### DEPARTMENTS

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### PROGRAMS

#### UNDERGRADUATE

**Associate**
- Civil Engineering Technology
- Industrial Technology

**Baccalaureate**
- Applied Physics
- Biology
- Chemistry
- Civil Engineering Technology
- Electromechanical Engineering Technology
- Engineering Graphics and Design
- Engineering Physics
- Geoscience
- Manufacturing Engineering Technology
- Mathematics
- Occupational Safety and Health
- Physics
- Telecommunications Systems Management
- Wildlife and Conservation Biology

**Minor**
- Actuarial Science
- Anthropology
- Applied Statistics
- Archaeology
- Astronomy
- Biology
- Chemistry
- Earth Science
- Engineering Science
- Environmental Geology
- Environmental Technology
- Geographic Information Science
- Industrial and Engineering Technology
- Mathematical Biology

**Certificate**
- Geographic Information Science

#### GRADUATE

**Master's**
- Applied Engineering and Technology Management
- Biology
- Chemistry
- Geosciences
- Mathematics
- Occupational Safety and Health
- Sustainability Science
- Telecommunications Systems Management

**Certificate**
- Professional Telecommunications Systems Management
The departments in the Jesse D. Jones College of Science, Engineering and Technology have a proud history of preparing students for careers in biology, chemistry, engineering, engineering technology, geosciences, industrial technology, mathematics, occupational safety and health, physics, statistics, sustainability science, and telecommunications.

The college’s faculty are talented educators who make quality instruction a priority. They make themselves accessible to students and help them achieve their academic, professional, and career goals. Faculty continuously refine the curriculum which ensures that our degree programs are current and timely in addressing the needs and expectations of our students. The faculty are also recognized scholars who carry out interesting research projects with funding from a variety of national, state, and private agencies. Like some of the finest liberal arts colleges in the country, we use our research program to enhance the learning environment for our undergraduate and graduate students. Many Murray State students have the opportunity to work side-by-side with faculty trying to solve some of the most interesting questions facing the scientific community today. Our students, both undergraduate and graduate, have published the results of their research in national journals and presented their work at regional and national conferences. In addition, students at Murray State have the opportunity to gain valuable hands-on experience through our co-op and internship programs. These kinds of experiences give our graduates the edge they need when applying for graduate school, professional school, or when entering the job market.

Our students study in comfortable, modern facilities, including the new Gene W. Ray science campus. The departments of biology and chemistry are housed in two beautiful state-of-the-art buildings, the Biology Building and Jesse D. Jones Hall. A third building to house the engineering and physics programs is under construction and will complete the campus in 2017. The college also enjoys excellent facilities in the Collins Center for Industry and Technology, Faculty Hall, and Blackburn Science Building.

Murray State’s designation as a Commonwealth Center of Excellence for Reservoir Research and the Program of Distinction in Telecommunications Systems Management adds to our distinctiveness both in the state and in the national and international academic communities.

Your academic experience in our college will be different from that found at many universities. The student-centered faculty, excellent facilities, and attractive curricular tracks offered here will provide you with an education that you will value throughout your life and career.

Programs and Facilities

Program of Distinction in Telecommunication Systems Management. The telecommunications field, which incorporates networks of leading-edge technologies such as fiber optic systems, satellites, wireless, telephony and cable, is rapidly changing and growing. The changes taking place in this field are dramatically influencing how individuals and institutions communicate and how they conduct business. Technological advances in the telecommunications area have profoundly affected government, retail, finance, health care, education, industry and entertainment sectors. Murray State’s exciting program in telecommunications systems management is helping prepare our graduates to become the leaders in this important emerging field.

Watershed Studies Institute. Murray State University hosts one of the five designated Centers of Excellence in the Commonwealth of Kentucky. With funding support from agencies like the National Science Foundation, Department of Energy, Environmental Protection Agency, Tennessee Valley Authority and the Kentucky Department for Natural Resources, Murray State’s research program in ecosystem sciences is both nationally and internationally recognized.

The Watershed Studies Institute provides outstanding research opportunities for scientists from around the world to study the region’s unique environment. The Institute also provides Murray State University undergraduate and graduate students with an opportunity to engage in hands-on research with faculty who are at the vanguard of ecosystem science.

Three distinct components make up the Institute: the Hancock Biological Station (HBS), the Mid-America Remote Sensing Center (MARC), and the Chemical Services Laboratory (CSL). The Institute’s primary mission is to provide the infrastructure, support, and intellectual education and research of watershed ecosystems.

• Mid-America Remote Sensing Center. Since the late 1970s when Murray State was declared the Commonwealth’s technology transfer agent for NASA’s Landsat satellite, MARC has distinguished itself in the area of remote sensing and Geographic Information Systems (GIS). Students from around the world have received classroom instruction and have been mentored in research by the MARC Associates, a group of faculty and staff with expertise in a wide variety of application areas, many of which are focused on natural and cultural resource areas including land cover mapping, archaeological site analysis, mineral exploration, water quality and wildlife habitat mapping, emergency preparedness, and demographic modeling. Research projects have been conducted for local, state, and federal agencies, the private sector, and the university. MARC provides training in remote sensing and GIS and acts as a resource center for those within and beyond the university. MARC is one component of the Watershed Studies Institute and, as such, maintains a GIS for the lower reaches of the Kentucky Lake drainage basin.

• Hancock Biological Station. A year-round research and teaching facility located on beautiful Kentucky Lake, the HBS is one of the finest centers of its kind in the Midwest. HBS acts as the field research focal point for the Watershed Studies Institute and for the Ecological Consortium of Mid-America. The facilities, which include both faculty and student housing, are available year-round to all scientists interested in ecosystem research. Hancock Biological Station contains state-of-the-art laboratories for aquatic chemistry, scanning electron microscopy, ecology, wildlife and fisheries. A full-time technical staff operates the facilities. Field-oriented classes at the station attract students from around the nation. A wide variety of formal classes are offered each summer. These may include ecology, ornithology, limnology, field botany, stream ecology, reservoir ecology, scanning electron microscopy and vertebrate ecology. Independent research topics provide opportunities for individualized instruction and close interactions with researchers. Classes are open to undergraduates, graduate students, teachers and others interested in enhancing their knowledge of ecology, ecosystems and the natural environment.

• Chemical Services Laboratory. The Chemical Services Laboratory offers analytical laboratory services for industries and institutions in the west Kentucky and greater Ohio Valley region. Services include analyses for environmental chemistry, ecotoxicology, trace element, and acid-deposition studies. In addition to serving the needs of the region, this laboratory offers an opportunity for instruction and training at both the undergraduate and graduate levels.

Note: L=literature; R=research; PT=professional training. See page 68.
Sustainability Studies Minor

The Sustainability Studies minor is an interdisciplinary exploration of sustainability issues focusing on the environment and/or sustainable development. Integrating knowledge and experiences from the sciences, engineering, agriculture, business, humanities, and arts, the minor is designed to complement any major area of study by focusing on ecological health, sustainable agriculture, and economic sustainability.

MINOR:
Sustainability Studies

Total Minor Requirements ........................................ 22-24 hrs

Required Courses ....................................................... 10 hrs
BIO 103 Saving Planet Earth
ENG 371 Literature and the Environment
IDC 150 Issues in Sustainability Studies
PHI 376 Environmental Ethics

Restricted Electives ................................................... 6 hrs
Choose two of the following:
AGR 353 World Food, Agriculture and Society
CET 284 Sustainable Design and Construction
REC 450 Recreational Use of Natural Resources

Unrestricted Electives ................................................. 6-8 hrs
Chosen from the following with program coordinator approval:
AGR 345, 378, 455; ANT 320; ARC 314; BIO 112, 330, 506, 578; CHE 502, 513; ECO 345, 410; ENT 286; GSC 424, 507; PSY 373; SOC 325, 380, 455.

Note: Six hours of the minor must be upper-level courses.

Sustainability Science
Graduate Coordinator - Howard Whiteman
(270) 809-6753

The Sustainability Science program is an interdisciplinary master’s program within the Jones College of Science, Engineering, and Technology designed to prepare students for careers in sustainability or closely related fields that have sustainability needs. The course of study allows specialization in one of four tracks: Agricultural Sustainability, Environmental Sustainability, Industrial and Technical Sustainability, and Sustainability Education. All students must complete a core curriculum, two restricted electives, and advanced courses in their area of interest.

Requirements for Admission

Applicants must meet all Murray State University requirements (see Graduate Admissions). Additional requirements for unconditional and conditional admission are listed below.

Unconditional
- Baccalaureate degree in science-related field.
- At least a 3.0 undergraduate GPA.
- Composite GRE score of at least 297 (148 verbal + 149 quantitative).
- International students: TOEFL score of at least 527; iBT TOEFL of 71; or IELTS score of 6.0.

Conditional
- Recommendation of the advisory committee; international students must meet minimum testing scores described above.

Master of Science: Sustainability Science

Total Course Requirements ........................................... 30-32 hours

Core Requirements ................................................... 17 hrs
CET 687 Sustainable Environmental Technology
GSC 601 Understanding Scientific Communication
GSC 607 Land Use Planning
WSC 601 Seminar in Sustainability Science
WSC 693 Sustainability Practicum I
WSC 694 Sustainability Practicum II

Restricted Electives .................................................. 6-7 hrs
Choose two of the following:
AGR 643 Sustainable Agriculture

CIP 30.3301
ARC 615  Environmental Archaeology
BIO 665  Biogeochemistry
STA 665  Applied Statistics I

Unrestricted Electives .................................................. 6-9 hrs
Choose elective hours from one of the following emphasis areas:

Agricultural Sustainability
AGR 636  Seminar in International Agriculture Systems
AGR 649  Weeds and Their Control
AGR 652  Agricultural Policy
AGR 655  Advanced Soil Fertility
AGR 661  Sustainable Agriculture
AGR 662  Principles of Agroecology
AGR 671  Advanced Precision Agriculture
AGR 674  Agricultural Irrigation and Water Systems
CHE 604  Fundamentals of Toxicology
CHE 613  Environmental Chemistry
GSC 612  Remote Sensing
GSC 621  Geographic Information Systems

Environmental Sustainability
AGR 662  Principles of Agroecology
ARC 610  Landscape Archaeology
ARC 615  Environmental Archaeology
BIO 635  Biogeography
BIO 642  Watershed Ecology
BIO 665  Biogeochemistry
BIO 675  Invasion Ecology
BIO 678  Conservation Biology
BIO 685  Restoration Ecology
BIO 690  Disturbance Ecology
CHE 604  Fundamentals of Toxicology
CHE 613  Environmental Chemistry
GSC 612  Remote Sensing
GSC 621  Geographic Information Systems

Industrial and Technical Sustainability
CET 655  Environmental Regulatory Affairs
CET 681  Pollution Assessment and Control
CET 682  Industrial Ecology
CET 686  Environmental Assessment and Remediation
CET 687  Sustainable Environmental Technology
CET 688  Waste Minimization and Pollution Prevention
CHE 600  Chemistry of Fuels
CHE 604  Fundamentals of Toxicology
CHE 613  Environmental Chemistry
IET 619  Industrial Energy Management
OSH 622  Toxicology of Industrial Materials
OSH 646  Fundamentals of Risk Control
OSH 687  Wastewater Treatment
OSH 689  Solid and Hazardous Waste Treatment

Sustainability Education
EDU 615  Introduction to Environmental Education
EDU 664  Techniques of Teaching Environmental Education
EDU 665  Field Experiences in Environmental Education
EDU 667  International Environmental Education
EDU 668  Agriculture and the Environment in the Classroom
The Department of Biological Sciences offers baccalaureate programs with a major in biology (pre-medicine, pre-dentistry, pre-optometry, pre-physical therapy, pre-physician assistant, molecular biology, fisheries, aquatic biology, secondary certification, and watershed science tracks are available) or an area of concentration in wildlife and conservation biology. These programs are designed to prepare students for professional or graduate work in the life sciences, such as the M.S. in biology offered by the department. Curricula provide students with a basic core of science courses plus advanced biology courses in their particular field of interest. The department also offers a two-year, pre-professional program in pharmacy and a minor in biology.

The department has offices, classrooms, laboratories, and research facilities in the newly constructed Biology Building and on the third floor of the Blackburn Science Building. The department also has two off-campus resources which are utilized in field-oriented teaching and research programs. One of these, Murphy’s Pond, is a 300-acre preserve in Hickman County with one of the few remaining cypress swamps in western Kentucky. The other, Hancock Biological Station, is a modern classroom/laboratory complex located on the western shore of Kentucky Lake, 17 miles from the main campus. The station is ideally located in an area of diverse aquatic habitats and is the focal point for the reservoir research on Kentucky Lake and Lake Barkley.

**MAJOR:** Bachelor of Science/Bachelor of Arts Degree

**Biology**

**University Studies Requirements**

(See Academic Degrees and Programs.)

- **Scientific Inquiry, Methodologies, and Quantitative Skills**
  - CHE 201 General College Chemistry
  - CHE 202 General Chemistry and Qualitative Analysis
  - MAT 150 Algebra and Trigonometry
  - or
  - MAT 250 Calculus and Analytic Geometry I

- **University Studies Electives**
  - PHY 130 General Physics I
  - PHY 131 General Physics I Laboratory
  - or
  - PHY 235 Mechanics, Heat and Wave Motion
  - PHY 236 Mechanics, Heat and Wave Motion Laboratory

**Required Courses**

- BIO 100T Transitions
- BIO 115 The Cellular Basis of Life
- BIO 216 Biological Inquiry and Analysis
- BIO 221 Zoology: Animal Form and Function
- BIO 222 Botany: Plant Form and Function
- BIO 305 Introduction to Evolutionary Principles
- BIO 330 Principles of Ecology
- BIO 333 Genetics
- BIO 499 Senior Biology Seminar
- BIO electives, 300-level or above (13 hrs)

**Co-Requirements for Biology Major**

- **Group 1:**
  - CHE 312 Organic Chemistry I
  - CHE 320 Organic Chemistry II
  - **or Group 2:**
  - CHE 210 Brief Organic Chemistry
  - CHE 215 Chemistry Laboratory
  - CHE 330 Basic Biochemistry

**Required Minor**

- Minor in Biology
Unrestricted Electives .................................................. 17-28 hrs

Total Curriculum Requirements ........................................ 120 hrs
1 May be used to fulfill University Studies requirements.
2 A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used. BIO 488 and 489 will not count here.
3 This course does not apply toward the chemistry minor.
4 Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

AREA: Bachelor of Science/Bachelor of Arts Degree
Biology/Biomedical Sciences Track1

University Studies Requirements .................. 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• Scientific Inquiry, Methodologies, and Quantitative Skills
  CHE 201 General College Chemistry
  MAT 250 Calculus and Analytic Geometry I
  PHY 130 General Physics I2
  PHY 131 General Physics I Laboratory2
• University Studies Electives
  CHE 202 General Chemistry and Qualitative Analysis2

Required Courses ...................................................... 47 hrs
BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 216 Biological Inquiry and Analysis3
BIO 221 Zoology: Animal Form and Function2,3
  or
BIO 222 Botany: Plant Form and Function1
BIO 290 Biomedical Research I
BIO 300 Introductory Microbiology
BIO 321 Cell Biology: Mechanisms4
  or
BIO 323 Cell Biology: Systems4
BIO 322 Animal Physiology
BIO 333 Genetics
BIO 388 Biomedical Research II
BIO 389 Biomedical Research III
BIO 438 Biomedical Research IV
BIO 439 Biomedical Research V
BIO 499 Senior Biology Seminar
BIO 533 Molecular Genetics

Co-Requirements for Area .......................................... 18 hrs
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 530 Fundamentals of Biochemistry I
CHE 540 Fundamentals of Biochemistry II
PHY 132 General Physics II2,3
PHY 133 General Physics II Laboratory2,3

Restricted Electives .................................................... 15 hrs
Choose from the following:
BIO 308 Ethics in Biology4
BIO 320 Comparative Vertebrate Anatomy
BIO 321 Cell Biology: Mechanisms4
  or
BIO 323 Cell Biology: Systems4
BIO 421 Vertebrate Histology
BIO 501 Immunology
BIO 504 Medical Cell Biology
BIO 521 Cell Biology Laboratory
BIO 528 Neurobiology
BIO 534 Molecular Genetics Laboratory
BIO 597 Topics in Advanced Molecular Biology
MAJOR: Bachelor of Science/Bachelor of Arts Degree

Biology/Molecular Biology Track

University Studies Requirements ........................................ 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  CHE 201 General College Chemistry
  MAT 250 Calculus and Analytic Geometry I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
  or
  PHY 235 Mechanics, Heat and Wave Motion
  PHY 236 Mechanics, Heat and Wave Motion Laboratory

• **University Studies Electives**
  CHE 202 General Chemistry and Qualitative Analysis

Required Courses ............................................................... 37 hrs
BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 216 Biological Inquiry and Analysis
BIO 221 Zoology: Animal Form and Function
BIO 222 Botany: Plant Form and Function
BIO 300 Introductory Microbiology
BIO 321 Cell Biology: Mechanisms
  or
  BIO 323 Cell Biology: Systems
  BIO 333 Genetics
  BIO 499 Senior Biology Seminar
  BIO 533 Molecular Genetics
  BIO 534 Molecular Genetics Laboratory
  BIO 597 Topics in Advanced Molecular Biology

**Co-Requirements for Biology Major** .................................. 21 hrs
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 530 Fundamentals of Biochemistry I
CHE 540 Fundamentals of Biochemistry II
PHY 132 General Physics II
PHY 133 General Physics II Laboratory
  or
  PHY 255 Electricity, Magnetism and Light
  PHY 256 Electricity, Magnetism and Light Laboratory
STA 554 Statistical Methods

Required Minor ............................................................... 0-21 hrs

Unrestricted Electives ..................................................... 11-20 hrs

Total Curriculum Requirements ........................................ 120 hrs

1 May be used to fulfill University Studies requirements.
2 Chemistry co-requirements may apply toward chemistry minor.
MAJOR: Biology/Pre-Medical/Pre-Dental Track

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements ........................................... 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**
CHE 201 General College Chemistry
MAT 150 Algebra and Trigonometry
or
MAT 250 Calculus and Analytic Geometry I
PHY 130 General Physics I
PHY 131 General Physics I Laboratory
or
PHY 235 Mechanics, Heat and Wave Motion and
PHY 236 Mechanics, Heat and Wave Motion Laboratory

**Social and Self-Awareness and Responsible Citizenship**
PSY 180 General Psychology (recommended)

**University Studies Electives**
CHE 202 General Chemistry and Qualitative Analysis

Required Courses ............................................................... 40 hrs
BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 216 Biological Inquiry and Analysis¹
BIO 221 Zoology: Animal Form and Function¹
BIO 222 Botany: Plant Form and Function¹
BIO 321 Cell Biology: Mechanisms
or
BIO 323 Cell Biology: Systems
BIO 322 Animal Physiology
BIO 333 Genetics
BIO 499 Senior Biology Seminar
BIO electives, 300-level or above (12 hrs)²

**Co-Requirements for Biology Major** .................................... 12 hrs
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
PHY 132 General Physics II¹
PHY 133 General Physics II Laboratory¹
or
PHY 255 Electricity, Magnetism and Light¹ and
PHY 256 Electricity, Magnetism and Light Laboratory¹

**Required Minor²** ............................................................. 3-21 hrs

**Unrestricted Electives³** .................................................... 8-21 hrs

Total Curriculum Requirements ............................................ 120 hrs

¹May be used to fulfill University Studies requirements.
²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used. BIO 488 and 489 will not count here.
³Chemistry co-requirements may apply toward chemistry minor.
⁴ENG 204 strongly recommended. Electives other than ENG 204 must be at the 300-level or above.
MAJOR: Biology/Pre-Optometry Track

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements ........................................ 41-42 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  MAT 250 Calculus and Analytic Geometry I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
  and
  PHY 132 General Physics II
  PHY 133 General Physics II Laboratory
  or
  PHY 235 Mechanics, Heat and Wave Motion
  PHY 236 Mechanics, Heat and Wave Motion Laboratory
  and
  PHY 255 Electricity, Magnetism and Light
  PHY 256 Electricity, Magnetism and Light Laboratory

• **Social and Self-Awareness and Responsible Citizenship**
  PSY 180 General Psychology

• **University Studies Electives**
  CHE 201 General College Chemistry

Required Courses ........................................................... 41 hrs

BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 216 Biological Inquiry and Analysis¹
BIO 221 Zoology: Animal Form and Function¹
BIO 222 Botany: Plant Form and Function¹
BIO 300 Introductory Microbiology
BIO 322 Animal Physiology
BIO 333 Genetics
BIO 499 Senior Biology Seminar
BIO electives, 300-level or above (12 hrs)²

Co-Requirements for Biology Major........................................ 23 hrs

CHE 202 General Chemistry and Qualitative Analysis³
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 330 Basic Biochemistry

or

CHE 530 Fundamentals of Biochemistry I
ENG 204 Advanced Expository Writing⁴
STA 135 Introduction to Probability and Statistics⁴

Required Minor³ ............................................................ 0-21 hrs

Unrestricted Electives ...................................................... 0-15 hrs

Total Curriculum Requirements ....................................... 120 hrs

¹May be used to fulfill University Studies requirements.
²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used. BIO 488 and 489 will not count here.
³Chemistry co-requirements may apply toward chemistry minor.
MAJOR:
Biology/Pre-Physical Therapy Track

University Studies Requirements ........................................ 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• Scientific Inquiry, Methodologies, and Quantitative Skills
  CHE 201 General College Chemistry
  MAT 150 Algebra and Trigonometry
  or
  MAT 250 Calculus and Analytic Geometry I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
  • Social and Self-Awareness and Responsible Citizenship
  PSY 180 General Psychology
  • University Studies Electives
  CHE 202 General Chemistry and Qualitative Analysis

Required Courses .......................................................... 39-44 hrs
BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 216 Biological Inquiry and Analysis¹
BIO 120 Scientific Etymology
BIO 221 Zoology: Animal Form and Function¹
BIO 222 Botany: Plant Form and Function¹
BIO 220 Clinical Terminology
BIO 300 Introductory Microbiology
  or
  BIO 321 Cell Biology: Mechanisms
  BIO 320 Comparative Vertebrate Anatomy
  or
  BIO 227 Human Anatomy
  and
  BIO 228 Human Anatomy Laboratory
BIO 322 Animal Physiology
BIO 333 Genetics
BIO 499 Senior Biology Seminar
BIO electives, approved by advisor, 300-level or above (9 hrs)²
(If BIO 320 is taken, only four hours of 300-level or above.)

