

EXAMPLE COURSE LISTS AND CHECKPOINTS

The list below includes representative courses, but the list is not exhaustive. Courses offered at [UNC](#) and [NCSSU](#) are indicated in blue and red, respectively. Note that each course may be used to fulfill either the Math OR Engineering OR Electives requirement, but a single course may NOT fulfill more than one requirement simultaneously.

I.a: EXAMPLE ENGINEERING COURSES

I.a.i: Biomedical Imaging

- [BMME 550: BME 550: Medical Imaging: Ultrasound, MRI and Optical](#)
- [BMME 560: BME 560: Medical Imaging: X-ray, CT and Nuclear](#)
- [BME 512: Biomedical Signal Processing](#)
- [BME 522: Medical Instrumentation](#)
- [BMME 565: Biomedical Instrumentation](#)
- [BMME 580: Microcontroller Applications I](#)
- [BMME 581: Microcontroller Applications II](#)
- [BMME 775: COMP 775: Image Processing and Analysis](#)
- [COMP 665: Images, Graphics and Vision](#)
- [COMP 766: Visual Solid Shape](#)
- [COMP 776: Computer Vision in our 3D World](#)
- [COMP 787: Visual Perception](#)
- [ECE 514: Random Processes](#)
- [ECE 751: Detection and Estimation Theory](#)
- [ECE 759: Pattern Recognition](#)
- [ECE 763: Computer Vision](#)

I.a.ii: Biomedical Microdevices

- [BMME 465: Biomedical Instrumentation I](#)
- [BMME 510: Biomaterials](#)
- [BME 512: Biomedical Signal Processing](#)
- [BMME 515: Introduction to Systems Biology](#)
- [BME 522: Medical Instrumentation](#)
- [BME 525: Bioelectricity](#)
- [BMME 551: BME 551: Medical Device Design](#)
- [BMME 552: BME 552: Medical Device Design II](#)
- [BMME 580: Microcontroller Applications I](#)
- [BMME 581: Microcontroller Applications II](#)
- [CHEM 445: Electroanalytical Chemistry](#)
- [CHEM 447: Bioanalytical Chemistry](#)
- [CHEM 449: Microfabricated Chemical Measurement Systems](#)
- [CHEM 541: Analytical Microscopy](#)

I.a.iii: Pharmacoengineering

BME 590: Advanced Drug Delivery Systems
BME 540: Nanobiotechnology Processing, Characterization, and Applications
BME 590: Cellular Engineering
BME 590: Immunoengineering
BMME 890: Genetic Engineering
BMME 510: Biomaterials
BMME 515: Introduction to Systems Biology
BME (TE) 566: Polymeric Biomaterials Engineering
MAE 531: Engineering Design Optimization
CHE 596: Colloidal Science and Nanoengineering
CHE 596: Engineering of Bioactive Compounds
BEC 515: Biopharmaceutical Product Characterization Techniques
BEC 536: Introduction to Downstream Process Development
BEC 590: Industry Practicum in Biomanufacturing
CHE 752: Separation Processes For Biological Materials
MEDC 842: Therapeutic Proteins
MOPH 738. Nanomedicine
DPET 832. Pharmacogenomics
DPET 853. PK Module 1: Pharmacokinetic Concepts and Applications
DPET 854. PK: Module 2: Pharmacodynamic Concepts and Applications
DPET 856. Advanced Pharmacokinetics and Pharmacodynamics
DPET 857. PK Module 3: Population PK/PD Analysis
DPET 858. PK Module 4: Advanced PK/PD Modeling

I.a.iv: Regenerative Medicine

BME 584: Tissue Engineering Fundamentals
BMME 890: Genetic Engineering
BME 590: Functional Tissue Engineering
BME 543: Cardiovascular Biomechanics
BMME 505: Biomechanics
BMME 510: Biomaterials
BMME 515: Introduction to Systems Biology
BME (TE) 566: Polymeric Biomaterials Engineering
MAE 531: Engineering Design Optimization
ISE 543: Musculoskeletal Mechanics
ISE 767: Upper Extremity Biomechanics
ISE 768: Spine Biomechanics
BME 551: Med Device Design
CHE 596: Colloidal Science and Nanoengineering

