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# Ogden College of Science and Engineering

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Ogden College Hall, Office 1017

Phone: 270-745-4449

Website: [www.wku.edu/ogden](http://www.wku.edu/ogden)

Email: [ogdencollegedeansoffice@wku.edu](mailto:ogdencollegedeansoffice@wku.edu)

Dr. Cheryl Stevens, Dean

[Cheryl.Stevens@wku.edu](mailto:Cheryl.Stevens@wku.edu)

## Departments/School

- Agriculture
- Biology
- Chemistry
- Engineering and Applied Sciences
- Geography and Geology
- Mathematics
- Physics and Astronomy
- Psychological Sciences

**Mission:** The mission of Ogden College of Science and Engineering is to **empower** individuals to become leaders through academic achievement, global **connections**, and engagement in research, education and **service**.

**Vision:** Ogden College of Science and Engineering is a community of creative and critical thinkers achieving local to global impact.

Ogden College of Science and Engineering encompasses the applied and basic sciences, offering a broad range of degree programs in agriculture, biology, chemistry, computer science, construction management, engineering, geography, geology, architectural science, advanced manufacturing, mathematics, meteorology, physics, astronomy, and psychology.

We are recognized by the high quality and success of our students and graduates, which results from personal attention to student professional development through engagement with faculty in projects that expand on classroom instruction.

Ogden College is located on the campus of an earlier educational institution established in Bowling Green in 1877 as a provision in the will of Major Robert W. Ogden. The original Ogden College closed, and its properties were leased to WKU in 1928. The name Ogden reappeared when the Ogden College of Science and Technology was established within Western Kentucky University in 1965.

Students and faculty at WKU have benefited from its membership in Oak Ridge Associated Universities (ORAU). ORAU is a consortium of 114 colleges and universities and a contractor for the U.S. Department of Energy (DOE) located in Oak Ridge, Tennessee. ORAU works with its member institutions to help their students and faculty gain access to federal research facilities throughout the country; to keep its members informed about opportunities for fellowships, scholarships, and research appointments; and to organize research alliances among its members. Programs cover a wide variety of disciplines including earth sciences, epidemiology, engineering, physics, geological sciences, pharmacology, ocean sciences, biomedical sciences, nuclear chemistry, and mathematics. Many of these programs are especially designed to increase the numbers of underrepresented minority students pursuing degrees in science and engineering related disciplines.

For more information about ORAU and its programs, contact: Dr. Cathleen Webb, Associate Dean of OCSE and the ORAU counselor for WKU.

Ogden College is home to the Health Professions Advisement Center (HPAC). WKU has an outstanding track record of students gaining entry to the health professions. At HPAC, students interested in attending a school or college of medicine, dentistry, pharmacy, physical therapy, occupational therapy, optometry, veterinary medicine, chiropractic medicine, podiatry or physician assistant, will receive information, advice and guidance on their preparation for admission to professional school.

In collaboration with the College of Education, Ogden College offers the SKyTeach Program for those interested in teaching science and math at middle or high school levels. This program is a replication of a nationally recognized program in teacher preparation developed at the University of Texas - Austin. WKU received \$2.4 million in funding from Exxon/Mobil through the National Mathematics and Science Initiative to develop the SKyTeach program at WKU.

Those interested in more detailed information regarding programs offered by departments of the College should follow the links listed under departments or email the Dean of Ogden College of Science and Engineering directly.

## SkyTeach

Dr. Les Pesterfield, Co-Director  
Dr. Martha M. Day, Co-Director

Snell Hall B104

Phone: 270-745-3900; Fax: 270-745-2014

Email: [Skyteach@wku.edu](mailto:Skyteach@wku.edu)

Website: <http://www.wku.edu/skyteach/>

**Master Teachers:** David Almand, David Bell,  
Catherine Poteet, Melissa Rudloff,  
Rico Tyler

SKyTeach offers opportunities to undergraduate students at Western Kentucky University entering careers in mathematics and science education. SKyTeach is a unique collaboration between the College of Education and Behavioral Sciences and Ogden College of Science and Engineering, modeled after the highly successful UTeach program at the University of Texas at Austin. Students enrolled in the program complete four year degree programs leading to double majors in Science and Mathematics Education (SMED) and a content area major in middle grades mathematics, middle grades science, mathematics, chemistry, biology, physics, or earth/space science.

### Major in Middle School Science

**Reference Number:** 734

**Minimum Hours for Major:** 30-31

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://www.wku.edu/degreepaths/18-19/documents/cebs/middle\\_grade\\_science\\_734\\_774.pdf](http://www.wku.edu/degreepaths/18-19/documents/cebs/middle_grade_science_734_774.pdf)

The Middle School Science major is for students who plan to teach science in grades 5 through 9. The middle school science major also requires completion of the science and mathematics education (SMED) program. Upon successful completion of both majors, the student will earn a Bachelor of Science degree and will qualify for an institutional recommendation for a Kentucky Provisional Certificate for teaching in the middle grades (5-9) science field.

To major in Middle School Science, students must complete 30-31 semester hours of coursework with a "C" or higher in each course. All science courses must be completed with an average GPA of 2.75 or better.

Students must complete the following core courses: ASTR 104 or ASTR 106, BIOL 122/BIOL 123, GEOL 111/GEOL 113 or GEOL 112/GEOL 114, PHYS 201 or PHYS 231/PHYS 232, and SMED 360. Students must take three of the five following hours of upper-level science courses: ASTR 405, BIOL 303, CHEM 470, GEOL 305, or PHYS 410. In addition, students must take 3 hours of upper-level restricted elective course chosen from: BIOL 319/BIOL 322, BIOL 325, BIOL 326, BIOL 327, BIOL 334, BIOL 348, GEOG 471, GEOL 408, GEOL 310, GEOL 311, GEOL 325, GEOL 380, GEOL 405, SMED 300, SMED 400. Students must complete the following support courses: MATH 117 or MATH 136 or MATH 142, BIOL 120/BIOL 121, and CHEM 105/CHEM 106, or CHEM 120/CHEM 121.

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## Department of Agriculture

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**Dr. Fredrick DeGraves, Chair**

**Environmental Sciences & Technology Building,  
Office 269**

**Phone: 270-745-3151; Fax: 270-745-5972**

**Website: [www.wku.edu/agriculture](http://www.wku.edu/agriculture)**

**Professors:** L. Brown, B. Gilfillen, T. William,  
P. Woosley

**Associate Professors:** F. DeGraves, S. King,  
T. Kingery, M. Stone

**Assistant Professors:** H. Galloway, J. Gill,  
D. Gumirakiza

**Instructor I:** D. Berkshire, L. Galloway,  
C. Scudder

**Clinical Assistant Professor:** R. Dennis

**Professor Emeritus:** E. Gray

**USDA Research Scientist:** A. Netthisinghe

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The complexity of the technological and financial structure of modern agriculture has made education increasingly important. It has also brought about a need for personnel to fill positions in various businesses and professions which support agriculture.

Processing and marketing of agricultural products and supplying of agricultural chemicals, machinery, seed, feed and other products require research, sales and service personnel who have met specific educational requirements. Governmental agencies which conduct research, extension, advisory and regulatory activities are staffed by highly trained agricultural personnel.

The Department of Agriculture strives to fill the needs of both the student who requires general technical knowledge for production agriculture and the student who needs more specialized training to pursue one of many careers. This is accomplished by offering specific curricula with enough flexibility to allow specialization within the curriculum.

Many students studying agriculture have urban backgrounds and lack farm experiences. The Department of Agriculture uses the University Farm and the Agricultural Exposition Center as integral parts of its laboratory and classroom instructional program to provide practical experiences. Internships and cooperative work experiences are encouraged for all students.

To complete the 120 semester hours required for a Bachelor of Science degree in agriculture, students must complete the basic curriculum and one of the concentrations. The basic curriculum includes the Colonnade Program and specialty support requirements as well as basic professional courses in agriculture. These concentrations are agribusiness, agricultural education, agronomy (plant science or soil science), animal science, horse science, dairy science, general agriculture, turf and golf course management, horticulture, and pre-veterinary. These concentrations allow students to vary their course selection to better meet their particular area of interest. The student, in consultation with an assigned advisor, will choose specific courses in addition to the basic curriculum.

When planning a program of study, students should be aware of the University academic requirements and regulations contained in this catalog in the chapter "Academic Information." Specific attention should be given to the subsections in the chapter entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations. Students should be aware that some academic programs may include additional scholastic regulations and standards not specified in the catalog. To obtain a copy of these regulations, students should contact the department head.

Agriculture majors who follow the listed guidelines can graduate in 4 years (8 semesters) or less.

#### **Guidelines**

1. Be advised by an assigned faculty advisor in the Department of Agriculture each semester and enroll in the courses decided upon at the advising session.
2. Excluding remedial classes, receive a passing grade for an average of 15 hours per semester for 8 semesters with a minimum 2.0 GPA and a minimum total of 120 hours, including 42 or more hours upper-division (300- and 400-level) courses. Complete the Colonnade Program requirements of the department and the university. Note specific required mathematics, biology and chemistry courses.
3. Deviation from any of these conditions might lead to the need for additional hours / courses and / or semester in order to graduate.

#### **Major in Agriculture**

**Reference Number:** 508

**Minimum Hours for Major:** 50

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

#### **Sample Degree Path Per Concentration:**

*Agronomy (Plant):* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_agronomy\\_plant\\_science\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_agronomy_plant_science_508.pdf)

*Agronomy (Soil):* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_agronomy\\_soil\\_science\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_agronomy_soil_science_508.pdf)

*Agribusiness:* [http://wku.edu/degreepaths/18-19/documents/ocse/agribusiness\\_508](http://wku.edu/degreepaths/18-19/documents/ocse/agribusiness_508)

*Agricultural Education:* [http://wku.edu/degreepaths/18-19/documents/ocse/agriculture\\_education\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/agriculture_education_508.pdf)

*Agricultural Systems:* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_systems\\_508](http://wku.edu/degreepaths/18-19/documents/ocse/ag_systems_508)

*Animal Science:* [https://www.wku.edu/degreepaths/18-19/documents/ocse/ag\\_animal\\_science\\_508.pdf](https://www.wku.edu/degreepaths/18-19/documents/ocse/ag_animal_science_508.pdf)

*Dairy Science:* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_dairy\\_sci\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_dairy_sci_508.pdf)

*General Agriculture:* [http://wku.edu/degreepaths/18-19/documents/ocse/agriculture\\_general\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/agriculture_general_508.pdf)

*Horticulture:* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_dairy\\_sci\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_dairy_sci_508.pdf)

*Horse Science:* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_horse\\_sci\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_horse_sci_508.pdf)

*Turf and Golf Course Management:* [http://wku.edu/degreepaths/18-19/documents/ocse/ag\\_turf\\_golf\\_course\\_mgt\\_508.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/ag_turf_golf_course_mgt_508.pdf)

This major in Agriculture requires a minimum of 50 semester hours in agriculture and leads to a Bachelor of Science degree. Electives chosen from agriculture courses focusing on a concentration, when approved by an assigned advisor, complete the minimum total of 50 semester hours in agriculture. No other minor or major is required for the student following the curriculum for this major in agriculture. At least half of the semester hours in the major must be in courses numbered 300 or above.