Co-Requirements for Biology Major ................................. 24-25 hrs
BIO 450 Exercise Physiology
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
PSY 300 Principles and Methods of Statistical Analysis
  or
  STA 135 Introduction to Probability and Statistics¹
  PHY 132 General Physics II¹
  PHY 133 General Physics II Laboratory¹
  PSY 260 Lifespan Development
  SOC 133 Introduction to Sociology¹

Required Minor³ ............................................................. 3-21 hrs

Unrestricted Electives ................................................... 0-12 hrs

Total Curriculum Requirements ...................................... 120 hrs

¹May be used to fulfill University Studies requirements.
²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used. BIO 488 and 489 will not count here.
³Chemistry co-requirements may apply toward chemistry minor.
MAJOR: Biology/Pre-Physician Assistant Track

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements .......................... 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
* Scientific Inquiry, Methodologies, and Quantitative Skills
  CHE 201 General College Chemistry
  MAT 150 Algebra and Trigonometry
  or  
  MAT 250 Calculus and Analytic Geometry I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
* Social and Self-Awareness and Responsible Citizenship
  PSY 180 General Psychology
  SOC 133 Introduction to Sociology
* University Studies Electives
  CHE 202 General Chemistry and Qualitative Analysis

Required Courses ............................................. 40 hrs
BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 120 Scientific Etymology
BIO 216 Biological Inquiry and Analysis
BIO 220 Clinical Terminology
BIO 221 Zoology: Animal Form and Function
BIO 222 Botany: Plant Form and Function
BIO 300 Introductory Microbiology
BIO 321 Cell Biology: Mechanisms
BIO 323 Cell Biology: Systems
BIO 333 Genetics
BIO 499 Senior Biology Seminar
BIO electives, 300-level or above (10 hrs) \[BIO 488 and 489 will not count here\]

Co-Requirements for Biology Major.......................... 26-27 hrs
BIO 227 Human Anatomy
BIO 228 Human Anatomy Laboratory
BIO 229 Human Physiology
BIO 230 Human Physiology Laboratory
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
PSY 300 Principles and Methods of Statistical Analysis
or
STA 135 Introduction to Probability and Statistics
PHY 132 General Physics II
PHY 133 General Physics II Laboratory
PSY 260 Lifespan Development

Required Minor (Chemistry recommended) .................. 3-21 hrs

Unrestricted Electives ....................................... 0-9 hrs

Total Curriculum Requirements .......................... 120 hrs

1 May be used to fulfill University Studies requirements.
2 A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used. BIO 488 and 489 will not count here.
3 Chemistry co-requirements may apply toward chemistry minor.
AREA: Biology/Fisheries and Aquatic Biology Track

University Studies Requirements ........................................ 43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  CHE 201  General College Chemistry
  MAT 150  Algebra and Trigonometry
  or
  MAT 250  Calculus and Analytic Geometry I
  PHY 130  General Physics I
  PHY 131  General Physics I Laboratory

• **Social and Self-Awareness and Responsible Citizenship**
  One of the following:
  BIO 103  Saving Planet Earth
  BIO 308  Ethics in Biology
  COM 260  Communication Ethics
  PHI 202  Ethics
  POL 140  American National Government

• **University Studies Electives**
  STA 135  Introduction to Probability and Statistics
  and one of the following:
  COM 131  Interpersonal Communication
  ENG 224  Writing in the Professions

Required Courses .......................................................... 67-75 hrs

BIO 100T Transitions
BIO 115  The Cellular Basis of Life
BIO 221  Zoology: Animal Form and Function
BIO 222  Botany: Plant Form and Function
BIO 240  Biological Applications of GIS
  or
  GSC 202  Introduction to GIS
BIO 330  Principles of Ecology
BIO 333  Genetics
BIO 499  Senior Biology Seminar
BIO 549  Fisheries Techniques
BIO 570  Ichthyology
BIO 578  Conservation Biology
  or
BIO 584  Wildlife Policy and Administration
BIO 582  Fisheries Management
BIO 586  Limnology
  or
BIO 588  Reservoir Ecology
CHE 202  General Chemistry and Qualitative Analysis
CHE 210  Brief Organic Chemistry
CHE 215  Brief Organic Chemistry Laboratory

and four of the following not selected previously:
BIO 305  Introduction to Evolutionary Principles
BIO 467  Parasitology
BIO 493  Undergraduate Research III
BIO 542  Watershed Ecology
BIO 546  Stream Ecology
BIO 561  Freshwater Invertebrates
BIO 563  Aquatic Entomology
BIO 568  Wetland Ecology
BIO 572  Herpetology
BIO 573  Ornithology
BIO 574  Mammalogy
BIO 578  Conservation Biology
BIO 584  Wildlife Policy and Administration
BIO 586  Limnology
BIO 587  Freshwater Biology
BIO 588  Reservoir Ecology
BIO 595  Internship

and 3-5 credits from the following:
AGR 328  Statistics for Food and Agriculture
AGR 345  Soil Science
AGR 346  Soil Science Lab
CHE 330  Biochemistry
CSC 101  Introduction to Problem Solving using Computers
GSC 125  Weather and Climate
GSC 199  Earth Science
GSC 200  Introduction to Oceanography
GSC 210  Hydrology
GSC 303  Introduction to Water Science
GSC 305  Introduction to Cartography
GSC 312  Introduction to Remote Sensing
GSC 314  Sediments and Soils
GSC 424  Conservation and Environmental Geosciences
GSC 512  Remote Sensing
GSC 521  Geographic Information Systems
MAT 250  Calculus and Analytic Geometry I\(^1\)
PHY 235  Mechanics, Heat and Wave Motion
PHY 255  Electricity, Magnetism, and Light
PSY 300  Principles and Methods of Statistical Analysis
STA 235  Introduction to Probability and Statistics

Unrestricted Electives .......................................................... 2-10 hrs

Total Curriculum Requirements ........................................ 120 hrs

\(^1\)Upon completion of the Fisheries and Aquatic Biology track, students can be certified by the American Fisheries Society (if MAT 250 is taken as part of the program.)

MAJOR: Bachelor of Science/Bachelor of Arts Degree
Biology/Secondary Certification (Grades 8-12) Track
CIP 26.0101

University Studies Requirements ................................. 43-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  CHE 201  General College Chemistry
  CHE 202  General Chemistry and Qualitative Analysis
  MAT 150  Algebra and Trigonometry
• **Social and Self-Awareness and Responsible Citizenship**
  EDP 260  Psychology of Human Development
• **University Studies Electives**
  EDU 103  Issues and Practices of American Education\(^1\)
  PHY 130  General Physics I\(^1\)
  PHY 131  General Physics I Laboratory\(^2\)

**Note:** Certification requires a grade of \(B\) or better in one English composition course and a \(B\) or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

Required Courses .......................................................... 38 hrs
BIO 100T  Transitions
BIO 115  The Cellular Basis of Life
BIO 216  Biological Inquiry and Analysis
BIO 221  Zoology: Animal Form and Function
BIO 222  Botany: Plant Form and Function
BIO 300  Introductory Microbiology
BIO 320  Comparative Vertebrate Anatomy
Science, Engineering and Technology

BIO 322  Animal Physiology
BIO 330  Principles of Ecology
BIO 333  Genetics
BIO 499  Senior Biology Seminar

Co-Requirements for Biology Major .............................. 11-12 hrs

Chemistry Requirement

Group 1:
CHE 312  Organic Chemistry I
CHE 320  Organic Chemistry II
or Group 2:
CHE 210  Brief Organic Chemistry\(^3,4\)
CHE 215  Brief Organic Chemistry Laboratory\(^3,4\)
CHE 330  Basic Biochemistry

Physics Requirement

PHY 132  General Physics I\(^5\)
PHY 133  General Physics II Laboratory\(^6\)

Required for Secondary Certification\(^6\) ............................ 33 hrs

EDU 303  Strategies of Teaching
EDU 403  Structures and Foundations of Education
EDU 405  Evaluation and Measurement in Education\(^7\)
REA 427  Teaching Content Area Literacy in the Secondary School
SEC 420  Practicum in Secondary Schools\(^7\)
SEC 421  Student Teaching in the Secondary School
SEC 422  Extended Practicum\(^8\)
SED 300  Educating Students with Disabilities

Required Minor\(^9\) ......................................................... 3-21 hrs

Total Curriculum Requirements .................. 123-148 hrs\(^9\)

\(^1\)With a grade of \(B\) or better.
\(^2\)PHY 235 and 236 will also meet this requirement.
\(^3\)May be used to fulfill University Studies requirements.
\(^4\)This course does not apply toward the chemistry minor.
\(^5\)PHY 255 and 256 will also meet this requirement.
\(^6\)PRAXIS Exam required during last semester before student teaching. Certification requires a grade of \(B\) or better in one English composition course and a grade of \(B\) or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.
\(^7\)EDU 405 and SEC 420 must be taken together and two semesters before student teaching.
\(^8\)Must be taken one semester before student teaching.
\(^9\)Chemistry co-requirements may apply toward chemistry minor.

AREA: Bachelor of Science/Bachelor of Arts Degree

Wildlife and Conservation Biology/Conservation Biology Track  
CIP 03.0601

University Studies Requirements .................. 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

*Global Awareness, Cultural Diversity, and the World’s Artistic Traditions*

POL 250  Introduction to International Relations

*Scientific Inquiry, Methodologies, and Quantitative Skills*

STA 135  Introduction to Probability and Statistics

CHE 105  Introductory Chemistry

or

CHE 201  General College Chemistry

MAT 150  Algebra and Trigonometry

or

MAT 250  Calculus and Analytical Geometry I

*Social and Self-Awareness and Responsible Citizenship*

ECO 231  Principles of Microeconomics
• University Studies Electives

BIO 216 Biological Inquiry and Analysis
ENG 224 Writing for the Professions

Core Courses .......................... 62-65 hrs

BIO 100T Transitions
BIO 115 The Cellular Basis of Life
BIO 149 Introduction to Wildlife and Conservation Biology
BIO 221 Zoology: Animal Form and Function
BIO 222 Botany: Plant Form and Function
BIO 310 Vertebrate Natural History
BIO 330 Principles of Ecology
BIO 333 Genetics
BIO 380 Wildlife Techniques
BIO 499 Senior Biology Seminar
BIO 578 Conservation Biology
BIO 580 Principles of Wildlife Management
BIO 584 Wildlife Policy and Administration
BIO 554 Dendrology and Forest Conservation
and
BIO 350 Systematic Botany
or
BIO 553 Field Botany

and one of the following:

BIO 382 Scientific Communication for the Biologist
ENG 324 Technical Writing

and one of the following:

BIO 572 Herpetology
BIO 573 Ornithology
BIO 574 Mammalogy

and two of the following:

AGR 345 Soil Science
AGR 350 Soil Survey
AGR 455 Soil Management
CHE 210 Brief Organic Chemistry
CHE 215 Organic Chemistry Laboratory

and

GSC 199 Earth Science
GSC 314 Sediments and Soils
PHY 130 General Physics I
PHY 131 General Physics I Laboratory

Conservation Biology Track ......................... 17 hrs

GSC 202 Introduction to Geographical Information Science

and one of the following:

ECO 310 Issues in the Global Economy
ECO 345 Environmental Economics

and a minimum of ten hours from the following: 2

ANT 320 Human Ecology
BIO 240 Biological Applications in GIS
BIO 300 Introductory Microbiology
BIO 308 Ethics in Biology
BIO 525 Biogeography
BIO 548 Principles of Managing Diseases in Wildlife
BIO 568 Wetland Ecology
BIO 570 Ichthyology
BIO 572 Herpetology
BIO 573 Ornithology
BIO 574 Mammalogy
BIO 577 Population and Conservation Genetics
BIO 581 Applied Wildlife Economics, Policy, and Administration
BIO 590 Disturbance Ecology
GSC 312 Introduction to Remote Sensing
GSC 350  Field Techniques in Geosciences  
GSC 512  Remote Sensing  
GSC 521  Geographic Information Systems  
PLN 507  Land Use Planning  
SOC 455  Environmental Sociology  

Total Curriculum Requirements .......................... 121-125 hrs  
1Meets course requirements for Associate Wildlife Biologist Certification from The Wildlife Society.  
2Only one course from BIO 572, 573, and 574 (if not taken as a core course) will count toward this requirement.  

AREA:  
Bachelor of Science/Bachelor of Arts Degree  
Wildlife and Conservation Biology/Conservation Education and Interpretation Track  
CIP 03.0601  

University Studies Requirements ......................... 42-43 hrs  
(See Academic Degrees and Programs.)  

University Studies selections must include:  
• **Scientific Inquiry, Methodologies, and Quantitative Skills**  
  STA 135  Introduction to Probability and Statistics  
  CHE 105  Introductory Chemistry  
  or  
  CHE 201  General College Chemistry  
  MAT 150  Algebra and Trigonometry  
  or  
  MAT 250  Calculus and Analytical Geometry I  
• **Social and Self-Awareness and Responsible Citizenship**  
  EDP 260  Psychology of Human Development  
  HIS 221  American Experience to 1865  
  or  
  HIS 222  American Experience since 1865  
• **University Studies Electives**  
  BIO 216  Biological Inquiry and Analysis  
  ENG 224  Writing for the Professions  

Core Courses1 .................................................. 62-65 hrs  
BIO 100T  Transitions  
BIO 115  The Cellular Basis of Life  
BIO 149  Introduction to Wildlife and Conservation Biology  
BIO 221  Zoology: Animal Form and Function  
BIO 222  Botany: Plant Form and Function  
BIO 310  Vertebrate Natural History  
BIO 330  Principles of Ecology  
BIO 333  Genetics  
BIO 380  Wildlife Techniques  
BIO 499  Senior Biology Seminar  
BIO 578  Conservation Biology  
BIO 580  Principles of Wildlife Management  
BIO 584  Wildlife Policy and Administration  
BIO 554  Dendrology and Forest Conservation  
and  
BIO 350  Systematic Botany  
  or  
BIO 553  Field Botany  
and one of the following:  
BIO 382  Scientific Communication for the Biologist  
ENG 324  Technical Writing  
and one of the following:  
BIO 572  Herpetology  
BIO 573  Ornithology  
BIO 574  Mammalogy  
and two of the following:  
AGR 345  Soil Science  
AGR 350  Soil Survey  
AGR 455  Soil Management
CHE 210 Brief Organic Chemistry

CHE 215 Organic Chemistry Laboratory

GSC 199 Earth Science

GSC 314 Sediments and Soils

PHY 130 General Physics I

PHY 131 General Physics I Laboratory

**Conservation Education and Interpretation Track .................. 17 hrs**

EDU 404 Teaching Environmental Education

REC 202 Recreation Program Planning

and a minimum of 13 hours from the following.²

BIO 240 Biological Applications in GIS

BIO 525 Biogeography

BIO 542 Watershed Ecology

BIO 546 Stream Ecology

BIO 561 Freshwater Invertebrates

BIO 563 Aquatic Entomology

BIO 564 Entomology

BIO 568 Wetland Ecology

BIO 570 Ichthyology

BIO 572 Herpetology

BIO 573 Ornithology

BIO 574 Mammalogy

BIO 590 Disturbance Ecology

GSC 202 Introduction to Geographical Information Science

GSC 306 Landscapes of the National Parks

GSC 350 Field Techniques in Geosciences

GSC 512 Remote Sensing

GSC 521 Geographic Information Systems

PLN 507 Land Use Planning

REC 411 Curriculum Development in Adventure Education

REC 450 Recreational Use of Natural Resources

REC 465 Interpretation of Cultural and Natural Resources

**Total Curriculum Requirements ........................................ 121-125 hrs**

¹Meets course requirements for Associate Wildlife Biologist Certification from The Wildlife Society.

²Only one course from BIO 572, 573, and 574 (if not taken as a core course) will count toward this requirement.

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**AREA:** Bachelor of Science/Bachelor of Arts Degree

**Wildlife and Conservation Biology/Conservation Law Enforcement Track**

CIP 03.0601

**University Studies Requirements .................. 42-43 hrs**

(See Academic Degrees and Programs.)

University Studies selections must include:

**• Scientific Inquiry, Methodologies, and Quantitative Skills**

STA 135 Introduction to Probability and Statistics

CHE 105 Introductory Chemistry

or

CHE 201 General College Chemistry

MAT 150 Algebra and Trigonometry

or

MAT 250 Calculus and Analytical Geometry I

**• Social and Self-Awareness and Responsible Citizenship**

CRI 140 Introduction to Criminal Justice

PSY 180 General Psychology

**• University Studies Electives**

BIO 216 Biological Inquiry and Analysis

ENG 224 Writing for the Professions

**Core Courses² .......................................................... 62-65 hrs**

BIO 100T Transitions
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 115</td>
<td>The Cellular Basis of Life</td>
</tr>
<tr>
<td>BIO 149</td>
<td>Introduction to Wildlife and Conservation Biology</td>
</tr>
<tr>
<td>BIO 221</td>
<td>Zoology: Animal Form and Function</td>
</tr>
<tr>
<td>BIO 222</td>
<td>Botany: Plant Form and Function</td>
</tr>
<tr>
<td>BIO 310</td>
<td>Vertebrate Natural History</td>
</tr>
<tr>
<td>BIO 330</td>
<td>Principles of Ecology</td>
</tr>
<tr>
<td>BIO 333</td>
<td>Genetics</td>
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<tr>
<td>BIO 380</td>
<td>Wildlife Techniques</td>
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<tr>
<td>BIO 499</td>
<td>Senior Biology Seminar</td>
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<tr>
<td>BIO 578</td>
<td>Conservation Biology</td>
</tr>
<tr>
<td>BIO 580</td>
<td>Principles of Wildlife Management</td>
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<td>BIO 584</td>
<td>Wildlife Policy and Administration</td>
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<tr>
<td>BIO 554</td>
<td>Dendrology and Forest Conservation</td>
</tr>
<tr>
<td>BIO 350</td>
<td>Systematic Botany</td>
</tr>
<tr>
<td>BIO 553</td>
<td>Field Botany</td>
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<tr>
<td></td>
<td>and one of the following:</td>
</tr>
<tr>
<td>BIO 382</td>
<td>Scientific Communication for the Biologist</td>
</tr>
<tr>
<td>ENG 324</td>
<td>Technical Writing</td>
</tr>
<tr>
<td></td>
<td>and one of the following:</td>
</tr>
<tr>
<td>BIO 572</td>
<td>Herpetology</td>
</tr>
<tr>
<td>BIO 573</td>
<td>Ornithology</td>
</tr>
<tr>
<td>BIO 574</td>
<td>Mammalogy</td>
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<tr>
<td></td>
<td>and two of the following:</td>
</tr>
<tr>
<td>AGR 345</td>
<td>Soil Science</td>
</tr>
<tr>
<td>AGR 350</td>
<td>Soil Survey</td>
</tr>
<tr>
<td>AGR 455</td>
<td>Soil Management</td>
</tr>
<tr>
<td>CHE 210</td>
<td>Brief Organic Chemistry</td>
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<td></td>
<td>and</td>
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<tr>
<td>CHE 215</td>
<td>Organic Chemistry Laboratory</td>
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<tr>
<td>GSC 199</td>
<td>Earth Science</td>
</tr>
<tr>
<td>GSC 314</td>
<td>Sediments and Soils</td>
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<tr>
<td>PHY 130</td>
<td>General Physics I</td>
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<td></td>
<td>and</td>
</tr>
<tr>
<td>PHY 131</td>
<td>General Physics I Laboratory</td>
</tr>
</tbody>
</table>

Conservation Law Enforcement Track ........................................ 17 hrs

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRJ 220</td>
<td>Law Enforcement</td>
</tr>
<tr>
<td>CRJ 300</td>
<td>Crime and Criminals</td>
</tr>
</tbody>
</table>

and a minimum of eleven hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 240</td>
<td>Biological Applications in GIS</td>
</tr>
<tr>
<td>BIO 548</td>
<td>Principles of Managing Diseases in Wildlife</td>
</tr>
<tr>
<td>BIO 570</td>
<td>Ichthyology</td>
</tr>
<tr>
<td>BIO 572</td>
<td>Herpetology</td>
</tr>
<tr>
<td>BIO 573</td>
<td>Ornithology</td>
</tr>
<tr>
<td>BIO 574</td>
<td>Mammalogy</td>
</tr>
<tr>
<td>BIO 581</td>
<td>Applied Wildlife Economics, Policy, and Administration</td>
</tr>
<tr>
<td>BIO 582</td>
<td>Fisheries Management</td>
</tr>
<tr>
<td>CRJ 240</td>
<td>Corrections</td>
</tr>
<tr>
<td>CRJ 346</td>
<td>Crime Investigation</td>
</tr>
<tr>
<td>CRJ 365</td>
<td>Interviewing and Interrogation</td>
</tr>
<tr>
<td>CRJ 445</td>
<td>Criminal Justice Diversity</td>
</tr>
<tr>
<td>GSC 202</td>
<td>Introduction to Geographical Information Science</td>
</tr>
<tr>
<td>REC 465</td>
<td>Interpretation of Cultural and Natural Resources</td>
</tr>
</tbody>
</table>

Total Curriculum Requirements ............................................. 121-125 hrs

1Meets course requirements for Associate Wildlife Biologist Certification from The Wildlife Society.
2Only one course from BIO 572, 573, and 574 (if not taken as a core course) will count toward this requirement.
University Studies Requirements ........................................ 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

- **Scientific Inquiry, Methodologies, and Quantitative Skills**
  - STA 135 Introduction to Probability and Statistics
  - CHE 105 Introductory Chemistry
    or
  - CHE 201 General College Chemistry
  - MAT 150 Algebra and Trigonometry
    or
  - MAT 250 Calculus and Analytical Geometry

- **Social and Self-Awareness and Responsible Citizenship**
  - ECO 231 Principles of Microeconomics

- **University Studies Electives**
  - BIO 216 Biological Inquiry and Analysis
  - ENG 224 Writing for the Professions

Core Courses .......................................................... 62-65 hrs

- BIO 100T Transitions
- BIO 115 The Cellular Basis of Life
- BIO 149 Introduction to Wildlife and Conservation Biology
- BIO 221 Zoology: Animal Form and Function
- BIO 222 Botany: Plant Form and Function
- BIO 310 Vertebrate Natural History
- BIO 330 Principles of Ecology
- BIO 333 Genetics
- BIO 380 Wildlife Techniques
- BIO 499 Senior Biology Seminar
- BIO 578 Conservation Biology
- BIO 580 Principles of Wildlife Management
- BIO 584 Wildlife Policy and Administration
- BIO 554 Dendrology and Forest Conservation
  and
- BIO 350 Systematic Botany
  or
- BIO 553 Field Botany
  and one of the following:
- BIO 382 Scientific Communication for the Biologist
- ENG 324 Technical Writing
  and one of the following:
- BIO 572 Herpetology
- BIO 573 Ornithology
- BIO 574 Mammalogy
  and two of the following:
- AGR 345 Soil Science
- AGR 350 Soil Survey
- AGR 455 Soil Management
- CHE 210 Brief Organic Chemistry
  and
- CHE 215 Organic Chemistry Laboratory
- GSC 199 Earth Science
- GSC 314 Sediments and Soils
- PHY 130 General Physics I
  and
- PHY 131 General Physics I Laboratory

**Wildlife Biology Track** ............................................ 17 hrs

- GSC 202 Introduction to Geographical Information Science

and a minimum of 13 hours from the following:

- AGR 240 Crop Science
BIO 240 Biological Applications in GIS  
BIO 320 Comparative Vertebrate Anatomy  
BIO 525 Biogeography  
BIO 548 Principles of Managing Diseases in Wildlife  
BIO 568 Wetland Ecology  
BIO 570 Ichthyology  
BIO 572 Herpetology  
BIO 573 Ornithology  
BIO 574 Mammalogy  
BIO 577 Population and Conservation Genetics  
BIO 581 Applied Wildlife Economics, Policy, and Administration  
BIO 582 Fisheries Management  
EDU 404 Teaching Environmental Education  
GSC 312 Introduction to Remote Sensing  
GSC 512 Remote Sensing  
GSC 521 Geographic Information Systems  
MAT 554 Statistical Methods  
PLN 507 Urban and Regional Land Use Planning  
REC 465 Interpretation of Cultural and Natural Resources  

**Total Curriculum Requirements ..................................... 121-125 hrs**  
1 Meets course requirements for Associate Wildlife Biologist Certification from The Wildlife Society.  
2 Only one course from BIO 570, 572, 573, and 574 (if not taken as a core course) will count toward this requirement.  

