



College of Science, Engineering and Technology

Steve Cobb, Dean

Robert Pervine, Associate Dean

201 Industry and Technology Building

270-809-2888



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The departments in the College of Science, Engineering and Technology have a proud history of preparing students for careers in biology, chemistry, geosciences, mathematics, statistics, industrial technology, engineering technology, telecommunications, graphic communications, engineering and physics.

The college's faculty are talented educators who make quality instruction a priority. They make themselves accessible to students and enjoy helping 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, which now include a new science campus. The departments of biology and chemistry are now housed in two beautiful state-of-the-art buildings, the Biology Building and Jesse D. Jones Hall. A proposed third building to house the engineering and physics programs would complete the campus. The college also enjoys excellent facilities in the Collins Center for Industry and Technology, Hugh L. Oakley Applied Science Building, and Blackburn Science Building.

Murray State's designation as a Commonwealth Center of Excellence for Reservoir Research and the Program of Distinction in Telecommunication 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 those found at many universities. The student-centered faculty, excellent facilities, and attractive curricular options 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 systems and 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.

Three distinct components make up the Institute: the Hancock Biological Station (HBS), the Mid-America Remote sensing Center (MARC), and the Chemical Analysis Laboratory (CAL). The Institute's primary mission is to provide the infrastructure, support, and intellect for education and research of watershed ecosystems.

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.

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 who expertise is related to a wide variety of applications 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

College of Science, Engineering and Technology

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 Analysis Laboratory. The Chemical Analysis Laboratory provides reasonably priced analyses and instruction in environmental analytical chemistry at both the undergraduate and graduate levels. The Chemical Analysis Laboratory is a major contributor to the Institute's research through its provision of chemical analyses for environmental chemistry, ecotoxicological, trace element and acid deposition studies. In addition, it offers regional laboratory service for industries, institutions and individuals in west Kentucky, the greater Ohio Valley region and beyond in fulfillment of its regional economic service role.

Pre-Professional Programs

Students planning to pursue the following professions should consult with the appropriate advisor before beginning their studies.

- **Dentistry:** Dr. Timothy Johnston, Department of Biological Sciences, and Dr. Robert Volp, Department of Chemistry.
- **Engineering:** Dr. Ted Thiede, Professional Engineer, Department of Engineering and Physics; Dr. Mike Kemp, Professional Engineer, Department of Industrial and Engineering Technology.
- **Forensics:** Dr. Daniel Johnson, Department of Chemistry.
- **Medicine:** Dr. Sterling Wright, Department of Biological Sciences; and Dr. Ricky Cox, Department of Chemistry.
- **Optometry:** Dr. David Canning and Dr. Tom Timmons, Department of Biological Sciences.
- **Pharmacy:** Dr. Leon Duobinis-Gray, Department of Biological Sciences; Dr. Harry Fannin, Department of Chemistry.
- **Physical Therapy:** Dr. Terry Derting and Dr. Claire Fuller, Department of Biological Sciences.

Department of Biological Sciences

2112 Biology Building

270-809-2786

Chair: Tom J. Timmons. **Faculty:** Arkov, Canning, Derting, Duobinis-Gray, Flinn, Fuller, He, Johnston, Martin, Nakamura, Saar, Timmons, Trzepacz, Weber, D. White, S. White, Whiteman, Wright, Zimmerer.

The Department of Biological Sciences offers baccalaureate programs with a major in biology (pre-medicine, pre-dentistry, pre-optometry, pre-physical therapy, molecular biology, fisheries, aquatic biology and secondary certification options 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. 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-or-

ented 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: Biology

Bachelor of Science/Bachelor of Arts Degree CIP 26.0101

University Studies Requirements¹45-46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 201 General College Chemistry
CHE 202 General Chemistry and Qualitative Chemistry
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
236 Mechanics, Heat and Wave Motion Laboratory

Required Courses..... 41 hrs

BIO 099 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 330 Principles of Ecology
BIO 333 Genetics
BIO 499 Senior Biology Seminar
BIO electives: 16 hrs approved by advisor, 300-level or above
[BIO 488 and 489 will not count here²]

Co-Requirements for Biology Major.....7-8 hrs

Group 1:
CHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
or Group 2:
CHE 210 Brief Organic Chemistry³
CHE 215 Chemistry Laboratory³
CHE 330 Basic Biochemistry

Required Minor⁴3-21 hrs

Unrestricted Electives.....4-22 hrs

Total Curriculum Requirements 120 hrs

¹Curriculum satisfies 9-10 hours of science University Studies requirements and ten hours of University Studies electives.

²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used.

³This course does not apply toward the chemistry minor.

⁴Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

AREA:**Biology/Biomedical Sciences Option¹****Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101****University Studies Requirements 45 hrs**
(see Chapter 4, University Studies Requirements)

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
PHY 132 General Physics II²
PHY 133 General Physics II Laboratory²**Required Courses..... 46 hrs**

BIO 099 Transitions
 BIO 115 The Cellular Basis of Life
 BIO 216 Biological Inquiry and Analysis
 BIO 221 Zoology: Animal Form and Function²
or
 BIO 222 Botany: Plant Form and Function
 BIO 290 Biomedical Research I
 BIO 300 Introductory Microbiology
 BIO 321 Cell Biology: Mechanisms
or
 BIO 323 Cell Biology: Systems
 BIO 322 Animal Physiology
or
 BIO 555 Plant 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 14 hrsCHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 530 Fundamentals of Biochemistry I
CHE 540 Fundamentals of Biochemistry II**Restricted Electives..... 15 hrs***Choose from the following:*

BIO 320 Comparative Vertebrate Anatomy
 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
 CHE 305 Analytical Chemistry
 CHE 403 Basic Physical Chemistry
 PHY 370 Introduction to Modern Physics

Total Curriculum Requirements 120 hrs¹A freshman must have a math ACT score of 25 or higher to declare

a major in Biomedical Sciences. However, any student may apply to the program and must have completed 32 credit hours with a GPA of 3.0, and must have taken BIO 115, 216, CHE 201, 202 and MAT 250 with grades of *B* or better. Any student wishing to seek this degree (whether declared as a freshman or not) must apply to the Biomedical Sciences committee for admission into the program.

²Required for area if not taken as a University Studies elective.**MAJOR:****Biology/Molecular Biology Option****Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101****University Studies Requirements¹ 45-47 hrs**
(see Chapter 4, University Studies Requirements)

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 *and*
236 Mechanics, Heat and Wave Motion Laboratory•*University Studies Electives:*CHE 202 General Chemistry and Qualitative Analysis
PHY 132 General Physics II
PHY 133 General Physics II Laboratory
or
PHY 255 Electricity, Magnetism and Light *and*
256 Electricity, Magnetism and Light Laboratory**Required Courses..... 40 hrs**

BIO 099 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 537 Experimental Biochemistry
 BIO 597 Topics in Advanced Molecular Biology

Co-Requirements for Biology Major² 17 hrsCHE 312 Organic Chemistry I
CHE 320 Organic Chemistry II
CHE 530 Fundamentals of Biochemistry I
CHE 540 Fundamentals of Biochemistry II
MAT 560 Statistical Methods**Unrestricted Electives 16-18 hrs****Total Curriculum Requirements 120 hrs**¹Curriculum satisfies all hours of science University Studies requirements (Section II).²Chemistry co-requirements may fulfill the requirements for a minor in chemistry.

MAJOR:
Biology/Pre-Medical/Pre-Dental Option

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements¹45-47 hrs
(see Chapter 4, University Studies Requirements)

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

236 Mechanics, Heat and Wave Motion Laboratory

•*University Studies Electives:*

CHE 202 General Chemistry and Qualitative Analysis

PHY 132 General Physics II

PHY 133 General Physics II Laboratory

or

PHY 255 Electricity, Magnetism and Light and

256 Electricity, Magnetism and Light Laboratory

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

PSY 180 General Psychology (*recommended*)

Required Courses.....40 hrs

BIO 099 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 321 Cell Biology: Mechanisms

or

BIO 323 Cell Biology: Systems

BIO 322 Animal Physiology

BIO 333 Genetics

BIO 499 Senior Biology Seminar

BIO electives: *12 hrs approved by advisor 300 level or above*
[BIO 488 and 489 will not count here]²

Co-Requirements for Biology Major.....8 hrs

CHE 312 Organic Chemistry I

CHE 320 Organic Chemistry II

Required Minor³3-21 hrs

Unrestricted Electives⁴4-24 hrs

Total Curriculum Requirements 120 hrs

¹Curriculum satisfies all hours of science University Studies requirements (Section II).

²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used.

³Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

⁴ENG 204 strongly recommended. Electives other than ENG 204 must be at the 300 level or above.

MAJOR:
Biology/Pre-Optometry Option

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements44-46 hrs
(see Chapter 4, University Studies Requirements)

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

236 Mechanics, Heat and Wave Motion Laboratory

and

PHY 255 Electricity, Magnetism and Light

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

MAT 135 Introduction to Probability and Statistics

Required Courses.....41 hrs

BIO 099 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 322 Animal Physiology

BIO 333 Genetics

BIO 499 Senior Biology Seminar

BIO electives: *12 hrs approved by advisor 300-level or above*
[BIO 488 and 489 will not count here]¹

Co-Requirements for Biology Major.....22 hrs

CHE 202 General Chemistry and Qualitative Analysis

CHE 312 Organic Chemistry I

CHE 320 Organic Chemistry II

CHE 330 Basic Biochemistry

CHE 530 Fundamentals of Biochemistry I

ENG 204 Advanced Expository Writing

Required Minor²0 hrs

Unrestricted Electives11-13 hrs

Total Curriculum Requirements 120 hrs

¹A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used.

²Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

**MAJOR:
Biology/Pre-Physical Therapy Option****Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101****University Studies Requirements¹ 45 hrs**
(see Chapter 4, University Studies Requirements)

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

*and***•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

PHY 132 General Physics II

PHY 133 General Physics II Laboratory

Required Courses.....39-40 hrs

BIO 099 Transitions

BIO 115 The Cellular Basis of Life

BIO 216 Biological Inquiry and Analysis

BIO 120 Scientific Etymology

BIO 221 Zoology: Animal Form and Function

BIO 222 Botany: Plant Form and Function

BIO 220 Clinical Terminology

BIO 300 Introductory Microbiology

or

BIO 321 Cell Biology

BIO 320 Comparative Vertebrate Anatomy

BIO 322 Animal Physiology

BIO 333 Genetics

BIO 499 Senior Biology Seminar

BIO electives: *4 hrs approved by advisor, 300 level or above
[BIO 488 and 489 will not count here]²***Co-Requirements for Biology Major.....17-18 hrs**

BIO 450 Exercise Physiology

CHE 312 Organic Chemistry I

CHE 320 Organic Chemistry II

MAT 135 Introduction to Probability and Statistics

or

PSY 300 Principles and Methods of Statistical Analysis

PSY 260 Lifespan Development

Required Minor³3-21 hrs**Unrestricted Electives0-16 hrs****Total Curriculum Requirements120-124 hrs**¹Curriculum satisfies all science University Studies requirements.²A maximum of three hours total from BIO 483, 484 and BIO 491, 492, 493, 494 may be used.³Chemistry co-requirements may apply toward the requirements for a minor in chemistry.**MAJOR:
Biology/Fisheries/Aquatic Biology Option****Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101****University Studies Requirements¹ 45 hrs**
(see Chapter 4, University Studies Requirements)

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

•University Studies Electives:

CHE 202 General Chemistry and Qualitative Analysis

MAT 135 Introduction to Probability and Statistics

Required Biology Courses..... 44 hrs

BIO 099 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 330 Principles of Ecology

BIO 333 Genetics

BIO 499 Senior Biology Seminar

BIO 586 Limnology²*and 15 hrs selected from the following:*

BIO 535 Watershed Ecology

BIO 546 Stream Ecology

BIO 547 Aquatic Vascular Plants

BIO 561 Freshwater Invertebrates

BIO 563 Aquatic Entomology

BIO 570 Ichthyology

BIO 582 Fisheries Management

BIO 587 Freshwater Biology

BIO 589 Reservoir Ecology

Co-Requirements for Biology Major.....7-8 hrs*and Group 1:*CHE 210 Brief Organic Chemistry³CHE 215 Brief Organic Chemistry Laboratory³

CHE 330 Basic Biochemistry

or Group 2:

CHE 312 Organic Chemistry I

CHE 320 Organic Chemistry II

Required Minor⁴3-21 hrs**Unrestricted Electives2-21 hrs****Total Curriculum Requirements 120 hrs**¹Curriculum satisfies all hours of science University Studies requirements and nine hours of University Studies electives.²Some aquatic classes are only offered as summer Hancock Biological Station courses.³This course does not apply toward the chemistry minor.⁴Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

MAJOR:
Biology/Secondary Certification (Grades 8-12)

Bachelor of Science/Bachelor of Arts Degree
CIP 26.0101

University Studies Requirements¹ 46 hrs
(see Chapter 4, University Studies Requirements)

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 Education²
- PHY 130 General Physics I³
- PHY 131 General Physics I Laboratory³

Note: Certification requires a grade of *B* or better in one English composition course and a *C* 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..... 41 hrs

- BIO 099 Transitions
- BIO 112 Field Biology
- 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
- 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 Chemistry⁴
 - CHE 215 Brief Organic Chemistry Laboratory⁴
 - CHE 330 Basic Biochemistry

Physics Requirement - Group 1:

- PHY 132 General Physics II⁵
- PHY 133 General Physics II Laboratory⁵

Required for Secondary Certification⁶ 29 hrs

- COM 372 Communication in Educational Environments
- EDU 303 Strategies of Teaching
- EDU 403 Structures and Foundations of Education
- EDU 405 Evaluation and Measurement in Education
- EDU 422 Student Teaching Seminar (optional)
- SEC 420 Practicum in Secondary Schools
- SEC 421 Student Teaching in the Secondary School
- SED 300 Educating Students with Disabilities

Required Minor⁷ 3-21 hrs

Total Curriculum Requirements 130-149 hrs⁷

¹Curriculum satisfies 15 hours of science University Studies requirements.

²With a grade of *C* or better.

³PHY 235 and 236 will also meet this requirement.

⁴This course does not apply toward the chemistry minor.

⁵PHY 255 and 256 will also meet this requirement.

⁶PRAXIS 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 *C* 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.

⁷Chemistry co-requirements may apply toward the requirements for a minor in chemistry.

AREA:
Wildlife and Conservation Biology

Bachelor of Science/Bachelor of Arts Degree
CIP 03.0601

University Studies Requirements 45 hrs
(see Chapter 4, University Studies Requirements)

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

•*University Studies Electives:*

- CHE 202 General Chemistry and Qualitative Analysis
- MAT 135 Introduction to Probability and Statistics

Core Courses 33-37 hrs

- BIO 099 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 330 Principles of Ecology
 - BIO 333 Genetics
 - BIO 350 Systematic Botany
- or*
- BIO 553 Field Botany
 - BIO 499 Senior Biology Seminar
- and the following two courses:*
- CHE 210 Brief Organic Chemistry
 - CHE 215 Organic Chemistry Laboratory
- or the following two courses:*
- CHE 312 Organic Chemistry I
 - CHE 320 Organic Chemistry II

Option of Study 40-41 hrs

Choose one of the following three options:

Wildlife Biology¹

- BIO 154 Dendrology
- BIO 320 Comparative Vertebrate Anatomy
- BIO 380 Wildlife Techniques
- BIO 580 Principles of Wildlife Management
- BIO 584 Wildlife Policy and Administration

- PLN 507 Urban and Regional Land Use Planning
and two of the following:
 BIO 572 Herpetology
 BIO 573 Ornithology
 BIO 574 Mammalogy
 Elective (0-1 hrs)
and one of the following:
 CSC 199 Introduction to Information Technology
 PHY 140 Introduction to Computing Applications in
 Science and Engineering
and one of the following:
 ENG 204 Advanced Expository Writing
 ENG 324 Technical Writing
 ENG 325 Professional Technical Writing
 ENG 404 Advanced Composition

Conservation Biology

- BIO 308 Ethics in Biology
 BIO 578 Conservation Biology
 BIO 580 Principles of Wildlife Management
and two of the following:
 BIO 570 Ichthyology
 BIO 572 Herpetology
 BIO 573 Ornithology
 BIO 574 Mammalogy
and
 ECO 230 Principles of Macroeconomics
 ECO 231 Principles of Microeconomics
 ECO 310 Issues in the Global Economy
 GSC 512 Remote Sensing
or
 GSC 521 Geographic Information Systems
 PLN 507 Urban and Regional Land Use Planning
 POL 250 Introduction to International Relations
or
 POL 252 Contemporary Political Systems
 SOC 231 Social Problems²
Elective-300 level or above (1 hr)

Zoological Conservation

- BIO 300 Introductory Microbiology
or
 BIO 467 General Parasitology
 BIO 322 Animal Physiology
 BIO 538 Animal Behavior
 BIO 539 Animal Behavior Laboratory
 BIO 578 Conservation Biology
and two of the following:
 BIO 570 Ichthyology
 BIO 572 Herpetology
 BIO 573 Ornithology
 BIO 574 Mammalogy
and
 AGR 300 Principles of Animal Nutrition
 AGR 322 Veterinary Laboratory Principles
 AGR 329 Veterinary Hematology and Microbiology
 AGR 331 Small Animal Diseases
 AGR 332 Animal Nursing and Radiography

Unrestricted Electives0-2 hrs

Total Curriculum Requirements120-123 hrs

¹Certification available from The Wildlife Society.
²Will count as University Studies Social and Self-Awareness and Responsible Citizenship elective.

Pre-Pharmacy Curriculum¹

Required Courses 58 hrs

- BIO 221 Zoology: Animal Form and Function
 BIO 227 Human Anatomy
 BIO 228 Human Anatomy Laboratory
 BIO 300 Introductory Microbiology
 CHE 201 General College Chemistry
 CHE 202 General Chemistry and Qualitative Analysis
 CHE 312 Organic Chemistry I
 CHE 320 Organic Chemistry II
 CHE 325 Organic Chemistry II Laboratory
 ECO 231 Principles of Microeconomics
 ENG 105 Reading, Writing and Inquiry
 ENG 204 Advanced Expository Writing
 MAT 135 Introduction to Probability and Statistics
 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
 Electives: Social and Self-Awareness and Responsible Citizen-
 ship (3 hrs) Cross-cultural³ (3 hrs)
 Humanities² (6 hrs) General electives (4 hrs)

Total Curriculum Requirements74 hrs

¹The 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 option and include all the courses listed above. The pre-pharmacy advisor should be consulted.

²Must be a two-course series.

³A course focusing on the study of a Third World or non-Western country.

Biology Minor21 hrs

Complete any two of BIO 115, 216, 221 and 222. Twelve hours of electives 300 level or above (BIO 330 and 333 are highly recommended) 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 101, 488, 489, and 499 will not count toward this minor. Six hours must be upper-level (300 and greater) courses completed in residence at Murray State University.

Department of Chemistry
456 Blackburn Science Building
270-809-2584

Chair: Judy Ratliff. **Faculty:** Anderson, Cox, Fannin, Fawzy, Johnson, Loganathan, McCreary, Muscio, Ratliff, Revell, Volp.

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

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.

College of Science, Engineering and Technology

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 a nationally recognized chemistry student organizations, the Student Affiliates 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: Chemistry

Bachelor of Science/Bachelor of Arts Degree CIP 40.0501

ACCREDITED BY:
American Chemical Society

University Studies Requirements41-47 hrs (see Chapter 4, University Studies Requirements.)

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 Lab¹
PHY 255 Electricity, Magnetism and Light¹
PHY 256 Electricity, Magnetism and Light Lab¹

Required Courses.....63 hrs
CHE 099 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 511 Advanced Inorganic Chemistry I
CHE 512 Inorganic Chemistry Laboratory
CHE 519 Instrumental Analysis
CHE 530 Fundamentals of Biochemistry I
CSC 232 Visual Basic Programming I²
MAT 308 Calculus and Analytic Geometry II
MAT 309 Calculus and Analytic Geometry III

Required Limited Electives³3 hrs
CHE 488 Cooperative Education/Internship
or
CHE 495 Senior Research

Unrestricted Electives.....7-13 hrs

Total Curriculum Requirements 120 hrs

¹Required for area if not taken as a University Studies elective.

²EGR 140 may be substituted.

³In 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. option should contact the graduate coordinator in the department no later than during the junior year.

MAJOR: Chemistry

Bachelor of Science/Bachelor of Arts Degree CIP 40.0501

University Studies Requirements41-47 hrs
(See Chapter 4, University Studies Requirements.)

