strength of Materials

CVE 6081 Foundation Engineering

CVE 6085 Advanced Structural Analysis

CVE 6088 Finite Element Modeling of Structures

AE 6040 Façade Engineering I

AE 6041 Building Information Modeling

Building Systems and Energy Concentration

AE 6130 Modeling and Simulation of Building Energy Systems
AE 6010 Advanced Building Mechanical Systems

AE 6020 Advanced Lighting and Daylighting

MECH 6094 Fundamentals and Applications of Solar Energy

Building Construction Concentration

AE 6040 Façade Engineering I

CVE 6036 Value Engineering and Constructability

AE 6041 Building Information Modeling

AE 6042 Advanced Building Information Modeling

AE 6043 Virtual Design and Construction

CVE 6004 Temporary Structures

CVE 6011 Advanced Strength of Materials

**Elective Courses**

BANA 7011 Data Analysis (with permission)

BANA 6037 Data Visualization (with permission)

BANA 6095 Case Studies in Business Analytics (with permission)

CVE 7010 Risk and Reliability

CVE 6042 Sustainable Construction and LEED

CVE 6041 Project Management Functions

CVE 6037 Construction Financing and Strategic Planning

CVE 6036 Value Engineering and Constructability

CVE 7089 Earthquake Engineering

EECE 8115C Humans, Machines, Robots and their Interactions

ENVE 6048 Quantitative Sustainability

ENGR 6012 Innovation and Design Thinking

MECH 6013 Introduction to Smart Structures

MECH 6066 Acoustics

MECH 6034 Distributed Sensing Systems

**Capstone**– 1 course

Students have the option of completing a project (register for 3 credits of capstone) or complete a final comprehensive exam (0 credit capstone; 1 additional course required). The project option can include an internship but the internship must be integral to the project.

*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**

**Artificial Intelligence**

**MEng Core Courses** – 2 courses

**Required AI Courses** – complete the 3 required courses:

CS 6033 Artificial Intelligence Fall

EECS 6036 Intelligent Systems Fall

 or

MECH 6035 Intelligent Systems Fall

CS 6073 Deep Learning Spring

**Elective Courses** – select at least 4 courses from the following:

CS 6037 Machine Learning Fall

CS 6054 Information Retrieval Fall

AEEM 6096 Fuzzy Control Systems Fall

CS 7063 Adv. Machine Learning Spring

New class Machine Learning for Control

EECE 7065 Complex Sys and Networks Spring

CS 6021 Math logic Spring

**Capstone** – complete 1 of the 3 capstone experiences:

AEEM 8060 Master of Engineering Capstone Project

EECE 9060 Master of Engineering Capstone Project

MECH 9011 Master of Engineering Capstone Project

**MEng Graduate Program Curriculum**

**Biomedical Engineering**

The Biomedical Engineering degree is meant to be flexible to meet the needs of prospective students. The coursework requirements are:

**MEng Core Courses – 2 courses**

**Fundamental BME Courses** - MEng students in BME are required to take a minimum of 12 credit hours of BME coursework. Any BME course at the graduate level (6000 or higher) is acceptable. These are typically available:

Fall

BME 6011 Magnetic Resonance Imaging

BME 6012 Biomedical Signal and Image Processing

BME 7001 BME Survey

BME 7002C Bioinstrumentation

BME 7021 Tissue Biomechanics

BME 7082 Introduction to Data Science

Spring

BME 6010 Biomedical Ultrasound

BME 6024 Joint Biomechanics

BME 6030 Functional Tissue Engineering

BME 7005 Biomedical Research Design

BME 7020C Adv Medical Device Design I

BME 7061 Biostatistics in Research

**BME-MEng Electives -** BME MEng students need to complete a minimum of 2 elective courses (6 credit hours) as part of their MEng curriculum. These electives permit breadth, depth, or interdisciplinary focus depending on student educational objectives. They should be graduate level courses from any discipline as long as they meet the students’ career goals and are approved by the BME MEng Advisor.

**BME MEng Capstone Requirement** – BME MEng Students are required to complete a capstone project of 3-6 credit hours. In BME, it is expected that the capstone project will demonstrate applications of biomedical engineering skills and synthesis of knowledge acquired in course work. If additional capstone credit hours are taken above the 6 credit hours maximum, they do not count toward the student’s other course requirements. With the MEng advisor’s approval, students can choose: 1) to complete a project, 2) to perform an internship, or 3) to prepare a written paper under the supervision of the capstone advisor.