**AREA:** Bachelor of Science/Bachelor of Arts Degree  
**Wildlife and Conservation Biology/Zoological Conservation Track**  
**CIP 03.0601**  

**University Studies Requirements .......................... 42-43 hrs**  
(See Academic Degrees and Programs.)  

University Studies selections must include:  

**• Scientific Inquiry, Methodologies, and Quantitative Skills**  
STA 135 Introduction to Probability and Statistics  
CHE 105 Introductory Chemistry  
CHE 201 General College Chemistry  
MAT 150 Algebra and Trigonometry  
MAT 250 Calculus and Analytical Geometry I  

**• University Studies Electives**  
BIO 216 Biological Inquiry and Analysis  
ENG 224 Writing for the Professions  

**Core Courses** .......................................................... 62-65 hrs  
BIO 100T Transitions  
BIO 115 The Cellular Basis of Life  
BIO 149 Introduction to Wildlife and Conservation Biology  
BIO 221 Zoology: Animal Form and Function  
BIO 222 Botany: Plant Form and Function  
BIO 310 Vertebrate Natural History  
BIO 330 Principles of Ecology  
BIO 333 Genetics  
BIO 380 Wildlife Techniques  
BIO 499 Senior Biology Seminar  
BIO 578 Conservation Biology  
BIO 580 Principles of Wildlife Management  
BIO 584 Wildlife Policy and Administration  
BIO 554 Dendrology and Forest Conservation  

and  

BIO 577 Population and Conservation Genetics  
BIO 581 Applied Wildlife Economics, Policy, and Administration  

**and one of the following:**  
BIO 382 Scientific Communication for the Biologist  
ENG 324 Technical Writing
and one of the following:
BIO 572 Herpetology
BIO 573 Ornithology
BIO 574 Mammalogy

and two of the following:
AGR 345 Soil Science
AGR 350 Soil Survey
AGR 455 Soil Management
CHE 210 Brief Organic Chemistry
CHE 215 Organic Chemistry Laboratory
GSC 199 Earth Science
GSC 314 Sediments and Soils
PHY 130 General Physics I
PHY 131 General Physics I Laboratory

Zoological Biology Track......................................................... 17 hrs
AGR 300 Principles of Animal Nutrition
AGR 310 Applications in Animal Technology
AGR 322 Veterinary Laboratory Principles
EDU 404 Teaching Environmental Education

and a minimum of seven hours from the following:²
AGR 324 Veterinary Diagnostic Imaging
AGR 329 Veterinary Hematology and Microbiology
AGR 332 Veterinary Nursing
BIO 240 Biological Applications in GIS
BIO 300 Introductory Microbiology
BIO 322 Animal Physiology
BIO 467 General Parasitology
BIO 538 Animal Behavior
BIO 539 Animal Behavior Laboratory
BIO 548 Principles of Managing Diseases in Wildlife
BIO 570 Ichthyology
BIO 572 Herpetology
BIO 573 Ornithology
BIO 574 Mammalogy
BIO 577 Population and Conservation Genetics
REC 465 Interpretation of Cultural and Natural Resources

Total Curriculum Requirements ............................................. 121-125 hrs
¹Meets course requirements for Associate Wildlife Biologist Certification from The Wildlife Society.
²Only one course from BIO 572, 573, and 574 (if not taken as a core course) will count toward this requirement.

Biology Minor........................................................................... 21 hrs
Complete BIO 115, 216, and either 221 or 222 (or both). A maximum of three hours total from BIO 483, 484, 491, 492, 493, or 494 may be used. Remaining BIO hours should be chosen with advisor’s approval (BIO 330 and 333 are highly recommended). BIO 101, 488, 489, and 499 will not count toward this minor. Six hours must be upper-level (300 and greater) courses.

Pre-Pharmacy Curriculum¹
Required Courses ................................................................. 58 hrs
BIO 221 Zoology: Animal Form and Function²
BIO 227 Human Anatomy
BIO 228 Human Anatomy Laboratory
BIO 300 Introductory Microbiology
CHE 201 General College Chemistry²
CHE 202 General Chemistry and Qualitative Analysis²
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 325 Organic Chemistry II Laboratory
ECO 231 Principles of Microeconomics²
ENG 105 Reading, Writing and Inquiry²
ENG 204 Advanced Expository Writing²
MAT 250 Calculus and Analytic Geometry I²
PHY 130 General Physics I²
PHY 131 General Physics I Laboratory
PHY 132 General Physics II
PHY 133 General Physics II Laboratory
STA 135 Introduction to Probability and Statistics

Elective hours:
Cross-cultural (3) General electives (4) Humanities (6) Social and Self-Awareness and Responsible Citizenship (3)

Total Curriculum Requirements ........................................ 74 hrs

1 The above program is based on the current admission requirements of the College of Pharmacy, University of Kentucky. Other colleges of pharmacy will have somewhat different requirements from those listed above. The curriculum can be modified to meet the requirements of most professional programs. Pre-pharmacy students desiring a four year program to receive the B.S. degree should follow the pre-medicine track and include all the courses listed above. The pre-pharmacy advisor should be consulted.
2 May be used to fulfill University Studies requirements if completing a B.A. or B.S. degree.
3 A course focusing on the study of a developing or non-Western country.
4 Must be a two-course series.

Graduate Program

Graduate Coordinator - Michael Flinn

The Department of Biological Sciences offers the Master of Science degree. The M.S. program is designed to prepare the student to assume an active career in teaching and/or research or to pursue further graduate studies.

Requirements for Admission

Applicants must meet the Murray State University requirements (see Graduate Admissions). A faculty member must agree to mentor the student. Additional requirements for unconditional and conditional admission are as follows.

Unconditional

• Undergraduate courses in botany, zoology, ecology, and genetics.
• Eight undergraduate hours in chemistry.
• Composite GRE score of 300 (V+Q) or higher on current scale or 1,000 (V+Q) or higher on prior scale.

Conditional

Recommendation of the advisory committee.

Master of Science: Biology  CIP 26.0101

Within the guidelines, the individual’s program is developed by an advisory committee to ensure proficiency in the basic areas of zoology, botany, ecology and genetics. The thesis track is strongly recommended for anyone considering further research or graduate activities.

THESIS REQUIREMENTS

Total Course Requirements ............................................. 30 hours
BIO 689 Introduction to Graduate Study
BIO 696 Understanding Scientific Communication
BIO 697 Seminar
BIO 698-699 Thesis
BIO 600-level and above courses (9-20 hrs)
Graduate advisor/committee approved courses in related fields (0-11 hrs)

Other Degree Requirements
• Proficiency in quantitative methods through MAT 665 or a graduate course in bioinformatics, such as BIO 657.
• A preliminary examination will be given in the student’s first semester to assess the student’s understanding of principles across the diverse disciplines of biology.
• Oral defense of thesis.

NON-THESIS REQUIREMENTS

Total Course Requirements ............................................. 36 hours
BIO 689 Introduction to Graduate Study
BIO 696 Understanding Scientific Communication
BIO 697 Seminar
BIO 600-level and above courses (16-32 hrs)
Graduate advisor/committee approved courses in related fields (0-16 hrs)

Other Degree Requirements
Proficiency in quantitative methods through STA 665 or a graduate course in bioinformatics, such as BIO 657.
A preliminary examination will be given in the student’s first semester to assess the student’s understanding of principles across the diverse disciplines of biology.

**Optional Degree Requirement**  
BIO 695 Biological Research (4) with prior approval of the research topic by the student’s graduate committee; results to be presented while enrolled in BIO 697. Research credits can be counted toward the 36-hour requirement.

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**Master of Science: Biology/Watershed Science Concentration**  
CIP 26.0101

<table>
<thead>
<tr>
<th>Total Course Requirements</th>
<th>30 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Courses</strong></td>
<td>10 hours</td>
</tr>
<tr>
<td>BIO 642 Watershed Ecology</td>
<td></td>
</tr>
<tr>
<td>(same as GSC 642)</td>
<td></td>
</tr>
<tr>
<td>BIO 689 Introduction to Graduate Study</td>
<td></td>
</tr>
<tr>
<td>BIO 696 Understanding Scientific Communication</td>
<td></td>
</tr>
<tr>
<td>BIO 697 Seminar</td>
<td></td>
</tr>
<tr>
<td>BIO 698-699 Thesis</td>
<td></td>
</tr>
</tbody>
</table>

**Restricted Electives**  
17 hours  
*Courses must be approved by the advisory committee and represent at least two disciplines, one of which must be BIO.*

- AGR 674 Agricultural Irrigation and Water Systems
- BIO 625 Biogeography
- BIO 630 Animal Ecology
- BIO 631 Plant Ecology
- BIO 632 Quantitative Ecology
- BIO 646 Stream Ecology
- BIO 661 Freshwater Invertebrates
- BIO 663 Aquatic Entomology
- BIO 668 Wetland Ecology
- BIO 669 Biological Limnology
- BIO 670 Limnological Analysis Laboratory
- BIO 671 Ichthyology
- BIO 672 Herpetology
- BIO 678 Conservation Biology
- BIO 682 Waterfowl Management
- BIO 683 Fisheries Management
- BIO 686 Limnology
- BIO 687 Freshwater Biology
- BIO 688 Reservoir Ecology
- BIO 690 Disturbance Ecology
- CET 655 Environmental Regulatory Affairs
- CET 681 Pollution Assessment and Control
- CET 685 Remediation Technology
- CHE 613 Environmental Chemistry
- CHE 617 Advanced Organic Chemistry
- CHE 627 Chemical Separations
- CHE 628 Mass Spectrometry
- CHE 665 Biogeochemistry
- GSC 612 Remote Sensing
- GSC 621 Geographic Information Systems
- GSC 640 Advanced Remote Sensing
- GSC 641 Digital Image Processing Research
- GSC 662 Hydrogeology
- GSC 665 Physical/Chemical Limnology
- GSC 680 Advanced Geographic Information Systems

**Other Degree Requirements**  
Successful completion of STA 665.

Written and oral comprehensive examinations as specified by the advisory committee in broad aspects of watershed science and area of concentration (usually taken in third semester of residence).  
Defense of thesis.
Master of Arts in Education: Secondary Teacher Leader with Biology Concentration  

The Department of Biological Sciences provides instruction in support of the M.A.Ed. in Secondary Teacher Leader with a concentration in biology. Prospective students should contact the graduate coordinator in the College of Education and Human Services for details on advising and graduate program design.

Department of Chemistry  
1201 Jesse D. Jones Hall  
270-809-2584

Chair: Harry Fannin. Faculty: Allenbaugh, Clear, Cox, Fannin, Fawzy, Johnson, Loganathan, McCreary, Miller, Revell, Subbedi, Volp, Whittaker.

The Department of Chemistry is certified by the American Chemical Society’s Committee on Professional Training. The department offers an area in chemistry or a major with tracks in biochemistry, forensics, polymer and materials science, pre-medical, pre-dental, pre-pharmacy, pre-MBA, or teacher certification.

The chemistry area program is designed for students planning careers in engineering, the chemical industry, or for those who plan to pursue graduate study following the baccalaureate degree. Upon completion of this program, graduates are certified as professional chemists. Alumni with the area are well prepared to succeed in nationally recognized Ph.D. programs in chemistry.

The chemistry major program is recommended for students planning careers in medicine, dentistry, veterinary medicine, pharmacy, secondary education, toxicology, or biochemistry.

The department offers a minor in chemistry as well as a Master of Science in Chemistry. Murray State has nationally recognized chemistry student organizations, the Student Members of the American Chemical Society, the Forensic Science Student Association, and a national chemistry honor society-Gamma Sigma Epsilon.

The department is closely aligned with the Chemical Services Laboratory (CSL), the Watershed Studies Institute (WSI), and efforts to enhance environmental and biomedical sciences at Murray State University.

An excellent undergraduate research program is maintained that allows students to become involved in research projects during their first semester at MSU or later if they so desire. Students present posters or talks each semester at local and/or national meetings.

Students interested in chemistry, should contact the chair of the Department of Chemistry, Murray State University, 1201 Jesse D. Jones Hall, Murray, KY 42071-3300, Phone: (270) 809-2584 Fax: (270) 809-6474, or visit our website at www.murraystate.edu/chemistry.

AREA:  
Bachelor of Science/Bachelor of Arts Degree  
Chemistry  
ACCREDITED BY: American Chemical Society

University Studies Requirements ................................................................. 43-46 hrs  
(See Academic Degrees and Programs.)

University Studies selections must include:  
• Scientific Inquiry, Methodologies, and Quantitative Skills  
  MAT 250 Calculus and Analytic Geometry I
  PHY 235 Mechanics, Heat and Wave Motion
  PHY 236 Mechanics, Heat and Wave Motion Lab
  PHY 255 Electricity, Magnetism and Light
  PHY 256 Electricity, Magnetism and Light Lab

Required Courses ...................................................................................... 65 hrs  
CHE 100T Transitions
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 325 Organic Chemistry II Laboratory
CHE 400 Chemical Literature
CHE 401 Ethics for the Chemist
CHE 410 Physical Chemistry I
CHE 420 Physical Chemistry II
CHE 509 Advanced Inorganic Chemistry I
CHE 510 Inorganic Chemistry Laboratory
CHE 519 Instrumental Analysis
CHE 530 Fundamentals of Biochemistry I
CHE 576 Polymer Chemistry
CSC 235 Programming in C++
MAT 308 Calculus and Analytic Geometry II
MAT 309 Calculus and Analytic Geometry III

Required Limited Electives\(^3\) .................................................. 3 hrs
CHE 488 Cooperative Education/Internship
or
CHE 495 Senior Research

Unrestricted Electives .......................................................... 6-9 hrs

Total Curriculum Requirements ........................................ 120 hrs

\(^1\)Required for area if not taken as a University Studies elective.

\(^2\)CSC 232 or EGR 140 may be substituted.

\(^3\)In conjunction with this program it is possible through careful course selection to obtain an M.S. degree with one additional year of study following the awarding of the B.S. degree. Students interested in this M.S. concentration should contact the graduate coordinator in the department no later than during the junior year.

MAJOR:
Bachelor of Science/Bachelor of Arts Degree
Chemistry

University Studies Requirements ......................... 41-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  MAT 250 Calculus and Analytic Geometry I\(^1\)
  PHY 130 General Physics I \(^1\) and
  PHY 131 General Physics I Laboratory\(^1\)
  PHY 132 General Physics II \(^1\) and
  PHY 133 General Physics II Laboratory\(^1\)

Required Courses ............................................................ 35 hrs
CHE 100T Transitions
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 352 Basic Chemical Instrumentation
CHE 403 Basic Physical Chemistry
CSC 235 Programming in C++\(^2\)

Required Limited Electives ........................................ 3 hrs
CHE 488 Cooperative Education/Internship
or
CHE 495 Senior Research

Required Minor ............................................................ 21 hrs

Electives\(^3\) ........................................................................ 17-20 hrs

Total Curriculum Requirements ...................................... 120 hrs

\(^1\)Required for major if not taken as a University Studies elective.

\(^2\)CSC 232 or EGR 140 may be substituted.

\(^3\)At least one three-hour free elective must be chosen from outside Chemistry and may not be counted as a University Studies requirement.
MAJOR:
Chemistry/Secondary Certification (Grades 8-12) Track

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501

NOTE: Requirements for teacher certification are established by the Kentucky Education Professional Standards Board. Students are cautioned that requirements may change. For current information, students should check with an advisor in the Department of Adolescent, Career and Special Education.

University Studies Requirements ............................................. 41-50 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• Scientific Inquiry, Methodologies, and Quantitative Skills
  MAT 250 Calculus and Analytic Geometry
  PHY 130 General Physics I \(^1\) and
  PHY 131 General Physics I Laboratory\(^1\)
  PHY 132 General Physics II \(^1\) and
  PHY 133 General Physics II Laboratory\(^1\)

• Social and Self-Awareness and Responsible Citizenship
  EDP 260 Psychology of Human Development\(^2\)

• University Studies Electives
  CSC 199 Introduction to Information Technology\(^3\), \(^4\)
  EDU 103 Issues and Practices of American Education\(^2\)
  Note: Certification requires a grade of B or better in one English composition course and a B or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

Required Courses ............................................................... 30 hrs
CHE 100T Transitions
CHE 120 Chemical Laboratory Safety
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 403 Basic Physical Chemistry

Required Limited Electives ................................................... 3-4 hrs
Select from the following:
CHE 330 Basic Biochemistry
CHE 352 Basic Chemical Instrumentation
CHE 504 Fundamentals of Toxicology
CHE 513 Environmental Chemistry

Secondary Certification Courses ........................................... 33 hrs
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education\(^5\)
REA 427 Teaching Content Area Literacy in the Secondary School
SEC 420 Practicum in Secondary Schools\(^5\)
SEC 421 Student Teaching in the Secondary School
SEC 422 Extended Practicum\(^5\)
SED 300 Educating Students with Disabilities

Required Minor ....................................................................... 21 hrs

Total Curriculum Requirements ........................................... 128-137 hrs

\(^1\)Required for major if not taken as a University Studies elective. Students pursuing a Physics minor may substitute PHY 235/236 and 255/256 for PHY 130/131 and 132/133.

\(^2\)Required for secondary certification if not taken as a University Studies elective.

\(^3\)May substitute CSC 232 or EGR 140, but these will not count for University Studies electives.

\(^4\)With a grade of C or better.

\(^5\)EDU 405 and SEC 420 must be taken together and two semesters before student teaching.

\(^6\)Must be taken one semester before student teaching.
Chemistry Teaching Specialization

The teaching specialization in chemistry is a path to secondary certification in chemistry, designed to accompany certification in another science content area. (All College of Education and Human Services secondary certification course requirements must be met.) The teaching specialization in chemistry meets and exceeds Murray State University’s requirements for a minor in chemistry. **Note:** Even though this program exceeds Murray State University’s requirements for a chemistry minor, in order for a chemistry minor to appear on a transcript, a minor must be declared, and all residential and graduation requirements must be met.

Requirements for teacher certification are established by the Kentucky Education Professional Standards Board. Students are cautioned that changes in these requirements may occur. Therefore, for the most current information, students should check with an advisor in the College of Education and Human Services.

Chemistry Teaching Specialization ........................................ 24 hrs
CHE 120 Chemical Laboratory Safety
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
*Choose one elective from the following:*
CHE 320 Organic Chemistry II
CHE 352 Basic Chemical Instrumentation
CHE 330 Basic Biochemistry
CHE 403 Basic Physical Chemistry

MAJOR: Bachelor of Science/Bachelor of Arts Degree
Chemistry/Pre-Medical/Pre-Dental Track
CIP 40.0501

University Studies Requirements ......................... 41-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
*Scientific Inquiry, Methodologies, and Quantitative Skills*
MAT 250 Calculus and Analytic Geometry I
PHY 130 General Physics I
PHY 131 General Physics I Laboratory
PHY 132 General Physics II
PHY 133 General Physics II Laboratory

Required Courses ..................................................... 38 hrs
CHE 100T Transitions
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 352 Basic Chemical Instrumentation
CHE 403 Basic Physical Chemistry
CHE 530 Fundamentals of Biochemistry I
CSC 235 Programming in C++
ENG 204 Advanced Expository Writing
or
ENG 324 Technical Writing

Required Minor3 ..................................................... 21 hrs

Unrestricted Electives ............................................... 17-20 hrs

Total Curriculum Requirements ......................... 120 hrs

1 Required for major if not taken as a University Studies elective.
2 CSC 232 or EGR 140 may be substituted.
3 Biology minor strongly recommended.
MAJOR:  
Chemistry/Biochemistry Track  
Bachelor of Science/Bachelor of Arts Degree  
CIP 40.0501

University Studies Requirements ................................. 41-44 hrs  
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  MAT  250  Calculus and Analytic Geometry I  
  PHY  130  General Physics I and  
  PHY  131  General Physics I Laboratory  
  PHY  132  General Physics II and  
  PHY  133  General Physics II Laboratory  

Required Courses ..................................................... 44 hrs  
CHE  100T  Transitions  
CHE  201  General College Chemistry  
CHE  202  General Chemistry and Qualitative Analysis  
CHE  305  Analytical Chemistry  
CHE  312  Organic Chemistry I  
CHE  320  Organic Chemistry II  
CHE  352  Basic Chemical Instrumentation  
CHE  403  Basic Physical Chemistry  
CHE  530  Fundamentals of Biochemistry I  
CHE  537  Experimental Biochemistry  
CHE  540  Fundamentals of Biochemistry II  
CSC  235  Programming in C++

Required Minor* ...................................................... 21 hrs

Electives ........................................................................ 11-14 hrs

Total Curriculum Requirements ..................................... 120 hrs

1Required for major if not taken as a University Studies elective.
2CSC 232 or EGR 140 may be substituted.
3Biology minor is strongly recommended.

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MAJOR:  
Chemistry/Forensics Track  
Bachelor of Science/Bachelor of Arts Degree  
CIP 40.0501

University Studies Requirements ................................. 41-44 hrs  
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  MAT  250  Calculus and Analytic Geometry I  
  PHY  130  General Physics I and  
  PHY  131  General Physics I Laboratory  
  PHY  132  General Physics II and  
  PHY  133  General Physics II Laboratory  

Required Courses ..................................................... 34 hrs  
CHE  100T  Transitions  
CHE  201  General College Chemistry  
CHE  202  General Chemistry and Qualitative Analysis  
CHE  305  Analytical Chemistry  
CHE  312  Organic Chemistry I  
CHE  320  Organic Chemistry II  
CHE  325  Organic Chemistry II Laboratory  
CHE  403  Basic Physical Chemistry I  
CSC  235  Programming in C++

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Required Limited Electives .................................................. 10 hrs
ARC  335  Forensic Archaeology
CHE  330  Basic Biochemistry
CHE  352  Basic Chemical Instrumentation

Criminal Justice Minor1 .................................................... 21 hrs
CRI 220, 333, and 346 are required selections.

Unrestricted Electives .................................................... 11-14 hrs

Total Curriculum Requirements ...................................... 120 hrs

1Required for major if not taken as a University Studies elective.
2CSC 232 or EGR 140 may be substituted.
3A second major in Criminal Justice can substitute for the minor.

MAJOR:
Chemistry/Polymer and Materials Science Track
Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501

University Studies Requirements .................................... 38-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• Scientific Inquiry, Methodologies, and Quantitative Skills
  MAT  250  Calculus and Analytic Geometry I1
  PHY  235  Mechanics, Heat and Wave Motion1
  PHY  236  Mechanics, Heat and Wave Motion Laboratory1
  PHY  255  Electricity, Magnetism and Light1
  PHY  256  Electricity, Magnetism and Light Laboratory1

Required Courses ........................................................... 51 hrs
CHE  100T  Transitions
CHE  201  General College Chemistry
CHE  202  General Chemistry and Qualitative Analysis
CHE  305  Analytical Chemistry
CHE  312  Organic Chemistry I
CHE  320  Organic Chemistry II
CHE  352  Basic Chemical Instrumentation
CHE  503  Industrial Chemistry
CHE  576  Polymer Chemistry
CSC  235  Programming in C++2
EGR  240  Thermodynamics I
EGR  375  Materials Science
MAT  308  Calculus and Analytic Geometry II
PHY  370  Introduction to Modern Physics

Required Limited Electives .............................................. 3 hrs
CHE  488  Cooperative Education/Internship
   or
CHE  495  Senior Research

Required Minor3 ............................................................ 11-21 hrs

Unrestricted Electives .................................................... 1-17 hrs

Total Curriculum Requirements .................................... 120 hrs

1Required for major if not taken as a University Studies elective.
2CSC 232 or EGR 140 may be substituted.
3PHY 235, 236, 255, and 256 count toward a physics minor, with 11 additional hours remaining; otherwise, 21 hours are required to complete a minor.
MAJOR: Chemistry/Pre-Pharmacy Track

University Studies Requirements ........................................... 41-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**
MAT 250 Calculus and Analytic Geometry I
PHY 130 General Physics I
PHY 131 General Physics I Laboratory
PHY 132 General Physics II
PHY 133 General Physics II Laboratory

**Social and Self-Awareness and Responsible Citizenship**
ECO 231 Principles of Microeconomics

Required Courses ......................................................................... 46 hrs
CHE 100T Transitions
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 325 Organic Chemistry II Laboratory
CHE 330 Basic Biochemistry
CHE 352 Basic Chemical Instrumentation
CHE 403 Basic Physical Chemistry I
CSC 235 Programming in C++
STA 135 Introduction to Probability and Statistics

Required Minor* ........................................................................ 21 hrs

Unrestricted Electives ................................................................. 9-12 hrs

Total Curriculum Requirements ................................................... 120 hrs
*Colleges of pharmacy will have somewhat different requirements from those listed above. The curriculum can be modified to meet the requirements of most professional programs.
1Required for major if not taken as a University Studies elective.
2CSC 232 or EGR 140 may be substituted.
3Biology minor is strongly recommended.