University Studies selections must include:
•*Scientific Inquiry, Methodologies, and Quantitative Skills:*
MAT 250 Calculus and Analytic Geometry I¹
PHY 130 General Physics I¹ *and*
PHY 131 General Physics I Laboratory¹
PHY 132 General Physics II¹ *and*
PHY 133 General Physics II Laboratory¹

Required Courses.....36 hrs
CHE 099 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 232 Visual Basic Programming I²

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

Required Minor..... 21 hrs

Electives³ 13-19 hrs

Total Curriculum Requirements 120 hrs

¹Required for major if not taken as a University Studies elective.

²EGR 140 may be substituted.

³At 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)

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 Requirements41-47 hrs
 (See Chapter 4, University Studies Requirements.)

University Studies selections must include:

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

MAT 250 Calculus and Analytic Geometry

PHY 130 General Physics I¹ and

PHY 131 General Physics I Laboratory¹

PHY 132 General Physics II¹ and

PHY 133 General Physics II Laboratory¹

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

EDP 260 Psychology of Human Development²

•*University Studies Electives:*

CSC 199 Introduction to Information Technology^{3,4}

EDU 103 Issues and Practices of American Education^{2,3}

Note: Certification requires a grade of *B* or better in one English composition course and a *C* 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

CHE 099 Transitions

CHE 120 Chemical Laboratory Safety

CHE 201 General College Chemistry

CHE 202 General Chemistry and Qualitative Analysis

CHE 303 Strategies of Teaching Chemistry

or

EDU 303 Strategies of Teaching

CHE 305 Analytical Chemistry

CHE 312 Organic Chemistry I

CHE 320 Organic Chemistry II

CHE 403 Basic Physical Chemistry

Required Limited Electives.....3 hrs

Select from the following:

CHE 330 Basic Biochemistry

CHE 352 Basic Chemical Instrumentation

CHE 502 Fundamentals of Toxicology

CHE 513 Environmental Chemistry

Secondary Certification Courses.....26 hrs

COM 372 Communication in Educational Environments

EDU 403 Structures and Foundations of Education

EDU 405 Evaluation and Measurement in Education

SEC 420 Practicum in Secondary Schools

SEC 421 Student Teaching in the Secondary School

SED 300 Educating Students with Disabilities

Required Minor.....21 hrs
Total Curriculum Requirements123-129 hrs

¹Required 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.

²Required for secondary certification if not taken as a University Studies elective.

³With a grade of C or better.

⁴May substitute CSC 232 or EGR 140, but these will not count for University Studies electives.

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 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 your 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.

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

Chemistry Teaching Specialization24 hrs

MAJOR:
Chemistry/Pre-Medical/Pre-Dental Option

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501
University Studies Requirements 41-47 hrs
 (see Chapter 4, University Studies Requirements.)

University Studies selections must include:

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

MAT 250 Calculus and Analytic Geometry I¹

PHY 130 General Physics I¹

PHY 131 General Physics I Laboratory¹

PHY 132 General Physics II¹

PHY 133 General Physics II Laboratory¹

Required Courses..... 36 hrs

CHE 099 Transitions

CHE 201 General College Chemistry

CHE 202 General Chemistry and Qualitative Analysis

College of Science, Engineering and Technology

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 232 Visual Basic Programming I²

Required Limited Chemistry Electives 3 hrs

Required Minor³ 21 hrs

Unrestricted Electives 13-19 hrs

Total Curriculum Requirements 120 hrs

¹Required for major if not taken as a University Studies elective.

²EGR 140 may be substituted.

³Biology minor strongly recommended.

MAJOR:

Chemistry/Biochemistry Option

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501

University Studies Requirements41-47 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

MAT 250 Calculus and Analytic Geometry I¹

PHY 130 General Physics I¹ and

PHY 131 General Physics I Laboratory¹

PHY 132 General Physics II¹ and

PHY 133 General Physics II Laboratory¹

Required Courses 45 hrs

CHE 099 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 232 Visual Basic Programming I²

Required Minor³ 21 hrs

Electives4-10 hrs

Total Curriculum Requirements 120 hrs

¹Required for major if not taken as a University Studies elective.

²EGR 140 may be substituted.

³Biology minor required, including BIO 221, 222, 300, and 333; remaining courses must include 533 and 534. A biology minor must be declared, and all residential and graduation requirements met

MAJOR:

Chemistry/Forensics Option

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501

University Studies Requirements41-47 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

MAT 250 Calculus and Analytic Geometry I

PHY 130 General Physics I¹ and

PHY 131 General Physics I Laboratory¹

PHY 132 General Physics II¹ and

PHY 133 General Physics II Laboratory¹

Required Courses 35 hrs

CHE 099 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 232 Visual Basic Programming I²

Required Limited Electives 10 hrs

ARC 335 Forensic Archaeology

CHE 330 Basic Biochemistry

CHE 352 Basic Chemical Instrumentation

Criminal Justice Minor³ 21 hrs

CRJ 220, 333, and 346 are required selections.

Unrestricted Electives4-10 hrs

Total Curriculum Requirements 120 hrs

¹Required for major if not taken as a University Studies elective.

²EGR 140 may be substituted.

³A second major in Criminal Justice can substitute for the minor.

MAJOR:

Chemistry/Pre-Pharmacy Option¹

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501

University Studies Requirements41-47 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

MAT 250 Calculus and Analytic Geometry I²

PHY 130 General Physics I²

PHY 131 General Physics I Laboratory²

PHY 132 General Physics II²

PHY 133 General Physics II Laboratory²

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

ECO 231 Principles of Microeconomics

Required Courses.....47 hrs

- CHE 099 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 232 Visual Basic Programming I³
- MAT 135 Introduction to Probability and Statistics

Biology Minor21 hrs

Complete any two of BIO 115, 216, 221 and 222. Twelve hours of electives 300 level or above (BIO 330 and 333 are highly recommended) 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 101 and 201 will not count toward this minor. Six hours must be upper-level (300 and greater) courses completed in residence at Murray State University.

Unrestricted Electives3-9 hrs

Total Curriculum Requirements120 hrs

¹This 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. The pre-pharmacy advisor should be consulted.

²Required for major if not taken as a University Studies elective.

³EGR 140 may be substituted.

**MAJOR:
Chemistry/Pre-MBA Option**

**Bachelor of Science/Bachelor of Arts Degree
CIP 40.0501**

University Studies Requirements41-47 hrs
(See Chapter 4, University Studies Requirements.)

University Studies selections must include:

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

- MAT 250 Calculus and Analytic Geometry I¹
- PHY 130 General Physics I¹
- PHY 131 General Physics I Laboratory¹
- PHY 132 General Physics II¹
- PHY 133 General Physics II Laboratory¹

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

- ECO 230 Principles of Macroeconomics¹

Required Courses.....36 hrs

- CHE 099 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 232 Visual Basic Programming I²

Required Business Courses/Minor³24 hrs

- ACC 200 Principles of Financial Accounting
- ACC 201 Principles of Managerial Accounting
- BPA 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 Electives10-16 hrs

Total Curriculum Requirements120 hrs

¹Required for major if not taken as a University Studies elective.

²EGR 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 your transcript, a minor must be declared, and all residential and graduation requirements must be met.

Chemistry Minor.....21 hrs

CHE 201, 202 and electives selected from the following chemistry courses: 305, 312, 320, 325, 352, 400, 403, 410, 420, 435, 488, 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 completed in residence at Murray State University.

**Department of Engineering and Physics
131 Blackburn Science Building
270-809-2993**

Chair: Ted Thiede. **Faculty:** Cobb, Crofton, Hereford, Ieta, Kobraei, Nimmo, Pallone, Rogers, Thiede.

The undergraduate programs lead to a bachelor of arts or bachelor of science degree in engineering physics, physics, or applied physics. These curricula are designed to prepare the student for graduate or professional work in physics, engineering, teaching and related fields which require men and women with a broad basic education in physics, mathematics and the engineering sciences. The department also offers a minor in physics and a minor in engineering science.

The Engineering Physics curriculum is accredited as an engineering program by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET).

**MAJOR:
Physics**

**Bachelor of Science/Bachelor of Arts Degree
CIP 40.0801**

University Studies Requirements46-55 hrs
(see Chapter 4, University Studies Requirements)

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

College of Science, Engineering and Technology

EGR 390 Engineering Measurements
PHY 099 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 Chemistry^{1,2}
CHE 202 General Chemistry and Qualitative Analysis^{1,2}
CSC 420 Numerical Analysis I
or
MAT 442 Introduction to Numerical Analysis²
MAT 250 Calculus and Analytic Geometry I^{1,2}
MAT 308 Calculus and Analytic Geometry II^{1,2}
MAT 309 Calculus and Analytic Geometry III^{1,2}
MAT 411 Ordinary Differential Equations²

Required Limited Electives..... 3 hrs

PHY/EGR courses numbered 300 or above.

Required Minor..... 3-21 hrs²

Unrestricted Electives..... 3-30 hrs

Total Curriculum Requirements 120 hrs

¹Fulfill University Studies requirements.

²CHE 201 and 202 fulfill requirements for a minor in chemistry; MAT 250, 308, 309, 411 and 442 fulfill requirements for a minor in math.

MAJOR:

Physics/Secondary Certification (Grades 8-12)

Bachelor of Science/Bachelor of Arts Degree 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 Requirements46-55 hrs (see Chapter 4, University Studies Requirements)

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 C 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 099 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 Chemistry^{1,2}
CHE 202 General Chemistry and Qualitative Analysis^{1,2}
CSC 420 Numerical Analysis I
or
MAT 442 Introduction to Numerical Analysis²
MAT 250 Calculus and Analytic Geometry I^{1,2}
MAT 308 Calculus and Analytic Geometry II^{1,2}
MAT 309 Calculus and Analytic Geometry III^{1,2}
MAT 411 Ordinary Differential Equations²

Required Limited Electives..... 3 hrs

PHY/EGR courses numbered 300-level or above.

Required for Secondary Certification 32 hrs

COM 372 Communication in Educational Environments
EDU 103 Issues and Practices of American Education³
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
SEC 420 Practicum in Secondary Schools
SEC 421 Student Teaching in the Secondary School
SED 300 Educating Students with Disabilities

Required Minor..... 3-21 hrs²

Total Curriculum Requirements 122-149 hrs

¹Fulfill University Studies requirements.

²CHE 201 and 202 fulfill requirements for a minor in chemistry; MAT 250, 308, 309, 411 and 442 fulfill requirements for a minor in math.

³With a grade of C or better.

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 secondary certification course requirements must be met.) **Note:** Even though this program exceeds Murray State University's requirements for a physics minor, in order for a Physics Minor to appear on your 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.