**MEng Graduate Program Curriculum**

**Civil Engineering**

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 track can choose among options in Building Systems, Construction Engineering and Management, Structural Engineering, Geotechnical Engineering, or Transportation Engineering. *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 courses may not exceed six (6).

**MEng Core Courses – 2 courses**

**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. An internship alone is NOT considered a valid Capstone Project, however a Capstone Project that contains a summative analysis of some or all aspects of the internship work, with explicit reflections on the ties to the coursework taken and on how the data and/or information collected could have been used more efficiently or how codes and specification used hindered or contributed to the success of the internship work and how this codes could be improved or changed can be considered a valid Capstone Project. The Capstone Project consists of a written report and an oral presentation to the MEng committee.

**Civil Engineering Depth Options – Required Classes**

*Option 1 – Structural Engineering*

CVE 7011 Structural Mechanics **Fall**

CVE 7012 Finite Element Analysis **Spring**

CVE 7081 Theory and Design of Concrete Structures I **Fall 2019**

CVE 7085 Metal Structures Theory and Design I **Fall 2020**

CVE 7088 Structural Dynamics **Fall**

*Option 2 – Geotechnical Engineering*

CVE 7011 Structural Mechanics **Fall**

CVE 7061 Consolidation and Settlement **TBA**

CVE 7062 Soil Shear Strength and Slope Stability **TBA**

Take **two** of the following courses:

CVE 6081 Foundation Engineering **Fall**

CVE 7081 Theory and Design of Concrete Structures I **Fall 2019**

CVE 7085 Metal Structures Theory **Fall 2020**

In addition students must complete **three** of the following

CVE 6082 Reinforced Concrete Design of Shallow Foundations **Spring**

CVE 6063 Principles of Pavement Engineering **TBD**

GEOL 7001C Geomorphic Processes **TBD**

GEOL 6004 Glacial Geology **TBD**

*Option 3. – Building Systems*

CVE 6042 Sustainable Construction and LEED **Fall**

CVE 6047 Energy Efficiency in Buildings and Energy Modeling **Spring**

AE 6010 Advanced Building Mechanical Systems **Spring**

AE 6020 Advanced Lighting and Daylighting **Spring**

AE 6030 Modeling and Simulation of Building Energy Systems **Fall**

Select elective courses in consultation with area advisor: suggested courses are MECH 6097 – HVAC Design I, MECH 6098 – HVAC Design II, MECH 6013 – Intro to Smart Structures, MECH 6034 – Distributed Sensing and Control, MECH 6066 – Acoustics, MECH 6094 – Fundamentals and Applications of Solar Energy, ARCH 7081 – Environmental Technologies I, ARCH 7082 – Environmental Technologies II.

*Option 4 – Construction Engineering and Management*

CVE 6044 Construction Law **Fall**

CVE 6042 Sustainable Construction and LEED **Fall**

ENGR 6050 Fundamentals of Leadership (from core courses) **Fall/Spring**

CVE 6036 Value Engineering and Constructability **Fall**

CVE 6037 Construction Financing and Strategy Planning **Fall 2019**

Select elective courses in consultation with area advisor from the following list:

AEEM 6067 Entrepreneurship and Tech Law **TBD**

CVE 6041 Project Management Functions **Spring**

ENGR 6010 Effectiveness in Technical Organizations **Online**

ENGR 6012 Innovation and Design Thinking **TBD**

ENVE 6099 Sustainable Urbanism and International Perspective **TBD**

MECH 6074 Quality Control **Online**

OLHR 6050 Teams **TBD**

OM 7011 Management of Operations **TBD**

MGMT 7014 Leadership and Organizations **Fall/Spring** with Permission

Advisor Approved CVE courses

Advisor/Program Director/College Approved LCOB courses

*Option 5 – Transportation Engineering*

 Take at least five (5) courses from the following list:

 Required (take both):

CVE 6010C Advanced Traffic Engineering, or **Fall 2020**

CVE 6024 Highway Engineering and Traffic Safety **Fall 2020**

Systems (pick at least one of the following)

CVE 6022C Traffic Control and Signal System Design **Fall 2019**

CVE 7074 Traffic Flow Theory and Network Modeling **Spring 2020**

CVE 7076 Intelligent Transportation Systems **Fall 2020**

Planning (pick at least one of the following courses)

CVE 6026 Computational Methods in Civil Engineering **Spring 2020**

CVE 6079 Engineering Data Management and Analysis **Fall 2020**

**Elective Courses:**

*With permission of their advisor, the graduate program director, and of the college, students may select some of their elective credit hours in areas outside of Civil Engineering and/or outside of the College of Engineering and Applied Science. Independent studies may also be arranged, for a maximum of 6 semester credit hours total.*