All students must take the following courses outside of the major:

- Mathematics Course (3 hours): MATH 115 or higher (Note: Students focusing in Pre-Veterinary Medicine must take MATH 116 or higher)
- Chemistry Courses (6 hours): CHEM 105, CHEM 107, CHEM 120, or CHEM 222
- Chemistry Labs (2 hours): CHEM 106, CHEM 108, CHEM 121, or CHEM 223
- Biology Course and Lab (4 hours): BIOL 120, BIOL 121 (Note: Students pursuing the Horticulture Concentration may take BIOL 120 and BIOL 121 or BIOL 122 and BIOL 123.)

The following courses are required for each concentration.

**Agribusiness Concentration**

- *Basic Agriculture Courses (29 hours)*: AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494.
- *Agribusiness Courses (18 hours)*: AGECE 261, MGT 210, MKT 220, AGECE 361, AGECE 362, AGECE 463
- *Agribusiness Elective (3 hours)*: AGECE 366, AGECE 460, AGECE 461, AGECE 468, AGRI 369, AGECE 471, AGECE 391, AGECE 475

**Agricultural Education Concentration**

- *Basic Agriculture Courses (29 hours)*: AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494.
- *Agricultural Economics (3 hours)*: AGECE 361
- *Soils Elective (3 hours)*: Any AGRO course
- *Horticulture Elective (3 hours)*: Any HORT course
- *Animal Science Elective (3 hours)*: Any ANSC course
- *Agricultural Elective (3 hours)*: Any AGRI, AGRO, ANSC, AGECE, AGECE, AGMC, or HORT course
- *Teacher Certification Requirements (32 hours)*: AGECE 250, PSY 310, SPED 330, AGECE 470, AGECE 471, AGRI 398, EDU 489, LTCY 421, SEC 490.

**Agricultural Systems Concentration**

- *Basic Agriculture Courses (29 hours)*: AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Agricultural Mechanization Courses (18 hours)*: AGMC 172/AGMC 173, AGMC 377/AGMC 378, AGMC 373/AGMC 374, AGMC 425, AGECE 366, AMS 227.
- *Agricultural Mechanization Elective (3 hours)*: Choose 3 credit hours from any AGECE, AGECE, AGMC, AGRI, AGRO, ANSC, or HORT course.

**Agronomy (Plant Science) Concentration**

- *Basic Agriculture Courses (29 hours)*: AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Agronomy – Plant Science Courses (20 hours)*: AGRO 310, AGRO 352, AGRI 355, AGECE 361, AGRO 409, AGRO 410, AGRO 414, AGRO 418, AGRO 420, AGRO 421, AGRO 422, and AGRO 111 or AGRO 351
- *Agronomy Elective (3 hours)*: AGRI 315, AGRI 493, AGRO 452, AGRO 454, AGRO 457, AGRO 458.

**Agronomy (Soil Science) Concentration**

- *Basic Agriculture Courses (29 hours)*: AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Required Agronomy Courses*: AGRO 351 (1 hour)
  - Four of the following courses: AGRO 352, AGRO 452, AGRO 454, AGRO 455/AGRO 456, AGRO 457/AGRO 458.
  - Two of the following courses: AGRO 310, AGRO 409/AGRO 410, AGRO 414, AGRO 420/AGRO 421, AGRO 422.

**Animal Science Concentration**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Beef or Swine Courses (3 hours):* ANSC 442/ANSC 443 or ANSC 444/ANSC 445
- *Animal Science Courses (26 hours):* ANSC 141, ANSC 240, ANSC 241, ANSC 338, ANSC 340, ANSC 344, ANSC 347, ANSC 437, ANSC 438, ANSC 446, ANSC 447, ANSC 448.

**Dairy Science Concentration**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494.
- *Dairy Science Courses (29 hours):* ANSC 141, ANSC 240, ANSC 241, ANSC 338, ANSC 340, ANSC 344, ANSC 347, ANSC 431, ANSC 432, ANSC 437, ANSC 438, ANSC 446, ANSC 447, ANSC 448.

**General Agriculture Concentration**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Agriculture Courses (21 hours):* Any AGECE, AGED, AGMC, AGRI, AGRO, ANSC, or HORT courses.

**Horticulture Concentration**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Horticulture Courses (16 hours):* HORT 301, HORT 302, HORT 313, HORT 316, HORT 317, HORT 407, HORT 408, AGRI 369, AGRO 351
- *Electives (5 hours):* Any HORT, AGRO, AGECE, or AGRI courses

**Horse Science Concentration**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170/AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494
- *Horse Science Courses (29 hours):* ANSC 141, ANSC 240, ANSC 241, ANSC 330, ANSC 331, ANSC 338, ANSC 340, ANSC 344, ANSC 347, ANSC 437, ANSC 438, ANSC 446, ANSC 447, ANSC 448

**Turf and Golf Course Management**

- *Basic Agriculture Courses (29 hours):* AGRO 110, ANSC 140, AGECE 160, AGMC 170 / AGMC 171, AGRI 175, AGMC 176, AGRI 291 or AGRI 491, AGRO 320 or ANSC 345 or AGECE 360 or AGMC 326, AGRO 350, AGRI 397, AGRI 398, AGRI 494.
- *Turf and Golf Course Management Courses (35 hours):* AGMC 172, AGMC 173, AGMC 270, AGMC 271, AGMC 272, AGMC 273, AGMC 371, AGMC 372, AGMC 392, AGMC 393, HORT 301, HORT 302, HORT 304, HORT 305, HORT 313, HORT 474, AGRI 369, AGRO 351, and AGECE 260 or HORT 475 (Sports Turf Management) or HORT 475 (Commercial Lawn Care Management)

**Major in Agriculture**

**Reference Number:** 605

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 30

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/agriculture\\_605.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/agriculture_605.pdf)

This major in agriculture requires completion of a minimum of 30 semester hours and leads to a Bachelor of Science degree. These hours must be taken in approved agriculture courses and a suitable major or minor(s) in other departments must be earned to total at least 54 approved semester hours. Agriculture courses required for a major are AGRO 110, AGRO 350, AGECE 360, ANSC 140, AGMC 170/AGMC 171, AGRI 291 or AGRI 491, AGRI 397, AGRI 398 and AGRI 494. Electives chosen by the student and approved by an assigned advisor provide sufficient credits to satisfy an option. In addition, majors are required to complete specified courses in biology, chemistry and mathematics. At least half of the semester hours in the major must be in courses numbered 300 or above.

### **Minor in Agriculture**

**Reference Number:** 308

**Minimum Hours for Minor:** 21

The student must take the following courses: AGRI 494, AGRO 110, and ANSC 140. The student must choose 3 credit hours from the following courses: AGECE 360, AGRO 320, AGRO 350, or ANSC 345. The student must take 9 hours of Agriculture electives at the 300-level or above.

### **Minor in Floristry**

**Reference Number:** 369

**Minimum Hours for Minor:** 21

The minor in floristry requires 21 hours and is meant to enhance majors such as business, horticulture, hospitality management, hotel restaurant management, and interior design. Students who elect the minor in floristry will develop skills needed to establish and manage a retail floral business, with emphasis on logistics, resources, marketing and risk management. Students should take the following courses: HORT 209, HORT 309, HORT 312, HORT 316, HORT 317, HORT 330, HORT 340, and HORT 420.

### **Associate Degree in Agricultural Technology and Management (A.S.)**

**Reference Number:** 205

**Minimum Hours for Degree:** 60

**Degree:** Associate of Science

#### ***Turf and Golf Course Management Option***

This program is designed for individuals interested in becoming superintendents of golf courses, athletic fields and parks and recreational facilities, lawn care professionals, and cemetery caretakers. The course of study includes the care and growing of warm and cool season grasses, turf disease management, and equipment management and maintenance. A total of 60 hours of specific courses are required for this program. Agriculture courses required for the turf and golf course management option in this degree are AGRO 110, AGRO 350, AGRO 170/AGRO 171, AGRO 172/AGRI 173, AGRO 270/AGRO 271, AGRO 272/AGRO 273, AGRO 371/AGRO 372, AGRO 392/AGRO 393, HORT 313. Also required are CHEM 105/CHEM 106, BIOL 120/BIOL 121, MATH 115 or MATH 116, an Arts and Humanities, a Social and Behavioral course, ENG 100 and COMM 145. The remaining hours will be fulfilled by elective courses approved by an advisor, with 10 hours taken from AGECE, AGRI, HORT, AGRO, and/or AGMC courses.

#### ***General Agriculture Option***

This two-year curriculum is designed to fulfill the needs of students primarily interested in the application of modern agricultural technology. Agriculture courses required for the general option in this degree are AGRO 110, ANSC 140\*, AGMC 170/AGMC 171, AGECE 360, AGRI 397, and AGRO 350. Also required are ENG 100, COMM 145, MATH 115 or MATH 116, CHEM 105/CHEM 106, a humanities, a social and behavioral course, and BIOL 120/BIOL 121. The remaining hours will be fulfilled by elective courses approved by an advisor, with 12 hours taken from Agriculture Economics, Agriculture, Horticulture, Agronomy, and/or Agriculture Mechanics. *\*Not required for Horticulture.*

### **Teacher Certification in Agricultural Education**

Numerous job opportunities are available for students who have completed certification for teaching agriculture education in public schools at the middle or secondary level. A 2.5 minimum grade point average in agriculture, the Colonnade Program, and professional education is required for admission to teacher education. Students desiring to become certified to teach agriculture education in Kentucky public schools are required to have a minimum of 50 hours in agriculture including a minimum of 6 hours of plant/horticulture science, 6 hours of animal science, 6 hours of agricultural mechanics (AGMC 170/AGMC 171 and AGMC 371/AGMC 372), 6 hours of agricultural economics (AGECE 360 and AGECE 361), and 6 hours of soil sciences. Computer science requirement may be fulfilled by completing AGECE 365, CSCI 145C or CIS 141. Professional education courses required are AGED 250 (EDU 250), PSY 310, SPED 330, AGRI 398, AGED 470, AGED 471, EDU 489, LTCY 421 and SEC 490. Student must complete EDU 250, PSY 310, SPED 330, AGRI 398 before the fall semester of the senior year. AGED 470 and AGED 471 are taught the fall semester. EDU 489 and SEC 490 are completed the student teaching semester, usually the spring semester. Teachers hired in other states may be required to have other professional education coursework according to local regulations.