AST 115 Introductory Astronomy
AST 116 Introductory Astronomy Laboratory
MAT 250 Calculus and Analytic Geometry I¹
MAT 308 Calculus and Analytic Geometry II²
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 570 Introduction to Modern Physics

Required Limited Electives.....9 hrs
PHY/EGR courses numbered 300-level or above.

Physics Teaching Specialization.....36 hrs
¹Corequisite of PHY 235.
²Corequisite of PHY 255.

AREA:
Engineering Physics

Bachelor of Science Degree
CIP 14.1201

ACCREDITED BY:
 Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET)

Note: This degree program has been approved by the Kentucky Education Professional Standards Board as an option for secondary education certification in physics. Students seeking certification via this option 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.¹

University Studies Requirements46 hrs
 (see Chapter 4, University Studies Requirements)

University Studies selections must include:
 •*Social and Self-Awareness and Responsible Citizenship:*
 ECO 231 Principles of Microeconomics

Core Courses45 hrs
 CHE 201 General College Chemistry^{2,3}
 EGR 099 Transitions
 EGR 140 Introduction to Computing Applications
 in Science and Engineering
 EGR 195 Methods of Engineering Physics
 EGR 240 Thermodynamics I
 EGR 259 Statics
 EGR 264 Linear Circuits I
 EGR 330 Dynamics
 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 I^{2,3}
 MAT 308 Calculus and Analytic Geometry II^{2,3}
 MAT 309 Calculus and Analytic Geometry III^{2,3}
 MAT 411 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

Concentration Requirements.....27-39 hrs
 Each student must fulfill the requirements for either the Biomedical, Electrical or Mechanical Engineering Concentration.

Biomedical Engineering Concentration⁶
 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
 EGR 365 Linear Circuits II
 EGR 375 Materials Science
 MAT 135 Introduction to Probability and Statistics
 Technical Electives (9 hrs)⁴

Electrical Engineering Concentration
 EGR 365 Linear Circuits II
 EGR 366 Analog Electronics I
 EGR 378 Logic Design I
 EGR 461 Electricity and Magnetism II
 EGR 468 Digital Signal Processing
 Technical Electives (8 hrs)⁴
 Mathematics Depth Elective (3 hrs)^{3,5}

Mechanical Engineering Concentration
 EGR 344 Fluid Mechanics
 EGR 346 Heat Transfer
 EGR 359 Mechanics of Materials
 EGR 375 Materials Science
 ITD 102 CAD Applications
 Technical Electives (9 hrs)⁴
 Mathematics Depth Elective (3 hrs)^{3,5}

Unrestricted Elective⁷0-3 hrs

Total Curriculum Requirements121-130 hrs

¹Must be admitted to teacher education. See Chapter 5 for requirements.

²These courses are required and also fulfill University Studies requirements.

³This course is considered a program corequisite and may be shared with a minor or second major.

⁴Technical Electives are to be chosen from EGR/PHY courses, 300-level and above, or from the list of mathematics depth electives, or as approved by department chair.

⁵Mathematics depth electives should be courses at the 300-level and above.

⁶Students completing the concentration in Biomedical Engineering and intending to seek admission to medical school are encouraged to complete the following: BIO 321, 333; CHE 320 and 325.

⁷Students choosing the Electrical Engineering or Mechanical Engineering concentrations should complete three hours of unrestricted elective courses.

AREA:
Applied Physics

Bachelor of Science/Bachelor of Arts Degree
CIP 40.0801

University Studies Requirements46-55 hrs
 (see Chapter 4, University Studies Requirements)

University Studies selections must include:

•*Oral and Written Communication:*

COM 161 Introduction to Public Speaking

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

College of Science, Engineering and Technology

Required Courses.....33 hrs

EGR 140	Introduction to Computing Applications in Science and Engineering
EGR 240	Thermodynamics I
EGR 264	Linear Circuits I
PHY 099	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
<i>or</i>	
PHY 580	Modern Physics I
PHY 460	Electricity and Magnetism I
PHY 470	Optics
PHY 530	Mechanics I

Co-requirements for Area6 hrs

CHE 201	General College Chemistry ^{1,2}
CHE 202	General Chemistry and Qualitative Analysis ^{1,2}
CSC 420	Numerical Analysis I
<i>or</i>	
MAT 442	Introduction to Numerical Analysis ²
MAT 250	Calculus and Analytic Geometry I ^{1,2}
MAT 308	Calculus and Analytic Geometry II ^{1,2}
MAT 309	Calculus and Analytic Geometry III ^{1,2}
MAT 411	Ordinary Differential Equations ²

Technical Electives³24 hrs

Unrestricted Electives.....2-11 hrs

Total Curriculum Requirements120 hrs

¹Fulfill University Studies requirements.

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:

Applied Physics/Pre-MBA Option

Bachelor of Science/Bachelor of Arts Degree CIP 40.0801

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 option. 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
BPA 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

Physics Minor.....22 hrs

PHY 235, 236, 255, 256, 370, and nine additional hours of approved physics courses numbered 300 and above. PHY 130 and 132 may be substituted for PHY 235 and 255 with approval from the department chair. Six hours must be upper-level courses completed in residence at Murray State University.

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 completed in residence at Murray State University.

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 411	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	

Department of Geosciences

104A Wilson Hall

270-809-2591

Chair: George Kipphut. **Faculty:** Cetin, Homsey, Hong, Leasure, Ortmann, Wesler, Zhang.

An area in geoscience with options in earth science, earth science teacher certification, environmental geology, geoarchaeology, and geographic information science are provided by the department faculty. 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 Option

Bachelor of Science Degree CIP 40.0601

University Studies Requirements41-46 hrs
(see Chapter 4, University Studies Requirements)

Recommended University Studies Elective:

CSC 101 Introduction to Problem Solving Using Computers

Required Courses47 hrs

- ARC 150 Introduction to Archaeology
- AST 115 Introductory Astronomy
- AST 116 Introductory Astronomy Laboratory
- GSC 099 Transitions
- GSC 101 The Earth and the Environment¹
- GSC 102 Earth through Time¹
- GSC 125 Weather and Climate¹
- GSC 202 Introduction to Geographic Information Sciences
- GSC 301 Understanding Scientific Communication
- GSC 303 Introduction to Water Science
- GSC 305 Map Analysis
- GSC 336 Principles of Geomorphology
- GSC 339 Field Geology
- or
- GSC 350 Field Techniques in Geosciences
- GSC 512 Remote Sensing
- GSC 521 Geographic Information Systems

Required Limited Electives.....5-6 hrs

Select upper-level courses from the list of approved geology electives given under the option in environmental geology.

Collateral requirement 5 hrs

MAT 150¹ (or above)

Unrestricted Electives17-22 hrs

Total Curriculum Requirements 120 hrs

¹Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.

AREA:

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

Bachelor of Science Degree

CIP 40.0601

University Studies Requirements44 hrs

(see Chapter 4, University Studies Requirements)

University Studies selections must include:

Scientific Inquiry, Methodologies, and Quantitative Skills:

GSC 101 The Earth and the Environment²

GSC 102 Earth through Time²

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:

CSC 199 Introduction to Information Technology¹

Recommended University Studies Elective:

CSC 101 Introduction to Problem Solving Using Computers

Note: Certification requires a grade of *B* or better in one English composition course and a *C* 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.....39 hrs

- ARC 150 Introduction to Archaeology
- AST 115 Introductory Astronomy
- AST 116 Introductory Astronomy Laboratory
- GSC 099 Transitions
- GSC 125 Weather and Climate²
- GSC 202 Introduction to Geographic Information Sciences
- GSC 301 Understanding Scientific Communication
- GSC 303 Introduction to Water Science
- GSC 305 Map Analysis
- GSC 336 Principles of Geomorphology
- GSC 339 Field Geology
- GSC 512 Remote Sensing
- GSC 521 Geographic Information Systems

Required Limited Electives.....8-9 hrs

Select upper-level courses from the list of approved geology electives given under the option in environmental geology, below.

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 I

CHE 106 Introductory Chemistry II

CHE 201 General College Chemistry

CHE 202 General Chemistry and Qualitative Analysis

C. Physics

PHY 235 Mechanics, Heat and Wave Motion

and

PHY 236 Mechanics, Heat and Wave Motion Laboratory

PHY 255 Electricity, Magnetism and Light

and

PHY 256 Electricity, Magnetism and Light Laboratory

Required for Secondary Certification32 hrs

EDU 103 Issues and Practices of American Education¹

EDU 303 Strategies of Teaching

EDU 403 Structures and Foundations of Education

EDU 405 Evaluation and Measurement in Education

EDU 422 Student Teacher Seminar

SEC 420 Practicum in Secondary Schools

SEC 421 Student Teaching in the Secondary School

SED 300 Educating Students with Disabilities

Total Curriculum Requirements123-124 hrs

¹With a grade of *C* or better

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 secondary certification course requirements must be met. **Note:** Even though this program exceeds Murray

College of Science, Engineering and Technology

State University's requirements for an earth science minor, in order for a Earth Science Minor to appear on your 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.

AST 115 Introductory Astronomy
AST 116 Introductory Astronomy Laboratory
GSC 101 The Earth and the Environment
GSC 102 Earth through Time
GSC 125 Weather and Climate
GSC 202 Introduction to Geographic Information Sciences
GSC 303 Introduction to Water Science
GSC 336 Principles of Geomorphology
GSC 339 Field Geology

Earth Science Teaching Specialization.....30 hrs

AREA: Geoscience/Environmental Geology Option

**Bachelor of Science Degree
CIP 40.0601**

University Studies Requirements41-46 hrs
(see Chapter 4, University Studies Requirements)

•*Recommended University Studies Elective:*

CSC 101 Introduction to Problem Solving Using Computers

Required Courses.....46 hrs

ARC 150 Introduction to Archaeology
GSC 099 Transitions
GSC 101 The Earth and the Environment¹
GSC 102 Earth through Time¹
GSC 202 Introduction to Geographic Information Sciences
GSC 210 Hydrology
GSC 301 Understanding Scientific Communication
GSC 305 Map Analysis
GSC 310 Rock and Mineral Resources
GSC 314 Sediments, Soils and Stratigraphy
GSC 336 Principles of Geomorphology
GSC 512 Remote Sensing
GSC 521 Geographic Information Systems
GSC 560 Hydrogeology

Required Limited Electives.....8-9 hrs

(choose from the following approved electives)

ARC 300 Archaeology Method and Theory
ARC 302 Archaeological Field Work I
ARC 304 Archaeology Laboratory Methods
ARC 390 Geoarchaeology
CET 280 Plane Surveying
GSC 303 Introduction to Water Science
GSC 312 Introduction to Remote Sensing
GSC 335 Landscapes of the National Parks
GSC 339 Field Geology
GSC 350 Field Techniques in Geosciences
GSC 430 Crystallography and Optical Mineralogy

GSC 431 Igneous and Metamorphic Petrology
GSC 432 Stratigraphy and Sedimentary Petrology
GSC 433 Structural Geology
GSC 488 Cooperative Education/Internship
GSC 489 Cooperative Education/Internship
GSC 507 Land Use Planning
GSC 522 Digital Cartography
GSC 524 Conservation and Environmental Geology
GSC 534 Invertebrate Paleontology
GSC 535 Watershed Ecology
GSC 575 Field Vertebrate Paleontology
GSC 591 Special Problems
GSC 592 Special Problems
GSC 593 Special Problems

Collateral requirement5 hrs
MAT 150¹ (or above)

Unrestricted Electives14-20 hrs
Board of Registration for Professional Geologists recommends the following courses to enhance performance on the Professional Geologist Examination.