**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– 1 course**

**Elective Courses –** Typical courses include

CHE 6023 Biochemical Engineering Spring

CHE 6045C Transport Phenomena Modelling Spring

CHE 6058C Bioprocess Eng & Renewable Spring

CHE 6057 Fuel Cells Fall

CHE 6094 Computational Chemistry Spring

CHE 6076 Colloid Science Spring

CHE 6036 Computational Methods

CHE 6046 Microfluidics

CHE 9072 003 Special Topics – Computational Methods Fall

CHE 9072 013 Special Topics – Microfluidics 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:

**MEng Core Courses – 2 courses**

**MEng Seminar** – Students complete 3 credits of seminar toward the 30 credit hour requirement in the fall semester

**Capstone–** Students complete 3 credits of capstone toward the 30 credit hour requirement in the spring semester.

**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 (choose 5 of the 6 courses):

1. CS 6051 Database Theory 3 Credits (Fall or Spring)

2. EECE 6029 Introduction to Operating systems 3 Credits (Fall or Spring)

3. EECE 6017C Embedded Systems 4 Credits (Fall)

4. EECE 7095 Introduction to Computer Architecture 3 Credits (Fall)

5. EECE 6080C VLSI Design 4 credits (Fall)

6. EECE 6038C Adv. Microsystems 4 credits (Spring)

Elective Courses (Choose 2 from the following List):

1. CS 6043 Computer Networking 3 Credits (Fall or Spring)

2. EECE 6083 Compiler Theory and Practice 3 Credits (Spring)

3. CS 7081 Advanced Algorithms 3 Credits (Fall or Spring)

4. EECE 6036 Intelligent Systems 3 credits (Fall)

5. CS 6058 Data Security & Privacy (Fall)

6. EECE 7075 Principles of Modern Networking 3 credits (Spring)

7. EECE 6023C Security & Trust for Cyberphyiscal Systems (Spring)

8. CS 70xx Encryption (Spring)

9. EECE 6028C Intelligent Machine Design (Fall)

10. EECE 6034C Hardware FPGA Trustworthy (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 (choose 4 of the 5 courses):

1. EECE 6017C, Embedded Systems 4 Credits (Fall)

2. EECE 6029, Operating Systems 3 Credits (Fall and Spring)

3. EECE 6038C, Advanced Microsystem Design 4 Credits (Spring)

4. EECE 7095, Introduction to Computer Architecture 3 Credits (Fall)

5. CS 7092 Sensor Embedded Systems 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 (Fall)

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 (Fall)

7. EECE 6080C VLSI Design 4 credits (Fall)

8. EECE 7019 Bio-Inspired Robotics 3 credits (fall)

9. MECH 6031 Intro to Robotics 3 credits (Fall)

10. EECE 7092 Sensor Embedded Systems 3 credits (Spring)

11. EECE 7017C Trustworthy Embedded Systems 4 credits (Spring)

12. EECE 7075 Principles of Modern Networking 3 credits (Spring)

13. EECE 8115 Humans, Machines, Robots 3 credits (Spring)

14. EECE 6023C Security & Trust for Cyberphysical Systems (Spring)

15. EECE 6028C Intelligent Machine Design (Fall)

16. EECE 6034C Hardware FPGA Trustworthy (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 electrics 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 (Take all 3):

1. EECE 6080C Introduction to VLSI Design 4 credits (Fall)

2. EECE 6082C VLSI Design for Test and Power 4 credits (Spring)

3. EECE 6086C VLSI Design Automation 4 credits (Spring)

Elective Courses (Choose 2-3 from the following List):

1. EECE 6017C Embedded Systems 4 credits (Fall)

3. EECE 6038C Advanced Microsystems 4 credits (Spring)

3. CS 7081 Adv Algorithms 3 credits (Fall and Spring)

4. EECE 6083 Compilers 3 credits (Spring)

5. EECE 6029 Operating Systems (both Fall & Spring)

6. EECE 6036 Intelligent Systems (Fall)

7. CS 6051 Database Theory (both Fall & Spring)

8. EECE 6030 Trust in Digital Hardware (Fall)

9. EECE 8085C Topics in VLSI CAD (Spring)

10.EECE 7095 Comp Architecture (Fall)

11. EECE6034C Hardware FPGA Trustworthy (Spring)

**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 (take all 4):

1. CS 6055 Cyber Defense Overview 3 credits (Fall)

2. CS 6021 Mathematical Logic 3 credits (Spring)

3. CS 6056 Security Vulnerability Assessment 3 credits (Spring)

4. EECE 6032 Software Testing 3 credits (Fall)

Elective Courses (Choose 2 from the following List):