MAJOR: Chemistry/Pre-MBA Track

University Studies Requirements ........................................... 41-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**
MAT 250 Calculus and Analytic Geometry I
PHY 130 General Physics I
PHY 131 General Physics I Laboratory
PHY 132 General Physics II
PHY 133 General Physics II Laboratory

**Social and Self-Awareness and Responsible Citizenship**
ECO 230 Principles of Macroeconomics

Required Courses ......................................................................... 35 hrs
CHE 100T Transitions
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
CHE 305 Analytical Chemistry
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501
CHE  352  Basic Chemical Instrumentation  
CHE  403  Basic Physical Chemistry  
CSC  235  Programming in C++  

**Required Business Courses/Minor**  
ACC  200  Principles of Financial Accounting  
ACC  201  Principles of Managerial Accounting  
BUS  355  Information Systems and Decision Making  
CIS  443  Business Statistics III  
ECO  231  Principles of Microeconomics  
FIN  330  Principles of Finance  
MGT  350  Fundamentals of Management  
MKT  360  Principles of Marketing  

**Unrestricted Electives**  

**Total Curriculum Requirements**  

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1Required for major if not taken as a University Studies elective.  
2CSC 232 or EGR 140 may be substituted.  
3Even though this program exceeds Murray State University’s requirements for a business administration minor, for a business administration minor to appear on a transcript, a minor must be declared, and all residential and graduation requirements must be met.

**Chemistry Minor**  
CHE 201, 202 and electives selected from the following chemistry courses: 305, 312, 320, 325, 352, 400, 401, 403, 410, 420, 488, 495, and 330 or 530, but not both. A maximum of three hours may be counted from CHE 488. At least 21 hours is required. Six hours must be 300-level or above courses.

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**Graduate Programs**

Graduate Coordinator - Rachel Allenbaugh

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**Master of Science: Chemistry**

CIP 40.0501

**Requirements for Admission**

Applicants must meet the Murray State University requirements (see Graduate Admissions). Additional information regarding unconditional and conditional admission is given below.

**Unconditional**

To qualify for unconditional admission, an applicant must have:
1. an undergraduate degree in chemistry;  
2. an overall undergraduate GPA of 3.0/4.0 or higher;  
3. minimum GRE scores of: 140 verbal, 150 quantitative, 2.5 analytical writing;  
4. for international students, minimum scores of: TOEFL 527, iBT TOEFL 71, with no band less than 16, or IELTS 6.0 with no band less than 5.0.  
If the undergraduate degree does not conform to an ACS-certified program, students may be required to correct any deficiency in their undergraduate preparation.

**Conditional**

In exceptional cases (such as extensive work or research experience), students falling slightly below one of the unconditional admission benchmarks may still be considered for conditional admission. Applicants with TOEFL scores between 500 and 526 may be admitted on a conditional basis, but their proficiency in English will be further evaluated upon their arrival on campus, and they may be required to undertake additional study of English prior to beginning graduate work in chemistry.

**THESIS REQUIREMENTS**

**Total Course Requirements**  

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CHE  601  Seminar  
CHE  602  Seminar  
CHE  609  Advanced Inorganic Chemistry I  
CHE  617  Advanced Organic Chemistry  
CHE  681  Advanced Physical Chemistry  

Research and Other Requirements  
CHE  698-699** Thesis Research  
600-level courses (13 hrs) (Up to six hours may be selected from courses other than CHE.)  

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1Each student is required to prepare and present one seminar based on a thorough search of the chemical literature and one based on the student’s thesis research.
Other Degree Requirements
Successful completion of an advanced instrumental analysis course (CHE 619 or equivalent).
Submission and defense of a satisfactory thesis.

**NON-THESIS REQUIREMENTS**

**Total Course Requirements** ............................................ 36 hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHE 601</td>
<td>Seminar</td>
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<tr>
<td>CHE 602</td>
<td>Seminar</td>
<td>2</td>
</tr>
<tr>
<td>CHE 609</td>
<td>Advanced Inorganic Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHE 617</td>
<td>Advanced Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHE 681</td>
<td>Advanced Physical Chemistry</td>
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</tr>
<tr>
<td>600-level courses (22 hrs)</td>
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</tr>
</tbody>
</table>

(Up to nine hours may be selected from courses other than CHE.)

1CHE 691, 692, and 693 will not count toward completion of this degree.
2Each student is required to prepare and present two seminars based on a thorough search of the chemical literature.

Other Degree Requirements
Successful completion of an advanced instrumental analysis course (CHE 619 or equivalent).
CHE 600-level electives to total 36 hours.

**Master of Arts in Education: Secondary Teacher Leader with Chemistry Concentration**

The Department of Chemistry provides instruction in support of the M.A.Ed. in Secondary Teacher Leader with a concentration in chemistry. Prospective students should contact the graduate coordinator in the College of Education and Human Services for details on advising and graduate program design.

**Master of Science: Chemical Manufacturing Management**

This program has been suspended and no new students are being admitted. For current program information, contact the chair of the department.

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**Department of Geosciences**

334 Blackburn Science Building
270-809-2591

**Chair:** Robin Zhang. **Faculty:** Casey, Cetin, El-Masri, Hong, Ortmann, Stinchcomb, Zhang.

An area in geoscience with tracks in earth science, earth science teacher certification, environmental geology, geoarchaeology, and geographic information science are provided by the department faculty. Minors are offered in anthropology, archaeology, earth science, environmental geology, and geographic information science. An M.S. in Geosciences may also be earned.

In addition to the more traditional curricula, geosciences students have access to the Murray State Archaeology Lab, a summer field archaeology school, and the Mid-America Remote sensing Center (MARC), a core entity in the Murray State University Watershed Studies Institute (WSI).

Geosciences majors are encouraged to participate in internships and cooperative education experiences. Graduates have outstanding opportunities for employment as archaeologists, planners, cartographers, environmental geologists, remote sensing/GIS professionals, and other mapping science positions in business, government, and education.

**AREA:**

**Geoscience/Earth Science Track**

University Studies Requirements ........................................ 38-43 hrs
(See Academic Degrees and Programs.)

**Required Courses** .................................................... 46 hrs

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<td>ARC 150</td>
<td>Introduction to Archaeology¹</td>
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<td>AST 115</td>
<td>Introductory Astronomy</td>
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<td>AST 116</td>
<td>Introductory Astronomy Laboratory</td>
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<td>GSC 100T</td>
<td>Transitions</td>
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<td>GSC 101</td>
<td>The Earth and the Environment²</td>
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<tr>
<td>GSC 102</td>
<td>Earth through Time²</td>
<td></td>
</tr>
<tr>
<td>GSC 110</td>
<td>World Geography¹</td>
<td></td>
</tr>
</tbody>
</table>
Science, Engineering and Technology

**GSC 125 Weather and Climate**
**GSC 202 Introduction to Geographic Information Sciences**
**GSC 301 Understanding Scientific Communication**
**GSC 303 Introduction to Water Science**
**GSC 305 Introduction to Cartography**
**GSC 312 Introduction to Remote Sensing**
**GSC 336 Principles of Geomorphology**
**GSC 339 Field Geology**

*or*

**GSC 350 Field Techniques in Geosciences**

**Required Limited Electives** ......................................................... 9-10 hrs

Choose from the following approved electives:

**BIO 101 Biological Concepts**
**BIO 112 Field Biology**
**CHE 105 Introductory Chemistry**
**CHE 201 General College Chemistry**
**GSC 210 Hydrology**
**GSC 306 Landscapes of the National Parks**
**GSC 310 Rock and Mineral Resources**
**GSC 314 Sediments and Soils**
**GSC 330 Economic Geography**
**GSC 390 Geoarchaeology**
**GSC 424 Conservation and Environmental Geosciences**
**GSC 489 Cooperative Education/Internship**
**GSC 507 Land Use Planning**
**GSC 512 Remote Sensing**
**GSC 521 Geographic Information Systems**
**GSC 522 Digital Cartography**
**GSC 562 Hydrogeology**
**GSC 591 Special Problems**
**GSC 592 Special Problems**
**GSC 593 Special Problems**
**PHY 235 Mechanics, Heat and Wave Motion**
**PHY 236 Mechanics, Heat and Wave Motion Laboratory**

**Collateral requirement** ............................................................. 8 hrs

**MAT 150** (or above)
**CSC 101**<sup>3</sup> or **CSC 199**

**Unrestricted Electives** ............................................................. 13-19 hrs

**Total Curriculum Requirements** ............................................... 120 hrs

1 Will count towards University Studies Global Awareness, Cultural Diversity, and the World's Artistic Tradition requirements.
2 Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.
3 This is a University Studies electives writing-intensive or technology-intensive course.

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**AREA:** Bachelor of Science Degree

**Geoscience/Earth Science Secondary Certification Track (Grades 8-12)**

**Unrestricted Electives** ............................................................. 13-19 hrs

**Total Curriculum Requirements** ............................................... 120 hrs

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**University Studies Requirements** ............................................. 44 hrs

(See **Academic Degrees and Programs**.)

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**
**GSC 101 The Earth and the Environment**
**GSC 102 Earth through Time**
**MAT 150 Algebra and Trigonometry**

**Global Awareness, Cultural Diversity and the World’s Artistic Traditions**
**GSC 110 World Geography**

**Social and Self-Awareness and Responsible Citizenship**
**EDP 260 Psychology of Human Development**

**University Studies Electives**
**ARC 150 Introduction to Archaeology**
CSC 101 Introduction to Problem Solving Using Computers
EDU 103 Issues and Practices of American Education

Note: Certification requires a grade of B or better in one English composition course and a B or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

Required Courses ............................................................ 32 hrs
AST 115 Introductory Astronomy
AST 116 Introductory Astronomy Laboratory
GSC 100T Transitions
GSC 125 Weather and Climate
GSC 202 Introduction to Geographic Information Sciences
GSC 301 Understanding Scientific Communication
GSC 303 Introduction to Water Science
GSC 305 Introduction to Cartography
GSC 312 Introduction to Remote Sensing
GSC 336 Principles of Geomorphology
GSC 339 Field Geology
  or
GSC 350 Field Techniques in Geosciences

Required Limited Electives ............................................. 11 hrs
Select upper-level courses from the list of approved geology electives given under the track in environmental geology, below.

Note: The National Science Teachers Association (NSTA) recommends a minimum of one course from each of the following three areas, with total of recommended supplemental science hours to include no fewer than 16 semester hours.

A. Biology
BIO 101 Biological Concepts
BIO 112 Field Biology
BIO 221 Zoology: Animal Form and Function
BIO 222 Botany: Plant Form and Function

B. Chemistry
CHE 101 Consumer Chemistry
CHE 105 Introductory Chemistry
CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis

C. Physics
PHY 235 Mechanics, Heat and Wave Motion
PHY 236 Mechanics, Heat and Wave Motion Laboratory
PHY 255 Electricity, Magnetism and Light
PHY 256 Electricity, Magnetism and Light Laboratory

Required for Secondary Certification ......................... 33 hrs
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
REA 427 Teaching Content Area Literacy in the Secondary School
SEC 420 Practicum in Secondary Schools
SEC 421 Student Teaching in the Secondary School
SEC 422 Extended Practicum
SED 300 Educating Students with Disabilities

Total Curriculum Requirements ................................. 120 hrs

1Must be taken together and two semesters before student teaching.
2Must be taken one semester before student teaching.

Earth Science Teaching Specialization

The teaching specialization in earth science is a path to secondary certification in earth science designed to accompany certification in another science content area (biology/chemistry/physics). All College of Education and Human Services secondary certification course requirements must be met. Note: Even though this program exceeds Murray State University’s requirements for an earth science minor, in order for a earth science minor to appear on a transcript, a minor must be declared, and all residential and graduation requirements must be met.
Requirements for teacher certification are established by the Kentucky Education Professional Standards Board. Students are cautioned that changes in these requirements may occur. Therefore, for the most current information, students should check with an advisor in the College of Education and Human Services.

**Earth Science Teaching Specialization** ........................................ 30 hrs

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>AST 115</td>
<td>Introductory Astronomy</td>
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<td>AST 116</td>
<td>Introductory Astronomy Laboratory</td>
</tr>
<tr>
<td>GSC 101</td>
<td>The Earth and the Environment</td>
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<td>GSC 102</td>
<td>Earth through Time</td>
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<td>GSC 125</td>
<td>Weather and Climate</td>
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<td>GSC 202</td>
<td>Introduction to Geographic Information Sciences</td>
</tr>
<tr>
<td>GSC 303</td>
<td>Introduction to Water Science</td>
</tr>
<tr>
<td>GSC 336</td>
<td>Principles of Geomorphology</td>
</tr>
<tr>
<td>GSC 339</td>
<td>Field Geology</td>
</tr>
<tr>
<td>or</td>
<td>Field Techniques in Geosciences</td>
</tr>
</tbody>
</table>

**University Studies Requirements** ........................................ 38-43 hrs

(See [Academic Degrees and Programs](Academic Degrees and Programs).)

**Required Courses** ............................................................ 45 hrs

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 150</td>
<td>Introduction to Archaeology¹</td>
</tr>
<tr>
<td>GSC 100T</td>
<td>Transitions</td>
</tr>
<tr>
<td>GSC 101</td>
<td>The Earth and the Environment²</td>
</tr>
<tr>
<td>GSC 102</td>
<td>Earth through Time²</td>
</tr>
<tr>
<td>GSC 110</td>
<td>World Geography³</td>
</tr>
<tr>
<td>GSC 202</td>
<td>Introduction to Geographic Information Sciences</td>
</tr>
<tr>
<td>GSC 210</td>
<td>Hydrology</td>
</tr>
<tr>
<td>GSC 301</td>
<td>Understanding Scientific Communication</td>
</tr>
<tr>
<td>GSC 305</td>
<td>Introduction to Cartography</td>
</tr>
<tr>
<td>GSC 310</td>
<td>Rock and Mineral Resources</td>
</tr>
<tr>
<td>GSC 312</td>
<td>Introduction to Remote Sensing</td>
</tr>
<tr>
<td>GSC 314</td>
<td>Sediments and Soils</td>
</tr>
<tr>
<td>GSC 336</td>
<td>Principles of Geomorphology</td>
</tr>
<tr>
<td>GSC 562</td>
<td>Hydrogeology</td>
</tr>
</tbody>
</table>

**Required Limited Electives** ............................................. 9-10 hrs

Choose from the following approved electives:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 300</td>
<td>Archaeology Method and Theory</td>
</tr>
<tr>
<td>ARC 302</td>
<td>Archaeological Field Work I</td>
</tr>
<tr>
<td>ARC 304</td>
<td>Archaeology Laboratory Methods</td>
</tr>
<tr>
<td>ARC 390</td>
<td>Geoarchaeology</td>
</tr>
<tr>
<td>CET 280</td>
<td>Plane Surveying</td>
</tr>
<tr>
<td>GSC 200</td>
<td>Introduction to Oceanography</td>
</tr>
<tr>
<td>GSC 303</td>
<td>Introduction to Water Science</td>
</tr>
<tr>
<td>GSC 306</td>
<td>Landscapes of the National Parks</td>
</tr>
<tr>
<td>GSC 330</td>
<td>Economic Geography</td>
</tr>
<tr>
<td>GSC 339</td>
<td>Field Geology</td>
</tr>
<tr>
<td>GSC 350</td>
<td>Field Techniques in Geosciences</td>
</tr>
<tr>
<td>GSC 388</td>
<td>International Experience in the Geosciences</td>
</tr>
<tr>
<td>GSC 424</td>
<td>Conservation and Environmental Geosciences</td>
</tr>
<tr>
<td>GSC 489</td>
<td>Cooperative Education/Internship</td>
</tr>
<tr>
<td>GSC 507</td>
<td>Land Use Planning</td>
</tr>
<tr>
<td>GSC 512</td>
<td>Remote Sensing</td>
</tr>
<tr>
<td>GSC 521</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>GSC 522</td>
<td>Digital Cartography</td>
</tr>
<tr>
<td>GSC 534</td>
<td>Invertebrate Paleontology</td>
</tr>
<tr>
<td>GSC 542</td>
<td>Watershed Ecology</td>
</tr>
<tr>
<td>GSC 591</td>
<td>Special Problems</td>
</tr>
<tr>
<td>GSC 592</td>
<td>Special Problems</td>
</tr>
<tr>
<td>GSC 593</td>
<td>Special Problems</td>
</tr>
</tbody>
</table>
Collateral requirement .................................................. 8 hrs
MAT  150 (or above)
CSC 101 or CSC 199

Unrestricted Electives ............................................. 14-20 hrs
CHE  105 Introductory Chemistry

or
CHE  201 General College Chemistry
CHE  202 General Chemistry and Qualitative Analysis
CSC  101 Introduction to Problem Solving Using Computers (or other computer science course)

or
PHY  130 General Physics I

Total Curriculum Requirements .................................... 120 hrs

1 Will count towards University Studies Global Awareness, Cultural Diversity, and the World's Artistic Tradition requirements.
2 Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.
3 This is a University Studies electives writing-intensive or technology-intensive course.

AREA: Bachelor of Science Degree
Geoscience/Geoarchaeology Track
CIP 40.0601

University Studies Requirements .................................. 38-43 hrs
(See Academic Degrees and Programs.)

Recommended University Studies selection:
*Social and Self-Awareness and Responsible Citizenship
ANT  140 Introduction to Cultural Anthropology

Required Courses ..................................................... 43 hrs
ARC  150 Introduction to Archaeology
ARC  300 Archaeological Method and Theory
ARC  304 Archaeological Laboratory Methods
ARC  330 North American Archaeology
ARC  390 Geoarchaeology
GSC  100T Transitions
GSC  101 The Earth and the Environment
GSC  110 World Geography
GSC  202 Introduction to Geographic Information Sciences
GSC  301 Understanding Scientific Communication
GSC  305 Introduction to Cartography
GSC  312 Introduction to Remote Sensing
GSC  336 Principles of Geomorphology
Five credit hours chosen from the following:
ARC  302 Archaeological Field Work I
ARC  402 Archaeological Field Work II
ARC  510 Advanced Archaeological Field Work

Required Limited Electives .......................................... 10-11 hrs
Choose from the following approved electives:
ANT  311 Anthropology of Complex Societies
ANT  325 Biological Anthropology
ANT  329 North American Indians
ARC  314 Sediments and Soils
ARC  315 Special Topics in Archaeology
ARC  320 Human Ecology
ARC  321 Ancient Civilizations
ARC  335 Forensic Archaeology
ARC  340 Archaeology of Africa
ARC  350 Public Archaeology
ARC  357 Lithic Analyses
ARC  360 Historical Archaeology
ARC  370 Archaeology of the Eastern Woodlands
ARC  385 Archaeology of Eastern Asia
ARC  395 Archaeology of Religion
### AREA: Bachelor of Science Degree

**Geoscience/Geographic Information Science Track**

CIP 40.0601

**University Studies Requirements**

38-43 hrs  
(See Academic Degrees and Programs.)

**Required Courses**

43 hrs

- ARC 150 Introduction to Archaeology
- GSC 100T Transitions
- GSC 101 The Earth and the Environment
- GSC 110 World Geography
- GSC 125 Weather and Climate
- GSC 202 Introduction to Geographic Information Sciences
- GSC 301 Understanding Scientific Communication
- GSC 305 Introduction to Cartography
- GSC 312 Introduction to Remote Sensing
- GSC 330 Economic Geography
- GSC 336 Principles of Geomorphology
- GSC 512 Remote Sensing
- GSC 521 Geographic Information Systems

**Required Limited Electives**

10-11 hrs  
Choose from the following approved electives:

- GSC 210 Hydrology
- GSC 303 Introduction to Water Science
- GSC 306 Landscapes of the National Parks
- GSC 310 Rock and Mineral Resources
- GSC 314 Sediments and Soils
- GSC 350 Field Techniques in Geosciences
- GSC 390 Geoarchaeology
- GSC 424 Conservation and Environmental Geosciences
- GSC 488 Cooperative Education/Internship
- GSC 489 Cooperative Education/Internship
- GSC 507 Land Use Planning
- GSC 562 Hydrogeology
- GSC 591 Special Problems
- GSC 592 Special Problems
- GSC 593 Special Problems

**Collateral requirement**

8 hrs

MAT 150 (or above)

CSC 101 or CSC 199

**Total Curriculum Requirements**

120 hrs

1Will count towards University Studies Global Awareness, Cultural Diversity, and the World’s Artistic Tradition requirements.  
2Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.  
3This is a University Studies electives writing-intensive or technology-intensive course.
Unrestricted Electives .............................................. 15-21 hrs

Total Curriculum Requirements ................................. 120 hrs
  1Will count towards University Studies Global Awareness, Cultural Diversity, and the World's Artistic Tradition requirements.
  2Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.
  3This is a University Studies electives writing-intensive or technology-intensive course.

Anthropology Minor ................................................... 21 hrs
  Note: The Anthropology Minor is suspended at this time. No new students may declare this minor until further notice. Contact the department for further information. ANT 140, ANT 325, ARC 150, plus 12 hours of ANT 300-level or above electives. Electives may include ARC 325, 330, 340, and 385. Electives may substitute up to six hours selected from the following as approved by advisor: HIS 309, 354, 370, 451, SOC 337, 434. Six hours must be upper-level courses.

Archaeology Minor .................................................... 21 hrs
  ARC 150, 300, 302, 304, 350, plus six hours of ARC electives 300-level or above. Six hours must be upper-level courses.

Earth Science Minor .................................................. 21 hrs
  GSC 101, 102, 125, and 339 or 350. Six additional hours selected from the following: AST 115, 116; GSC 202, 210, 303, 310, 312, 336, 591, 592, 593. Six hours must be upper-level courses.

Environmental Geology Minor ..................................... 21 hrs
  GSC 101, 102, 202, and three additional geology courses chosen with the advice and consent of the chair of the Department of Geosciences. Six hours must be upper-level courses.

Geographic Information Science Minor ......................... 21 hrs
  GSC 110, 125, 202, 305, and seven hours of electives selected from the following: GSC 312, 350, 507, 512, 521, 522, 591, 592, 593. Six hours must be upper-level courses.

Social Science Minor .................................................. 24 hrs
  Open only to majors in economics, geoscience, history, or political science who seek secondary certification in social studies. ECO 231, GSC 110, HIS 221, POL 140, SOC 133; and six hours of upper level courses (300 or above) from the social science disciplines with approval of advisor. Courses required for a major may not be counted toward the minor; substitutions must be from a social science discipline other than the major and be approved by the advisor; and requirements for certification for teaching secondary school social studies, grades 8 through 12 through the College of Education must also be met. Six hours must be upper-level courses.

CERTIFICATE:  CIP 45.0702
Geographic Information Science
  The certificate in GIScience program is designed to provide students fundamental knowledge of geographic information science necessary for today’s diverse array of fields and disciplines. The certification program will provide students experience in data collection, data management methods and techniques, data visualization, data analysis and interpretation, and the principles and techniques to remote sensing. Student will gain experience using industry standard hardware and software to develop a variety of projects and explore several GIScience applications.