CHE 105 Introductory Chemistry I
or
CHE 201 General College Chemistry
CHE 106 Introductory Chemistry II
or
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
¹Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements.

AREA: Geoscience/Geoarchaeology Option

**Bachelor of Science Degree
CIP 40.0601**

University Studies Requirements41-46 hrs
(see Chapter 4, University Studies Requirements)

Recommended University Studies selection:

•*Social and Self-Awareness and Responsible Citizenship*

ANT 140 Introduction to Cultural Anthropology

•*Recommended University Studies Elective:*

CSC 101 Introduction to Problem Solving Using Computers

Required Courses.....47 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 099 Transitions
GSC 101 The Earth and the Environment¹
GSC 102 Earth through Time¹
GSC 202 Introduction to Geographic Information Sciences

- GSC 301 Understanding Scientific Communication
 - GSC 305 Map Analysis
 - GSC 336 Principles of Geomorphology
 - GSC 512 Remote Sensing
 - GSC 521 Geographic Information Systems
- 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 Electives5 hrs

(choose from the following approved electives)

- ANT 325 Biological Anthropology
- ARC 314 Sediments, Soils and Stratigraphy
- ARC 315 Special Topics in Archaeology
- ARC 321 Ancient Civilizations
- ARC 335 Forensic Archaeology
- ARC 340 Archaeology of Africa
- ARC 350 Public Archaeology
- ARC 360 Historical Archaeology
- ARC 370 Archaeology of the Eastern Woodlands
- ARC 375 Archaeology of the Western Great Lakes
- ARC 385 Archaeology of Eastern Asia
- ARC 402 Archaeological Field Work II
- ARC 425 Advanced Archaeological Laboratory Methods
- ARC 500 Directed Studies
- ARC 510 Advanced Archaeological Field Work
- ARC 592 Historic Preservation
- ARC 598 Museum Studies
- CET 280 Plane Surveying
- GSC 310 Rock and Mineral Resources
- GSC 339 Field Geology
- GSC 350 Field Techniques in Geosciences
- GSC 380 Photogrammetry
- GSC 522 Digital Cartography

Collateral requirement5 hrs

MAT 150¹ (or above)

Unrestricted Electives17-22 hrs

Total Curriculum Requirements 120 hrs

¹Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements

AREA:

Geoscience/Geographic Information Science Option

**Bachelor of Science Degree
CIP 40.0601**

University Studies Requirements41-46 hrs
(see Chapter 4, University Studies Requirements)

•*Recommended University Studies Elective:*

- CSC 101 Introduction to Problem Solving Using Computers

Required Courses46 hrs

- ARC 150 Introduction to Archaeology
- GSC 099 Transitions
- GSC 101 The Earth and the Environment¹
- GSC 102 Earth through Time¹

- GSC 110 World Geography
- GSC 125 Weather and Climate¹
- GSC 202 Introduction to Geographic Information Sciences
- GSC 301 Understanding Scientific Communication
- GSC 305 Map Analysis
- GSC 336 Principles of Geomorphology
- GSC 507 Land Use Planning
- GSC 512 Remote Sensing
- GSC 521 Geographic Information Systems
- GSC 522 Digital Cartography

Required Limited Electives5-6 hrs

(choose from the following approved electives)

- ARC 300 Archaeology Method and Theory
- ARC 302 Archaeological Field Work I
- ARC 304 Archaeology Laboratory Methods
- ARC 360 Historical Archaeology
- GSC 210 Hydrology*
- GSC 303 Introduction to Water Science
- GSC 312 Introduction to Remote Sensing
- GSC 335 Landscapes of the National Parks
- GSC 350 Field Techniques in Geosciences
- GSC 380 Photogrammetry
- GSC 488 Cooperative Education/Internship
- GSC 489 Cooperative Education/Internship
- GSC 523 Problems in Urban Geography and Urban Planning
- GSC 524 Conservation and Environmental Geosciences
- GSC 535 Watershed Ecology
- GSC 560 Hydrogeology
- GSC 570 Computer Applications in Geosciences
- GSC 580 Advanced Geographic Information Systems
- GSC 591 Special Problems
- GSC 592 Special Problems
- GSC 593 Special Problems

*Recommended courses

Collateral requirement5 hrs

MAT 150¹ (or above)

Unrestricted Electives17-23 hrs

Total Curriculum Requirements 120 hrs

¹Will count towards University Studies Scientific Inquiry, Methodologies, and Quantitative Skills requirements

Anthropology Minor21 hrs

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 completed in residence at Murray State University.

Archaeology Minor21 hrs

ARC 150, 300, 304; ARC/GSC 390, minimum of three hours of 302, plus six to eight hours of ARC electives 300-level or above. Six hours must be upper-level courses completed in residence at Murray State University.

Earth Science Minor25-26 hrs

GSC 101, 102, 125, 202, and 339 or 350; AST 115 and 116 or AST 215. Three additional hours of earth science coursework at the 300 level or above. Six hours must be upper-level courses completed in residence at Murray State University.

College of Science, Engineering and Technology

Environmental Geology Minor21 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 completed in residence at Murray State University.

Geographic Information Science Minor24 hrs
GSC 110, 125, 202, 305, 336, and six hours of electives in geographic information science approved by the chair of the Department of Geosciences. Six hours must be upper-level courses completed in residence at Murray State University.

Social Science Minor24 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 completed in residence at Murray State University.

Department of Industrial and Engineering Technology 263A Collins Center 270-809-3392

Chair: Danny Claiborne. **Faculty:** Bahadir, Benson, Claiborne, Combs, Greer, Hart, Kellie, Kemp, Magee, Mayes, Norsworthy, Okuda, Ottway, Palmer, Robinson, Schneiderman, Siebold, Spencer, Tubbs, Weatherly, Whitaker, Yarali, Zirbel.

The Department of Industrial and Engineering Technology offers associate and baccalaureate programs. Also offered are a technical minor and a master of science degrees.

Graduates from the Department of Industrial and Engineering Technology are prepared to succeed in a modern industrial environment. Typical positions within industrial and engineering applications include manufacturing and processes, construction and public works, computer systems and electronic systems, graphic communications, environmental management, pollution control, telecommunications, technical sales and management. Graduates fulfill management and supervisory positions, in addition to design, maintenance, and regulatory positions.

The department supports the university mission through the following services: (1) technical education to meet the needs of MSU students; (2) programs for non-traditional students; and (3) consulting and regional service for schools, industry and government agencies.

All undergraduate programs in the Department of Industrial and Engineering Technology are required to obtain on-the-job experience. The experience can occur via cooperative work/study, internships, summer employment or other methods which fulfill program requirements.

Engineering Technology Accreditation

The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) accredits Murray State programs in civil and construction engineering technology.

Engineering Registration (PE)

Students in TAC/ABET accredited programs within the department are encouraged to seek professional engineering (PE) registration and are provided assistance in preparing for the fundamentals of engineering (FE) registration examination, the first phase of becoming a professional engineer. The FE examination is available to IET graduates in numerous states; however, current Kentucky law prohibits TAC/ABET program graduates from seeking registration. Therefore, individual state boards should be contacted for eligibility requirements.

Engineering Technology

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

•Architectural Engineering Technology

A baccalaureate degree in architectural engineering technology provides students with a background in architectural design, computer aided drafting, 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 board 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.

•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. If the student seeks to attain professional engineering licensure, Murray State offers the first three years of a 3 + 1 civil engineering program articulated with the civil engineering program at the University of Louisville. Additionally, an associate degree in civil engineering technology may be obtained from Murray State University.

•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 opportuni-

ties 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.

•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.

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

**Bachelor of Science Degree
CIP 15.0201**

University Studies Requirements44-46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

•Scientific Inquiry, Methodologies, and Quantitative Skills:

CHE 105 Introductory Chemistry I

MAT 130 Technical Math I

or

MAT 150 Algebra and Trigonometry

MAT 230 Technical Math II

or

MAT 250 Calculus and Analytic Geometry I

•Social and Self-Awareness and Responsible Citizenship:

ECO 230 Principles of Macroeconomics

•University Studies Electives:

PHY 130 General Physics I *and*

PHY 131 General Physics I Laboratory

or

PHY 235 Mechanics, Heat and Wave Motion *and*

PHY 236 Mechanics, Heat and Wave Motion Laboratory

PHY 132 General Physics II *and*

PHY 133 General Physics II Laboratory

or

PHY 255 Electricity, Magnetism and Light *and*

PHY 256 Electricity, Magnetism and Light Laboratory

Core Courses43-45 hrs

CET 280 Plane Surveying

CET 298 Strength of Materials

CET 386 Building Construction Cost Estimating

ENG 324 Technical Writing

ENT 099 Transitions

ENT 286 Introduction to Environmental Engineering
Technology

ENT 287 Statics for Technology

ENT 382 Hydraulics

ENT 393 Engineering Economy

ENT 419 Senior Project I

IET 399 Professional Development Seminar I

IET 488 Cooperative Education/Internship

ITD 107 Introduction to Technical Drawing and Computer
Aided Drafting

MAT 308 Calculus and Analytic Geometry II
or

MAT 330 Technical Math III

TSM 110 Electrical Systems

Option Courses35 hrs

CET 310 Anatomy of Buildings

CET 385 Heavy Construction Cost Estimating

CET 481 Structural Steel Design

CET 482 Reinforced Concrete Design

ENT 458 Applying the National Electric Code

ITD 204 Parametric Modeling and Rendering

ITD 301 Architectural Drawing and Residential Planning

ITD 401 Architectural Drafting & Design-Multi-Family
Light Commercial

Technical Electives (9 hrs)