I.a.v: Rehabilitation Engineering

BMME 465: Biomedical Instrumentation I

BMME 505: Biomechanics
BMME 510: Biomaterials
BME 512: Biomedical Signal Processing
BMME 515: Introduction to Systems Biology
BME 522: Medical Instrumentation
BME 525: Bioelectricity
BME 541: Biomechanics
BME 543: Cardiovascular Biomechanics
BMME 550: BME 550: Medical Imaging: Ultrasound, MRI and Optical
BMME 551: BME 551: Medical Device Design
BMME 552: BME 552: Medical Device Design II
BMME 560: BME 560: Medical Imaging: X-ray, CT and Nuclear
BME (TE) 566: Polymeric Biomaterials Engineering
BMME 580: Microcontroller Applications I
BMME 581: Microcontroller Applications II
MAE 521: Linear Control and Design for MIMO Systems
MAE 522: Non Linear System Analysis and Control
MAE 531: Engineering Design Optimization
MAE 534: Mechatronics Design
MAE 535: Design of Electromechanical Systems
MAE 543: Fracture Mechanics
MAE 544: Real Time Robotics
ISE 540: Human Factors in Systems Design
ISE 541: Occupational Safety Engineering
ISE 543: Musculoskeletal Mechanics
ISE 544: Occupational Biomechanics
ISE 740: Engineering Psychology of Human-Computer Interaction
ISE 743: Ergonomic Performance Assessment
ISE 744: Human Information Processing
ISE 745: Human Performance Modeling
ISE 767: Upper Extremity Biomechanics
ISE 768: Spine Biomechanics

I.b: EXAMPLE MATHEMATICS COURSES

BMME 775: Image Processing and Analysis
BME 512: Biomedical Signal Processing
BMA 567: Modeling of Biological Systems
BMA 771: Biomathematics I
ECE 513: Digital Signal Processing
ECE 514: Random Processes
MATH 528: Mathematical Methods for the Physical Sciences
MATH 535: Introduction to Probability
MATH 547: Linear Algebra for Applications
MATH 564: Mathematical Modeling

MATH 566: Introduction to Numerical Analysis
MATH 577: Linear Algebra
MATH 661: Scientific Computation
MATH 768: Mathematical Modeling I
MA 501: Advanced Mathematics for Engineers and Scientists I
MA 502: Advanced Mathematics for Engineers and Scientists II
MA 520: Linear Algebra
MA 523: Linear Transformations and Matrix Theory
MA 531: Dynamic Systems and Multivariable Controls I
MA 532: Ordinary Differential Equations I
MA 537: Nonlinear Dynamics and Chaos
MA 546: Probability and Stochastic Processes
MA 580: Numerical Analysis I
MA 719: Vector Space Methods in System Optimization
MA 731: Dynamic Systems and Multivariable Controls II
MA 732: Ordinary Differential Equations II
MA 780: Numerical Analysis II

I.c: EXAMPLE STATISTICS COURSES

BIOS 550: Basic Elements of Probability and Statistical Inference
BIOS 600: Principles of Statistical Inference
EPID 715: Theory And Quantitative Methods In Epidemiology
EPID 716: Epidemiologic Data Analysis
EPID 722: Epidemiologic Analysis Of Time-To-Event Data
EPID 733: Clinical Trials In Epidemiology
SOC 711: Analysis Of Categorical Data
ST 515: Experimental Statistics for Engineers I
ST 511: Experimental Statistics for Biological Sciences I

I.d: EXAMPLE TECHNICAL ELECTIVE COURSE

I.d.i: Biomedical Imaging

BME (TE) 566: Polymeric Biomaterials Engineering
BME 583/584: Tissue Engineering Fundamentals
BMME 770: Physiology and Methods in Genomics
MA 523: Linear Transforms and Matrix Theory
MA 580: Numerical Analysis I
MATH 547: Linear Algebra for Applications
MATH 661: Scientific Computation
PHYS 415: Optics
PHYS 711: Electromagnetic Theory I
PHYS 771: Advanced Spectroscopic Techniques I
PY 516: Physical Optics

I.d.ii: Biomedical Microdevices

BME (TE) 566: Polymeric Biomaterials Engineering
BME 583/584: Tissue Engineering Fundamentals
BME 590 002: Tissue Engineering Technologies
BMME 740: Advanced Biomaterials
BMME 770: Physiology and Methods in Genomics
CSC 530: Computational Methods in Molecular Biology