Total Course Requirements ....................................... 15 hours¹
  GSC  202  Introduction to Geographic Information Science
  GSC  512  Remote Sensing
  GSC  521  Geographic Information Systems

  One elective course from the following:
  AGR  471  Applications in Precision Agriculture
  CIS  307  Decision Support Technologies
  CIS  317  Principles of Information Systems Analysis and Design
  CSC  145  Introduction to Programming
  CSC  232  Visual Basic Programming
  CSC  310  Data Administration
  CSC  345  Data Structures
  GSC  305  Introduction to Cartography
  GSC  507  Land Use Planning
  GSC  522  Digital Cartography
  GSC  570  Computer Applications in Geosciences
  MKT  585  Integrated Business GIS

  ¹A grade of C or better must be earned in all courses.
Graduate Program

Graduate Coordinator - Robin Zhang

The Department of Geosciences offers a Master of Science degree in Geosciences. Students choose the thesis or the non-thesis option. Four concentrations are offered for the thesis option: Environmental Geology, Geoarchaeology, Geoinformatics, and Watershed Sciences. Each student’s program is developed in consultation with the graduate coordinator.

The Environmental Geology Concentration is an interdisciplinary master’s program within the Jones College of Science, Engineering and Technology designed to prepare students for further graduate studies or careers in either the public or private sector. This concentration focuses on the chemical, physical, and biological aspects of environmental change both in the present and in the geologic past.

The Geoarchaeology Concentration is an interdisciplinary master’s degree program designed to prepare students for further graduate studies or careers in the public or private sector. The geoarchaeology concentration offers students a broad range of options to develop a curriculum that matches their particular interests and needs. The geoarchaeology concentration emphasizes the relationship between human culture and the natural environment and provides opportunities to apply the principles and methods of geoscience research in an archaeological context.

The Geoinformatics Concentration is designed to prepare students for further graduate studies or careers in the field of geospatial information science and technology. Geospatial technology is a fast growing field with broad and multidisciplinary applications that has penetrated every aspect of our daily lives. The Geoinformatics Concentration provides students with up-to-date training on geospatial theory, application, and technology.

The Watershed Science Concentration is jointly sponsored between the Department of Geosciences and the Watershed Studies Institute (WSI). The Watershed Studies Institute program in Watershed Science is an interdisciplinary master’s program within the Jones College of Science, Engineering and Technology designed to prepare students for careers or for further graduate studies in the broader aspects of watershed management and science. The student’s program is developed in consultation with the graduate coordinator. Visit the Watershed Studies Institute site to learn more.

Geosciences is closely associated with the Mid-America Remote sensing Center (MARC) where hardware and software related to remote sensing and geographic information science are located. Students also have the opportunity to conduct research through activities of the department’s Archaeology Laboratory.

Requirements for Admission

Applicants must meet the Murray State University requirements (see Graduate Admissions). The department requires that three letters of recommendation and GRE scores accompany application materials. A letter discussing reasons for the applicant’s interest in the program should also be forwarded. Additional requirements for unconditional and conditional admission are as follows.

Unconditional
To qualify for unconditional admission, an applicant must have an overall grade point average of 3.0 (on a 4.0 scale) in a geoscience (or related) field and a composite GRE score (V+Q) of 1,000 old scale or 300 new scale.

Conditional
Students admitted conditionally are admitted to full standing after completing (1) any remedial courses required by the graduate faculty and (2) one semester of graduate work with an overall grade point average of 3.0 or above.

Master of Science: Geosciences/Environmental Geology Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSC 619</td>
<td>Seminar in Research Techniques</td>
<td>3</td>
</tr>
<tr>
<td>GSC 621</td>
<td>Geographic Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>GSC 696</td>
<td>Understanding Scientific Communication</td>
<td>3</td>
</tr>
<tr>
<td>GSC 698</td>
<td>Thesis Research I</td>
<td>3</td>
</tr>
<tr>
<td>GSC 699</td>
<td>Thesis Research II</td>
<td>3</td>
</tr>
</tbody>
</table>

Environmental Geology Restricted Electives ...................... 15 hours

Choose any two courses of the following (6-7 hours):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 686</td>
<td>Limnology</td>
</tr>
<tr>
<td>CHE 665</td>
<td>Biogeochemistry</td>
</tr>
<tr>
<td>GSC 642</td>
<td>Watershed Ecology</td>
</tr>
<tr>
<td>GSC 633</td>
<td>Paleoecology</td>
</tr>
<tr>
<td>GSC 680</td>
<td>Advanced Geographic Information Systems</td>
</tr>
</tbody>
</table>

Eight to nine hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 615</td>
<td>Environmental Archaeology</td>
</tr>
<tr>
<td>BIO 623</td>
<td>Physiological Ecology</td>
</tr>
<tr>
<td>BIO 625</td>
<td>Biogeography</td>
</tr>
<tr>
<td>BIO 632</td>
<td>Quantitative Ecology</td>
</tr>
<tr>
<td>BIO 646</td>
<td>Stream Ecology</td>
</tr>
</tbody>
</table>
BIO 678 Conservation Biology
BIO 690 Disturbance Ecology
CET 655 Environmental Regulatory Affairs
CET 681 Pollution Assessment and Control
CHE 613 Environmental Chemistry
GSC 636 Soils and Geomorphology
GSC 662 Hydrogeology
GSC 665 Physical/Chemical Limnology
GSC 691 Special Problems
GSC 692 Special Problems
GSC 693 Special Problems
MAT 665 Applied Statistics I
WSC 601 Seminar in Sustainability Studies

Other Degree Requirements
Defense of thesis.

**Master of Science: Geosciences/Geoarchaeology Concentration**

<table>
<thead>
<tr>
<th>Total Course Requirements</th>
<th>30 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 600 Graduate Seminar in Archaeology</td>
<td></td>
</tr>
<tr>
<td>GSC 619 Seminar in Research Techniques</td>
<td></td>
</tr>
<tr>
<td>GSC 621 Geographic Information Systems</td>
<td></td>
</tr>
<tr>
<td>GSC 696 Understanding Scientific Communication</td>
<td></td>
</tr>
<tr>
<td>GSC 698 Thesis Research</td>
<td></td>
</tr>
<tr>
<td>GSC 699 Thesis Research</td>
<td></td>
</tr>
</tbody>
</table>

**Geoarchaeology Restricted Electives** 12 hours

Choose one course from the following:
- ARC 602 Graduate Archaeological Field Work
- GSC 636 Soils and Geomorphology
- GSC 656 Geophysical Surveying

Choose nine hours from the following:
- ARC 604 Archaeological Laboratory Systems
- ARC 605 Archaeological Information Systems
- ARC 610 Landscape Archaeology
- ARC 615 Environmental Archaeology
- GSC 612 Remote Sensing
- GSC 680 Advanced Geographic Information Systems
- GSC 691 Special Problems
- GSC 692 Special Problems
- GSC 693 Special Problems
- MAT 665 Applied Statistics I
- WSC 601 Seminar in Sustainability Studies

Other Degree Requirements
Defense of thesis.

**Master of Science: Geosciences/Geoinformatics Concentration**

<table>
<thead>
<tr>
<th>Total Course Requirements</th>
<th>30 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSC 619 Seminar in Research Techniques</td>
<td></td>
</tr>
<tr>
<td>GSC 621 Geographic Information Systems</td>
<td></td>
</tr>
<tr>
<td>GSC 696 Understanding Scientific Communication</td>
<td></td>
</tr>
<tr>
<td>GSC 698 Thesis Research</td>
<td></td>
</tr>
<tr>
<td>GSC 699 Thesis Research</td>
<td></td>
</tr>
</tbody>
</table>

**Required Concentration Courses** 10 hours
- GSC 612 Remote Sensing
- GSC 640 Advanced Remote Sensing
- GSC 680 Advanced Geographic Information Systems
Geoinformatics Restricted Electives ............................. 5 hours
Choose from the following:
- CIS 609 Data Warehouses and Business Intelligence
- CIS 615 Information System Security
- GSC 622 Digital Cartography
- GSC 641 Digital Image Processing Research
- GSC 656 Geophysical Surveying
- GSC 660 Spatial Analysis Techniques
- GSC 661 Precision GIS/GPS Applications
- GSC 678 Terrestrial Ecosystem Modeling
- GSC 679 Remote Sensing of Vegetation
- GSC 691 Special Problems
- GSC 692 Special Problems
- GSC 693 Special Problems
- MAT 665 Applied Statistics I

Other Degree Requirements
- Defense of thesis.

Master of Science: Geosciences/Watershed Science Concentration

THESIS REQUIREMENTS

Total Course Requirements ............................................. 30 hours
- GSC 619 Seminar in Research Techniques\(^{st}\)
- GSC 621 Geographic Information Systems
- GSC 642 Watershed Ecology
- GSC 696 Understanding Scientific Communication
- GSC 698 Thesis Research\(^{1, 30}\)
- GSC 699 Thesis Research\(^{1, 30}\)

Watershed Science Restricted Electives ............................. 5 hours
Courses must be approved by the advisory committee and represent at least two disciplines.
- AGR 674 Agricultural Irrigation and Water Systems
- BIO 625 Biogeography
- BIO 630 Animal Ecology
- BIO 631 Plant Ecology
- BIO 632 Quantitative Ecology
- BIO 646 Stream Ecology
- BIO 661 Freshwater Invertebrates
- BIO 663 Aquatic Entomology
- BIO 668 Wetland Ecology
- BIO 669 Biological Limnology
- BIO 670 Limnological Analysis Laboratory
- BIO 671 Ichthyology
- BIO 672 Herpetology
- BIO 678 Conservation Biology
- BIO 682 Waterfowl Management
- BIO 683 Fisheries Management
- BIO 686 Limnology
- BIO 687 Freshwater Biology
- BIO 688 Reservoir Ecology
- BIO 690 Disturbance Ecology
- CET 655 Environmental Regulatory Affairs
- CET 681 Pollution Assessment and Control
- CET 685 Remediation Technology
- CHE 613 Environmental Chemistry
- CHE 617 Advanced Organic Chemistry
- CHE 627 Chemical Separations
- CHE 628 Mass Spectrometry
- CHE 665 Biogeochemistry
- GSC 616 Isotope Geochemistry
- GSC 636 Soils and Geomorphology
- GSC 640 Advanced Remote Sensing
- GSC 641 Digital Image Processing Research
- GSC 643 Soil Micromorphology

CIP 40.0699
Science, Engineering and Technology

GSC 662 Hydrogeology
GSC 665 Physical/Chemical Limnology
GSC 678 Terrestrial Ecosystem Modeling
GSC 679 Remote Sensing of Vegetation
GSC 680 Advanced Geographic Information Systems

Other Degree Requirements
Successful completion of MAT 665 Applied Statistics I if substituted for GSC 619.
Written and oral comprehensive examinations as specified by the advisory committee in broad aspects of watershed science and area of
concentration (usually taken in third semester of residence).
Defense of thesis.

NON-THESIS REQUIREMENTS

Total Course Requirements ............................................. 30 hours
GSC 612 Remote Sensing
GSC 619 Seminar in Research Techniques
GSC 621 Geographic Information Systems
GSC 680 Advanced Geographic Information Systems
GSC 696 Understanding Scientific Communication

Electives ........................................................................ 14 hours
GSC courses, at 600-level (9-10 hrs)
GSC or related courses at 600-level (4-5)

Other Degree Requirements
Written and oral comprehensive examinations.

Institute of Engineering
263A Collins Center
270-809-3392

Chair: Danny Claiborne. Faculty: Bahadir, Bunget, Claiborne, Crofton, Ford, Giltner, Hereford, Hildebrant, Kemp, Kobraei, Leedy, Lopez, Martin, Okuda, Ottway, Palmer, Payne, Perry, Ridley, Rogers, Schneiderman, Siebold, Thiede, Tubbs, Yarali, Zirbel.

The Institute of Engineering offers undergraduate programs in engineering, engineering technology, engineering graphics and design, physics and telecommunications systems management. It also offers a graduate program in applied engineering and technology
management.

Murray State University offers a Bachelor of Science in Engineering (B.S.E.) as a major in engineering physics. The Engineering Physics program has four tracks in mechanical engineering, electrical engineering, biomedical engineering and advanced physics. In all of these
areas, students will learn to use advanced analytical techniques in solving engineering problems, and will develop the applied background
to attack new engineering challenges.

Murray State’s Engineering Physics degree is an engineering program accredited by the Engineering Accreditation Commission of ABET (EAC/ABET). This accreditation will place a student on the pathway to become a licensed engineer in Kentucky and throughout the country.
Recognition by this organization has been earned by 22 Engineering Physics programs nationwide.

The Institute of Engineering offers strong undergraduate programs in engineering technology, which are: architectural engineering
technology, civil engineering technology, construction engineering technology, electromechanical engineering technology, environmental engineering technology, manufacturing engineering technology, and surveying engineering technology. Graduates from these programs are
prepared to succeed in a modern industrial environment.

The Institute also offers an engineering graphics and design program. Graduates from this program are able to apply product and process
design for products related to manufacturing or mechanical design.

Students interested in physics have two degree options. The traditional physics major is accompanied by a flexible area in applied physics,
where a student can design curricular choices to fit their chosen professional goals. These degrees are well-suited to students desiring
teaching certification, or intending to pursue graduate degrees or corporate/industrial research positions.

Kentucky’s Program of Distinction in Telecommunications Systems Management (TSM) is also offered by the Institute of Engineering. The
TSM program is actually an interdisciplinary program between the Jesse D. Jones College of Science, Engineering and Technology and the
Arthur J. Bauernfeind College of Business. The TSM program prepares graduates to work on cutting-edge information technologies related
to wireless technology, security, and network administration while also applying concepts toward business decisions and critical strategic
planning as it relates to telecommunications systems.

Engineering Accreditation
The B.S.E. in Engineering Physics (including all tracks in biomedical, electrical, mechanical and advanced physics) is an engineering pro-
gram accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. This accreditation will place a student on the
pathway to become a licensed engineer in Kentucky and throughout the country.
Engineering Technology Accreditation

The Engineering Technology Accreditation Commission of ABET (ETAC/ABET) accredits Murray State programs in civil and construction engineering technology. The Civil Engineering Technology/General Track and the Civil Engineering Technology/Construction Track programs are accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org.

AREA: Engineering Physics¹

Bachelor of Science in Engineering Degree
CIP 14.1201

ACCREDITED BY: Engineering Accreditation Commission of ABET. [http://www.abet.org](http://www.abet.org)

University Studies Requirements ........................................ 38-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

**Social and Self-Awareness and Responsible Citizenship**

ECO 231 Principles of Microeconomics

or

HON 232 Honors Seminar in Economics

Core Courses ................................................................. 52 hrs

CHE 201 General College Chemistry²,³

EGR 100T Transitions

EGR 101 Introduction to Engineering⁴

EGR 140 Introduction to Computing Applications in Science and Engineering

EGR 240 Thermodynamics I

EGR 259 Statics

EGR 264 Linear Circuits I

EGR 330 Dynamics

EGR 363 Signals and Systems

EGR 375 Materials Science

EGR 390 Engineering Measurements

EGR 460 Electricity and Magnetism I

EGR 498 Senior Engineering Design I

EGR 499 Senior Engineering Design II

MAT 250 Calculus and Analytic Geometry I²,³

MAT 308 Calculus and Analytic Geometry II²,³

MAT 309 Calculus and Analytic Geometry III²,³

MAT 338 Ordinary Differential Equations³

PHY 235 Mechanics, Heat and Wave Motion²

PHY 236 Mechanics, Heat and Wave Motion Laboratory²

PHY 255 Electricity, Magnetism and Light

PHY 256 Electricity, Magnetism and Light Laboratory

PHY 370 Introduction to Modern Physics

PHY 470 Optics

Advanced Physics Track
Completion of nine hours of 300-level and above PHY courses beyond the core course requirements.

Biomedical Engineering Track⁵

BIO 115 Cellular Basis of Life

BIO 322 Animal Physiology

CHE 202 General Chemistry and Qualitative Analysis

CHE 312 Organic Chemistry I

EGR 310 Fundamentals of Biomedical Engineering

Electrical Engineering Track
Choose four of the following courses:

EGR 360 Electric Machines

EGR 365 Linear Circuits II

EGR 366 Analog Electronics I

EGR 376 Computational Analysis in Engineering

EGR 378 Logic Design I

EGR 461 Electricity and Magnetism II

EGR 463 Power Systems

EGR 466 Power Electronics

EGR 468 Digital Signal Processing
Mechanical Engineering Track

Choose four of the following courses:

EGR 340 Wave Analysis of Dynamic Systems
EGR 342 Thermodynamics II
EGR 344 Fluid Mechanics
EGR 346 Heat Transfer
EGR 359 Mechanics of Materials
EGR 459 Mechanical Design
ITD 102 CAD Applications

Mathematics Depth Elective\(^{1}\) ............................................ 3-4 hrs
Each student must complete a mathematics depth elective chosen from MAT 335, 440, 442, 460, 508, 512, 513, 522, 523, 524, 525, 535, 538, 542, 545, 570; STA 450, 540, 541, 554 or as approved by the department chair. Students with a Biomedical Engineering track must take STA 135, 540, or 554 for this elective.

Technical Electives\(^{6,7}\) ...................................................... 18-29 hrs
Each student must complete 18 hours of technical electives. A minimum of 12 technical elective credit hours must be obtained from EGR courses. Completion of a track is encouraged but not required.

Unrestricted Elective ........................................................... 0-9 hrs

Total Curriculum Requirements .......................................... 120-128 hrs

\(^{1}\) This degree program has been approved by the Kentucky Education Professional Standards Board as a track for secondary education certification in physics. Students seeking certification via this Track must complete the Engineering Physics curriculum and the courses required for secondary certification as listed above. For current information, student should consult an advisor in the Department of Adolescent, Career and Special Education and with Teacher Education Services.

\(^{2}\) These courses are required and also fulfill University Studies requirements.

\(^{3}\) This course is considered a program corequisite and may be shared with a minor or second major.

\(^{4}\) Previous credit for EGR 195 fulfills this requirement.

\(^{5}\) Students completing the track in biomedical engineering and intending to seek admission to medical school are encouraged to complete the following: BIO 321, 333; CHE 320 and 325.

\(^{6}\) Technical Electives must come from the courses listed in the areas of emphasis or EGR/PHY courses, 300-level and above, or as approved by department chair.

\(^{7}\) A maximum of six technical elective credit hours may come from combinations of EGR/PHY 488, 489, 520, and EGR 388.

Engineering Science Minor ................................................ 22 hrs
EGR 240, 259, 264, and 330, plus nine additional hours of engineering-related courses approved by an advisor in the Department of Engineering and Physics. Six hours must be upper-level courses.

Pre-Engineering Curriculum (64 hrs)

CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Analysis
EGR 140 Introduction to Computing Applications in Science and Engineering
MAT 250 Calculus and Analytic Geometry I
MAT 308 Calculus and Analytic Geometry II
MAT 309 Calculus and Analytic Geometry III
MAT 338 Ordinary Differential Equations
PHY 235 Mechanics, Heat and Wave Motion
PHY 236 Mechanics, Heat and Wave Motion Laboratory
PHY 255 Electricity, Magnetism and Light
PHY 256 Electricity, Magnetism and Light Laboratory
University Studies courses
Discipline-specific courses

MAJOR:

Physics

Bachelor of Science/Bachelor of Arts Degree

CIP 40.0801

University Studies Requirements ................................. 38-44 hrs
(See Academic Degrees and Programs.)

Note: See required courses below before selecting Scientific Inquiry, Methodologies, and Quantitative Skills University Studies electives.

Required Courses ........................................................... 32 hrs

EGR 140 Introduction to Computing Applications in Science and Engineering
EGR 240 Thermodynamics I
EGR 390 Engineering Measurements
PHY 100T Transitions
PHY 235  Mechanics, Heat and Wave Motion
PHY 236  Mechanics, Heat and Wave Motion Laboratory
PHY 255  Electricity, Magnetism and Light
PHY 256  Electricity, Magnetism and Light Laboratory
PHY 460  Electricity and Magnetism I
PHY 470  Optics
PHY 530  Mechanics I
PHY 580  Modern Physics I

Co-requirements for Major ................................................... 6 hrs
CHE 201  General College Chemistry¹ ²
CHE 202  General Chemistry and Qualitative Analysis¹ ²
CSC 420  Numerical Analysis I
or
MAT 442  Introduction to Numerical Analysis²
MAT 250  Calculus and Analytic Geometry I¹ ²
MAT 308  Calculus and Analytic Geometry II¹ ²
MAT 309  Calculus and Analytic Geometry III¹ ²
MAT 338  Ordinary Differential Equations¹

Required Limited Electives ................................................ 3 hrs
PHY/EGR courses numbered 300 or above.

Required Minor ................................................................. 3-21 hrs²

Unrestricted Electives ....................................................... 14-20 hrs

Total Curriculum Requirements .......................................... 120 hrs
¹Fulfill University Studies requirements. Required for major if not taken as a University Studies requirement.
²CHE 201 and 202 fulfill requirements for a minor in chemistry; MAT 250, 308, 309, 338, and 442 fulfill requirements for a minor in math.

MAJOR: Bachelor of Science/Bachelor of Arts Degree
Physics/Secondary Certification (Grades 8-12)  CIP 40.0801

NOTE: Requirements for teacher certification are established by the Kentucky Education Professional Standards Board. Students are cautioned that changes in these requirements may occur. For current information, student should check with an advisor in the Department of Adolescent, Career and Special Education and with Teacher Education Services.

University Studies Requirements ................................. 38-44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• Social and Self-Awareness and Responsible Citizenship
EDP  260  Psychology of Human Development

Note: Certification requires a grade of B or better in one English composition course and a B or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

Required Courses .............................................................. 32 hrs
EGR 140  Introduction to Computing Applications in Science and Engineering
EGR 240  Thermodynamics I
EGR 390  Engineering Measurements
PHY 100T  Transitions
PHY 235  Mechanics, Heat and Wave Motion
PHY 236  Mechanics, Heat and Wave Motion Laboratory
PHY 255  Electricity, Magnetism and Light
PHY 256  Electricity, Magnetism and Light Laboratory
PHY 460  Electricity and Magnetism I
PHY 470  Optics
PHY 530  Mechanics I
PHY 580  Modern Physics I

Co-requirements for Major ................................................... 6 hrs
CHE 201  General College Chemistry¹ ²
CHE 202  General Chemistry and Qualitative Analysis¹ ²
CSC 420 Numerical Analysis I
or
MAT 442 Introduction to Numerical Analysis
MAT 250 Calculus and Analytic Geometry I\textsuperscript{1,2}
MAT 308 Calculus and Analytic Geometry II\textsuperscript{1,2}
MAT 309 Calculus and Analytic Geometry III\textsuperscript{1,2}
MAT 338 Ordinary Differential Equations\textsuperscript{2}

\textbf{Required Limited Electives} ................................................................. 3 hrs

\textit{PHY/EGR courses numbered 300-level or above.}

\textbf{Required for Secondary Certification} ........................................ 35 hrs

EDU 103 Issues and Practices of American Education\textsuperscript{3}
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
REA 427 Teaching Content Area Literacy in the Secondary School
SEC 420 Practicum in Secondary Schools\textsuperscript{4}
SEC 421 Student Teaching in the Secondary School
SEC 422 Extended Practicum\textsuperscript{5}
SED 300 Educating Students with Disabilities

\textbf{Required Minor} .................................................................................. 3-21 hrs\textsuperscript{2}

\textbf{Total Curriculum Requirements} .................................................. 120-123 hrs

\textsuperscript{1}Fulfill University Studies requirements. Required for major if not taken as a University Studies requirement.

\textsuperscript{2}CHE 201 and 202 fulfill requirements for a minor in chemistry; MAT 250, 308, 309, 338 and 442 fulfill requirements for a minor in math.

\textsuperscript{3}With a grade of \textbf{B} or better.

\textsuperscript{4}EDU 405 and SEC 420 must be taken together and two semesters before student teaching.