Total Curriculum Requirements122-126 hrs

AREA: Civil Engineering Technology

**Bachelor of Science Degree
CIP 15.0201**

ACCREDITED BY:

Technology Accreditation Commission of the Accreditation
Board for Engineering and Technology (TAC/ABET)

University Studies Requirements44-46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

•Scientific Inquiry, Methodologies, and Quantitative Skills:

CHE 105 Introductory Chemistry I

MAT 130 Technical Math I

or

MAT 150 Algebra and Trigonometry

MAT 230 Technical Math II

or

MAT 250 Calculus and Analytic Geometry I

•Social and Self-Awareness and Responsible Citizenship:

ECO 230 Principles of Macroeconomics

•University Studies Electives:

PHY 130 General Physics I *and*

PHY 131 General Physics I Laboratory

or

PHY 235 Mechanics, Heat and Wave Motion *and*

PHY 236 Mechanics, Heat and Wave Motion Laboratory

PHY 132 General Physics II *and*

PHY 133 General Physics II Laboratory

or

PHY 255 Electricity, Magnetism and Light *and*

College of Science, Engineering and Technology

PHY 256 Electricity, Magnetism and Light Laboratory

Core Courses43-45 hrs

CET 280 Plane Surveying
CET 298 Strength of Materials
CET 386 Building Construction Cost Estimating
ENG 324 Technical Writing
ENT 099 Transitions
ENT 286 Introduction to Environmental Engineering Technology
ENT 287 Statics for Technology
ENT 382 Hydraulics
ENT 393 Engineering Economy
ENT 419 Senior Project I
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 107 Introduction to Technical Drawing and Computer Aided Drafting
MAT 308 Calculus and Analytic Geometry II
or
MAT 330 Technical Math III
TSM 110 Electrical Systems

Option Courses35 hrs

CET 310 Anatomy of Buildings
CET 370 Route Surveying
CET 481 Structural Steel Design
CET 482 Reinforced Concrete Design
CET 483 Construction Materials
CET 484 Soil Mechanics and Foundations
ENT 458 Applying the National Electric Code
GSC 101 The Earth and The Environment
Technical Electives (8 hrs)

Total Curriculum Requirements122-126 hrs

AREA: Civil Engineering Technology/ Construction Engineering Technology Option

**Bachelor of Science Degree
CIP 15.0201**

ACCREDITED BY:

Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET)

University Studies Requirements44-46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I

MAT 130 Technical Math I

or

MAT 150 Algebra and Trigonometry

MAT 230 Technical Math II

or

MAT 250 Calculus and Analytic Geometry I

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

ECO 230 Principles of Macroeconomics

•*University Studies Electives:*

PHY 130 General Physics I and

PHY 131 General Physics I Laboratory

or

PHY 235 Mechanics, Heat and Wave Motion *and*

PHY 236 Mechanics, Heat and Wave Motion Laboratory

PHY 132 General Physics II *and*

PHY 133 General Physics II Laboratory

or

PHY 255 Electricity, Magnetism and Light *and*

PHY 256 Electricity, Magnetism and Light Laboratory

Core Courses43-45 hrs

CET 280 Plane Surveying
CET 298 Strength of Materials
CET 386 Building Construction Cost Estimating
ENT 099 Transitions
ENT 286 Introduction to Environmental Engineering Technology
ENT 287 Statics for Technology
ENT 382 Hydraulics
ENT 393 Engineering Economy
ENG 324 Technical Writing
ENT 419 Senior Project
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 107 Introduction to Technical Drawing and CAD
MAT 308 Calculus and Analytic Geometry II
or
MAT 330 Technical Math III
TSM 110 Electrical Systems

Option Courses35 hrs

ACC 200 Principles of Financial Accounting
CET 310 Anatomy of Buildings
CET 385 Heavy Construction Cost Estimating
CET 480 Construction Planning and Management
CET 481 Structural Steel Design
or
CET 482 Reinforced Concrete Design
CET 483 Construction Materials
CET 484 Soil Mechanics and Foundations
ENT 458 Applying the National Electric Code
LST 240 The Legal Environment of Business
MGT 350 Fundamentals of Management
OSH 384 Construction Safety

Total Curriculum Requirements122-126 hrs

AREA: Civil Engineering Technology/ Environmental Engineering Technology Option

**Bachelor of Science Degree
CIP 15.0201**

ACCREDITED BY:

Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET)

University Studies Requirements44-46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I

MAT 130 Technical Math I

or

MAT	150	Algebra and Trigonometry
MAT	230	Technical Math II
<i>or</i>		
MAT	250	Calculus and Analytic Geometry I
• <i>Social and Self-Awareness and Responsible Citizenship:</i>		
ECO	230	Principles of Macroeconomics
• <i>University Studies Electives:</i>		
PHY	130	General Physics I and
PHY	131	General Physics I Laboratory
<i>or</i>		
PHY	235	Mechanics, Heat and Wave Motion and
PHY	236	Mechanics, Heat and Wave Motion Laboratory
PHY	132	General Physics II and
PHY	133	General Physics II Laboratory
<i>or</i>		
PHY	255	Electricity, Magnetism and Light and
PHY	256	Electricity, Magnetism and Light Laboratory

Core Courses43-45 hrs

CET	280	Plane Surveying
CET	298	Strength of Materials
CET	386	Building Construction Cost Estimating
ENG	324	Technical Writing
ENT	099	Transitions
ENT	286	Introduction to Environmental Engineering Technology
ENT	287	Statics for Technology
ENT	382	Hydraulics
ENT	393	Engineering Economy
ENT	419	Senior Project
IET	399	Professional Development Seminar I
IET	488	Cooperative Education/Internship
ITD	107	Introduction to Technical Drawing and CAD
MAT	308	Calculus and Analytic Geometry II
<i>or</i>		
MAT	330	Technical Math III
TSM	110	Electrical Systems

Option Courses.....36 hrs

CET	284	Sustainable Design and Construction
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	106	Introductory Chemistry II
ENT	400	Thermodynamics and Energy Development
Technical Electives (8 hrs)		

Total Curriculum Requirements123-127 hrs

ASSOCIATE:

Civil Engineering Technology

Associate of Science Degree
CIP 15.0201

University Studies Requirements20 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:
•*Scientific Inquiry, Methodologies, and Quantitative Skills:*
GSC 101 The Earth and the Environment
PHY 130 General Physics I

PHY	131	General Physics I Laboratory
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Required Courses.....32 hrs

CET	280	Plane Surveying
CET	298	Strength of Materials
CET	302	Structural Drawing
CET	370	Route Surveying
CET	483	Construction Materials
ENT	099	Transitions
ENT	286	Introduction to Environmental Engineering Technology
ENT	287	Statics for Technology
ENT	382	Hydraulics
ITD	107	Introduction to Technical Drawing and Computer Aided Drafting

Support Courses.....24 hrs

CHE	105	Introductory Chemistry I
CSC	232	Visual Basic Programming I
ENG	324	Technical Writing
MAT	130	Technical Math I
MAT	230	Technical Math II
PHY	132	General Physics II
PHY	133	General Physics II Laboratory

Total Curriculum Requirements76 hrs

CIVIL ENGINEERING 3 + 1 PROGRAM
in articulation with the University of Louisville

This articulation agreement enables qualified students enrolled in the civil engineering technology program in the College of Industry and Technology at Murray State University to Complete a majority of the University of Louisville Bachelor of Science in Civil Engineering (B.S.C.E.) degree program course requirements while at Murray State University. The remainder of the B.S.C.E. program requirements are to be completed at the University of Louisville with the opportunity to proceed to the master of engineering degree at that institution.

University Studies Requirements49 hrs
(see Chapter 4, University Studies Requirements)

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
PHY 235 Mechanics, Heat and Wave Motion
•*Social and Self-Awareness and Responsible Citizenship:*
ECO 230 Principles of Macroeconomics
•*University Studies Electives:*
MAT 309 Calculus and Analytic Geometry III
PHY 255 Electricity, Magnetism and Light
•*Additional requirement:*
CSC 420 Numerical Analysis I

Required Courses.....63 hrs

CET	280	Plane Surveying
CET	298	Strength of Materials
CET	481	Structural Steel Design
CET	482	Reinforced Concrete Design
CET	483	Construction Materials
CHE	201	General College Chemistry
ENT	099	Transitions
ENT	287	Statics for Technology
ENT	365	Dynamics for Technology
GSC	101	The Earth and the Environment
IET	371	Practicum in Technology II
IET	380	Professional Internship I

College of Science, Engineering and Technology

IET	488	Cooperative Education/Internship
ITD	107	Introduction to Technical Drawing and Computer Aided Drafting
MAT	335	Matrix Theory and Linear Algebra
MAT	411	Ordinary Differential Equations
MAT	540	Mathematical Statistics I
PHY	236	Mechanics, Heat and Wave Motion Laboratory
PHY	365	Linear Circuits II
CE	360	Transportation Engineering (ITV from UofL)
CE	370	Engineering Hydraulics (ITV from UofL)

Required Courses at UofL.....28 hrs*

CE	201	CE Programming
CE	320	Structural Analysis
CE	400	Applications in CE Programming
CE	401	CE Seminar/Professional Practice
CE	402	Seminar in CE
CE	420	Matrix Structural Design or
CE	460	Transportation Systems Design
CE	450	Geomechanics
CE	470	Surface Water Hydrology
CE	471	Water Supply and Sewerage
CE	551	Foundation Engineering
IE	570	Engineering Design Economics

Total Curriculum Requirements 140 hrs

*CE and IE prefixes are not Murray State University courses and are not described in this bulletin. Descriptions for these courses may be found in the *University of Louisville Undergraduate Bulletin*.