**Graduate Program** – The Department of Agriculture offers the Master of Science in Agriculture. For additional information, see [www.wku.edu/graduate](http://www.wku.edu/graduate) or contact the department.



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## Department of Biology

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**Dr. Bruce A. Schulte, Head**

**Thompson Complex, Central Wing, Office 359**

**Phone: 270-745-3696; Fax: 270-745-6856**

**Website: <http://www.wku.edu/biology>**

**Professors:** C. Davis, S. Grubbs, S. Jacobshagen, R. King, D. McElroy, A. Meier, T. Philips, N. Rice, C. Rinehart, B. Schulte, M. Smith, M. Stokes

**Associate Professors:** L. Alice, N. Ashley, K. Crawford, C. Dick, C. Emani, S. Huskey, J. Johnson, P. Lienesch, A. Srivastava, D. Weisberger, R. Wyatt

**Assistant Professors:** S. Banga, K. Bilyk

**Pedagogical Assistant Professors:** K. McDaniel, N. Jones Mountjoy

**Instructor I:** R. Tembo

**Instructor II:** N. Sharma

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Students interested in biology are presented with a variety of dynamic educational opportunities. These opportunities, involving diverse biological subdisciplines from molecules to ecosystems, challenge the students of biology in one of the most exciting eras of human history. The Department of Biology is dedicated to producing well-informed, scientifically literate graduates capable of applying the knowledge and skills acquired to ensure professional success and lifelong learning.

Undergraduate students collaborate with biology faculty on an array of interesting research topics. By applying what they have learned from time in the classroom to their involvement with research projects, students can more smoothly make the transition to professional and graduate programs and the work force. Modern classrooms and research laboratories, and the Potter-Nicely Outdoor Education Center and Green River Preserve provide outstanding settings for student research. The Biology Department is also proud to house the Biotechnology Center, Center for Biodiversity Studies, and Bioinformatics and Information Science Center. The centers are integral components of the WKU Applied Research and Technology Program, a state-funded program of distinction.

When planning a program of study in the Department of Biology each student must be aware of the University's academic requirements and regulations contained in this catalog in the section, "Academic Information." Specific attention should be given to the subsections entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations. Students should be aware that some academic programs may require additional scholastic requirements and standards not specified in the catalog. To obtain a copy of these requirements, students should contact the department head. We offer four options for a B.S. degree: A Biology major without a minor (reference number 525), a Biology major with a minor (reference number 617), a Biochemistry major (reference number 519), a Molecular Biotechnology major (reference number 738), and a Medical Laboratory Science major (reference number 5004). Each is described below along with our minor in Biology, Joint Undergraduate-Master's Program (JUMP), Teaching Certifications, and other Special Programs.

### Major in Biology

**Reference Number:** 525

**Minimum Hours for Major:** 48

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/biology\\_without\\_minor\\_525.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/biology_without_minor_525.pdf)

This option for a major in Biology requires a minimum of 48 hours in biology with 24 hours at the 300 or higher level. No minor is required. A range of upper level courses are available in ecology and evolutionary biology, molecular and cellular biology, plant biology, animal biology, and microbiology. All students are required to complete BIOL 120/BIOL 121, BIOL 122/BIOL 123, each with a grade of "C" or better, and BIOL 489. In addition, students must select 11 hours of restricted elective coursework chosen from the following.

- BIOL 222/BIOL 223 or BIOL 224/BIOL 225 or BIOL 226/BIOL 227
- BIOL 319/BIOL 322 or BIOL 327/BIOL 337
- BIOL 315 or BIOL 316

Students must also select five laboratory experience courses chosen from: BIOL 212, BIOL 312, BIOL 321, BIOL 322, BIOL 324, BIOL 325, BIOL 326, BIOL 328, BIOL 331, BIOL 337, BIOL 348, BIOL 350, BIOL 356, BIOL 400, BIOL 404, BIOL 405, BIOL 412, BIOL 447, BIOL 450, BIOL 456, BIOL 457, BIOL 458, BIOL 460, BIOL 470, BIOL 472, BIOL 485, BIOL 496, BIOL 497.

Students must also select one science process course chosen from: BIOL 212, BIOL 312, BIOL 331, BIOL 350, BIOL 397, BIOL 404, BIOL 407, BIOL 412, BIOL 456, BIOL 457, BIOL 470, BIOL 472, BIOL 495, BIOL 496, BIOL 497, or HON 404.

In consultation with their advisor, students select majors-level coursework to obtain a minimum of 48 credits total, provided that at least 24 hours total are upper-division courses. Students may count up to 6 credit hours of a combination of BIOL 369 and/or BIOL 399, and up to 4 credits of BIOL 485 toward this major.

Because an understanding of the principles of subjects outside of biology, in particular agriculture, chemistry, geography and geology, mathematics, physics and sociology is essential to the study of biology; majors are required to complete supporting courses as follow:

1. MATH 116 and MATH 117 or MATH 118 or higher
2. PHYS 231/PHYS 232 or PHYS 255/PHYS 256
3. CHEM 120/CHEM 121, and
4. Two courses from the following list: AGRO 350 and AGRO 452 or AGRO 454 or AGRO 455/AGRO 456 or AGRO 457/AGRO 458, BIOL 382, CHEM 222/CHEM 223, CHEM 314 or CHEM 340/CHEM 341, CHEM 330, CIS 243, CIS 226 or CS 146, GEOG 328, GISC 316, GISC 317, GISC 417, MATH 136, MATH 137, MATH 142, MATH 305, MATH 307, PHYS 332/PHYS 233 or PHYS 265/PHYS 266; SOCL 302.

### Major in Biology

**Reference Number:** 617

**Minimum Hours for Major:** 36

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/biology\\_with\\_a\\_minor\\_617.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/biology_with_a_minor_617.pdf)

This option for a major in biology requires a minimum of 36 semester hours in biology with 18 hours at the 300 or higher level plus the requirements of a minor area or a second major. The major-minor/second major combination must be at least 54 unduplicated semester hours. All students are required to complete BIOL 120/BIOL 121, BIOL 122/BIOL 123, each with a grade of "C" or better, and BIOL 489. In addition, students must select 11 hours of restricted elective coursework chosen from the following:

- BIOL 222/BIOL 223 or BIOL 224/BIOL 225 or BIOL 226/BIOL 227
- BIOL 319/BIOL 322 or BIOL 327/BIOL 337
- BIOL 315 or BIOL 316

Students must also select three laboratory experience courses chosen from: BIOL 212, BIOL 312, BIOL 321, BIOL 322, BIOL 324, BIOL 325, BIOL 326, BIOL 328, BIOL 331, BIOL 337, BIOL 348, BIOL 350, BIOL 356, BIOL 400, BIOL 404, BIOL 405, BIOL 412, BIOL 447, BIOL 450, BIOL 456, BIOL 457, BIOL 458, BIOL 460, BIOL 470, BIOL 472, BIOL 485, BIOL 496, BIOL 497.

Students must also select one science process course chosen from: BIOL 212, BIOL 312, BIOL 331, BIOL 350, BIOL 397, BIOL 404, BIOL 407, BIOL 412, BIOL 456, BIOL 457, BIOL 470, BIOL 472, BIOL 495, BIOL 496, BIOL 497, or HON 404.

In consultation with their advisor, students select majors-level coursework to obtain a minimum of 36 credits total, provided that at least 18 hours total are upper-division courses. Students may count up to 3 credit hours of a combination of BIOL 369 and/or BIOL 399, and up to 4 credit hours of BIOL 485 toward this major.

Because an understanding of the principles of subjects outside of biology, in particular agriculture, chemistry, geography and geology, mathematics, physics and sociology is essential to the study of biology, majors are required to complete supporting courses as follow:

1. MATH 116 and 117 or MATH 118 or higher
2. PHYS 231/PHYS 232 or PHYS 255/PHYS 256
3. CHEM 120/CHEM 121, and
4. Two courses from the following list: AGRO 350 and AGRO 452 or AGRO 454 or AGRO 455/AGRO 456 or AGRO 457/AGRO 458, BIOL 382, CHEM 222/CHEM 223, CHEM 314 or CHEM 340/CHEM 341, CHEM 330, CIS 243, CIS 226 or CS 146, GEOG 328, GISC 316, GISC 317, GISC 417, MATH 136, MATH 137, MATH 142, MATH 305, MATH 307, PHYS 332/PHYS 233 or PHYS 265/PHYS 266, SOCL 302.



### Major in Molecular Biotechnology

**Reference Number:** 738

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 55

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/molecular\\_biotechnology\\_738.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/molecular_biotechnology_738.pdf)

This major requires a minimum of 55 hours of molecular biotechnology – related courses in biology that involve subjects such as genome discovery, molecular biology, microbiology, bioinformatics and research experience or an internship, among others. At least 28 of these hours must be at the 300 or higher level. No minor is required. All students are required to complete: BIOL 120/BIOL 121, BIOL 122/BIOL 123, BIOL 212, BIOL 226/BIOL 227, BIOL 312, BIOL 319/BIOL 322, BIOL 327/BIOL 337, BIOL 350, BIOL 369 or BIOL 399, BIOL 382, BIOL 388, BIOL 411, BIOL 446, BIOL 447, BIOL 489. Students must also take BIOL 388 every semester for a minimum of 5 at 0 credit hours before being able to take the course for 1 credit hour in their last semester. In addition, students must take either BIOL 369 or BIOL 399.

Students must also select 10 credit hours of elective courses from: BIOL 222/BIOL 223 or BIOL 224/BIOL 225, BIOL 316, BIOL 328, BIOL 330, BIOL 331, BIOL 335, BIOL 400, BIOL 403, BIOL 404, BIOL 407, BIOL 412, BIOL 420, BIOL 440, BIOL 464, BIOL 467, BIOL 470, BIOL 490, BIOL 495, BIOL 496.

Because an understanding of mathematics, chemistry and physics is required for a full understanding of Molecular Biotechnology and because an understanding of workplace – related issues is important for a successful application of molecular biotechnology, students are required to complete the supporting courses of either MATH 117 or MATH 136, CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 340/CHEM 341 and CHEM 342/CHEM 343, PHYS 231/PHYS 232 and PHYS 332/PHYS 233, and of either AMS 371 or AMS 390 or AMS 430.

### Major in Biochemistry

**Reference Number:** 519

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 60

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry\\_519.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry_519.pdf)

Interested students should contact Dr. S. Jacobshagen, Department of Biology. For more information, see page 216 of this catalog for a list of courses.