1. CS-6097 Wireless and Mobile Networking 3 credits (Fall)

2. EECE-7095 Introduction to Computer Architecture 3 credits (Fall)

3. EECE-6017C Embedded Systems 4 credits (Fall)

4. CS 6043Computer Networks 3 credits (Fall and Spring)

5. CS 70XX Encryption (Spring)

6. CS 6058 Data Security & Privacy 3 credits (Fall)

7. CS 7038 Malware Analysis 3 credits (Spring)

8. CS 7092 Sensor Embed Sys 3 credits (Spring)

9. EECE 6029 Operating Systems 3 credits (Fall & Spring)

10. EECE 6083 Compilers 3 credits (Spring)

11. EECE 7017C Trustworthy Embedded Sys 4 credits (Spring)

12. EECE 6038C Adv Microsystems 3 credits (Spring)

13. EECE 6023C Security & Trust for Cyberphysical Systems (Spring)

14. EECE 6034C Hardware FPGA Trustworthy (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 Choose 3 of 5):

1. CS 6035 Learning Probabilistic Models 3 credits (Spring)

2. CS 6052 Intelligent Data Analysis 3 credits (both Fall & Spring)

3. CS 6054 Info Retrieval 3 credits (Fall)

4. CS 6073 Deep Learning 3 credits (Spring)

5. CS 6025 Data Encoding 3 credits (Spring)

Elective Courses (Choose 3 from the following List):

1. CS 6033 Artificial Intelligence 3 credits (Fall)

2. CS 6037 Machine Learning 3 credits (Fall)

3. CS 6051 Database Theory 3 credits (both Fall & Spring)

4. CS 6068 Parallel Computing 3 credits (Fall)

5. CS 6072 Network Science 3 credits (Fall)

6. CS 7081 Adv Algorithms3 credits (both Fall & Spring)

7. EECE 6017C Embedded Systems 4 credits (Fall)

8. EECE 6029 Operating Systems 3 credits (both Fall & Spring)

9. EECE 6036 Intelligent Systems 3 credits (Fall)

10. EECE 7095 Comp Architecture 3 credits (Fall)

11. CS 6058 Data Security & Privacy 3 credits (Fall)

12. CS 6065 Cloud Computing 3 credits (Fall)

13. CS 70xx Encryption 3 credits (Spring)

14. CS 7051 Adv. Topic: Spatial Temp Data Mining 3 credits (Spring)

15. "EECE 6038C Adv Microsystems 4 credits (Spring)

16. EECE 6083 Compilers 3 credits (Spring)

17. CS 70\*\* Big Data Analytics 3 credits (Spring)

*With permission, students may select 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:

**MEng Core Courses – 2 courses**

**MEng Seminar** – Students complete 3 credits of seminar toward the 30 credit hour requirement in the fall semester

**Capstone–** Students complete 3 credits of capstone toward the 30 credit hour requirement in the spring semester.

**General Computer Science**

The General Computer Science track is focused 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 (Choose 3 of 5):

1. CS 6037 Machine Learning 3 credits (Fall)

2. CS 6051 Database Theory 3 credits (Fall & Spring)

3. CS 6072 Network Science 3 credits (Fall)

4. CS 7081 Adv Algorithms 3 credits (Fall & Spring)

5. EECE 6029 Op Systems 3 credits (Fall & Spring)

Elective Courses (Choose 3 from the following List):

CS 6027 Requirement Eng 3 credits (Fall)

CS 6033 Artificial Intelligence 3 credits (Fall)

CS 6035 Learning Probabilistic Models 3 credits (Fall)

CS 6043 Computer Networks 3 credits (Fall)

CS 6052 Intelligent Data Analysis 3 credits (Fall & Spring)

CS 6058 Data Security and Privacy 3 credits (Fall)

CS 6060 Computer Graphic 3 credits (Fall)

CS 6065 Cloud Computing 3 credits (Fall)

CS 6068 Parallel Computing 3 credits (Fall)

CS 6097 Wireless & Mobile Networks 3 credits (Fall)

EECE 6036 Intelligent Systems 3 credits (Fall)

CS 6021 Math Logic 3 credits (Spring)

CS 6028 Lg Scale SW Eng 3 credits (Spring)

CS 6073 Deep Learning 3 credits (Spring)

CS 70XX Encryption 3 credits (Spring)

CS 7063 Adv Topics in Machine Learning 3 credits (Spring)

CS 7075 Principles of Modern Networking 3 credits (Spring)