AREA:

Electromechanical Engineering Technology

Bachelor of Science Degree

CIP 15.0403

University Studies Requirements44-46 hrs

(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I

MAT 130 Technical Math I

or

MAT 150 Algebra and Trigonometry

MAT 230 Technical Math II

or

MAT 250 Calculus and Analytic Geometry I

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

ECO 230 Principles of Macroeconomics

•*University Studies Electives:*

PHY 130 General Physics I and

PHY 131 General Physics I Laboratory

or

PHY 235 Mechanics, Heat and Wave Motion and

PHY 236 Mechanics, Heat and Wave Motion Laboratory

PHY 132 General Physics II and

PHY 133 General Physics II Laboratory

or

PHY 255 Electricity, Magnetism and Light and

PHY 256 Electricity, Magnetism and Light Laboratory

Core Courses57 hrs

CET 298 Strength of Materials

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 361 Introduction to Motion Controls

EMT 455 Manufacturing Control Systems

ENT 287 Statics for Technology

ENT 351 Industrial and Commercial Power Distribution

ENT 365 Dynamics for Technology

ENT 393 Engineering Economy

ENT 458 Applying the National Electric Code

TSM 110 Electrical Systems I

TSM 133 Intro to Telecom Technology and Methods

TSM 210 Electrical Systems II

TSM 241 Networking Fundamentals

Support Courses22-24 hrs

CSC 232 Visual Basic Programming I

ENG 324 Technical Writing

ENT 099 Transitions

IET 399 Professional Develop Seminar I

IET 488 Cooperative Education/Internship

ITD 102 CAD Applications

MAT 308 Calculus and Analytic Geometry II

or

MAT 330 Technical Math III

Technical Electives (6 hrs)

Total Curriculum Requirements123-127 hrs

Environmental Regulatory Affairs Minor22-23 hrs

CET 341, CET 342, CET 353, ENT 286, and 9-10 hours of limited electives selected in consultation with advisor. Prerequisite courses are not applicable to this minor. Six hours must be upper level courses completed in residence at Murray State University.

Graphic Communications Management

This program is designed to prepare individuals for employment at the supervisory and management levels in the printing industry.

Graduates of this program will be qualified to function as entry level managers, production planners, quality control specialists, production control expeditors, estimators, printing sales representatives, or customer service representatives.

•Graphic Communications Technology

This program is designed to enable the student to acquire technical and professional competencies for a career in printing or related fields.

A graduate of this program may expect to qualify as an in-plant supervisor, estimator, technician, technical equipment operator, or sales or technical representative. Instruction and experience in design, management, and technical fundamentals of graphic communications are emphasized.

AREA:**Graphic Communications Management****Bachelor of Science Degree****CIP 10.0302****University Studies Requirements43-44 hrs**

(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I

MAT 117 Mathematical Concepts

or

MAT 140 College Algebra

MAT 135 Introduction to Probability and Statistics

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

ECO 140 Contemporary Economics

or

ECO 230 Principles of Macroeconomics

or

ECO 231 Principles of Microeconomics

•*University Studies Electives:*

CSC 125 Internet and Web Page Design

Required Courses.....53-57 hrs

ACC 200 Principles of Financial Accounting

ART 111 Two-dimensional Design

or

ITD 107 Introduction to Technical Drawing
and Computer Aided Drafting

ENG 324 Technical Writing

GCM 099 Transitions

GCM 151 Introduction to Print Media Management

GCM 153 Electronic Imaging

GCM 250 Fundamentals of Photography

GCM 252 Digital Image Conversion

GCM 342 Finishing and Distribution

GCM 352 Press Image Transfer I

GCM 354 Principles of Estimating

GCM 365 Customer Service in Print Media

GCM 441 Desktop Multimedia

GCM 442 Digital Interactive Technology

GCM 454 Color Management and Quality Control

IET 399 Professional Develop Seminar I

IET 488 Cooperative Education/Internship

MGT 350 Fundamentals of Management

MKT 360 Principles of Marketing

Required Electives.....24 hrs*Select electives from courses listed below with advisor approval.
At least six hours of electives must be 300-level or above*

ART 101 Drawing I: Introduction to Drawing

ART 111 Two-Dimensional Design

ART 350 Introduction to Graphic Design I: Digital Art

ART 351 Graphic Design II: Type and Image

ART 352 Graphic Design III: Layout and Introduction to
Design Systems

ART 451 Graphic Design IV: Systems Design

COM 384 Communication Skills for Professionals

COM 461 Persuasive Communication

GCM 340 Introduction to Gravure

GCM 350 Basic Color Photography

GCM 357 Industrial Photography

GCM 358 Commercial Photography

GCM 359 Publication Photography

GCM 360 Portraiture Photography

GCM 440 Electronic Digital Photography

ITD 107 Introduction to Technical Drawing
and Computer Aided Drafting

ITD 492 Plant Layout and Material Handling

MGT 551 Organizational Behavior

OSH 300-level elective (approved by advisor)

Total Curriculum Requirements120-122 hrs¹Students interested in pursuing a MBA should select the Management Emphasis. The following should be used as technical electives: ACC 201, CIS 443, and MAT 220.²May be used as a University Studies elective.**Graphic Communications Technology Minor21 hrs**

ITD 101 and 18 hours of graphic communications technology approved by Graphic Communications Management advisor, selected from the following courses: GCM 151, 152, 153, 250, 252, 353, 354, 454, 541, 554, 556. Six hours must be upper-level courses completed in residence at Murray State University.

Photography Minor21 hrs

GCM 151 and 18 hours of photography and graphic communications approved by Graphic Communications Management advisor, selected from the following courses: GCM 152, 250, 252, 350, 357, 358, 359, 360, 540. Six hours must be upper-level courses completed in residence at Murray State University.

Industrial Technology and Design

The Industrial Technology Options are: Drafting and Design, Industrial Supervision, and Interior Design.

•**Engineering Graphics and Design (Drafting 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 the articles required 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.

Engineering graphics and design 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.

•**Interior Design**

A baccalaureate degree in interior design provides students with the fundamentals of design, design analysis, space planning, the design of all interior spaces, and an understanding of related aspects of environmental design. In addition, graduates will be able to conduct research and solve problems relative to the function and quality of interior design. Graduates will be prepared to work as a professional interior designer, and with architects and engineers in designing interiors for residential and commercial buildings.

College of Science, Engineering and Technology

This program prepares graduates to enter positions in interior design and related areas in environmental design and to work in private business where interior design knowledge is critical. With a broad range of skills in technical drawing and CAD, architectural drawing, engineering graphics, and designing interiors graduates are prepared to work in a variety of architectural construction, and engineering consulting firms as interior designers.

•Manufacturing Technology

A baccalaureate degree in manufacturing 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, computer aided drafting, 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.

AREA: Engineering Graphics and Design

Bachelor of Science Degree
CIP 15.1302

University Studies Requirements45 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I
MAT 135 Introduction to Probability and Statistics
PHY 130 General Physics I
PHY 131 General Physics I Laboratory

•*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 Courses38 hrs

ENG 324 Technical Writing
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 099 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 Drawing & Residential Planning
ITD 350 Construction Systems
MAT 130 Technical Math I
MGT 350 Fundamentals of Management

Required Courses.....30 hrs

CET 298 Strength of Materials
ENT 287 Statics for Technology
ITD 202 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
Technical Elective (3 hrs)

Emphasis7 hrs

Choose one area of emphasis below:

Industrial/Manufacturing Design

IET 597 Quality Control
ITD 403 Product and Tooling Design

Architectural/Construction Design

CET 310 Anatomy of Buildings
ITD 401 Architectural Drafting and Design-Multi-Family Light Commercial

Total Curriculum Requirements 120 hrs

AREA: Interior Design

Bachelor of Science Degree
CIP 15.0603

ENDORSED BY:

The National Kitchen and Bath Association (NKBA)

University Studies Requirements46 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

CHE 105 Introductory Chemistry I
MAT 135 Introduction to Probability and Statistics
PHY 130 General Physics I
PHY 131 General Physics I Laboratory

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

ECO 231 Principles of Microeconomics
or

SOC 133 Introduction to Sociology

•*University Studies Electives:*

CSC 199 Introduction to Information Technology
MAT 117 Mathematical Concepts (or higher)

Core Courses38 hrs

ENG 324 Technical Writing
IET 399 Professional Development Seminar I
IET 488 Cooperative Education/Internship
ITD 099 Transitions
ITD 101 Introduction to Design and Graphic Communications

or

ITD 107 Introduction to Technical Drawing and Computer Aided Drafting
ITD 104 Computer Aided Design
ITD 130 Manufacturing Processes and Materials
ITD 204 Parametric Modeling and Rendering
ITD 301 Architectural Drawing and Residential Planning
ITD 350 Construction Systems
MAT 130 Technical Math I
MGT 350 Fundamentals of Management

Required Courses.....37 hrs

- ITD 221 Design in the Near Environment
- ITD 251 Equipment
- ITD 253 Interior Design Studio I
- ITD 351 Textiles for Interior Design
- ITD 352 History of Interiors I
- ITD 353 Interior Design Studio II
- ITD 401 Architectural Drafting and Design Multi-Family Light Commercial
- ITD 452 History of Interiors II
- ITD 453 Contract Interiors
- ITD 455 Housing for Handicapped and Elderly
- ITD 458 Interior Design Market Experience
- ITD 459 NCIDQ and NKBA Exam Review
- RES 132 Real Estate Principles I
- Technical Elective (3 hrs)

Total Curriculum Requirements 121 hrs

**AREA:
Manufacturing Technology**

**Bachelor of Science Degree
CIP 15.0613**

University Studies Requirements45 hrs
(see Chapter 4, University Studies Requirements)

- University Studies selections must include:
- Scientific Inquiry, Methodologies, and Quantitative Skills:*
 - CHE 105 Introductory Chemistry I
 - MAT 135 Introduction to Probability and Statistics
 - PHY 130 General Physics I
 - PHY 131 General Physics I Laboratory
 - 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 Courses38 hrs

- ENG 324 Technical Writing
- IET 399 Professional Development Seminar I
- IET 488 Cooperative Education/Internship
- ITD 099 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 Drawing and Residential Planning
- 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 597 Quality Control
- ITD 202 Applied Technical Drawing
- ITD 306 Engineering Graphics
- ITD 330 Machine Tool Processes
- ITD 492 Plant Layout and Material Handling

- MGT 551 Organizational Behavior
- TSM 110 Electrical Systems
- Technical Electives (4 hrs)

Total Curriculum Requirements 120 hrs

**ASSOCIATE:
Industrial Technology**

**Associate of Science Degree
CIP 15.0612**

University Studies Requirements22 hrs
(see Chapter 4, University Studies Requirements)

- 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 099 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

Technical Electives 14 hrs

Total Curriculum Requirements64 hrs

Industrial and Engineering Technology Minor.....21 hrs

Program must be approved by an advisor with at least six hours of courses at level 300 or above completed in residence at Murray State University.

Telecommunications Systems Management

Telecommunications systems are networks of leading-edge technologies such as fiber optic systems, satellites, wireless, telephony, and cable, which are connected to computers 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 teleconferencing, 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.

The baccalaureate program provides students specialization options within the curriculum. 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 emphasis 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

College of Science, Engineering and Technology

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 College of Business and Public Affairs and the College of Science, Engineering and Technology. These programs which are jointly administered by the two colleges (see page 57 in the College of Business and Public Affairs section) provide students a unique opportunity to develop both technical expertise and management expertise in this dynamic field.