### Major in Medical Laboratory Science

**Reference Number:** 5004

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 83

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/medical\\_lab\\_science\\_5004.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/medical_lab_science_5004.pdf)

Interested students should contact Dr. K. McDaniel, Department of Biology. For more information, see page 217 for program information and a list of courses.

### Minor in Biology

**Reference Number:** 326

**Minimum Hours for Minor:** 24

The minor in biology requires a minimum of 24 semester hours in biology with 12 hours at the 300 or higher level. The required courses are BIOL 120/BIOL 121 and BIOL 122/BIOL 123. Students, with the aid of their advisor, select additional biology courses to complete the minor. Students may count up to 3 credit hours of a combination of BIOL 369 and BIOL 399 and up to 4 credit hours of BIOL 485 toward this minor.

### Food Science Certificate

**Reference Number:** 1724

**Minimum Hours for Certificate:** 12

The certificate in Food Science is designed for a student seeking a career in the food industry. The certificate requires 12 semester hours with 6 hours required as BIOL 336 and CHEM 306 and 6 hours of elective courses from the following list of courses: AGECE 360, AGECE 468, AGRI 101, AGRI 315, AGRI 493, AGRO 110, AGRO 311, AGRO 320, AMS 301, AMS 303, AMS 352, AMS 395, ANSC 140, ANSC 141, ANSC 340, BIOL 470, HMD 151, HMD 152, HMD 211, HMD 251, or a course approved by an advisor.

### **Secondary Teaching Certification in Biology**

Students who wish to be certified to teach high school biology must complete both the major in Biology (reference number 525 or 617) and the major in Science and Mathematics Education (reference number 774), offered in the School of Teacher Education. Interested students should contact the SKyTeach Office, Snell Hall B104, 270-745-3900.

### **Middle Grades Science Certification**

Students who wish to teach middle school science must complete both the major in Middle School Science Education (reference number 734), offered by Ogden College and SKyTeach, and the major in Science and Mathematics Education (reference number 774), offered in the School of Teacher Education. Interested students should contact the SKyTeach Office Snell B104, 270-745-3900.

### **Other Department Programs**

Several other biologically oriented, specialized programs are available such as biophysics and environmental science, as well as several pre-professional programs. Specific details of these programs are listed under Pre-Professional and Interdisciplinary Programs.

### **Joint Undergraduate-Master's Program (JUMP)**

For highly motivated students, especially those planning to pursue further graduate or professional study, the department offers a five-year JUMP program leading to both B.S. and M.S. degrees in biology. Completion of the M.S. portion of the program may require enrollment in summer terms during the fourth and fifth years. A key component of this program is early and sustained involvement in undergraduate research, beginning in the sophomore year. JUMP enrollees must have a 3.2 or higher GPA, and a minimum of 45 earned undergraduate hours, but no more than 90 earned hours to be considered for JUMP. As such, interested students must work closely with their undergraduate advisor early in their freshman or sophomore year to design their five-year JUMP plan and identify a faculty mentor and area of research. Contact the Biology Graduate Program Coordinator, Dr. Carl Dick, for more information.

**Graduate Programs** – Students interested in graduate study in biology should consult the The Graduate School's website at [www.wku.edu/graduate](http://www.wku.edu/graduate) for detailed information concerning the various programs available. For specific questions related to Biology, please contact Dr. Carl Dick or specifically for the non-thesis option, Dr. Chandra Emani.

The Department of Biology offers the following: (1) M.S. degree with a research thesis, especially attractive for students interested in a career in biology or in preparation for Ph.D. studies; (2) M.S. degree without a research thesis, often beneficial for career advancement or those working in the field of education (an online option for this degree path is available); (3) M.A.E. (Masters of Art in Education) with a specialization major in Biology (minor in Secondary Education) or a minor in Biology (major in Secondary Education). The M.A.E. in biology is designed to enhance the preparation of middle grades or secondary teachers of biology.

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## **Department of Chemistry**

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**Dr. Stuart Burris, Chair**

**College High Hall, Office 2116**

**Phone: 270-745-3457; Fax: 270-745-5361**

**Website: [www.wku.edu/chemistry](http://www.wku.edu/chemistry)**

**Professors:** S. Burris, Y. Cao, E. Conte, D. Dahl, L. Pesterfield, C. Stevens, C. Webb, K. Williams, R. Zhang

**Associate Professors:** J. Maddox, M. Nee, C. Skipworth, B. Yan

**Assistant Professors:** Y. Deng, L. Hill, M. Kim, B. Williams

**Scholar-In-Residence:** E. Stevens

**Instructor II:** A. Brooks, D. Wolfgang

**Instructor I:** S. Edwards

**Professors Emeriti:** D. Hartman, C. Henrickson, N. Hunter, W-P. Pan, J. Riley, L. Shank, D. Slocum, C. Wilkins

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Mission Statement: WKU Chemistry empowers students of all backgrounds to think critically about the molecular sciences and promotes a vibrant regional economy through training, public service, and industrial collaboration. We ignite a spirit of life-long learning through engaged classroom and laboratory instruction, hands-on experience in nationally recognized research, and direct mentoring by faculty. This enables our students to define their own career path and to make an impact both locally and globally.

Chemistry is often described as “The Central Science” in today’s technology-driven world. Chemistry plays an important role in the research, development, and quality assurance of products and materials ranging from pharmaceuticals and polymers to ceramics and nanocomposites. Knowledge and understanding of fundamental chemical concepts are crucial to success in professions such as medicine, pharmacy, veterinary medicine, forensic science, environmental science, engineering, medical laboratory science, physical therapy, nursing, patent and environmental law, and science education.

In order to best serve such a diverse audience, the chemistry curriculum at Western Kentucky University offers an integrated series of lecture and laboratory courses. Our courses provide students with grounding in theoretical models balanced with real-life applications and hands-on laboratory experiences. This allows students to achieve an understanding of chemical and physical phenomena at the molecular level and to develop the critical thinking skills necessary for chemical problem solving. In addition to coursework, the Department of Chemistry provides our undergraduates a wide variety of research opportunities from biochemistry to materials science. Research encourages students to continue building their laboratory skills and scientific knowledge while working one-on-one with a faculty member. Undergraduate research students often present their research at both regional and national professional meetings. The combination of lecture, laboratory and one-on-one faculty interaction allows students to develop the skills necessary to be successful in their chosen profession.

As part of the educational experience, students are routinely trained in the operation of state-of-the-art instrumentation in the academic and research laboratories. The Department has extensive holdings of instrumentation, including atomic spectrometers, calorimeters, electrochemical analyzers, elemental analyzers, gas chromatographs, FTIR spectrometers, ion chromatographs, mass spectrometers, spectrofluorophotometers, UV-visible spectrophotometers, a Nd-YAG laser system, a 500 MHz nuclear magnetic resonance spectrometer, and a 90 MHz fixed magnet NMR.

Colonnade Program requirements for students majoring outside the sciences can be satisfied by CHEM 101, CHEM 109, or CHEM 111, where only one semester of chemistry is needed, or by the sequences CHEM 105/CHEM 106, CHEM 107/CHEM 108 or CHEM 120/CHEM 121, CHEM 222/CHEM 223, where two semesters of chemistry are desired.

Biochemistry courses (CHEM 446, CHEM 447, CHEM 462, and CHEM 467) are also offered as part of the curriculum. CHEM 446 is required for the major approved by the American Chemical Society. Biochemistry is also strongly recommended for pre-medicine and pre-dentistry students, and for biology majors desiring a second major in chemistry.

When planning a program of study in Chemistry, each student should be aware of the University’s academic requirements and regulations contained in the “Academic Information” chapter of this catalog. Specific attention should be given to the subsections in the chapter entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations. Students should be aware that some academic programs may require additional scholastic regulations and standards not specified in the catalog. To obtain a copy of these regulations, students should contact the Department Chair.

**Major in Chemistry**

**Program Coordinator:** S. Burris

**Reference Number:** 623

**Minimum Hours for Degree:** 120-123

**Minimum Hours for Major:** 33-53

**Degree:** Bachelor of Science

**Sample Degree Path for Concentration:**

*ACS Approved:* [http://wku.edu/degreepaths/18-19/documents/ocse/chemistry\\_acs\\_623.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/chemistry_acs_623.pdf)

*General:* [http://wku.edu/degreepaths/18-19/documents/ocse/chemistry\\_general\\_623.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/chemistry_general_623.pdf)

*Foundations:* [http://wku.edu/degreepaths/18-19/documents/ocse/chemistry\\_foundations\\_623.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/chemistry_foundations_623.pdf)

*Teacher Certification:* [http://wku.edu/degreepaths/18-19/documents/ocse/chemistry\\_teaching\\_cert\\_623.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/chemistry_teaching_cert_623.pdf)

The major in chemistry requires a minimum of 33 semester hours and leads to the Bachelor of Science degree. Requirements of the major include selecting one of four concentrations. A second major or minor or the ACS-Approved Concentration is also required. The department offers four concentrations that lead to a Bachelor of Science degree in chemistry. The most common are the American Chemical Society (ACS) Approved Concentration, typically for those desiring graduate education in chemistry and the General Chemistry Concentration, typically for pre-health profession students with a double major. The third concentration (Foundations) is for those students who only desire a minor instead of a second major. The fourth concentration is for students desiring Teacher Certification in Chemistry. Prior to a selection of a program of study a student should consult with a chemistry advisor to determine the most appropriate option.

### **ACS Approved Concentration**

WKU is on the approved list of the Committee on Professional Training of the American Chemical Society. For the Chemistry Department to certify graduates in this concentration, the completion of a minimum of 53 hours of chemistry courses, 16-18 hours of math and science cognate courses, and the Colonnade general education courses for the Bachelor of Science is required. Required chemistry courses for the ACS Approved concentration are CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 320, CHEM 330, CHEM 340/CHEM 341, CHEM 342/CHEM 343, CHEM 398, CHEM 399 (2 hours), CHEM 420/CHEM 421, CHEM 435/CHEM 436, CHEM 446, CHEM 450/CHEM 451, CHEM 452/CHEM 453. Required support courses are MATH 136, MATH 137, PHYS 231/PHYS 232 or PHYS 255/PHYS 256, PHYS 322/PHYS 233 or PHYS 265/PHYS 266.

It is recommended that CHEM 330 be taken as soon after CHEM 222 as possible. It is also recommended that physical chemistry, CHEM 450/CHEM 451, CHEM 452/CHEM 453, be taken in the junior year because CHEM 450 is a prerequisite for CHEM 420.

Students whose high school preparation in mathematics makes them initially ineligible for MATH 136 should consult their academic advisor for the proper first course in mathematics. It is recommended that students in this program take MATH 237, MATH 307 and MATH 331 in addition to the minimum math requirements listed above.