I.d.iii: Pharmacoengineering

BME 590: Advanced Drug Delivery Systems
BME 540: Nanobiotechnology Processing, Characterization, and Applications
BME 590: Cellular Engineering
BME 590: Immunoengineering
BMME 890: Genetic Engineering
BMME 510: Biomaterials
BMME 515: Introduction to Systems Biology
BME (TE) 566: Polymeric Biomaterials Engineering
MAE 531: Engineering Design Optimization
CHE 596: Proteins at Interfaces: Interactions, Structure, and Function
CHE 596: Colloidal Science and Nanoengineering

I.d.iv Regenerative Medicine

BME 584: Tissue Engineering Fundamentals
BME 583: Tissue Engineering Technologies (2 hours only)
BME 590: Functional Tissue Engineering
BME 890: Genetic Engineering
BME 543: Cardiovascular Biomechanics
BMME 505: Biomechanics
BMME 510: Biomaterials
BMME 515: Introduction to Systems Biology
BME (TE) 566: Polymeric Biomaterials Engineering
MAE 531: Engineering Design Optimization
ISE 543: Musculoskeletal Mechanics
ISE 767: Upper Extremity Biomechanics
ISE 768: Spine Biomechanics
CHE 596: Proteins at Interfaces: Interactions, Structure, and Function
BME 551: Med Device Design
CHE 596: Colloidal Science and Nanoengineering

I.d.v: Rehabilitation Engineering

BIOL 450: Introduction to Neurobiology
BME 583/584: Tissue Engineering Fundamentals
BME 590 002: Tissue Engineering Technologies

BMME 740: Advanced Biomaterials -
BMME 770: Functional Genomics Methods
BMME 840 Rehabilitation Engineering Design
EPID 600: Principles of Epidemiology
EXSS 700: Applied Statistics and Research Methods in Exercise and Sports Science
EXSS 730: Management of Athletic Injuries
EXSS 732: Human Anatomy for Athletic Trainers
EXSS 735: Sports Medicine Analysis: Special Problems Related To Sports Medicine
EXSS 739: Practicum in Athletic Training
EXSS 780: Physiology of Exercise
EXSS 781: Clinical Exercise Prescription and Testing
EXSS 782: Nutritional Aspects of Exercise
EXSS 783: Assessment of Physiological Function In Exercise
EXSS 784: Advanced Topics in Exercise Physiology
EXSS 785: Seminar in Exercise Physiology
EXSS 789: Practicum in Exercise Physiology
EXSS 890: Special Topics in Exercise and Sport Science
HBHE 600: Social and Behavioral Sciences in Public Health
HBHE 753: Qualitative Evaluation and Research Methods
HBHE 772: Planning Health Promotion in Community, Worksite, School, and Medical Settings
NUTR 600: Human Metabolism: Macronutrients
NUTR 810: Physical Activity Epidemiology and Public Health
NUTR 812: Introduction to Obesity: From Cell to Society
NUTR 814: Obesity Epidemiology
PSY 502: Physiological Psychology
PSY 704: Learning and Motivation
PSY 757: Innovation and Technology
PSYC 701: Brain and Behavior I
PSYC 702: Brain and Behavior II
PSYC 703: Advanced Biological Psychology: CNS
PSYC 704: Applications of Experimental Psychology to Health Research

II: CHECKPOINTS FOR PROGRESS TO DEGREE COMPLETION

II.a: Doctoral Students

- Pass the written qualifying exam by the end of the first year.
- Select a research advisor and laboratory by the end of the 2nd semester. This lab is expected to provide full support (stipend, tuition, etc.) for the student during the course of their studies.
- Submit an approved Plan of Work by the end of the first year in the program.
- Form the advisory committee (minimum of 5 members, at least 3 of whom are BME core and/or affiliated faculty).

- Pass the written research proposal and the oral preliminary exam by the end of the sixth semester.
- Pass the oral dissertation defense and complete the written dissertation.

II.b: Research Master's Students

- Select a research advisor and laboratory by the end of the first semester.
- Submit an approved Plan of Work by the end of the 1st semester.
- Form the advisory committee (minimum of 3 members, at least 2 of whom are BME core and/or affiliated faculty).
- Pass the oral thesis defense and complete the written thesis by end of fourth semester.