CS 7082 Adv. Algorithms 2 3 credits (Spring)

CS 7092 Sensor Embed Sys 3 credits (Spring)

CS 70\*\* Big Data Analytics 3 credits (Spring)

EECE 6036 Intelligent Systems

CS 7051 Adv. Topic: Spatial Temp Data Mining

**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 (take all 4):

1. CS 6055 Cyber Defense Overview 3 credits (Fall)

2. CS 6021 Mathematical Logic 3 credits (Spring)

3. CS 6056 Security Vulnerability Assessment 3 credits (Spring)

4. CS 6058 Data Security & Privacy 3 credits (Fall)

Elective Courses (Choose 2 from the following List):

CS 6043 Computer Networks 3 credits (Fall)

CS 6097 Wireless & Mobile Networks 3 credits (Fall)

CS 7035 Cryptography 3 credits (Fall)

EECE 7095 Comp Architecture 3 credits (Fall)

EECE 6032 Software Testing 3 credits (Fall)

CS 6065 Cloud Computing 3 credits (Fall)

CS 70xx Encryption 3 credits (Spring)

CS 7038 Malware Analysis 3 credits (Spring)

CS 7082 Sensor Embed Sys 3 credits (Spring)

EECE 6023C Security & Trust for Cyberphysical Systems 3 credits (Spring)

EECE 7017C Trustworthy Embedded Sys 3 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 Choose 3 of 5):

1. CS 6052 Intelligent Data Analysis 3 credits (Fall and Spring)

2. CS 6054 Information Retrieval 3 credits (Fall)

3. CS 6025 Data Encoding 3 credits (Spring)

4. CS 6035 Learning Probl. Models 3 credits (Fall)

5. CS 6073 Deep Learning 3 credits (Spring)

Elective Courses (Choose 3 from the following List):

CS 6033 Artificial Intelligence 3 credits (Fall)

CS 6037 Machine Learning 3 credits (Fall)

CS 6051 Database Theory 3 credits (Fall & Spring)

CS 6068 Parallel Computing 3 credits (Fall)

CS 6072 Network Science 3 credits (Fall)

CS 7081 Adv Algorithms 3 credits (Fall & Spring)

EECS 6036 Intelligent Systems 3 credits (Spring)

CS 6058 Data Security & Privacy 3 credits (Fall)

CS 6025 Data Encoding (Spring)

CS 6065 Cloud Computing 3 credits (Fall)

CS 7051 Adv. Topic: Spatial Temp Data Mining 3 credits (Spring)

EECE 7063 Adv. Topics in Machine Learning 3 credits (Spring)

CS 70\*\* Big Data Analytics 3 credits (Spring)

CS 70xx Encryption

**Computer Science - Bioinformatics**

Required Courses (Take all 5)

CS7097C Intro to Functional Genomics (Fall)

CS7053 Intro to Medical Informatics (Fall)

CS6051 Database Theory (Fall or Spring)

EECE7099 Intro to BioInformatics (Spring)

CS7054 Data Science for Biomedical Research (Spring)

Elective Courses (Choose 1 from the following):

CS6033 AI (Fall)

CS6052 Intelligent Data Analytics (Fall)

CS6072 Network Science (Fall)

CS7081 Advanced Algorithms (Fall or Spring)

CS6073 Deep Learning (Spring)

CS6052 Intelligent Data Analysis (Spring)

**Computer Science – AI-Cyber**

Required Courses (Chose 4 of the 5)

CS 6055 Cyber Defense (Fall)

CS 6033 Artificial Intelligence (Fall)

CS 6037 Machine Learning (Fall)

EECE 6036 Intelligent Systems (Fall)

CS 6073 Deep Learning (Spring)

Elective Courses (Choose 2 from the following)

CS 6054 Information Retrieval

EECE 6032 Software Testing

CS 6058 Data Security and Privacy

CS 70xx Encryption

CS 6056 Security Vulnerability Assessment

CS 7038 Malware Analysis

EECE 7017C Trustworthy Embedded Sys

CS 6021 Math Logic

CS 7063 Advanced Machine Learning

CS 70\*\* Big Data Analytics

CS 6052 (both Fall & Spring) Intelligent Data Analysis

*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:

**MEng Core Courses – 2 courses**

**MEng Seminar** – Students complete 3 credits of seminar toward the 30 credit hour requirement in the fall semester

**Capstone–** Students complete 3 credits of capstone toward the 30 credit hour requirement in the spring semester.

**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 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 (Choose 4 of 5)

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. EECE6041C Microfabrication Lab 3 credits (Spring)