### **General Chemistry Concentration**

The requirements for the General Chemistry Concentration include (33 hours): CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 330, CHEM 340/CHEM 341, CHEM 342/CHEM 343, CHEM 320 or CHEM 446, CHEM 412 or CHEM 450/CHEM 451. Additional required courses (8-9 hours): MATH 136, PHYS 231/PHYS 232 or PHYS 255/PHYS 256. A second major is required for this concentration.

The General Chemistry Concentration is recommended for pre-profession students majoring in chemistry and other students who desire a double major. It is recommended that CHEM 330 be taken as soon after CHEM 222 as possible. Prerequisites for CHEM 412 are CHEM 314 or CHEM 340, CHEM 330, MATH 136, and PHYS 231 or PHYS 255, all with a grade of C or better. Students should be aware of this and plan accordingly.

### **Foundations Concentration**

The requirements for the Foundations Chemistry Concentration include (37 hours): CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 320, CHEM 330, CHEM 340/CHEM 341, CHEM 342/CHEM 343, CHEM 398, CHEM 446, CHEM 412 or CHEM 450/CHEM 451. Additional required courses (8-9 hours): MATH 136, PHYS 231 / PHYS 232 or PHYS 255/PHYS 256. A minor or second major is required for this concentration.

It is recommended that CHEM 330 be taken as soon after CHEM 222 as possible. Prerequisites for CHEM 412 are CHEM 314 or CHEM 340, CHEM 330, MATH 136, and PHYS 231 or PHYS 255, all with a grade of C or better. Students should be aware of this and plan accordingly.

### **Chemistry Major with Teacher Certification Concentration**

Students interested in teaching chemistry must declare a second major in Science and Mathematics Education (SMED) available through the College of Education and Behavioral Sciences. The following chemistry courses (35 hours) are required for the chemistry major: CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 314, CHEM 320, CHEM 330, CHEM 399 (2 hours), CHEM 412, CHEM 446, CHEM 447. Required support courses are MATH 136, PHYS 231/PHYS 232, PHYS 332/PHYS 233, GEOL 111/GEOL 113. The following courses (37 hours) are required for the SMED major: SMED 101, SMED 102, SMED 310, SMED 320, SMED 340, SMED 360, SMED 470, SMED 489, SPED 330, SEC 490, and LTCY 421.

It is recommended that CHEM 330 be taken as soon after CHEM 222 as possible. Prerequisites for CHEM 412 are CHEM 314 or CHEM 340, CHEM 330, MATH 136, and PHYS 231 or PHYS 255, all with a grade of C or better. Student should be aware of this and plan accordingly.

## **Major in Biochemistry**

**Reference Number:** 519

**Minimum Hours for Major:** 60

**Minimum Hours for Degree:**120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry\\_519.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry_519.pdf)

A BS degree in biochemistry requires a minimum of 60 credit hours and consists of core chemistry and biology courses with electives selected from chemistry, biology, agriculture and physics. For more information, see "Biochemistry" on page 222 for a list of courses and more information.

**Minor in Chemistry****Program Coordinator:** K. Williams**Reference Number:** 335**Minimum Hours for Minor:** 20

The minor in chemistry requires a minimum of 20 hours, including CHEM 120, CHEM 121, CHEM 222, CHEM 223, CHEM 330, CHEM 340, and CHEM 341. At least ten semester hours must be earned in courses numbered 300 and above and at least one upper-division laboratory-based course must be taken in residence at the WKU Bowling Green campus.

**Minor in Nutritional and Food Chemistry****Program Coordinator:** S. Burris**Reference Number:** 421**Minimum Hours for Minor:** 18

The minor in nutritional chemistry requires a minimum of 18 hours, including 12 hours of required courses and at least 6 hours of elective courses to be selected in consultation with an advisor. The required courses are CHEM 105, 106, 107, 108, and 304. Students must choose at least 6 hours from: CHEM 299, CHEM 314; HMD 211, HMD 360; AMS 301, AMS 303, AMS 352, AMS 381, AMS 443, AMS 462; BIOL 207, BIOL 208; AGEC 468. At least half of the credits must be at the upper-division level.

**Joint Undergraduate Master's Program (JUMP)**

Students may obtain both an ACS-Approved Bachelor of Science in either Chemistry or Biochemistry and a Master of Science in Chemistry concurrently within five years. Interested students can apply prior to completion of 90 hours of undergraduate credits. The Joint Undergraduate Master's program is an exciting opportunity for students who excel academically. Qualified students who have been admitted to JUMP may complete a maximum of 18 graduate hours as an undergraduate. Students should apply to The Graduate School upon, or before earning more than, 18 graduate hours. This will allow a student to accelerate advanced study while eliminating one year from the traditional route of separate BS and MS degrees. Contact the Chemistry JUMP Advisor or the Chemistry JUMP Coordinator for more information.

**Graduate Programs** – Graduate programs and the Master of Science and Master of Arts in Education with a minor in chemistry are available in the Department of Chemistry. Each year a number of graduate teaching assistantships are available for qualified graduate students. For additional information, see The Graduate School's website ([www.wku.edu/graduate](http://www.wku.edu/graduate)) or contact the Chemistry Graduate Program Coordinator.

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**School of Engineering and Applied Science**

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**Dr. Stacy Wilson, Director****Building:** COHH 2114**Phone:** (270) 745-3251**Website:** [www.wku.edu/seas](http://www.wku.edu/seas)**E-mail:** [seas@wku.edu](mailto:seas@wku.edu)**Professors:** G. Arbuckle, B. Askins, M. Atici, C. Byrne, M. Cambron, W. Campbell, R. Choate, M. Doggett, J. Ellis, J. Lenoir, K. Schmaltz, H. Wang, S. Wilson, Z. Xia, G. Xing, U. Ziegler**Associate Professors:** S. Aly, F. Ashrafzadeh, W. Collett, J. Gary, J. Khouryieh, Q. Li, S. Palmquist, B. Reaka, M. Revels, R. Yang**Assistant Professors:** T. Alyousef, M. Galloway, B. Haddad, K. Haleen, O. Mansour, Y. Mowafi, M. Nursheshmeh, F. Orooji, A. Rezaslotani**Professor Emeritus:** T. Leeper, G. Mills, J. Russell**Instructor I:** I. Abumuhfouz, M. Chidurala, B. Janes, E. Martelli, J. Wilson**Instructor II:** G. Smith

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Modern society continues to become more dependent on technology. Personal and portable technologies provide people with more capability and connectivity worldwide. Homes become smarter as the number of connected devices grows. The manufacturing process becomes progressively more sophisticated as the technical requirements increase. To meet these challenges, industry must have access to students who not only have a strong foundation in their discipline but also can apply this knowledge to solve real problems.

The focus of the new WKU School of Engineering and Applied Sciences (SEAS) is to educate students to be leaders in a changing technical landscape, to provide solutions to the problems facing the modern high tech society, and to provide a workforce to support the technological complexity of industry.



In order to provide students with the necessary skills, the programs in the School of Engineering and Applied Sciences are project-based which means that students have opportunities to engage in project activities throughout the curricula to support design, development, implementation, and troubleshooting.

The School of Engineering and Applied Sciences offers Bachelor of Science degrees in the following areas:

- Architectural Science (reference number 518)
- Civil Engineering (reference number 534)
- Computer Information Technology (reference number 555)
- Computer Science (reference number 629)
- Construction Management (reference number 533)
- Electrical Engineering (reference number 537)
- Manufacturing Engineering Technology (reference number 5006)
- Mechanical Engineering (reference number 543)
- Technology Management (reference number 575)

The School of Engineering and Applied Sciences offers minors in computer science (reference number 341), construction management (reference number 343), electrical engineering (reference number 354), industrial sciences (reference number 395), land surveying (reference number 405), systems engineering (reference number 476), and floodplain management (reference number 361), as well as an associate degree in vocational/industrial and technical teacher education. SEAS also offers certificates in automation (reference number 1726), food processing and technology (reference number 1718), land surveying (reference number 1700), manufacturing and logistics (reference number 1727), manufacturing processing and technology (reference number 1728), six sigma and quality (reference number 1729).

The School of Engineering and Applied Sciences offers Master of Science degrees in computer science and engineering technology management and a graduate certificate in Lean Sigma.

### **Major in Architectural Science**

**Program Coordinator:** S. Aly

**Reference Number:** 518

**Minimum Hours for Degree:** 120

**Minimum Hours for Major:** 87

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/architectural\\_sciences\\_518.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/architectural_sciences_518.pdf)

Architectural Science is a bridge between design theory and construction practice. Architectural Technologists perform a variety of important functions in many areas of the architectural and building construction fields and are widely recognized by professionals in the construction industry. Graduates find employment as drafters, designers, construction planners, estimators, inspectors, technical sales representatives, and many other exciting areas.

**Career Opportunities:** Graduates obtain employment in a wide variety of organizations: architectural firms, engineering firms, interior design firms, contractors, design-build construction firms, surveying firms, government agencies, construction product manufacturers, construction material suppliers, inspection and testing firms, specialty consultants, and computer applications consultants.

**Program Description:** The program in Architectural Science is designed to provide graduates with a practical architectural education combining an understanding of the philosophy of building design with an applied technical knowledge of construction systems and materials. Graduates are prepared with the knowledge and skills to assist in developing drawings and related documentation, constructing architectural models, developing architectural renderings, creating digital images and visualizations, preparing cost estimates and construction planning documentation, and making professional presentations.

Program instruction includes architectural drafting, construction methods and materials, design principles, environmental systems, building systems, building codes, structural principles, project management, sustainability, and professional presentations.

The major in Architectural Science leads to a Bachelor of Science degree. A minor or second major is not required. Course requirements for the major are shown below.

The following courses are required for the major: AMS 140, AMS 151, AMS 163, AMS 251, AMS 261, AMS 262, AMS 263, AMS 273, AMS 282, AMS 305, AMS 325, AMS 351, AMS 363, AMS 369, AMS 371, AMS 390, AMS 398, AMS 430, AMS 469, AMS 488, AMS 490A, CE 303, CE 304, ENG 306 or ENG 307, 9 hours of advisor-approved architectural science electives, and 3 hours of advisor-approved management electives.

Students are also required to take the following additional courses outside of the major: AMS 180, ECON 150/ECO 150C or ECON 202/ECO 202C or ECON 203/ECO 203C or ECON 375 or ECON 390, or MATH 117 these courses may fulfill Colonnade requirements.



**Major in Civil Engineering**

**Program Coordinator:** J. Wilson

**Reference Number:** 534P (seeking admission)  
534 (officially admitted)

**Minimum Hours for Degree:** 129  
**Degree:** Bachelor of Science

**Minimum Hours for Major:** 68

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/civil\\_eng\\_534.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/civil_eng_534.pdf)

Civil engineers design a better world in which to live. They design, build, and maintain our nation's infrastructure including: roads and bridges; buildings and foundations; water supply and waste-water facilities; storm water management systems; and environmental protection facilities.