\textsuperscript{5}Must be taken one semester before student teaching.

\textbf{Physics Teaching Specialization}

The teaching specialization in physics is a path to secondary certification in physics, designed to accompany certification in another science content area. (All College of Education and Human Services secondary certification course requirements must be met.)

\textbf{Note:} Even though this program exceeds Murray State University's requirements for a physics minor, in order for a physics minor to appear on a transcript, a minor must be declared, and all residential and graduation requirements must be met.

\textit{Requirements for teacher certification are established by the Kentucky Education Professional Standards Board and changes in these requirements may occur. Students should check with an advisor in the College of Education and Human Services for the most current information.}

AST 115 Introductory Astronomy
AST 116 Introductory Astronomy Laboratory
MAT 250 Calculus and Analytic Geometry I\textsuperscript{1}
MAT 308 Calculus and Analytic Geometry II\textsuperscript{2}
PHY 235 Mechanics, Heat and Wave Motion
PHY 236 Mechanics, Heat and Wave Motion Laboratory
PHY 255 Electricity, Magnetism and Light
PHY 256 Electricity, Magnetism and Light Laboratory
PHY 370 Introduction to Modern Physics

\textbf{Required Limited Electives} ............................................................... 9 hrs

\textit{PHY/EGR courses numbered 300-level or above.}

\textbf{Physics Teaching Specialization} ...................................................... 36 hrs

\textsuperscript{1}Corequisite of PHY 235.

\textsuperscript{2}Corequisite of PHY 255.
AREA: Bachelor of Science/Bachelor of Arts Degree
Applied Physics

University Studies Requirements ........................................ 38-44 hrs
(See Academic Degrees and Programs.)
Note: See required courses below before selecting Scientific Inquiry, Methodologies, and Quantitative Skills University Studies electives.

Required Courses .......................................................... 33 hrs
EGR 140 Introduction to Computing Applications in Science and Engineering
EGR 240 Thermodynamics I
EGR 264 Linear Circuits I
PHY 100T Transitions
PHY 235 Mechanics, Heat and Wave Motion
PHY 236 Mechanics, Heat and Wave Motion Laboratory
PHY 255 Electricity, Magnetism and Light
PHY 256 Electricity, Magnetism and Light Laboratory
PHY 370 Introduction to Modern Physics
or
PHY 580 Modern Physics I
PHY 460 Electricity and Magnetism I
PHY 470 Optics
PHY 530 Mechanics I

Co-requirements for Area .................................................. 6 hrs
CHE 201 General College Chemistry¹, ²
CHE 202 General Chemistry and Qualitative Analysis¹, ²
CSC 420 Numerical Analysis I
or
MAT 442 Introduction to Numerical Analysis²
MAT 250 Calculus and Analytic Geometry I¹, ²
MAT 308 Calculus and Analytic Geometry II¹, ²
MAT 309 Calculus and Analytic Geometry III¹, ²
MAT 338 Ordinary Differential Equations²

Technical Electives³ ...................................................... 24 hrs

Unrestricted Electives ..................................................... 13-19 hrs

Total Curriculum Requirements ........................................ 120 hrs
¹Fulfill University Studies requirements. Required for area if not taken as a University Studies requirement.
²This course is considered a program corequisite and may be shared with a minor or second major.
³The technical electives are to be a coherent set of courses chosen to supply depth and breadth necessary for the pursuit of a particular career objective. The chosen electives must be approved by a departmental curriculum committee.

AREA: Bachelor of Science/Bachelor of Arts Degree
Applied Physics/Pre-MBA Track

Students who wish to complete a scientific course of study and qualify for admission to Murray State’s Master of Business Administration program may follow the Applied Physics Curriculum/Pre-MBA track. Course requirements are identical to those listed under the Applied Physics program, with the exception of technical electives. Technical electives must be chosen in accordance with MBA admission guidelines, and are as follows:

Pre-MBA Required Electives .............................................. 27 hrs
ACC 200 Principles of Financial Accounting
ACC 201 Principles of Managerial Accounting
BUS 355 Information Systems and Decision Making
CIS 443 Business Statistics III
ECO 230 Principles of Macroeconomics
ECO 231 Principles of Microeconomics
FIN 330 Principles of Finance
MGT 350 Fundamentals of Management
MKT 360 Principles of Marketing

Unrestricted Electives ...................................................... 6 hrs
Astronomy Minor ..................................................... 21 hrs
AST 115, 116, 316; PHY 130, 131, 132, 133, and six additional hours of approved astronomy courses numbered 300 and above. PHY 235 and 255 may be substituted for PHY 130 and 132 with approval from the department chair. Physics majors must take CHE 201 and GSC 101 in place of PHY 130, 131, 132, and 133. Six hours must be upper-level courses.

Physics Minor ............................................................. 22 hrs
PHY 235, 236, 255, 256, 370, and nine additional hours of approved physics (PHY) or engineering physics (EGR) courses numbered 300 and above. PHY 130 and 131 may be substituted for PHY 235 and 236; PHY 132 and 133 may be substituted for 255 and 256, with approval from the department chair. Six hours must be upper-level courses.

Engineering Technology Accreditation
The Technology Accreditation Commission of ABET (TAC/ABET) accredits Murray State programs in civil and construction engineering technology. The Civil Engineering Technology/General Track and the Civil Engineering Technology/Construction Track programs are accredited by the Technology Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012. Phone (410) 347-7700.

Professional Licensure
Students interested in pursuing a career as a professional land surveyor must complete courses specified by the Kentucky Board of Licensure for Professional Engineering and Land Surveyors (www.boels.ky.gov). Required courses may be taken as electives by students in the Civil Engineering Technology program under the supervision of an advisor. Students completing Board requirements normally sit for the Fundamentals of Surveying exam in their last semester at Murray State University.

Engineering Technology
The Engineering Technology programs are: Architectural Engineering Technology, Civil Engineering Technology, Construction Engineering Technology, Electromechanical Engineering Technology, and Environmental Engineering Technology.

Civil Engineering Technology
A baccalaureate degree in civil engineering technology provides students with a background in the design of steel and concrete structures, surveying, soil mechanics and foundations, construction materials, and engineering mechanics. Potential employers include construction companies, consulting engineering and architectural firms, state and federal governments, municipalities, testing laboratories, surveying firms, utilities, and materials suppliers.

The civil engineering technology program prepares graduates for careers in design (working with a team of engineers or architects in the preparation of engineering or architectural design documents), construction (as a field engineer, project engineer, or surveyor), or technical sales. An associate degree in civil engineering technology may also be obtained from Murray State University.

Architectural Engineering Technology
A baccalaureate degree in architectural engineering technology provides students with a background in architectural design, computer-aided design, building structures and structural design, steel and concrete structures, surveying and site planning, and construction estimating. Potential employers include architectural firms, construction (design/build) companies, consulting engineering firms, state and federal governments, municipalities, materials suppliers, and utilities. Architectural engineering technologists are educated in the process of taking a project from the drawing to the completed structure. Working together with architects and engineers, they assist in producing drawings and specifications for major construction projects. Architectural engineering technology prepares graduates for careers in architectural design, planning, development, and construction as well as technical or sales positions in a variety of manufacturing organizations associated with the building industry. An architectural engineering technology graduate seeking registration/licensure as an architect would usually pursue a Master of Architecture degree, typically requiring two or three years of additional study.

Construction Engineering Technology
A baccalaureate degree in construction engineering technology provides students with experience in construction, estimating, project management, scheduling, surveying, building structures, construction materials, and engineering mechanics. The curriculum stresses the application of technical knowledge, construction methods, problem-solving ability, and communication skills toward the completion of large-scale construction projects. Career opportunities for the construction-engineering technologist are as diverse as the industry. Potential employers include construction companies, general contractors, subcontractors, construction equipment and materials suppliers, testing laboratories, governments, industrial companies, and utilities.

The construction engineering technology program prepares graduates for supervisory and managerial careers within the construction industry. With a degree in construction engineering technology, the student will be qualified for an entry-level position as a construction project engineer, project manager, estimator, sales engineer, or field engineer.

Environmental Engineering Technology
A baccalaureate degree in environmental engineering technology provides graduates with backgrounds in municipals and industrial water and wastewater treatment system design and operations, water pollution control, solid and hazardous waste management and site remediation, air pollution control, and environmental regulatory compliance. Course work includes field and laboratory sampling and analysis plus design of pollution control systems.

Graduates obtain careers with industries, environmental consultants and remediation contractors, municipalities, testing laboratories, state or federal government agencies, and chemical manufacturing corporations.
Electromechanical Engineering Technology

A baccalaureate degree in electromechanical engineering technology provides students with backgrounds in mechanical and electrical systems, fluid power, controls, and industrial networks. Electromechanical graduates work in manufacturing and process plant engineering, operation, maintenance, new product design, systems design, system analysis, and systems integration.

The electromechanical engineering technologist is a blend of mechanical and electrical engineering technology, computer science, information technology, and control systems. Graduates have broad application backgrounds in automation, electronics, data acquisition, controls, programming, and mechanical and electrical science principles. This allows students to understand the design and operation of systems found in the plant environment.

Manufacturing Engineering Technology

A baccalaureate degree in manufacturing engineering technology provides students with a broad range of knowledge and skills related to industry and industrial supervision. Graduates from this program are exposed to the applied aspects of industrial processes, production systems, production management, computer integrated design, manufacturing systems, human relations and human resource development. The graduates from this program will generally work in one of a variety of industries working directly with engineers, designers, and production personnel as supervisors and technical support, utilizing skills in computer numerical control, hydraulics, machine tool processes, CAD, CAM, computer integration, industrial automation and system integration. Additional skills in electrical systems, accounting, marketing, human resource management and business management allows graduates to work in a variety of industrial environments.

ASSOCIATE:
Civil Engineering Technology

<table>
<thead>
<tr>
<th>University Studies Requirements</th>
<th>23 hrs</th>
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<tbody>
<tr>
<td>(See Academic Degrees and Programs.)</td>
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University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**

- PHY 130 General Physics I
- PHY 131 General Physics I Laboratory

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<thead>
<tr>
<th>Required Courses</th>
<th>32 hrs</th>
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<tbody>
<tr>
<td>CET 280 Plane Surveying</td>
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<td>CET 284 Sustainable Design and Construction</td>
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<td>CET 385 Construction Estimating I</td>
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<tr>
<td>ENG 324 Technical Writing</td>
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<td>ENT 100T Transitions</td>
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<td>ENT 287 Statics for Technology</td>
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<td>ENT 358 Mechanical and Electrical Systems</td>
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<tr>
<td>ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting</td>
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<th>Support Courses</th>
<th>13 hrs</th>
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<tr>
<td>GSC 101 The Earth and the Environment</td>
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<tr>
<td>MAT 130 Technical Math I</td>
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<tr>
<td>PHY 132 General Physics II</td>
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<tr>
<td>PHY 133 General Physics II Laboratory</td>
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Total Curriculum Requirements | 62 hrs |

AREA:
Civil Engineering Technology/General Track

This track is ACCREDITED BY: Engineering Technology Accreditation Commission of ABET, http://www.abet.org

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<tr>
<th>University Studies Requirements</th>
<th>44 hrs</th>
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<tbody>
<tr>
<td>(See Academic Degrees and Programs.)</td>
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</tbody>
</table>

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**

- MAT 130 Technical Math I
- PHY 130 General Physics I and
- PHY 131 General Physics I Laboratory
- PHY 132 General Physics II and
- PHY 133 General Physics II Laboratory

**Social and Self-Awareness and Responsible Citizenship**

- ECO 230 Principles of Macroeconomics
**University Studies Electives**
GSC 101 The Earth and the Environment  
MAT 230 Technical Math II

**Core Courses**  .............................................................................. 41 hrs
CET 280 Plane Surveying  
CET 284 Sustainable Design and Construction  
CET 385 Construction Estimating I  
CET 480 Construction Planning and Management  
ENG 324 Technical Writing  
ENT 100T Transitions  
ENT 287 Statics for Technology  
ENT 358 Mechanical and Electrical Systems  
ENT 382 Hydraulics  
ENT 393 Engineering Economy  
ENT 419 Senior Project I  
IET 125 Analytic Methods in Engineering Technology  
IET 399 Professional Development Seminar I  
IET 488 Cooperative Education/Internship  
ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting

**Required Courses**  .............................................................................. 26 hrs
CET 298 Strength of Materials  
CET 370 Route Surveying  
CET 410 Transportation Systems and Design  
CET 481 Structural Steel Design  
CET 482 Reinforced Concrete Design  
CET 483 Construction Materials  
CET 484 Soil Mechanics and Foundations  
ENT 286 Introduction to Environmental Engineering Technology

**Emphasis**  .............................................................................. 26 hrs
Civil
GSC 202 Introduction to Geographic Information Science  
GSC 507 Land Use Planning  
ITD 301 Architectural Design Studio I

Construction
CET 386 Construction Estimating II  
CET 483 Construction Materials  
CET 490 Construction Scheduling and Methods

Environmental
CET 330 Water Quality Technology I  
CET 331 Water Quality Technology II  
CET 585 Remediation Technology

**Total Curriculum Requirements**  ................................................. 120-122 hrs

**AREA: Civil Engineering Technology/Architectural Engineering Technology Track**

**University Studies Requirements**  ................................................. 44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

**Scientific Inquiry, Methodologies, and Quantitative Skills**
MAT 130 Technical Math I  
PHY 130 General Physics I  
PHY 131 General Physics I Laboratory  
PHY 132 General Physics II  
PHY 133 General Physics II Laboratory

**Social and Self-Awareness and Responsible Citizenship**
ECO 230 Principles of Macroeconomics
### University Studies Electives
- GSC 101 The Earth and the Environment
- MAT 230 Technical Math II

### Core Courses
- CET 280 Plane Surveying
- CET 284 Sustainable Design and Construction
- CET 385 Construction Estimating I
- CET 480 Construction Planning and Management
- ENG 324 Technical Writing
- ENT 100T Transitions
- ENT 287 Statics for Technology
- ENT 358 Mechanical and Electrical Systems
- ENT 382 Hydraulics
- ENT 393 Engineering Economy
- ENT 419 Senior Project I
- IET 125 Analytical Methods in Engineering Technology
- IET 399 Professional Development Seminar I
- IET 488 Cooperative Education/Internship
- ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting

### Track Courses
- CET 298 Strength of Materials
- CET 310 Anatomy of Buildings
- CET 481 Structural Steel Design
- CET 482 Reinforced Concrete Design
- CET 483 Construction Materials
- ITD 104 Computer Aided Design
- ITD 301 Architectural Design I
- ITD 401 Architectural Design II
- ITD 503 Architectural Design III

**Total Curriculum Requirements**

**AREA: Civil Engineering Technology/Construction Engineering Technology Track**

This track is ACCREDITED BY: Engineering Technology Accreditation Commission of ABET, http://www.abet.org

### University Studies Requirements
- **44 hrs**
  - **Scientific Inquiry, Methodologies, and Quantitative Skills**
    - MAT 130 Technical Math I
    - PHY 130 General Physics I
    - PHY 131 General Physics I Laboratory
    - PHY 132 General Physics II
    - PHY 133 General Physics II Laboratory
  - **Social and Self-Awareness and Responsible Citizenship**
    - ECO 230 Principles of Macroeconomics
  - **University Studies Electives**
    - GSC 101 The Earth and the Environment
    - MAT 230 Technical Math II

### Core Courses
- CET 280 Plane Surveying
- CET 284 Sustainable Design and Construction
- CET 385 Construction Estimating I
- CET 480 Construction Planning and Management
- ENG 324 Technical Writing
- ENT 100T Transitions
- ENT 287 Statics for Technology
- ENT 358 Mechanical and Electrical Systems
- ENT 382 Hydraulics
ENT 393 Engineering Economy
ENT 419 Senior Project
IET 125 Analytical Methods in Engineering Technology
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting

Track Courses ................................................................. 35 hrs
ACC 200 Principles of Financial Accounting
CET 298 Strength of Materials
CET 310 Anatomy of Buildings
CET 386 Construction Estimating II
CET 481 Structural Steel Design
CET 482 Reinforced Concrete Design
CET 483 Construction Materials
CET 484 Soil Mechanics and Foundations
CET 490 Construction Scheduling and Methods
MG T 350 Fundamentals of Management
OSH 384 Construction Safety

Total Curriculum Requirements ...................................... 120 hrs

AREA: Civil Engineering Technology/Environmental Engineering Technology Track

University Studies Requirements .................................... 44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

+ Scientific Inquiry, Methodologies, and Quantitative Skills
  MAT 130 Technical Math I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
  PHY 132 General Physics II
  PHY 133 General Physics II Laboratory

+ Social and Self-Awareness and Responsible Citizenship
  ECO 230 Principles of Macroeconomics

+ University Studies Electives
  GSC 101 The Earth and the Environment
  MAT 230 Technical Math II

Core Courses .................................................................... 41 hrs
CET 280 Plane Surveying
CET 284 Sustainable Design and Construction
CET 385 Construction Estimating I
CET 480 Construction Planning and Management
ENG 324 Technical Writing
ENT 100T Transitions
ENT 287 Statics for Technology
ENT 358 Mechanical and Electrical Systems
ENT 382 Hydraulics
ENT 393 Engineering Economy
ENT 419 Senior Project
IET 125 Analytical Methods in Engineering Technology
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting

Track Courses ................................................................. 37 hrs
CET 330 Water Quality Technology I
CET 331 Water Quality Technology II
CET 342 Air Quality Technology
CET 353 Solid and Hazardous Waste Management
CET 555 Environmental Regulatory Affairs
CET 585 Remediation Technology
CHE 111 Essentials of Chemistry and Biochemistry
ENT 286 Introduction to Environmental Engineering Technology
ENT 400 Energy Management
GSC 202 Introduction to Geographic Information Science
STA 135 Probability and Statistics

Total Curriculum Requirements ........................................ 122 hrs

AREA: Civil Engineering Technology/Surveying Engineering Technology Track

Bachelor of Science Degree
CIP 15.0201

University Studies Requirements ........................................ 44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  MAT 130 Technical Math I
  PHY 130 General Physics I
  PHY 131 General Physics I Laboratory
  PHY 132 General Physics II
  PHY 133 General Physics II Laboratory
• **Social and Self-Awareness and Responsible Citizenship**
  ECO 230 Principles of Macroeconomics
• **University Studies Electives**
  GSC 101 The Earth and the Environment
  MAT 230 Technical Math II

Core Courses ................................................................. 41 hrs
CET 280 Plane Surveying
CET 284 Sustainable Design and Construction
CET 385 Construction Estimating I
CET 480 Construction Planning and Management
ENG 324 Technical Writing
ENT 100T Transitions
ENT 287 Statics for Technology
ENT 358 Mechanical and Electrical Systems
ENT 382 Hydraulics
ENT 393 Engineering Economy
ENT 419 Senior Project
IET 125 Analytical Methods in Engineering Technology
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 107 Introduction to Technical Drawing and Computer-Aided Drafting

Track Courses ............................................................... 35 hrs
CET 370 Route Surveying
CET 381 Boundary Surveying I
CET 410 Transportation Systems and Design
CET 460 Geodesy
CET 486 Boundary Surveying II
CSC 202 Introduction to Geographic Information Science
GSC 521 Geographic Information Systems
PHI 202 Ethics
Technical Electives (5 hrs)

Total Curriculum Requirements ........................................ 120 hrs
University Studies Requirements ...................................... 43-47 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

- **Scientific Inquiry, Methodologies, and Quantitative Skills**
  - MAT 130  Technical Math I  
  - or
  - MAT 150  Algebra and Trigonometry  
  - or
  - MAT 308  Calculus and Analytic Geometry II  
  - or
  - MAT 330  Technical Math III  
  - PHY 130  General Physics I  
  - PHY 131  General Physics I Laboratory  
  - or
  - PHY 235  Mechanics, Heat and Wave Motion  
  - PHY 236  Mechanics, Heat and Wave Motion Laboratory

- **Social and Self-Awareness and Responsible Citizenship**
  - ECO 230  Principles of Macroeconomics

- **University Studies Electives**
  - MAT 230  Technical Math II  
  - or
  - MAT 250  Calculus and Analytic Geometry I  
  - PHY 132  General Physics II  
  - PHY 133  General Physics II Laboratory  
  - or
  - PHY 255  Electricity, Magnetism and Light  
  - PHY 256  Electricity, Magnetism and Light Laboratory

**Core Courses .......................................................... 62 hrs**

- CET 298  Strength of Materials  
- EMT 201  Engineering Technology Simulation  
- EMT 202  Engineering Technology Analysis  
- EMT 261  Introduction to Fluid Power Systems  
- EMT 262  Introduction to Fluid Power Systems Laboratory  
- EMT 310  Programmable Logic Controllers  
- EMT 312  Industrial Instrumentation  
- EMT 355  Electrical Machinery and Controls  
- EMT 455  Manufacturing Control Systems  
- EMT 461  Motion Controls  
- ENT 287  Statics for Technology  
- ENT 351  Industrial and Commercial Power Distribution  
- ENT 358  Mechanical and Electrical Systems  
- ENT 365  Dynamics for Technology  
- ENT 393  Engineering Economy  
- TSM 110  Electrical Systems I  
- TSM 210  Electrical Systems II  
- TSM 232  Operating Systems  
- TSM 241  Networking Fundamentals

**Support Courses ..................................................... 15 hrs**

- ENG 324  Technical Writing  
- ENT 100T  Transitions  
- IET 399  Professional Develop Seminar I  
- IET 488  Cooperative Education/Internship  
- ITD 102  CAD Applications  
- Technical Electives (6 hrs)

**Total Curriculum Requirements ......................... 120-124 hrs**
University Studies Requirements ........................................ 45 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  CHE 105  Introductory Chemistry
  PHY 130  General Physics I
  PHY 131  General Physics I Laboratory
  STA 135  Introduction to Probability and Statistics

• **Social and Self-Awareness and Responsible Citizenship**
  ECO 231  Principles of Microeconomics

• **University Studies Electives**
  CSC 199  Introduction to Information Technology
  MAT 230  Technical Math II

Core Courses ................................................................. 38 hrs
ENG 324  Technical Writing
IET 399  Professional Development Seminar I
IET 488  Cooperative Education/Internship
ITD 100T  Transitions
ITD 101  Introduction to Design and Graphic Communications
ITD 104  Computer Aided Design
ITD 130  Manufacturing Processes and Materials
ITD 204  Parametric Modeling and Rendering
ITD 301  Architectural Design I
ITD 350  Construction Systems
MAT 130  Technical Math I
MGT 350  Fundamentals of Management

Required Courses ............................................................. 37 hrs
EMT 261  Introduction to Fluid Power Systems
EMT 262  Introduction to Fluid Power Systems Laboratory
EMT 310  Programmable Logic Controllers
IET 587  Quality Control
ITD 202  Applied Technical Drawing
ITD 306  Engineering Graphics
ITD 330  Machine Tool Processes
MGT 551  Organizational Behavior
TSM 110  Electrical Systems
Technical Electives (7 hrs)

Total Curriculum Requirements ..................................... 120 hrs

**Engineering Graphics and Design**
A baccalaureate degree in engineering graphics and design provides students with the fundamentals of design principles, computer aided design, and commercial/industrial design standards. Graduates will be prepared to work with engineers and architects in designing, constructing and manufacturing in modern industrial and architectural corporations.

This broad based program emphasizes computer aided design, and design graphics including: mechanical engineering drawings, renderings, technical animations and 3D parametric design. Applied engineering and engineering design/CAD are typical job descriptors for engineering graphics and design graduates. Graduates typically find jobs in manufacturing companies, engineering consulting firms, and architectural firms utilizing cutting edge computer graphic design capabilities and applied engineering concepts in the design of modern processes, components and structures.