5. EECE 6078 Biomicrofluidic Systems 3 credits (Spring)

Elective Courses (Choose 2 from the following List):

EECE6048C Optics for Engineers 3 credits (Fall)

EECE6088 Principles of VLSI Devices 3 credits (Fall)

EECE7023 Thermoelectric Energy Conversion Devices 3 credits (Spring)

EECE7011 Electromagnetic Systems 3 credits (Spring)

MTEN 6013 Intro Smart Structures 3 credits (Fall)

EECE 6025 Power Electronics 3 credits (Spring)

EECE 6050 Comp/Org Semi Physics 3 credits (Spring)

EECE 7010 THz Principles and Applications 3 credits (Spring)

EECE 7126 Organic Electronics 3 credits (Spring)

EECE 8022 Introduction to Quaternions 3 credits (Spring)

MTEN 6012C Nanostructured Materials Eng 3 credits (Spring)

EECE6009C Advanced RF and Microwave Electronics (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. Student 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 in signal and systems.

Required Courses (Choose 4 of 6):

1. EECE6019 Probability and Random Processes 3 credits (Fall)

2. EECE7033 Linear Systems Theory 3 credits (Spring)

3. EECE6036 Intelligent Systems 3 credits (Fall)

4. EECE 6024 Dig Signal Processing 3 credits (Fall)

5. EECE 6042 Digital Image Processing 3 credits (Spring)

6. AEEM 6099 System Eng Analysis 3 credit (Spring)

Elective Courses (Choose 2 from the following List):

EECE 6011 RF & Microwave Wireless Comm 3 credits (Fall)

EECE 6016C Electric Machines & Drives 3 credits (Fall)

EECE 6017C Embedded Systems 4 credits (Fall)

CS 7054 Readings: Autonomous Agents & Distr. AI 3 credits (Fall)

EECE 6015C Instrumentation & Controls 3 credits (Spring)

EECE 6025 Power Electronic 3 credits (Spring)

EECE 6026 Communication Sys 3 credits (Spring)

EECE 6027 Digital Communication 3 credits (Spring)

EECE 6033 GPS System & Receivers 3 credits (Spring)

EECE 7010 THz Principles and Applications 3 credits (Spring)

EECE 7065 Complex Systems 3 credits (Spring)

EECE 7075 Principles of Modern Networking 3 credits (Spring)

AEEM 6003 Analytical Dynamics 3 credits (Spring)

AEEM 6015 Modern Control 3 credits (Spring)

AEEM 6098 Unmanned Aircraft Systems 3 credits (Spring)

EECE6028C Intelligent Machine Design (Fall)

EECE6009C Advanced RF and Microwave Electronics (Spring)

EECE7047 Dynamic Optimization (Spring)

EECE 6035 Information Theory (Spring)

**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 electrics 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 (Take all 3):

1. EECE 6080C Introduction to VLSI Design 4 credits (Fall)

2. EECE 6082C VLSI Design for Test and Power 4 credits (Spring)

3. EECE 6086C VLSI Design Automation 4 credits (Spring)

Elective Courses (Choose 2-3 from the following List):

EECE 6007 BioMed Microsys 3 credits (Fall)

EECE 6008 Fund of MEMs 32 credits (Fall)

EECE 6017C Embedded Systems 4 credits (Fall)

EECE 6018 Microfab of Semi Devices 3 credits (Fall)

EECE 6019 Probability & Random Process 3 credits (Fall)

EECE 6024 Dig Signal Process 3 credits (Fall

EECE 6036 Intelligent Systems 3 credits (Fall)

EECE 6088 Principles of VLSI 3 credits (Fall)

EECE 7033 Linear System Theory 3 credits

EECE 6030 Trust in Digital Hardware 3 credits (Fall)

EECE 6026 Communication Sys 3 credits (Spring)

EECE 8085C Topics in VLSI CAD 3 credits (Spring)

EECE6034C Hardware FPGA Trustworthy (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 (choose 4 of the 5 courses):

1. EECE 6017C, Embedded Systems 4 Credits (Fall)

2. EECE 6029, Operating Systems 3 Credits (Fall and Spring)

3. EECE 6038C, Advanced Microsystem Design 4 Credits (Spring)

4. EECE 7095, Introduction to Computer Architecture 3 Credits (Fall)

5. CS 7092 Sensor Embedded Systems 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 (Fall)

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 (Fall)