The mission of the civil engineering program is to prepare students for professional engineering and management positions in all phases of civil engineering projects. The program provides a broad educational background with a foundation in basic engineering and business principles. These basic skills are complemented by advanced topics in engineering design, management, finance, computer applications, and real world civil engineering experiences throughout the baccalaureate degree program. The civil engineering program at WKU focuses on construction, geotechnical engineering, construction materials, structures, surveying, and hydrology.

The teaching philosophy of this program focuses on project-based learning. This is achieved by placing competent, practicing engineers in the classroom as professors, engaging students in the practice of civil engineering through hands-on class projects, and involving students in faculty consulting and applied research activities. Real engineering projects often serve as class projects. Project sites and professional engineering and construction management firm offices often serve as classrooms.

The major in civil engineering leads to a Bachelor of Science degree. The curriculum requires a minimum of 68 technical specialty hours, completion of pre-major courses, additional 10 -11 semester hours of math and science requirements, and completion of Colonnade general education hours. The WKU Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

**Civil Engineering Program Educational Objectives**

The program achieves its mission by focusing on specific educational objectives. A few years after graduation, WKU CE graduates are expected to have the following characteristics:

- Objective 1:** Graduates attain positions of Engineer in Responsible Charge on projects in both the public and private sectors and successfully execute projects using technical and managerial skills while demonstrating professional and ethical behavior.
- Objective 2:** Graduates attain Engineering licensure and other professional certifications as appropriate to their career.
- Objective 3:** Graduates continue to pursue life-long learning opportunities through advanced degrees and various continuing education endeavors.
- Objective 4:** Graduates become leaders within their companies, the profession, and other activities.

The CE student outcomes are listed on the program website at [www.wku.edu/seas](http://www.wku.edu/seas).

**Academic Standards for the WKU Civil Engineering Program**

Students are admitted as a pre-major in civil engineering. To transition from pre-major to major and to graduate with a degree in civil engineering, students must complete each of the following courses and labs with a grade of "C" or better: ENG 100, COMM 145, MATH 136 and MATH 137, PHYS 255 and PHYS 256, EM 222, and GEOL 111. COMM 145 will be replaced with a Human Communications (OC course). Students must also complete the following courses with a grade of "C" or better: all pre-major courses, and all major courses except one. In addition, each student is required to have a 2-course sequence in four (4) different civil engineering areas. The curriculum already includes a 2-course sequence in structures, geotechnical engineering, and construction. Therefore, each student must select one of the technical electives to cover an additional area such as surveying, materials, environmental engineering, hydrology, or transportation.

Students must take the following 68 technical specialty credit hours required for the major: CE 176 or ME 176 or EE 101, CE 160, CE 161, CE 303, CE 304, CE 305, CE 310, CE 316, CE 332, CE 342, CE 352, CE 370, CE 371, CE 382, CE 400 or ENGR 490, CE 410, CE 411, CE 412, CE 461, CE 498 or ENGR 491, AMS 163, CHEM 120, CHEM 121, EM 222, EM 303. As part of the 68 technical specialty credit hours, students must take 3 hours of structures electives chosen from: CE 384 or CE 482. Students may not receive credit for both CE 482 or for CE 482, and CE 384.

Nine (9) credit hours of technical electives are required from the approved list: CE 300, CE 301, CE 326, CE 360, CE 361, CE 378, CE 379, CE 380, CE 381, CE 383, CE 426, CE 436, CE 440, CE 444, CE 462, CE 474, CE 475, CE 476, CE 486, CE 490, CE 491, EE 350, EM 313, CM 363, CM 400, CM 426, AMS 305, AMS 325, ENGR 400, GEOL 408, GEOL 310, GEOL 415, GISC 316, GISC 317, MATH 350, and ME 220.

Additional math and science requirements (10-11 hours) include GEOL 111/GEOL 113, MATH 237, MATH 331 and a science or math elective from the following list of courses CHEM 222/CHEM 223, PHYS 265/PHYS 266, GEOG 280, GEOL 311, GEOL 420, GEOL 445, GEOL 465, MATH 307, MATH 370, STAT 301.

For detailed information on the civil engineering program, please see the “Civil Engineering Handbook” (available [at http://wku.edu/seas](http://wku.edu/seas)) and/or contact your advisor.”

**Major in Computer Information Technology**

**Program Coordinator:** M. Revels

**Reference Number:** 555P (seeking admission)  
555 (officially admitted)

**Minimum Hours for Degree:** 120  
**Degree:** Bachelor of Science

**Minimum Hours for Major:** 60

**Suggested Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/computer\\_information\\_tech\\_555.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/computer_information_tech_555.pdf)

Computer Information Technology (CIT) is an integral part of modern life, business and, careers in the CIT field frequently exceed median pay and future job outlook growth. The CIT program at WKU can help prepare students for many rewarding careers, including:

- Computer Network Architect
- Computer Programmer
- Computer Support Specialist
- Database Administrator
- Information Security Analyst
- Network and Computer Systems Administrator
- Software Developer
- Web Developer

The CIT online degree requires 120 credit hours and leads to a Bachelor of Science degree. No minor or second major is required. Enrollment in the CIT program is limited and based on student qualifications. All courses in the major must be completed with a grade of “C” or better. The program requires 36-60 hours of upper-division CIT coursework, depending on transfer credits. All courses should be selected consistent with WKU’s degree requirements including:

- 36 hours minimum must be earned at WKU (typically satisfied by CIT course requirements below)
- 42 hours must be in upper-division credit (36 hours for students that transfer with an Associate of Applied Science degree in computer technology or related major, also satisfied by CIT course requirements below)
- 120 hours minimum overall
- Colonnade Program Requirements
- MATH 116 or higher

**Degree Requirements**

For transfer students (with an Associate of Applied Science degree or equivalent in computer technology or related major), 36 hours of CIT coursework is required. These include:

- Four 300-level core courses: CIT 300, CIT 302, CIT 352, CIT 372 (12 hours)
- Seven courses, to be selected from 400-level CIT courses and / or from AMS 342, AMS 367, AMS 390, AMS 394, AMS 396, AMS 430, AMS 475 (21 hours)
- Capstone course: AMS 490 (3 hours, to be taken in last semester)

For non-transfer students, 60 hours of CIT coursework is required. These include:

- Ten 300-level foundation courses: CIT 300, CIT 302, CIT 310, CIT 312, CIT 330, CIT 332, CIT 350, CIT 352, CIT 370, CIT 372 (30 hours)
- Nine courses, to be selected from 400-level CIT courses and/or from AMS 342, AMS 367, AMS 390, AMS 394, AMS 396, AMS 430, AMS 475 (27 hours)
- Capstone course: AMS 490 (3 hours, to be taken in last semester)

Please visit the program website for more information: [www.wku.edu/cit](http://www.wku.edu/cit).

**Major in Computer Science**

**Reference Number:** 629P (seeking admission)  
629 (officially admitted)

**Minimum Hours for Major:** 44-50

**Sample Degree Path for Concentration:**

*Without Concentration:* [http://wku.edu/degreepaths/18-19/documents/ocse/csci\\_any\\_minor\\_option\\_629.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/csci_any_minor_option_629.pdf)

*Specialty Option:* [http://wku.edu/degreepaths/18-19/documents/ocse/csci\\_specialty\\_option\\_629.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/csci_specialty_option_629.pdf)

*Systems/Scientific Applications:* [http://wku.edu/degreepaths/18-19/documents/ocse/csci\\_scientific\\_option\\_629.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/csci_scientific_option_629.pdf)

**Computer Science Program Educational Objectives**

The program achieves its mission by focusing on specific educational objectives. Within three to five years after graduation, WKU CS graduates are expected to be:

- Objective 1:** Engage in continuous learning to adapt to innovation and evolving technologies;
- Objective 2:** Design and implement solid solutions for rapidly changing computing & information systems;
- Objective 3:** Be effective team participants;
- Objective 4:** Effectively communicate ideas in verbal and written form at the appropriate level for the audiences; and
- Objective 5:** Be ethical and socially responsible computer science professional

The CS student outcomes are listed on the program website at [www.wku.edu/seas](http://www.wku.edu/seas).

The major in computer science requires a minimum of 44 semester hours. To be admitted to the computer science major, students must complete CS 180, CS 221, and CS 339 with grades of “C” or better. In addition, all CS courses counting toward the CS program major must be completed with a grade of “C” or better. Computer Science electives may include from 0-3 hours of 200-level courses.

Students must adhere to all University Policies as indicated in the WKU catalog section “Academic Information.” Additional requirements are as follows:

**Systems/Scientific Applications Concentration**

1. 50 hours are required including 47 hours of computer science courses and 3 hours of STAT 301.
2. ENG 307 and MATH 136 are required.
3. Completion of these 11 CS core courses (35 credit hours): CS 180, CS 221, CS 325, CS 339, CS 351, CS 360, CS 382, CS 396, CS 421, CS 425, and CS 496.
4. Completion of 12 hours of CS electives from the following courses: CS 372, CS 381, CS 443, CS 445, CS 446, CS 450, and CS 456.
5. Completion of 2 courses from the following list: MATH 137, MATH 305, MATH 307, MATH 331, MATH 405, MATH 406, MATH 470 and MATH 473.
6. Completion of one year of a laboratory science (a two semester sequence of the same science) and one additional science course (all must be designed for Science / Engineering majors).
7. One additional course from the above list of Mathematics courses (this course may not be used to satisfy any other CS major degree requirement) or one additional science course designed for science/engineering majors.

**Any Minor Option**

1. 44 hours of computer science courses are required.
2. ENG 307, MATH 136, and STAT 301, are required.
3. Completion of these 11 CS core courses (35 credit hours): CS 180, CS 221, CS 325, CS 339, CS 351, CS 360, CS 382, CS 396, CS 421, CS 425, and CS 496.
4. Completion of an additional 9 hours of CS electives at the 200-level or above (excluding CS 257) including 3 hours at the 400-level and another 3 hours at the 300-level or higher. Note: At most 1.5 hours of credit for CS 239 may count towards the major. At most 3 hours of credit for CS 239 and CS 245 (only for languages for which credit is not received through another course) may count towards the major.
5. Completion of any additional minor/major.

**Specialty Concentration**

1. 50 hours of computer science courses are required.
2. ENG 307, MATH 136, and STAT 301 are required.
3. Completion of these 13 CS core courses (41 credit hours): CS 180, CS 221, CS 325, CS 339, CS 351, CS 360, CS 381, CS 382, CS 396, CS 421, CS 425, CS 443, and CS 496.
4. An additional 18 hours of specialty courses, selected in consultation with a CS advisor, not used to satisfy specific other graduation requirements for the CS major or for the Colonnade Program, including 9 hours of which are at the 300 level or above.
5. Completion of an additional 9 hours of CS electives at the 200-level or above (excluding CS 257) including 3 hours at the 400-level and another 3 hours at the 300-level or higher. Note: At most 1.5 hours of credit for CS 239 may count towards the major. At most 3 hours of credit for CS 239 and 245 (only for languages for which credit is not received through another course) may count towards the major.