University Studies Requirements ..................................... 41 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• **Scientific Inquiry, Methodologies, and Quantitative Skills**
  CHE 105  Introductory Chemistry
Core Courses ............................................................ 42 hrs
CSC 199 Introduction to Information Technology
ENG 324 Technical Writing
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 100T Transitions
ITD 101 Introduction to Design and Graphic Communications
ITD 104 Computer Aided Design
ITD 130 Manufacturing Processes and Materials
ITD 204 Parametric Modeling and Rendering
ITD 301 Architectural Design I
ITD 350 Construction Systems
MAT 130 Technical Math I
MGT 350 Fundamentals of Management
STA 135 Introduction to Probability and Statistics

Required Courses ..................................................... 26 hrs
CET 298 Strength of Materials
ENT 287 Statics for Technology
ITD 302 Applied Technical Drawing
ITD 304 Advanced Parametric Modeling
ITD 306 Engineering Graphics
ITD 330 Machine Tool Processes
ITD 333 ANSI Fundamentals for Mechanical Product Design

Emphasis ............................................................... 11 hrs
Choose one area of emphasis below:
Industrial/Manufacturing Design
IET 587 Quality Control
ITD 403 Product and Tooling Design
ITD 498 Industrial Design Processes and Prototypes

Architectural/Construction Design
CET 310 Anatomy of Buildings
ITD 401 Architectural Design II
ITD 503 Architectural Design III

Total Curriculum Requirements .................................. 120 hrs

ASSOCIATE:  
Industrial Technology  

University Studies Requirements ............................... 22 hrs  
(See Academic Degrees and Programs.)

University Studies selections must also include:
*Scientific Inquiry, Methodologies, and Quantitative Skills
MAT 130 Technical Math I
PHY 130 General Physics I
PHY 131 General Physics I Laboratory
*Social and Self-Awareness and Responsible Citizenship
ECO 231 Principles of Microeconomics

Required Courses ..................................................... 28 hrs
EMT 261 Introduction to Fluid Power Systems
EMT 262 Introduction to Fluid Power Systems Laboratory
IET 399 Professional Development Seminar I
ITD 100T Transitions
ITD 101 Introduction to Design and Graphic Communications
ITD 104      Computer Aided Design
ITD 130      Manufacturing Processes and Materials
ITD 204      Parametric Modeling and Rendering
ITD 330      Machine Tool Processes
TSM 110      Electrical Systems I

Technical Electives ...................................................... 14 hrs

Total Curriculum Requirements ........................................ 64 hrs

Environmental Technology Minor ........................................ 21 hrs
CET 284, 330, 331, 342, 353, 555, and ENT 286. Prerequisite courses are not applicable to this minor. Six hours must be upper-level courses.

Industrial and Engineering Technology Minor ....................... 21 hrs
Program must be approved by an advisor with at least six hours of courses at 300-level or above.

Graduate Program

Graduate Coordinator - Michael Kemp

The Department of Industrial and Engineering Technology offers the Master of Science degree in Applied Engineering and Technology Management. This degree is designed for individuals who wish to further their knowledge of management, leadership, and technology. The program is appropriate for graduates with backgrounds in technology, engineering, science, and mathematics and other related fields who have significant business/industrial work experience.

The applied engineering and technology management degree places emphasis on the involvement with real situations and problems for an industrial setting. A broad range of selections are provided in the areas of resource management, supervision and training, quality control, environment and safety management, business and finance, research, communications, and information systems.

Requirements for Admission

Applicants must meet the Murray State University requirements (see Graduate Admissions). Additional requirements for unconditional and conditional admission are as follows. The Graduate Record Examination (GRE) is not required for admission to this program.

Unconditional

Admission to the Master of Science degree in Applied Engineering and Technology Management is open to persons holding a baccalaureate or higher degree from a regionally accredited college in engineering, engineering technology, science, or related fields. Persons holding degrees in other fields may also apply if the nature of the professional employment has provided significant technology-related experience.

Courses included in the program of study may require prerequisite course work.

Unconditional admission requires a 2.75 grade point average (GPA based on an A equals 4.0).

Conditional

Students denied unconditional admission to Master of Science degree programs in the Department of Industrial and Engineering Technology, but who meet University requirements for conditional admission, may petition for conditional admission. Conditional admission is usually reserved for applicants whose previous education and/or experience is evaluated by the department chair to indicate a likelihood of success. Students applying for conditional admission must have a GPA of 2.25 to 2.74. A student accepted conditionally will be expected to complete nine hours of prescribed work with a minimum 3.0/4.0 GPA. These initial nine hours are assigned by the advisor and may be in addition to the student’s program of study. After completion of these nine hours the Departmental Graduate Committee will evaluate the student’s progress. The first nine hours may include undergraduate or graduate courses as directed by the department. Depending on the student’s undergraduate preparation, undergraduate courses may be required before enrolling in any graduate courses. Graduate courses may be allowed concurrently with these undergraduate courses in special situations.

Language Proficiency

Applicants whose native tongue is not English or who did not graduate from an English speaking college or university must demonstrate language proficiency. Applicants must adhere to the university’s guidelines for language proficiency.
Master of Science: Applied Engineering and Technology Management  

The Applied Engineering and Technology Management program is designed for individuals who are seeking positions of increased leadership and responsibility in business, industry, and government. Emphasis is placed on involvement with real situations and problems. The student, in consultation with an advisor, will develop an interdisciplinary plan of study to increase skills in a specific technical area and to strengthen abilities to communicate effectively in the management of technical functions.

Total Course Requirements ........................................ 30 hours
CET 682 Industrial Environmental Management
IET 684 Engineering Economic Analysis
IET 691 Industrial Operations
IET 693 Systems Management Technology
IET 695 Industrial Supervision
IET 697 Research in Industrial and Engineering Technology
Electives ............................................................................. 12 hrs
Select four electives with advisor approval. (No more than two courses total may be taken with the following prefixes: ACC, BUS, CIS, FIN, MGT, or MKT.)

Other Degree Requirements
• A written comprehensive examination is required as a component of graduation requirements.
• Independent study, special problems, and workshop courses may only be taken in special circumstances and with prior advisor and instructor approval.
1 A basic statistics course or equivalent is required prior to enrolling in IET 697.

Telecommunications Systems Management
Telecommunications systems are networks of leading-edge technologies that allow organizations and individuals throughout business and industry to communicate instantaneously around the world. Telecommunications systems provide the architectural structure for such activities as electronic commerce, electronic banking, video conferencing, distance learning, telemedicine, data interchange, on-demand video, wireless technology, information security, and a host of other traditional and new uses for business and industry.

Students in the baccalaureate program will have the insight and ability to function in all areas of Telecommunications Systems Management (TSM) but will choose a program option that will support the aspect of management which interests them most - the physical system and its components, the software that drives the system, or the business structure and operations that depend on the system. In addition, they will be prepared to move on to the Master of Science in Telecommunications Systems Management if they so choose.

Telecommunications Systems Management is an interdisciplinary program drawing upon the strengths of the Bauernfeind College of Business and the Jesse D. Jones College of Science, Engineering and Technology. These programs which are jointly administered by the two colleges provide students a unique opportunity to develop both technical expertise and management expertise in this dynamic field.

AREA: Bachelor of Science
Telecommunications Systems Management

University Studies Requirements ........................................ 44 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:
• Scientific Inquiry, Methodologies, and Quantitative Skills
  MAT 140 College Algebra
  PHY 125 Brief Introductory Physics
  PHY 126 Brief Introductory Physics Laboratory
  STA 135 Introduction to Probability and Statistics
• Social and Self-Awareness and Responsible Citizenship
  ECO 231 Principles of Microeconomics
• University Studies Electives
  CSC 101 Introduction to Problem Solving Using Computers
  CSC 199 Introduction to Information Technology

Required Courses ............................................................ 59 hrs
ACC 200 Principles of Financial Accounting
CIS 307 Decision Support Technologies
CIS 317 Principles of Information Systems Analysis and Design
CSC 235 Programming in C++
ECO 335 Economics and Public Policy of the Telecommunications Industry
FIN 330 Principles of Finance
MGT 350 Fundamentals of Management
MKT 360 Principles of Marketing
TSM 100T Transitions
TSM 133 Telecommunications Technology and Methods
TSM 232 Operating Systems
TSM 233 Network Services
TSM 241 Networking Fundamentals
TSM 320 Introduction to Wireless Technology
TSM 343 Protocol Analysis
TSM 351 Principles of Information Security
TSM 411 Network Design, Operations and Management
TSM 443 Telephone Technology
TSM 488 Cooperative Education/Internship

Selected Emphasis .............................................................. 21 hrs
Choose any of the methods of completion below:
1) Select specific classes;
2) Select one or more complete emphasis areas;
3) Select approved electives to total 24 hours.

Note: When selecting courses for an area of emphasis or as an elective, a maximum of nine hours may be selected from courses with a business prefix including: ACC, BUS, CIS, FIN, MGT, MKT, or OSY. Adherence to course prerequisites is critical.

Wireless Communications Electronics
TSM 321 Wireless Communications
TSM 322 Wireless Communications II
TSM 323 Wireless Mobile Internet
TSM 421 Mobile Satellite Communications

Network Security
TSM 352 System Security
TSM 353 Network Security
TSM 440 Information Policy and Security Auditing
TSM 441 Advanced Information Security

System Administration
CSC 310 Database Administration
CSC 360 Scripting Languages
TSM 450 Telecommunications Policy and Management
TSM 517 Systems Planning

Approved Electives
CSC 370 Introduction to Artificial Intelligence
ENG 324 Technical Writing
LSC 443 Fundamentals of Operations and Technology
MGT 358 Entrepreneurial Business Plan Development
MKT 475 Marketing Strategies in E-Commerce
TSM 444 Enterprise Networks

Total Curriculum Requirements ........................................ 124 hrs

Telecommunications Systems Minor ............................... 21 hrs
TSM 133, 232, 233, and 241. Nine hours of advisor approved electives. Six hours must be 300- or 400-level courses.

Graduate Program

Graduate Coordinator - Michael Bowman
270-809-6218

The master’s program in telecommunications systems management provides students a core of fundamental courses and the concentration of choosing a specialization within the curriculum. Although students in the master’s program will have the insight and ability to manage all aspects of telecommunications systems, the program concentration choice will support the aspect of management which interests them most, the physical systems and its components or the business structure and operations that depend on the system.

Requirements for Admission
Applicants must meet the Murray State University requirements (see Graduate Admissions).
Unconditional

For a TSM applicant to be unconditionally admitted to the program, an applicant must satisfy one of two formulas:

- **GMAT Users:** \((200 \times UGPA) + \text{GMAT} \geq 1,000\)

- **GRE Users:** \(\text{GRE} \geq 321 - (11.66 \times \text{GPA})\) - (Combined quantitative and verbal sections only.)

**Note:** The GRE formula uses the combined score from the quantitative and verbal sections only. Ask the Educational Testing Service (ETS) to send scores directly to Murray State University using our institution code: 1494.

In addition, candidates must take the TOEFL and score at least 550 on the paper-based exam (or 213 on the computerized version) if English is not their native language or they have not graduated from an accredited English-speaking university.

Conditional

Applicants to the TSM graduate program may be admitted conditionally if their overall GPA is 2.75 or higher, or at least 3.0 for their last 60 hours of undergraduate study. Full admission to the program will be granted in one of only two ways, namely:

1) The applicant takes TSM 601, TSM 610 and one other core course (ACC 604, MGT 651, TSM 602, TSM 603, or TSM 630) as their first nine hours of the program and earns a GPA not less than 3.33 from the three core courses; or

2) the applicant takes the GMAT or GRE and meets the unconditional admission formula within their first semester in the program.

If neither of these two conditions is met, the student will be dropped from the program even if they have already taken graduate coursework.

International Admission

Applicants, from any country where English is a second language, will be required to demonstrate English language proficiency. This can be done by taking the Test of English as a Foreign Language (TOEFL) exam and score at least:

1) 550 pBT (paper-based test)
2) Minimum of 20 in each band iBT (internet-based test)
3) International English Language Testing System (IELTS) exam and score 6.0 on the academic test (with no band <5.5) to be fully admitted into the program.

Master of Science: Telecommunications Systems Management

<table>
<thead>
<tr>
<th>NON-THESIS REQUIREMENTS ONLY</th>
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<tbody>
<tr>
<td>Total Course Requirements ............................................</td>
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<td>ACC 604 Quantitative Financial Controls</td>
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<td>MGT 651 Seminar in Organizational Behavior</td>
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<td>TSM 601 Telecommunications Principles</td>
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<td>TSM 602 Telecommunications Systems</td>
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<td>TSM 603 Telecommunications Project Management</td>
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<td>TSM 610 Telecommunication Networks Management</td>
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<td>TSM 630 Telecommunications Legal Environment: Law, Policy and Regulations</td>
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<tr>
<td>TSM 680 Telecommunications Solution Development</td>
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<td>Electives (6 hrs)</td>
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Only one elective can be an ACC, BUS, CIS, FIN, MGT, or MKT prefix. Prefixes with no restrictions include: ECO, IET, and TSM. Other prefixes may be used with director’s approval. Check course descriptions for prerequisites. Not all 600-level courses are offered online.

CERTIFICATE: Professional Telecommunications Systems Management

CIP 11.0103

The Certificate in Professional Telecommunications Systems Management is designed to complement traditional, disciplinary graduate and professional degree programs. The certificate program will provide professionals (e.g., medical administrators, corporate managers) with an overview of current terminology, practices and concepts related to the area of information technology and telecommunications systems. This certificate is an online delivery program.

Requirements for Admission

Students who hold an undergraduate degree, graduate degree, or are currently enrolled in a graduate or professional degree program may apply for the Certificate in Professional Telecommunications Systems Management program.

Applicants must comply with the Murray State University requirements (see Graduate Admissions). Additional requirements for admission are as follows:

Unconditional

For a TSM applicant to be unconditionally admitted to the program, an applicant must satisfy one of two formulas:

- **GMAT Users:** \((200 \times UGPA) + \text{GMAT} \geq 1,000\)

- **GRE Users:** \(\text{GRE} \geq 321 - (11.66 \times \text{GPA})\) - (Combined quantitative and verbal sections only.)

**Note:** The GRE formula uses the combined score from the quantitative and verbal sections only. Ask the Educational Testing Service (ETS) to send scores directly to Murray State University using the institution code: 1494.
Conditional
An undergraduate GPA of 2.75 or higher, or at least 3.0 for their last 60 hours of undergraduate study. Full admission to the program will be granted in one of only two ways, namely: 1) The applicant takes TSM 601, 610 and one other certificate course (TSM 602, 603, or 615) as their first nine hours of the program and earns a GPA not less than 3.33 from the three core courses; or 2) the applicant takes the GMAT or GRE and meets the unconditional admission formula within their first semester in the program.

International Admission
Applicants from any country where English is a second language will be required to demonstrate English language proficiency. This can be done by taking the Test of English as a Foreign Language (TOEFL) exam and score at least: 1) 550 pBT (paper-based test), 2) minimum of 20 in each band iBT (internet-based test), or 3) take the International English Language Testing System (IELTS) exam and score 6.0 on the academic test (with no band <5.5) to be fully admitted into the certificate program.

Total Course Requirements ............................................ 18 hours
TSM 601 Telecommunications Principles
TSM 602 Telecommunications Systems
TSM 603 Telecommunications Project Management
TSM 610 Telecommunications Networks Management
TSM 615 Information System Security
Elective (3 hrs)
Students may transfer up to six credit hours of equivalent graduate courses into the program.

Department of Mathematics and Statistics
6C9 Faculty Hall
270-809-2311


The mission of the Department of Mathematics and Statistics is to engage the larger mathematical community through scholarship and research, to provide our service region with mathematical and statistical support for its educational and industrial objectives, and to equip our students with mathematical skills which they may apply in further degree programs and careers requiring expertise in mathematics. In particular, through our instruction and guidance we endeavor to provide our students with an understanding of mathematical ideas, and the ability to reason mathematically, analyze real world problems with mathematical techniques, and continue to read, learn, and communicate mathematics.

The department offers a major in mathematics, an area in mathematics with secondary certification, a major in mathematics with secondary certification, an area in applied mathematics, and an area in mathematics with a pre-MBA track. In these programs the student will learn mathematics as a fundamental discipline and as an essential tool in most other disciplines. Mathematics is also quite useful as a minor or second major. Additionally, the common awareness that mathematics is a substantial subject will enhance the prospects of any student who demonstrates a facility with the material. The minors offered by the department are actuarial science, applied statistics, mathematical biology, and mathematics.

Graduates with a major have gone on to careers in teaching, science, and industry. Some have improved their entry level prospects via graduate study at Murray State and/or in nationally known Ph.D. programs.

The area in applied mathematics will prepare the student for a career in business, industry, government or academics. The area consists of a core of applied mathematics courses and a 18-hour track in a related field. Each track contains further mathematical training, computer programming experience, and a broad study of a discipline which illustrates applications of mathematics. The program is flexible and, by its interdisciplinary nature, will provide the student with an understanding and experience in modeling and solving relative problems.

MAJOR: Mathematics
Bachelor of Science/Bachelor of Arts Degree
CIP 27.0101

University Studies Requirements ......................................... 38-44 hrs
(See Academic Degrees and Programs.)

Required Courses ............................................................ 25 hrs
MAT 100T Transitions
MAT 250 Calculus and Analytic Geometry I
MAT 308 Calculus and Analytic Geometry II
MAT 309 Calculus and Analytic Geometry III
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
STA 540 Mathematical Statistics
Required Limited Electives .................................................................................. 15 hrs
Five MAT courses (3 or 4 credit hour) selected from MAT 338 and MAT or STA courses numbered 400 or above including:

* at least one of the following:
  MAT 513 Modern Algebra I
  MAT 516 Introduction to Topology
  MAT 525 Advanced Calculus I

* and at least one of the following:
  MAT 442 Introduction to Numerical Analysis
  MAT 506 Mathematical Modeling I
  MAT 524 Boundary Value Problems
  STA 541 Mathematical Statistics II

Co-Requirements ................................................................................................. 3 hrs
One course in computer programming selected from: CSC 145, 232, 235, or EGR 140.

Required Minor ................................................................................................. 21 hrs

Electives ................................................................................................................. 12-18 hrs

Total Curriculum Requirements ........................................................................ 120 hrs

1May be taken as a University Studies elective.
2This is a University Studies writing intensive course.
3This is a University Studies technology intensive course.

AREA:
Bachelor of Science/Bachelor of Arts Degree
Mathematics/Secondary Certification (Grades 8-12) Track
CIP 27.0101

University Studies Requirements ........................................ 42-43 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

Scientific Inquiry, Methodologies, and Quantitative Skills
MAT 250 Calculus and Analytic Geometry I
MAT 308 Calculus and Analytic Geometry II

Social and Self-Awareness and Responsible Citizenship
PSY 180 General Psychology

University Studies Electives
EDP 260 Psychology of Human Development
EDU 103 Issues and Practices of American Education

Note: Certification requires a grade of B or better in one English composition course and a B or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

Required Courses ......................................................................................... 24 hrs
MAT 100T Transitions
MAT 309 Calculus and Analytic Geometry III
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
MAT 517 Foundations of Geometry
MAT 550 Teaching Mathematics
MAT 551 Mathematics for Teachers
STA 540 Mathematical Statistics I

Required Limited Electives ............................................................................ 18-20 hrs
Three MAT courses (3 or 4 credit hour) selected from MAT 338 and MAT or STA courses numbered 400 or above including:

* at least one of the following:
  MAT 513 Modern Algebra I
  MAT 516 Introduction to Topology
  MAT 525 Advanced Calculus I

* and at least one of the following:
  MAT 442 Introduction to Numerical Analysis
  MAT 506 Mathematical Modeling I
  MAT 524 Boundary Value Problems
  STA 541 Mathematical Statistics II
An additional course (at least 3 credit hours) selected from MAT 338 and MAT or STA courses numbered 400 or above.

and

At least three (3 or 4 credit hour) courses selected from courses numbered 400 or above or from courses related to the application of mathematics selected from a list approved by the Department of Mathematics and Statistics.

**Co-Requirement** ............................................. 3 hrs
One course in computer programming selected from: CSC 145, 232, 235, or EGR 140.

**Required for Secondary Certification** ........................... 33 hrs
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
REA 427 Teaching Content Area Literacy in the Secondary School
SEC 420 Practicum in Secondary Schools
SEC 421 Student Teaching in the Secondary School
SEC 422 Extended Practicum
SED 300 Educating Students with Disabilities

**Total Curriculum Requirements** .............................. 120-123 hrs

1. With a grade of B or better.
2. This is a University Studies writing intensive course.
3. This is a University Studies technology intensive course.
4. EDU 405 and SEC 420 must be taken together and two semesters before student teaching.
5. Must be taken one semester before student teaching.

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**MAJOR:**

**Mathematics/Secondary Certification (Grades 8-12) Track**

**University Studies Requirements** ............................... 42-45 hrs
(See *Academic Degrees and Programs*.)

University Studies selections must include:

- **Scientific Inquiry, Methodologies, and Quantitative Skills**
  - MAT 250 Calculus and Analytic Geometry I
  - MAT 308 Calculus and Analytic Geometry II

- **Social and Self-Awareness and Responsible Citizenship**
  - PSY 180 General Psychology

- **University Studies Electives**
  - EDP 260 Psychology of Human Development
  - EDU 103 Issues and Practices of American Education

Note: Certification requires a grade of B or better in one English composition course and a B or better in a University Studies math course, public speaking, and EDU 103 or equivalent course. Additional requirements for admission to teacher education and student teaching must be met. See advisor and/or Office of Teacher Education Services for details.

**Required Courses** ............................................................... 21 hrs
MAT 100T Transitions
MAT 309 Calculus and Analytic Geometry III
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
MAT 517 Foundations of Geometry
MAT 550 Teaching Mathematics
STA 540 Mathematical Statistics I

**Required Limited Electives** ............................................. 9 hrs
Three MAT courses (3 or 4 credit hour) selected from MAT 338 and MAT or STA courses numbered 400 or above including:

- at least one of the following:
  - MAT 513 Modern Algebra I
  - MAT 516 Introduction to Topology
  - MAT 525 Advanced Calculus I

- at least one of the following:
  - MAT 442 Introduction to Numerical Analysis
  - MAT 506 Mathematical Modeling I
  - MAT 524 Boundary Value Problems
  - STA 541 Mathematical Statistics II

and an additional course (at least 3 credit hours) selected from MAT 338 and MAT or STA courses numbered 400 or above.
Co-Requirement ......................................................... 3 hrs
One course in computer programming selected from: CSC 145, 232, 235, or EGR 140.

Required Minor ....................................................... 21 hrs

Required for Secondary Certification ............................ 33 hrs
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
REA 427 Teaching Content Area Literacy in the Secondary School
SEC 420 Practicum in Secondary Schools
SEC 421 Student Teaching in the Secondary School
SEC 422 Extended Practicum
SED 300 Educating Students with Disabilities

Total Curriculum Requirements ................................ 129-133 hrs

1With a grade of B or better.
2This is a University Studies writing intensive course.
3This is a University Studies technology intensive course.
4EDU 405 and SEC 420 must be taken together and two semesters before student teaching.
5Must be taken one semester before student teaching.

AREA: Bachelor of Science/Bachelor of Arts Degree
Mathematics/Applied Mathematics Track
CIP 27.0101

University Studies Requirements ............................... 38-44 hrs
(See Academic Degrees and Programs.)

Required Courses ................................................. 31 hrs
MAT 100T Transitions
MAT 250 Calculus and Analytic Geometry I
MAT 308 Calculus and Analytic Geometry II
MAT 309 Calculus and Analytic Geometry III
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
MAT 338 Ordinary Differential Equations
MAT 442 Introduction to Numerical Analysis
STA 540 Mathematical Statistics

Required Limited Electives ................................. 27-28 hrs
A. Three (3 or 4 credit hour) courses selected from MAT courses numbered 400 or above.
B. Five or six courses related to the application of mathematics. Must total at least 18 hours and be approved by the advisory committee.