7. EECE 6080C VLSI Design 4 credits (Fall)

8. EECE 7019 Bio-Inspired Robotics 3 credits (fall)

9. MECH 6031 Intro to Robotics 3 credits (Fall)

10. EECE 7092 Sensor Embedded Systems 3 credits (Spring)

11. EECE 7017C Trustworthy Embedded Systems 4 credits (Spring)

12. EECE 7075 Principles of Modern Networking 3 credits (Spring)

13. EECE 8115 Humans, Machines, Robots 3 credits (Spring)

14. EECE 6023C Security & Trust for Cyberphysical Systems (Spring)

15. EECE 6028C Intelligent Machine Design (Fall)

16. EECE 6034C Hardware FPGA Trustworthy (spring)

**Robotics & Automation**

The *Robotics and Automation* track focuses on developing new sensors and controls to achieve a higher level of performance from electro-mechanical, pneumatic, hydraulic and hybrid robotics devices.  Advanced hybrid hardware-software systems now make it possible to design elegant and sophisticated devices whose capabilities far surpass purely mechanical systems.

Required Courses (Choose 4of 6):

1. MECH 6031 Intro to Robotics 3 credits (Fall)

2, AEEM 6098 Unmanned Aircraft Systems 3 credits (Fall)

3. EECE 7019 Bio-Inspired Robotics 3 credits (Spring)

4. MECH 6032 Robot Control & Design 3 credits (Spring)

5. EECE 6015C Instrumentation & Controls 3 credits (Spring)

6. EECE 8115C Humans, Machines, Robots 3 credits (Spring)

Elective Courses (Choose 2 from the following List):

EECE 6011 RF & Microwave Wireless Comm 3 credits (Fall)

EECE 6017C Embedded Systems 4 credits (Fall)

EECE 6019 Probability & Random Process 3 credits (Fall)

EECE 6036 Intelligent Systems 3 credits (Fall)

EECE 6042 Digital Image Process 3 credits (Fall)

AEEM 6003 Analytical Dynamic 3 credits (Fall)

MECH 6035 Intelligent Systems 3 credits (Fall)

EECE 6025 Power Electronics 3 credits (Spring)

EECE 6038C Adv Microsystems 34 credits (Spring)

EECE 7017C Trustworthy Embedded Sys 4 credits (Spring)

MECH 6036 Robot Vision 3 credits (Spring)

AEEM 6015 Modern Controls 3 credits (Spring)

AEEM 7063 Flight Engineering 3 credits (Spring)

ENGR 7025 Concurrent Product & Process Design

EECE6028C Intelligent Machine Design

EECE 8115C Humans, Machines, Robots

EECE7047 Dynamic Optimization

*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 (6 – 9 cr hr)**

**Track Required Courses (10 – 15 cr hr)**

Minimum of Two Fundamental courses and

Minimum of One Design course

**Capstone (1 – 4 cr hr)**

**Elective Courses (2 – 9 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)

**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)

ENVE 6071 Aerosol Science, Eng & Control (4 cr hr)

GEOG 6071C Introduction to Geographic Information Systems (3 cr hr)

ENVE 6022C Atmospheric Chemistry and Monitoring

ENVE 6050 Civil and Environmental Infrastructure Systems Planning Under Uncertainty

**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)

*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:

MTEN 6001 Principles of Materials Science Fall

MTEN 6010L Physical Prop. Of Solids Fall

MTEN 6012C Nano Materials Eng Spring

MTEN 6013 Smart Structures

MTEN 6025C Polymer Processing Spring

MTEN 6034 Physics of Polymer Proc Spring

MTEN 6042 COMPOSITE MATERIALS Spring

MTEN 6060 Corrosion Spring

MTEN 6070 Phase Transitions Spring

MTEN 6085 Coatings Spring

MTEN 6097 Mechanical Behavior of Mater. Fall

MTEN 7010C Adv Materials Tech Fall

MTEN 7032 Polymer Analysis & Char Fall

MTEN 7035 Advanced Thermodynamics Fall

MTEN 7048 DIFFRACTION THEORY Spring

MTEN 7094 Fund of Polymer Science Fall

MTEN 8000 Solidification Proc of Materials Fall

**MEng Seminar** – Students complete 3 credits of seminar toward the 30 credit hour requirement in the fall semester

**Capstone–** Students complete 3 credits of capstone toward the 30 credit hour requirement in the spring semester.

*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**

**MEng Seminar** – Students complete 3 credits of seminar toward the 30 credit hour requirement in the fall semester

**Capstone–** Students complete 3 credits of capstone toward the 30 credit hour requirement in the spring semester.

**Track / Elective Courses – 6 courses**

Primary areas of specialization within Mechanical Engineering are:

 Structural Dynamics and Vibro-Acoustics  Solid Mechanics

 System Dynamics and Controls  Thermal-Fluids Engineering

 Design and Manufacturing

The following are typically available:

FALL

AEEM 6001 Advanced Strength of Materials

MECH 6013 Smart Structures (some years)

MECH 6020 Intro Adv manufacturing Processes

MECH 6022 Modelling and Simulation of Mult-physics systems

MECH 6031 Intro to Robotics

MECH 6035 Intelligent Systems

MECH 6046 Bio-Fluid Mechanics (some years)

MECH 6050 Occupational Safety Engineering

MECH 6060 Applied Fast Fourier Transforms

MECH 6063 Exp. Analysis of Rotating Systems (Some years)

MECH 6071 Advanced DFM

MECH 6074 Quality Control

MECH 6075 Production Planning & Control

MECH 6077 Micro & Nano Manufacturing

MECH 6079C Intro to Additive Manufacturing

MECH 6081 Modeling Materials

MECH 6095 Thermal Storage (some years)

MECH 6097 HVAC Design I

MECH 7002 Reliability Eng and Design

MECH 7005 Materials Prop and Selection for Mechanical Eng (some years)

MECH 7011 Math Meth for Decision making in Eng Systems

MECH 7012 Elasticity (some years)

MECH 7023 Thermoelectric energy Conv

MECH 7051 Continuum Mechanics (some years)

MECH 7067 Roterdynamics

MECH 7090 ConductionHeat Transfer (some years)

MECH 7093 Adv. Thermodynamics (some years)

MECH 7095 Bio-Heat Transfer (come years)

EGFD 7041 Viscous Flow and Heat Transfer

SPRING (subject to change)

MECH6004 Monte Carlo Methods

MECH6011 Computational Design

MECH6023 CAD for Manufacturing

MECH6032 Robot Control and Design

MECH6035 Intelligent Systems Theory

MECH6036 Robot Vision

MECH6051 Safety Eng & Product Liability

MECH6052 System Safety

MECH6062 Experimental Vibrations

MECH6063 Experimental Analysis of Rotating Systems

MECH6073 Intro to E-Manufacturing

MECH6074 Quality Control

MECH6076 Supply Chain Modeling and Optimization

MECH6094 Fundamentals & Applications of Solar Energy

MECH6095 Thermal Energy Storage

MECH6096 Internal Combustion Engines

MECH7052 Finite Element Method

MECH7055 Fracture Mechanics

MECH7064 Advanced System Dynamics

MECH7070 Advanced Manufacturing Processes

MECH7072 Precision engineering and Computational metrology

MECH7091 Convection Heat Transfer

MECH7094 Boiling Heat Transfer and Two-Phase Flow

*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.*

**MEng Graduate Program Curriculum**

**Robotics and Intelligent Autonomous Systems**

**MEng Core Courses** – two courses

**Required RIAS Courses** - select at least 2 of the 4 courses listed:

MECH 6031 Introduction to Robotics Fall

MECH 6032 Robot kinematics and Dyn Spring

AEEM 6018 Robot Controls Spring

EECE 6015C Instrum and Ind Control Spring

**Elective Courses** – select at least 4 courses from the following:

AEEM 6003 Analytical Dynamics Fall

AEEM 6015 Modern Control Spring

AEEM 6096 Fuzzy Control Systems Fall

AEEM 6098 Unmanned Aircraft Sys Fall

AEEM 6099 Systems Eng & Analysis Spring

AEEM 7032 Flight Test Engineering

AEEM 7063 Space Robotics

EECE 6016C Electric Machines and Drives Fall

EECE 6017C Embedded Systems Fall

EECE 6036 Intelligent Systems Fall

EECE 6042 Digital Image Processing Spring

EECE 7019 Bio-Inspired Robotics Spring

CS 6073 Deep Learning Spring

CS 6033 Artificial Intelligence Fall

CS 6037 Machine Learning Fall

EECE 7065 Complex Sys & Networks

EECE 7033 Linear System Theory Spring

EECE 8115C Humans, Machines, Robots and their Interaction1

MECH 6035 Intelligent Systems Fall

MECH 6036 Robot Vision Spring

MECH 7011 Decision Engineering Fall

MECH 7015 Humans, Machines, Robots and their Interaction1

1 This course is cross-listed in both EECE and ME but it can only be counted once.

**Capstone** – complete 1 of the 3 capstone experiences:

AEEM 8060 Master of Engineering Capstone Project

EECE 9060 Master of Engineering Capstone Project

MECH 9011 Master of Engineering Capstone Project