**Major in Construction Management****Program Coordinator:** B. Haddad**Reference Number:** 533**Minimum Hours for Degree:** 120**Minimum Hours for Major:** 69-70**Degree:** Bachelor of Science**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/construction\\_management\\_533.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/construction_management_533.pdf)

Construction Management involves planning, coordination, and control of projects from inception to completion. Construction Managers work out of a main or field office to perform a variety of important functions, including Project Planning, Cost Management, Time Management, Quality Management, Safety Management and Contract Administration.

**Career Opportunities:** Graduates obtain employment in a wide variety of organizations, including construction management firms, general contractors, and specialty contractors serving the commercial, industrial, heavy civil, and residential construction sectors. They may choose to become specialists in estimating, scheduling, safety, quality, or field supervision. Typical job titles include project manager, project engineer, office engineer, field engineer, estimator, quantity surveyor, and superintendent, along with many others.

**Program Description:** The program in Construction Management is designed to provide students with technical and managerial skills needed to assume leading positions in the construction industry. A minor or second major is not required. Course requirements for the major are shown below. Students should consult with an advisor in planning their four-year degree program.

The following courses are required for the major: AMS 163, AMS 217, AMS 261, AMS 262, AMS 271, AMS 282, AMS 305, AMS 310, AMS 325, AMS 371, AMS 390, AMS 394, AMS 398 or UC 400, AMS 430, AMS 490B, CM 250, CM 363, CM 462, CE 160/CE 161 or AGMC 170/AGMC 171, CE 303, CE 304, and CE 316.

Students must take one course from each of the following:

- Introductory accounting-financial - ACCT 200, MKT 220, MKT 325, MKT 390, FIN 161, FINC 161C, RE 170C, BUS 100C, BUS 102C, BUS 110C, BUS 250C, BUS 252C, ENT 312
- Business Law - MGT 301, MGT 333, or MGT 365.
- Intro to Economics/Principals of Economics – AGEC 360, ECON 150, ECON 202, ECON 203, ECON 375, ECON 390, ECO 150C, ECO 202C, ECO 203C. Students are also required to take MATH 117 or higher.

**Major in Electrical Engineering****Program Coordinator:** W. Collett**Reference Number:** 537P (seeking admission)  
537 (officially admitted)**Minimum Hours for Degree:** 124**Degree:** Bachelor of Science**Minimum Hours for Major:** 58**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/elec\\_eng\\_537.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/elec_eng_537.pdf)

Electrical engineering touches virtually every aspect of life in the twenty-first century. Electrical engineers are experts in dealing with electricity, electromagnetism, and electronics. Electrical engineers are employed in a variety of industries including:

- Circuits and Electronics
- Communication and Signal Processing
- Electrical Power Systems
- Computer Hardware and Embedded Systems
- Robotics, Control Systems and Automation Biomedical Applications
- Automotive and Aerospace Systems
- Manufacturing plants

The mission of our Electrical Engineering Program at WKU is to build a foundation of knowledge in electrical engineering by integrating a variety of project experiences at every level throughout the curriculum. Our program is to be relevant to our region and to produce graduates who can immediately contribute to the profitability of their employer. Our electrical engineering curriculum exposes students to a variety of topics to prepare them for careers as engineers.

The curriculum requires a minimum of 58 technical specialty hours and 33 semester hours of required science and mathematics courses.

The WKU Electrical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

### **Electrical Engineering Program Educational Objectives**

The program achieves its mission by focusing on specific educational objectives. A few years after graduation, WKU EE graduates are expected to be:

- Objective 1:** Pursuing successful and productive careers;
- Objective 2:** Applying their engineering education to address real-world problems;
- Objective 3:** Continuing their professional development and engaging in lifelong learning; and
- Objective 4:** Emerging as leaders in their companies, profession, and communities.

### **Academic Standards for the Electrical Engineering Program**

Students are admitted as a pre-major in Electrical Engineering. In order to transition from the pre-major to major and to graduate with a degree in Electrical Engineering, students must complete the following courses earning a grade of "C" or better in each course.

- EE 210 – Circuits & Networks (3.5 hours)
- ENG 100 – Freshman English (3 hours)
- Human Communication (F-OC)
- MATH 136 – Calculus and Analytical Geometry I (4 hours)
- MATH 137 – Calculus and Analytical Geometry II (4 hours)
- PHYS 255– University Physics I and Lab (5 hours)
- PHYS 265 – University Physics II (4 hours)

For detailed information on the electrical engineering program, please see <http://wku.edu/seas> and/or contact your advisor."

### **Courses required for major**

Students must take the following courses: EE 101, EE 180, EE 200, EE 210, EE 211, EE 300, EE 345, EE 380, EE 400 or ENGR 490, EE 401 or ENGR 491, EE 420, EE 431, EE 460, and EE 473 or PHYS 440.

In addition, students must take twelve hours of technical electives selected from: EE 405, EE 410 and EE 411, EE 432, EE 443, EE 445, EE 450/EE 451, EE 461, EE 462, EE 470/EE 475, EE 477, EE 479, EE 480, EE 490, or ENGR 360. Six hours of engineering/science electives must be taken from the below list:

*Engineering / Science Electives (must take at least 6 hours)*

- EM 222 or PHYS 350
- ME 220 or PHYS 330
- ME 240 – Materials and Methods of Manufacturing
- ME 330 or CE 342
- PHYS 450 – Classical Mechanics II
- PHYS 318 – Data Acquisition Using LabVIEW
- ENGR 400 – Principles of Systems Engineering
- Math 305 – Introduction to Mathematical Modeling
- PHYS 316 – Computational Physics

In addition, students must complete MATH 237, MATH 331, STAT 301, CS 239, and ECON 202 or ECON 203. Students must select a 3-hour math elective chosen from MATH 307, MATH 350, or MATH 370 and a 3-hour science elective chosen from CHEM 116, CHEM 120, BIOL 120, BIOL 122, BIOL 131, ENV 280, GEOL 111, or METR 121.

**Major in Manufacturing Engineering Technology**

**Program Coordinator:** M. Doggett

**Reference Number:** 5006

**Minimum Hours for Degree:** 120

**Minimum Hours for Major:** 58

**Degree:** Bachelor of Science

**Sample Degree Path:**

[http://wku.edu/degreepaths/18-19/documents/ocse/manufacturing\\_engineering\\_technology\\_5006.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/manufacturing_engineering_technology_5006.pdf)

This program prepares individuals to apply basic engineering principles and advanced manufacturing technical skills in support of industrial operations. The major includes instruction in optimization theory, human factors, organizational behavior, industrial processes, industrial planning procedures, systems integration, quality, and project management. Graduates achieve positions of leadership in business and industry while practicing innovation in the global marketplace.

**Career Opportunities:** Graduates obtain employment in a wide variety of positions. Some job titles of graduates include: systems integrator, industrial engineer, production manager, production specialist, new product development engineer, manufacturing engineer, quality manager, quality engineer, production engineer, general manager, plant manager, operations manager, industrial trainer, project manager, continuous improvement manager, and technology educator.

**Program Description:** A minor or second major is not required. Course requirements for the major are shown below. Students should consult with an advisor in planning their course schedules and career goals.

The major in manufacturing engineering technology requires the following 19 hours of technical core courses:

- Finance Selective: ACCT 200 or MKT 220 or FIN 161
- AMS 120 or (AMS 120-M1, AMS 120-M2, AMS 120-M3)
- AMS 163/AMS 205 or (AMS 205-M1, AMS 205-M2, AMS 205-M3)
- AMS 271
- UC 400 or AMS 398
- AMS 490E or (AMS 490-M1, AMS 490-M2, AMS 490-M3)
- AMS 328 or (AMS 328-M1, AMS 328-M2, AMS 328-M3)

The following courses are taken as part of the management core (24 hours):

- AMS 310 or (AMS 310-M1, AMS 310-M2, AMS 310-M3)
- AMS 356 or (AMS 356-M1, AMS 356-M2, AMS 356-M3)
- AMS 390 or (AMS 390-M1, AMS 390-M2, AMS 390-M3)
- AMS 430 or (AMS 430-M1, AMS 430-M2, AMS 430-M3)
- Communications Selective: BUS 214C or COMM 345 or COMM 346 or COMM 349 or COMM 362 or MGT 361
- Business Law Selective: MGT 200 or MGT 301 or MGT 333
- AMS 371 or (AMS 371-M1, AMS 371-M2, AMS 371-M3)
- AMS 394 or (AMS 394-M1, AMS 394-M2, AMS 394-M3)

The following courses are taken as part of the advanced manufacturing core (15 hours):

- AMS 217 or (AMS 217-M1, AMS 217-M2, AMS 217-M3)
- AMS 227 or (AMS 227-M1, AMS 227-M2, AMS 227-M3)
- AMS 342 or (AMS 342-M1, AMS 342-M2, AMS 342-M3)
- AMS 343 or (AMS 343-M1, AMS 343-M2, AMS 343-M3)
- AMS 370 or (AMS 370-M1, AMS 370-M2, AMS 370-M3)

Students must also take MATH 117 or higher as an additional required course.

**Project Lead the Way** – The School of Engineering and Applied Sciences (SEAS) agrees to grant college level credit for secondary school students from certified Project Lead the Way (PLTW) schools who satisfy the following requirements:

First, students must complete the following two (2) PLTW courses with a grade of B or above and a 6 or above on the End of Course college credit exam: 1. Introduction to Engineering Design; and 2. Principles of Engineering

Second, students must complete two (2) of the following PLTW courses with a grade of B or above and a 6 or above on the End of Course college credit exam: Aerospace Engineering; Biological Engineering; Civil Engineering and Architecture; Computer Integrated Manufacturing; Computer Science and Software Engineering; Digital Electronics; Capstone Course – Engineering Design and Development

Third, students must meet the requirements for admission to Western Kentucky University and enroll in the Bachelor of Science in Manufacturing Engineering Technology program within SEAS.



Finally, students requesting the credit must provide a written statement from the instructor of the PLTW program and the principal or guidance counselor, stating the student has successfully completed the program with the above specifications. In addition to the written statement an official transcript should be submitted for verification.