Co-Requirements ......................................................... 6 hrs
Two courses in computer programming selected from a list approved by the Department of Mathematics and Statistics.

Unrestricted Electives ............................................. 11-18 hrs

Total Curriculum Requirements ............................... 120 hrs

1May be taken as a University Studies elective.
2This is a University Studies writing intensive course.
3This is a University Studies technology intensive course.
4The program is very flexible. For example, an emphasis in either biology, chemistry, computer science, engineering physics, geoscience, statistics and finance, or actuarial science.
University Studies Requirements ................................................. 43-53 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

- **Scientific Inquiry, Methodologies, and Quantitative Skills**
  - MAT 250 Calculus and Analytic Geometry I
  - MAT 308 Calculus and Analytic Geometry II

- **Social and Self-Awareness and Responsible Citizenship**
  - ECO 230 Principles of Macroeconomics

- **University Studies Electives**
  - ECO 231 Principles of Microeconomics
  - MAT 309 Calculus and Analytic Geometry III

**Required Courses ............................................................... 39 hrs**

- ACC 200 Principles of Financial Accounting
- ACC 201 Principles of Managerial Accounting
- BUS 355 Information Systems and Decision Making
- CSC 199 Introduction to Information Technology¹
- FIN 330 Principles of Finance
- MAT 100T Transitions
- MAT 312 Mathematical Reasoning²
- MAT 335 Matrix Theory and Linear Algebra
- MGT 350 Fundamentals of Management
- MGT 443 Management of Operations and Technology
- MKT 360 Principles of Marketing
- STA 540 Mathematical Statistics I³
- STA 565 Applied Statistics I

**Required Limited Electives .................................................. 12-13 hrs**

Four (3 or 4 credit hour) courses selected from MAT 338 and MAT courses numbered 400 or above.

**Co-Requirements ............................................................... 3 hrs**

One course in computer programming selected from: CSC 145, 232, 235, or EGR 140.

**Unrestricted Electives .......................................................... 12-23 hrs**

**Total Curriculum Requirements ............................................. 120 hrs**

¹This is a University Studies technology intensive course.
²This is a University Studies writing intensive course.
³Will be a University Studies technology intensive course.

**Actuarial Science Minor ....................................................... 21-22 hrs**

MAT 250, 308, 309, 543, STA 540. Students already taking MAT 250, 308, 309, and STA 540 for another program may substitute these courses with: ECO 230, 231, FIN 330, MAT 555, STA 565, 567. Six hours must be upper-level courses.

**Applied Statistics Minor ....................................................... 22-23 hrs**

MAT 250, STA 135, 235, 565, plus at least two courses from the list MAT 308, 555 STA 450, 540, 541, 566, 567, 568, 569. For students already taking MAT 250, 308, STA 540 for another program, the recommended coursework is: STA 135, 235, 541, 565, 567, 568, and one of MAT 555, STA 566, 569. Six hours must be upper-level courses.

**Mathematical Biology Minor .................................................. 21 hrs**

Students not in a mathematics program take one or two of STA 135, 235 or 540 and one of MAT 250, 308 or 338. All students take BIO/MAT 460 and 461, and at least one of BIO 115, 216, 221, 222, 300, 305, 330, 333, 332, 557 so that the total number of hours in the minor is at least 21. Six hours must be upper-level courses.

**Mathematics Minor ............................................................. 23 hrs**

MAT 250, 308, 309 and nine hours of selected mathematics courses numbered above 309 (except for MAT 330, 399 or STA 554). Departmental approval required. Six hours must be upper-level courses.
Graduate Program

Graduate Coordinator - Timothy Schroeder

The Master of Science and Master of Arts degrees are designed to provide students with the opportunity to study graduate level mathematics so that they may (1) obtain preferred employment in mathematics with government or industry, (2) teach at the junior college level or be better prepared to teach at the secondary school level, or (3) continue working toward a doctor of philosophy degree.

The Master of Arts program is a broadly based program which includes a study of algebra, analysis, topology, and the foundations of mathematics. The Master of Science program consists of a core of applied mathematics together with a core (at most nine hours) in an allied field such as business, computer science, or physics. The program is flexible and is particularly suited to meet the needs of students preparing for careers in business, industry, or government.

The department also offers the Master of Arts in teaching degree in mathematics. This program is designed for certified teachers who wish to strengthen their discipline-based background and keep up with current information in educational theory, curriculum, and research.

All graduate programs in mathematics are planned in close consultation with the department graduate committee and are subject to its approval.

Requirements for Admission

Applicants must meet the Murray State University requirements (see Graduate Admissions). Additional requirements for unconditional and conditional admission to M.S. or M.A. programs are as follows:

Unconditional

- Bachelor’s degree from a regionally accredited college with a major (or equivalent) in mathematics or a related field;
- Overall GPA of 3.0 or above;
- Minimal GPA of 3.0 in all mathematics courses beginning with the first calculus course;
- Minimal GPA of 3.0 in all major courses; and
- If the major is in a related field (not mathematics), the student must have credit for three calculus courses (including a multivariable calculus course), a proof-based course, a matrix/linear algebra course, and a differential equations course.

Conditional

Recommendation of the department graduate committee or

- a bachelor’s degree from a regionally accredited college with a major in a related field and at least a 3.0 GPA in their major courses;
- Credit for three calculus courses (including a multivariable calculus course), a proof based course, and a matrix/linear algebra course with a 3.0 GPA in all mathematics courses beginning with the last elementary calculus course;
- GPA of 3.0 or above in all mathematics courses beginning with the last elementary calculus course; and
- two letters of recommendation from college teachers addressing the candidate’s ability to do mathematics graduate work.

Master of Arts: Mathematics

THESIS REQUIREMENTS

Total Course Requirements ................................................. 30 hours

MAT 725 Integration Theory
MAT or STA courses, 600- or 700-level (21 hrs)
MAT 798-799 Research and Thesis (6 hrs)

Other Degree Requirements

- Oral defense and examination of thesis.

NON-THESIS REQUIREMENTS

Total Degree Requirements ............................................. 30 hours

MAT 725 Integration Theory
and six hours chosen from MAT 716, 721, 722, 723 or 726
MAT or STA courses, 600- or 700-level (21 hrs)

Other Degree Requirements

- Program of study must include MAT 614 or 721 and MAT 616 or 716.
- Comprehensive examinations over coursework.

1All coursework must be approved by the department graduate committee. The student must complete two, two-course sequences. If the student has not completed two semesters of advanced calculus then one of the sequences must be MAT 625-626. At most, one of these sequences may be a completion of a sequence that was started as an undergraduate.
Master of Science: Mathematics

THESIS REQUIREMENTS

Total Course Requirements .............................................. 33 hours
- MAT or STA courses, 700-level (3 hrs)
- MAT or STA courses, 600 or 700-level (15-24 hrs)
- Allied field, 600 or 700-level (0-9 hrs)
- MAT 798-799 Research and Thesis (6 hrs)

Other Degree Requirements
- An advanced course in real analysis (MAT 725L, R).
- Oral defense and examination of thesis.

NON-THESIS REQUIREMENTS

Total Course Requirements .............................................. 33 hours
- MAT or STA courses, 700-level (9 hrs)
- MAT or STA courses, 600 or 700-level (15-24 hrs)
- Allied field, 600 or 700-level (0-9 hrs)

Other Degree Requirements
- An advanced course in real analysis (MAT 725L, R).
- Comprehensive examinations over coursework.

All coursework must be approved by the departmental graduate committee. The student must complete two, two-course sequences. If the student has not completed two semesters of advanced calculus then one of the sequences must be MAT 625-626. At most, one of these sequences may be a completion of a sequence that was started as an undergraduate.

Master of Arts in Teaching: Mathematics/Mathematics Teacher Leader

The Master of Arts in Teaching (M.A.T.) program is designed for certified teachers who wish to strengthen their background in mathematics and keep up with current information in educational theory, curriculum and research. The program provides for both reasonable depth in the mathematics area and graduate-level exposure in supporting disciplines. Completion of this program fulfills the requirements for Rank II classification. A student portfolio is required.

Requirements for Admission

Applicants must meet the Murray State University requirements (see Graduate Admissions). Additional requirements for unconditional and conditional admission to the M.A.T. program are as follows.

Unconditional
- Completion of requirements for teaching certification.
- Documentation of secondary teacher certification in the United States or comparable teacher qualification document from another country.
- Documentation of current certification for the duration of the program.
- Minor in mathematics with 3.0 minimum mathematics GPA.

Conditional
- See MSU requirements (see Graduate Admissions) and conditional admission requirements for certification (see College of Education and Human Services).
- Completion of requirements for teaching certification.
- Documentation of primary, middle, or secondary teacher certification in the United States or comparable teacher qualification document from another country.
- Documentation of current certification for the duration of the program.
- At least two calculus courses and two approved upper-level mathematics courses; and
- Two letters of recommendation from college teachers addressing the ability of the student to complete an M.A.T. degree in mathematics.

NON-THESIS REQUIREMENTS ONLY

Total Course Requirements .............................................. 33 hours
- MAT or STA courses, 600- or 700-level (18 hrs)

Education Courses
- EDU 600 Introduction to Teacher Leadership
- EDU 631 Classroom and Management and Student Motivation
- EDU 633 Curriculum Development
- EDU 637 Instruction for Diverse Learners
Master of Arts in Education: Secondary Teacher Leader with Mathematics Concentration

CIP 13.1205

The Department of Mathematics and Statistics provides instruction in support of the M.A.Ed. in Secondary Teacher Leader with a concentration in mathematics. Prospective students should contact the graduate coordinator in the College of Education and Human Services for details on advising and graduate program design.

Department of Occupational Safety and Health
157 Collins Center
270-809-2488

Chair: Tracey Wortham. Faculty: Atieh, Boyd, Byrd, Godfrey, Keller, Khalil, Medford, Morris, Spicer.

The Department of Occupational Safety and Health provides related curriculum offerings at the baccalaureate and master’s levels. Service courses are offered for individuals majoring in other fields such as business, science, health, psychology, education, and engineering technology. The department also offers a technical minor and a Master of Science degree, including an online Master of Science program with an emphasis in safety management that is equivalent to the on-campus program. The degree programs are designed to provide the technical and professional knowledge required by individuals pursuing professional careers in accident prevention, loss-control management and supervision, inspection and control of occupational hazards, industrial hygiene or environmental health and safety.

Occupational Safety and Health Track
This track is designed to provide the technical and professional knowledge required by individuals pursuing professional careers in accident prevention, loss control management and supervision, inspection and control of occupational hazards, and industrial hygiene.

Environmental Health and Safety Track
This track is designed to provide the technical and professional knowledge required by individuals pursuing professional careers in environmental issues and affairs such as water quality, air quality, and solid and hazardous waste management.

Requirements for Admission
Students may declare OSH as their area of choice at any point. However students must be formally admitted into the OSH program before they can enroll in restricted classes which are OSH 353 or 400- (excluding 488) and 500-level OSH classes. In order to be admitted to the OSH program, a student must (1) have completed at least 30 credit hours of coursework directly applicable to an OSH degree from the OSH University Studies requirements, required core courses, non-restricted OSH classes at the 100-, 200- and 300-levels, and technical electives, with a minimum GPA of 2.50; (2) have no grade less than a C in an OSH class; (3) complete an application packet for admission to the program; (4) be successfully reviewed by the OSH program admissions committee; (5) apply by February 1 for summer/fall enrollment or by September 1 for spring enrollment; (6) follow the most current bulletin when admitted to the program. Admission is competitive and based on available space. Admission is subject to application and careful evaluation by the OSH program admissions committee.

Degree Requirements
All occupational safety and health majors and minors must earn a grade of C or better in all OSH courses. Any OSH course with a grade below a C must be repeated. The maximum number of times a student may enroll in an OSH class is twice; this includes audits and withdrawals after the first week of class. Exceptions would be made only if the student was forced to drop the class due to a life-changing event and not due to performance in the class. If a grade less than C is received in any OSH course for a second time, the course cannot be repeated and the student is dismissed from the program and is not eligible for readmission. A cumulative grade point average of at least 2.50 must be maintained to graduate.
AREA: Occupational Safety and Health/Occupational Safety and Health Track

Bachelor of Science

CIP 15.0701


University Studies Requirements .............................................. 42 hrs

(See Academic Degrees and Programs.)

University Studies selections must include:

• Scientific Inquiry, Methodologies, and Quantitative Skills
  BIO 101 Biological Concepts
  CHE 105 Introductory Chemistry
  MAT 230 Technical Math II

• Social and Self-Awareness and Responsible Citizenship
  PSY 180 General Psychology

• University Studies Electives
  CSC 199 Introduction to Information Technology
  STA 135 Introduction to Probability and Statistics

Required Core Courses ........................................................... 51 hrs

ITD 120 Manufacturing Processes and Materials
MGT 350 Fundamentals of Management
OSH 100T Transitions
OSH 192 Introduction to Occupational Safety and Health
OSH 299 Professional Development Seminar I
OSH 310 Fire and Emergency Preparedness Preplanning
OSH 311 Hazardous Materials and Emergency Planning
OSH 320 Environmental and Occupational Health Engineering Technology
OSH 353 Prevention of Musculoskeletal Disorders in the Workplace
OSH 387 OSHA Standards for General Industry and Construction
OSH 420 Fundamentals of Industrial Hygiene
OSH 425 Physical Agents
OSH 450 Practical Application Lab
OSH 452 Systems Approach to Hazard Control
OSH 488 Cooperative Education/Internship
OSH 550 Safety and Health Program Management and Training
OSH 591 Engineering and Technical Aspects of Safety
PHY 125 Brief Introductory Physics
PHY 126 Brief Introductory Physics Lab

Safety Courses ............................................................................. 30 hrs

OSH 101 Emergency Medical Training
OSH 384 Construction Safety
OSH 445 Fundamentals of Loss Control
OSH 546 Fundamentals of Risk Control

Technical electives (15 hrs)

(Must be approved by advisor and chosen from the Technical Electives list below and/or the Environmental Health and Safety Track.)

Technical Electives (Choose from the following.)

CET 310 Anatomy of Buildings
CET 331 Water Quality Technology II
CET 385 Construction Estimating I
CET 480 Construction Planning and Management
CET 555 Environmental Regulatory Affairs
CHE 120 Chemical Laboratory Safety
CHE 210 Brief Organic Chemistry
CHE 215 Organic Chemistry Laboratory
CHE 330 Basic Biochemistry
COM 340 Intercultural Communication
COM 384 Communication Skills for Professionals
COM 439 Conflict and Communication
CRI 140 Introduction to Criminal Justice
CRI 355 Security in Business and Industry
ENG 228 Standard English Usage
MGT 550 Human Resource Management
MGT 555 Training and Development
MGT 575  Labor Management Relations
OSH 330  Global Issues in OSH
OSH 371  Professional Internship II
OSH 453  Human Factors in Safety Engineering
OSH 488  Cooperative Education/Internship
OSH 499  Professional Development Seminar II
OSH 536  Motor Fleet Safety
OSH 571  Problems in Safety and Health
OSH 578  Workshop in Safety and Health
PSY 405  Industrial and Organizational Psychology
SPA 106  Basic Spanish and Culture for Agriculture

Total Curriculum Requirements ........................................ 123 hrs

1CSC 199 can be substituted by another computer related course with advisor’s approval.
2May be repeated for additional credit.
3May be repeated for a second experience.

AREA: Bachelor of Science
Occupational Safety and Health/Environmental Health and Safety Track  CIP 15.0701


University Studies Requirements ........................................ 42 hrs
(See Academic Degrees and Programs.)

University Studies selections must include:

• Scientific Inquiry, Methodologies, and Quantitative Skills
  BIO 101  Biological Concepts
  CHE 105  Introductory Chemistry
  MAT 230  Technical Math II

• Social and Self-Awareness and Responsible Citizenship
  PSY 180  General Psychology

• University Studies Electives
  CSC 199  Introduction to Information Technology
  STA 135  Introduction to Probability and Statistics

Required Core Courses .................................................... 51 hrs
ITD 120  Manufacturing Processes and Materials
MGT 350  Fundamentals of Management
OSH 100T  Transitions
OSH 192  Introduction to Occupational Safety and Health
OSH 299  Professional Development Seminar I
OSH 310  Fire and Emergency Preparedness Preplanning
OSH 311  Hazardous Materials and Emergency Planning
OSH 320  Environmental and Occupational Health Engineering Technology
OSH 353  Prevention of Musculoskeletal Disorders in the Workplace
OSH 387  OSHA Standards for General Industry and Construction
OSH 420  Fundamentals of Industrial Hygiene
OSH 425  Physical Agents
OSH 450  Practical Application Lab
OSH 452  Systems Approach to Hazard Control
OSH 488  Cooperative Education/Internship
OSH 550  Safety and Health Program Management and Training
OSH 591  Engineering and Technical Aspects of Safety
PHY 125  Brief Introductory Physics
PHY 126  Brief Introductory Physics Lab

Environmental Health and Safety Courses ......................... 30 hrs
CET 330  Water Quality Technology I
CET 342  Air Quality Technology
CET 353  Solid Hazardous Waste Technology
OSH 511  Hazardous Waste Site Operations
OSH 523  Occupational Diseases
OSH 527  Air Contaminants and Industrial Ventilation
Technical electives (12 hrs)
(Must be approved by advisor and chosen from the Technical Electives list below and/or the Occupational Safety and Health Track.)

**Technical Electives (Choose from the following.)**

- CET 310 Anatomy of Buildings
- CET 331 Water Quality Technology II
- CET 385 Construction Estimating I
- CET 480 Construction Planning and Management
- CET 555 Environmental Regulatory Affairs
- CHE 120 Chemical Laboratory Safety
- CHE 210 Brief Organic Chemistry
- CHE 215 Organic Chemistry Laboratory
- CHE 330 Basic Biochemistry
- COM 439 Conflict and Communication
- COM 384 Communication Skills for Professionals
- COM 340 Intercultural Communication
- CRJ 140 Introduction to Criminal Justice
- CRJ 355 Security in Business and Industry
- ENG 228 Standard English Usage
- MGT 550 Human Resource Management
- MGT 555 Training and Development
- MGT 575 Labor Management Relations
- OSH 330 Global Issues in OSH
- OSH 371 Professional Internship II
- OSH 453 Human Factors in Safety Engineering
- OSH 488 Cooperative Education/Internship
- OSH 499 Professional Development Seminar II
- OSH 536 Motor Fleet Safety
- OSH 571 Problems in Safety and Health
- OSH 578 Workshop in Safety and Health
- PSY 405 Industrial and Organizational Psychology
- SPA 106 Basic Spanish and Culture for Agriculture

**Total Curriculum Requirements ...................................... 123 hrs**

1. CSC 199 can be substituted by another computer related course with advisor’s approval.
2. May be repeated for additional credit.
3. May be repeated for a second experience.

**Occupational Safety and Health Minor ......................... 21 hrs**

OSH 192, 353, 387, 420, and nine hours from OSH 101, 320, 384, 425, 452. Six hours must be upper-level courses. Courses may require prerequisites.

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**Graduate Program**

The graduate program in occupational safety and health is unique in this region. In light of an increased sensitivity to the safety of the work environment and to the overall health of all Americans, the program is a timely response to business and industry needs. Few programs of this type are found in higher education.

**Requirements for Admission**

Applicants must meet the Murray State University requirements (see Graduate Admissions). Additional requirements for unconditional and conditional admission are as follows.

**Unconditional**

Unconditional Admission status is granted only to students who graduate from Murray State University with a baccalaureate degree in occupational safety and health with an overall GPA of 3.00 or higher.

**Conditional**

Conditional Admission status is granted to students with an undergraduate GPA of 2.75 or higher, regardless of undergraduate baccalaureate degree field or major. To change to Unconditional status, the student must meet the university requirement of obtaining a 3.00 in the first nine hours of graduate work and additional criteria set forth by the Department of Occupational Safety and Health.

Students admitted from a different undergraduate field/discipline must complete the following course work in addition to the above GPA requirements. Undergraduate coursework is required in biology, chemistry, mathematics, and physics. The following courses are the minimum accepted requirements for pursuing a master’s degree in occupational safety and health.

- BIO 101
- CHE 105
- MAT 130 or MAT 140 and 145 or 150
- PSY 300 or STA 135
- PHY 125 and 126

Students must also complete 15 prerequisite credit hours in occupational safety and health and pass these courses with a grade of C or higher.
Prerequisite Undergraduate Requirements .......................... 15 hours
OSH 192 Introduction to Occupational Safety and Health
OSH 353 Prevention of Musculoskeletal Disorders in the Workplace
or
OSH 453 Human Factors in Safety Engineering
OSH 387 OSHA Standards for General Industry and Construction
OSH 420 Fundamentals of Industrial Hygiene
and
one of the following concentration-specific courses:

Safety Management
OSH 384 Construction Safety

Industrial Hygiene
OSH 425 Physical Agents

Environmental
OSH 320 Environmental and Occupational Health Engineering Technology

Master of Science: Occupational Safety and Health CIP 15.0701


Within departmental guidelines, the individual student’s program is developed in consultation with advisor.

THESIS REQUIREMENTS

Total Course Requirements ........................................... 30 hours

Technical Requirements ................................. 12 hrs
Choose four from the following:
OSH 621 Industrial Hygiene and Safety Program Development
OSH 623 Occupational Diseases
OSH 626 Industrial Hygiene Sampling Strategies
OSH 630 Global Issues in OSH
OSH 636 Transportation Safety
OSH 637 Biostatistics and Probability
OSH 640 Safety and Health Program Management and Training
OSH 645 Loss Control Measurement and Management
OSH 646 Fundamentals of Risk Control
OSH 654 Advanced Safety and Health Management and Administration
OSH 655 Legal Aspects of Safety and Health
OSH 656 Ergonomics and Biomechanics
OSH 658 Introduction to Occupational Epidemiology
OSH 644 Cooperative Education*1
(or approved elective with prior safety internship or equivalent)
OSH 680 Graduate Seminar in Occupational Safety and Health

Thesis ........................................................................... 6 hrs
OSH 698-699 Thesis

*1Technical requirements courses are selected based on the student’s program concentration and must be approved by the graduate program advisor.

NON-THESIS REQUIREMENTS

Total Course Requirements ........................................... 30 hours
Same as above with the following substitution for thesis:
OSH 644 Cooperative Education*1
(or approved elective with prior safety internship or equivalent)
and one of the following according to concentration
OSH 657 Current Literature and Research in Safety and Health*1 (Safety Management)
OSH 697 Research in Environmental Health and Safety*1 (Industrial Hygiene or Environmental)

All students (Thesis or Non-Thesis) must also complete 12 credit hours by selecting one of the following three concentrations. Substitutions within these concentrations can be made only with the approval of the advisor. Consult with advisor when choosing a concentration. Additional coursework may be required.
Safety Management Concentration ................................. 12 hrs
OSH  621  Industrial Hygiene and Safety Program Development
OSH  640  Safety and Health Program Management and Training
OSH  650  Occupational Safety and Health Organizational Leadership and Management
OSH  655  Legal Aspects of Safety and Health

Industrial Hygiene Concentration ................................. 12 hrs
OSH  621  Industrial Hygiene and Safety Program Development
OSH  622  Toxicology of Industrial Materials
OSH  627  Air Contaminants and Industrial Ventilation
OSH  663  Applied Workplace Ergonomics

Environmental Concentration ................................. 12 hrs
OSH  622  Toxicology of Industrial Materials
OSH  627  Air Contaminants and Industrial Ventilation
OSH  687  Wastewater Treatment
OSH  689  Solid and Hazardous Waste Treatment

Other Degree Requirement