Due to the dynamic nature of the field of telecommunications, new courses may be developed that may require substitution for existing courses in the program.

AREA:

Telecommunications Systems Management

Bachelor of Science
CIP 11.0401

University Studies Requirements44 hrs
(see Chapter 4, University Studies Requirements)

University Studies selections must include:

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

MAT 135 Introduction to Probability and Statistics

MAT 140 College Algebra

PHY 125 Brief Introductory Physics

PHY 126 Brief Introductory Physics Laboratory

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

ECO 231 Principles of Microeconomics

•*University Studies Electives:*

CSC 199 Introduction to Information Technology

Required Courses58 hrs

ACC 200 Principles of Financial Accounting

ACC 201 Principles of Managerial Accounting

CIS 307 Decision Support Technologies

CIS 317 Principles of Information Systems Analysis
and Design

CSC 101 Introduction to Problem Solving Using Computers

ECO 335 Economics and Public Policy of
Telecommunications Industry

FIN 330 Principles of Finance

MGT 350 Fundamentals of Management

MKT 360 Principles of Marketing

TSM 099 Transitions

TSM 121 Telecommunications Electronics Principles

TSM 133 Telecommunications Technology and Methods

TSM 232 Network Operating Systems

TSM 233 Network Services

TSM 241 Networking Fundamentals

TSM 320 Introduction to Wireless Technology

TSM 343 Protocol Analysis

TSM 411 Network Design, Operations and Management

TSM 443 Telephone Technology

TSM 488 Cooperative Education/Internship¹

Selected Emphasis24 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, BPA, 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 421 Mobile Satellite Communications

Network Security

TSM 351 Principles of Information Security

TSM 352 System Security

TSM 353 Network Security

TSM 441 Advanced Information Security

System Administration

CSC 235 Programming in C++

CSC 310 Database Administration

CSC 360 Scripting Languages

TSM 530 Systems Planning

Approved Electives

MGT 358 Entrepreneurial Business Plan Development

MGT 443 Management of Operations and Technology

MKT 475 Marketing Strategies in E-Commerce

TSM 440 Information Assurance Policy and Management

TSM 444 Wide Area Networks

Total Curriculum Requirements126 hrs

¹Maximum of three hours Internship or Cooperative Education counts toward a degree.

Telecommunications Systems Minor21 hrs

TSM 133, 232, 233, and 241. Nine hours of advisor approved electives. Six hours must be 300- or 400-level courses completed in residence at Murray State University.

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

Chair: Ed Thome. **Faculty:** Adongo, Alverson, Bennett, Calvert, Donnelly, Edson, K. Fister, R. Fister, Gibson, Hughes, Ivansic, Lewis, McCarthy, Mecklin, Patterson, Pearson, Porter, Pritchett, Roach, Schroeder, Thome, Yayenie, Zhang.

The objectives of the Department of Mathematics and Statistics are:

- to prepare its graduates for careers in science, business, research, industry and/or teaching;
- to continue its active involvement in the larger mathematical community through research and other scholarship;
- to provide students with the mathematical skills required for success in a wide variety of other programs within the university;
- to provide students with a view of the broad array of applications of mathematics; and
- to provide leadership and service in strengthening mathematics education in our service region and beyond.

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 option. 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.

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 option in a related field. Each option contains further mathematical training, computer programming experience, and a broad study of a discipline which illustrates applications of mathematics. The program is intentionally 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 Requirements41-47 hrs
(see Chapter 4, University Studies Requirements)

Required Courses..... 25 hrs

MAT 099 Transitions
MAT 250 Calculus and Analytic Geometry I¹
MAT 308 Calculus and Analytic Geometry II¹
MAT 309 Calculus and Analytic Geometry III¹
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
MAT 540 Mathematical Statistics I

Required Limited Electives..... 15 hrs

Five MAT courses numbered 400 or above including:

at least one of the following:

MAT 505 Abstract Algebra I
MAT 516 Introduction to Topology
MAT 525 Advanced Calculus I

and least one of the following:

MAT 442 Introduction to Numerical Analysis
MAT 501 Mathematical Modeling I
MAT 524 Boundary Value Problems
MAT 541 Mathematical Statistics II

Required Minor..... 21 hrs

Electives²12-18 hrs
(including one course in computer programming selected from a list approved by the Department of Mathematics and Statistics)

Total Curriculum Requirements 120 hrs

¹May be taken as a University Studies elective.

²At least one three-hour free elective must be chosen from outside mathematics and may not be counted as a University Studies requirement.

AREA: Mathematics/Secondary Certification Option (Grades 8-12)

Bachelor of Science/Bachelor of Arts Degree CIP 27.0101

University Studies Requirements46-49 hrs
(see Chapter 4, University Studies Requirements)

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 Education¹

MAT 309 Calculus and Analytic Geometry III

Note: Certification requires a grade of *B* or better in one English composition course and a *C* 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 099 Transitions
MAT 312 Mathematical Reasoning
MAT 335 Matrix Theory and Linear Algebra
MAT 510 Foundations of Geometry
MAT 540 Mathematical Statistics I
MAT 550 Teaching Mathematics
MAT 551 Mathematics for Teachers
Computer programming course (3 hrs)²

Required Limited Electives..... 18 hrs

Nine hours of MAT courses numbered 400 or above including:

at least one of the following:

MAT 421 Introduction to Algebraic Structures
MAT 505 Abstract 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 501 Mathematical Modeling I
MAT 524 Boundary Value Problems
MAT 541 Mathematical Statistics II

and

an additional MAT course

At least nine hours selected from courses numbered 400 or above or from courses in disciplines related to the application of mathematics selected from a list approved by the Department of Mathematics and Statistics.

Required for Secondary Certification 32 hrs

COM 372 Communication in Educational Environments
EDU 303 Strategies of Teaching
EDU 403 Structures and Foundations of Education
EDU 405 Evaluation and Measurement in Education
HEA 191 Personal Health³
SEC 420 Practicum in Secondary Schools
SEC 421 Student Teaching in the Secondary School

College of Science, Engineering and Technology

SED 300 Educating Students with Disabilities

Total Curriculum Requirements120-123 hrs

¹With a grade of C or better.

²Selected from a department-approved list.

³Department of Mathematics requirement.

MAJOR:

Mathematics/Secondary Certification (Grades 8-12)

**Bachelor of Science/Bachelor of Arts Degree
CIP 27.0101**

University Studies Requirements46-49 hrs

(see Chapter 4, University Studies Requirements)

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 Education¹

MAT 309 Calculus and Analytic Geometry III

Note: Certification requires a grade of B or better in one English composition course and a C 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 Courses21 hrs

MAT 099 Transitions

MAT 312 Mathematical Reasoning

MAT 335 Matrix Theory and Linear Algebra

MAT 510 Foundations of Geometry

MAT 540 Mathematical Statistics I

MAT 550 Teaching Mathematics

Computer programming course (3 hrs)²

Required Limited Electives9 hrs

MAT courses numbered 400 or above including:

at least one of the following:

MAT 421 Introduction to Algebraic Structures

MAT 505 Abstract 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 501 Mathematical Modeling I

MAT 524 Boundary Value Problems

MAT 541 Mathematical Statistics II

MAT elective

Required Minor21 hrs

Required for Secondary Certification32 hrs

COM 372 Communication in Educational Environments

EDU 303 Strategies of Teaching

EDU 403 Structures and Foundations of Education

EDU 405 Evaluation and Measurement in Education

HEA 191 Personal Health³

SEC 420 Practicum in Secondary Schools

SEC 421 Student Teaching in the Secondary School

SED 300 Educating Students with Disabilities

Total Curriculum Requirements129-132 hrs

¹With a grade of C or better.

²Selected from a department-approved list.

³Department of Mathematics requirement.

AREA:

Mathematics/Applied Mathematics Option

**Bachelor of Science/Bachelor of Arts Degree
CIP 27.0101**

University Studies Requirements41-47 hrs

(see Chapter 4, University Studies Requirements)

Required Courses31 hrs

MAT 099 Transitions

MAT 250 Calculus and Analytic Geometry I¹

MAT 308 Calculus and Analytic Geometry II¹

MAT 309 Calculus and Analytic Geometry III¹

MAT 312 Mathematical Reasoning

MAT 335 Matrix Theory and Linear Algebra

MAT 411 Ordinary Differential Equations

MAT 442 Introduction to Numerical Analysis

MAT 540 Mathematical Statistics I

Required Limited Electives33-36 hrs

A. Nine hours of mathematics courses numbered 400 or above^{2,3}

B. Two courses in computer programming²

C. 18 hours related to the application of mathematics^{2,3}

Unrestricted Electives6-15 hrs

Total Curriculum Requirements120 hrs

¹May be taken as a University Studies elective.

²These courses must be approved by the student's advisory committee.

³The program is very flexible. For example, possible options include, but are not limited to, an emphasis in either Biology, Chemistry, Computer Science, Geosciences, Physics, Statistics and Finance, or Actuarial Science.

AREA:

Mathematics/Pre-MBA Option

**Bachelor of Science/Bachelor of Arts Degree
CIP 27.0101**

University Studies Requirements41-47 hrs

(see Chapter 4, University Studies Requirements)

Required Electives56 hrs

ACC 200 Principles of Financial Accounting

ACC 201 Principles of Managerial Accounting

BPA 355 Information Systems and Decision Making

CSC 199 Introduction to Information Technology¹

ECO 230 Principles of Macroeconomics¹

ECO 231 Principles of Microeconomics¹

FIN 330 Principles of Finance

MAT 099 Transitions

MAT 250 Calculus and Analytic Geometry I¹

MAT 308 Calculus and Analytic Geometry II¹

MAT 309 Calculus and Analytic Geometry III¹
MAT 335 Matrix Theory and Linear Algebra
MAT 540 Mathematical Statistics I
MAT 565 Applied Statistics I
MGT 350 Fundamentals of Management
MGT 443 Management of Operations and Technology
MKT 360 Principles of Marketing

Required Limited Electives..... 15 hrs
A. Twelve hours of mathematics courses numbered 400 or above²
B. One course in computer programming²

Unrestricted Electives2-8 hrs

Total Curriculum Requirements 120 hrs
¹May be taken as a University Studies elective.
²These courses must be approved by the student's advisory committee.

Mathematics Minor.....23 hrs
MAT 250, 308, 309 and nine hours of selected mathematics courses numbered above 309 (except for 330, 399, 560). Departmental approval required. Six hours must be upper-level courses completed in residence at Murray State University.