If the previous four conditions are met, the following three (3) courses will be articulated to the student's Western Kentucky University record: 1) AMS 120 – Basic Electricity (3 credit hours), 2) AMS 205 – CADD for Manufacturing (3 credit hours), 3) AMS EL-L – Lower-Level Undergraduate Technical Elective (6 credit hours)

**Major in Mechanical Engineering****Program Coordinator:** C. Byrne**Reference Number:** 543P (seeking admission)  
543 (officially admitted)**Minimum Hours for Degree:** 122.5**Degree:** Bachelor of Science**Minimum Hours for Major:** 60.5**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/mechanical\\_engineering\\_543.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/mechanical_engineering_543.pdf)

Mechanical engineers are involved in designing and building almost everything that is needed in our modern world, from nearly invisible electro-mechanical devices to enormous power generating and distribution systems producing millions of horsepower. Mechanical engineers use scientific principles from the physical world to create a tremendous variety of mechanical and thermal systems. Practicing mechanical engineers use these principles to design, analyze, manufacture and maintain systems that include:

- automobiles and aircraft
- heating and cooling systems
- electric power plants
- specialized materials
- manufacturing plants
- industrial equipment and machinery

Mechanical engineers need a solid understanding of engineering science, which includes mechanics, engineering materials, thermodynamics and fluid mechanics. The program at WKU focuses on these sciences as well as design and professional skills necessary for a successful career in mechanical engineering. Our graduates have a strong competitive advantage with their unique background of engineering fundamentals combined with practical knowledge and experience. The mechanical engineering program provides a project-based, learner-driven environment relevant to the needs of modern society. In support of this learning environment, the professional engineering activities of the faculty create opportunities for the students to practice the art and science of contemporary Mechanical Engineering.

The major in Mechanical Engineering leads to a Bachelor of Science degree. The curriculum requires a minimum of 60.5 technical specialty hours, completion of required Colonnade coursework, and 32-33 semester hours of required mathematics and science.

The WKU Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

**Mechanical Engineering Program Educational Objectives**

The mission is achieved by focusing on specific program educational objectives. Within a few years of completing the Mechanical Engineering Program, a graduate will:

- Objective 1:** Either be contributing to their regions' economic development through employment in mechanical engineering or related professions, or pursuing advanced credentials.
- Objective 2:** Occupy leadership roles in their profession, or in their communities, as their career develops
- Objective 3:** Demonstrate professionalism on diverse teams across a range of varied responsibilities
- Objective 4:** Be proactive in their professional development and engage in the continuing education needed to maintain and enhance their career.

The ME student outcomes are listed on the program website at [www.wku.edu/seas](http://www.wku.edu/seas).

**Academic Standards for the Mechanical Engineering Program**

Students are admitted as a Pre-Major in Mechanical Engineering. In order to transition from Pre-Major to Major and to graduate with a degree in Mechanical Engineering, student must satisfy the requirements below. All courses below must have a grade of "C" or better.

- College Composition (F-W1) (3 hours)
- Human Communications (F-OC) (3 hours)
- MATH 136: Calculus I or equivalent credit (4 hours)
- MATH 137: Calculus II or equivalent credit (4 hours)
- PHYS 255/PHYS 256: University Physics I/Lab (5 hours)
- CHEM 116/CHEM 106 or CHEM 120/CHEM 121 (4 or 5 hours)
- EM 222: Statics (3 hours)

Total Hours: 26 or 27 hours

These pre-major eligibility requirements MUST be completed before enrolling in ME 200: Sophomore Design. Check iCAP for progress towards meeting these requirements.

In addition to satisfying the requirements to transition from pre-major to major in mechanical engineering, the student must earn a grade of “C” or better in the following courses required of the major: EM 303, ME 176, ME 180, ME 200, ME 220, and ME 240.

Each mechanical engineering student must also take at least one mathematics/science elective, for a total of a minimum of 32 hours of mathematics and science beginning at MATH 136. This elective must be chosen from the following list: ASTR 214, BIOL 120/BIOL 121, BIOL 122/BIOL 123, BIOL 207, CHEM 222/CHEM 223, PHYS 316, PHYS 318, MATH 305, MATH 307, MATH 310, MATH 370, STAT 301.

The following 60.5 hours are required for the major: ME 176, ME 180, ME 240, ME 241, EE 210, ME 200, EM 222, EM 313, EM 303, ME 347, ME 220, ME 344, ME 300, ME 310, ME 330, ME 325, ME 400 or ENGR 490, ME 332, ME 333, ME 412 or ENGR 491, and 12 hours of ME technical electives. Additional required courses for the major include: CHEM 120/CHEM 121 or CHEM 116/CHEM 106, PHYS 255, PHYS 256, PHYS 265, PHYS 266, MATH 136, MATH 137, MATH 237, MATH 331, and three hours of mathematics/science electives. Students must complete a minimum of 32 hours of mathematics and science courses beginning with MATH 136. Student must also satisfy the WKU Colonnade requirements.

For detailed information on the mechanical engineering program, please see the “Mechanical Engineering Program Guide” (available at <http://www.wku.edu/seas>) and consult your advisor.

**Major in Technology Management****Program Coordinator:** B. Janes**Reference Number:** 575**Minimum Hours for Degree:** 120**Minimum Hours for Major:** 63**Degree:** Bachelor of Science**Sample Degree Path:** [http://www.wku.edu/degreepaths/18-19/documents/ocse/tech\\_mgmt\\_575.pdf](http://www.wku.edu/degreepaths/18-19/documents/ocse/tech_mgmt_575.pdf)

Technology is defined as any tool or operating system designed to improve the efficiency, quality, and competitiveness of an organization. Technology Management at Western Kentucky University is a 2+2 program designed specifically for students who currently hold a certificate or associates degree from a technical school, two-year college or four-year institution. The Technology Management program is a capstone program that provides a two-year management emphasis for those working toward a supervisory position in industry. Graduates are empowered to obtain a position of leadership in business, industry or workforce development in support of innovation and global competitiveness. Students who transfer to WKU with an applied associate degree (e.g., Associate of Applied Science) receive a 12-hour waiver from the overall 42 hour upper-level course requirement.

**Career Opportunities:** Graduates obtain employment in a wide variety of positions, some job titles of graduates include: systems integrator, industrial engineer, production manager/specialist, manufacturing engineer, maintenance specialist, quality manager, quality engineer, production engineer, general manager, plant manager, industrial trainer, project manager, systems analyst, shift supervisor, and technology educator.

**Program Description:** Western Kentucky University provides upper-division hours both in the major and in general education toward the completion of the degree. Students take 39 hours of major that includes 12 hours of upper-division electives approved by the advisor. Majors then take general education or elective courses to fulfill university requirements regarding the following:

- 36 hours minimum in WKU courses
- 42 hours minimum upper-division courses (unless receiving a waiver)
- 120 hours minimum for graduation
- Colonnade Program Requirements
- MATH 116 or equivalent

**Degree Requirements for Technology Management Major (63 hours)**

- 24 semester hours of advisor approved courses transferred from a technical school, college or university 100/200 level and
- 39 semester hours –for a total of 63 hours in the major. Major courses include: AMS 271, AMS 310, AMS 342, AMS 356, AMS 371, AMS 390, AMS 394, AMS 430, AMS 490F, and twelve hours of advisor-approved technical upper-division electives.

Students should consult with an advisor in planning their four-year degree program in Technology Management.

**Minor in Computer Science****Program Coordinator:** M. Atici**Reference Number:** 341**Minimum Hours for Minor:** 20

The following 20 credit-hour program leads to a minor in computer science. All CS courses counting toward the CS program minor must be completed with a grade of "C" or better:

1. Completion of the following two required courses (8 hours): CS 180 and CS 221.
2. Completion of one of the following courses: CS 339 or CS 351.
3. Completion of 9 additional hours of CS courses at the 300-level or higher

**Minor in Construction Management****Program Coordinator:** B. Haddad**Reference Number:** 343**Minimum Hours for Minor:** 19-20

The minor in construction management a minimum of 19-20 hours, only 9 of which can be duplicated in the student's major program of study. The student who elects a minor in construction management must complete the following courses: AMS 261, AMS 262, CE 303, CM 250, CM 363, CM 462. Remaining hours shall be selected from the technical electives. Choose one 3 or 4 hours course from: AMS 163, AMS 251, AMS 305, AMS 325, AMS 390, AMS 394, AMS 430, MGT 301, MGT 314, MGT 333, CM 400, CE 316, CE 370/CE 371, or ENGR 400.

**Minor in Electrical Engineering****Program Coordinator:** W. Collett**Reference Number:** 354**Minimum Hours for Minor:** 21

The minor in electrical engineering requires a minimum of 21 semester hours in electrical engineering. The required courses include EE 210 and EE 211. Students, with the approval of an EE advisor, select additional electrical engineering courses to complete the minor; at least 11 hours must be at the 300-level or above. Students majoring in electrical engineering cannot earn a minor in electrical engineering. EE 350 does not count towards the EE minor.

**Minor in Floodplain Management****Program Coordinator:** W. Campbell**Reference Number:** 361**Minimum Hours for Minor:** 22

This minor has been coordinated with the Geography and Geology Department and with the Kentucky Association of Mitigation Managers. The Floodplain Management minor requires completion of at least 21 semester hours including 13 core hours taken by all students and an additional 8 hours of electives. At least six hours of the minor must be taken from classes not counting toward completion of the major. The minor provides students with basic knowledge and skills needed to implement and administer flood mitigation and recovery programs. Students develop familiarity with federal floodplain management regulations, the National Flood Insurance Program, hydrology, surveying, and tools such as Geographic Information Systems that are critical to administering an aggressive floodplain management program. Completion of the minor requires familiarity with all aspects of floodplain management and with the impacts of floods on individuals, on property, and on regional or national economics. Students successfully completing the program are encouraged to take the Certified Floodplain Manager (CFM) exam. The CFM is a nationally recognized certification and is considered a desirable qualification by many employers. Required courses for the minor are CE 160/CE 161, CE 300, GISC 316, and CE 461 or GEOG 310/GEOG 310. A minimum of 8 semester hours of electives must be selected from GEOL 111, GEOL 113, GEOL 420/GEOG 420, GEOG 391, GEOG 427, GEOL 445, GEOG, 455, GEOG 474, GISC 414, GISC 417, GISC 419, GISC 477, METR 121, METR 422, METR 324, METR 426, METR 431, METR 433, METR 437, METR 438, CE 301, CE 380, CE 381, CE 461, CE 480, CE 481.

For students majoring in civil engineering, a suggested sequence of courses for completion of this minor is: CE 160 and CE 161, CE 380 and CE 381, METR 121, CE 300, and CE 461.

For students majoring in geography or geology, a suggested sequence of courses for completion of this minor is: GEOG 121, CE 160 and CE 161, CE 300, GEOG 310, and GISC 414.

**Minor in Industrial Sciences****Program Coordinator:** B. Reaka**Reference Number:** 395**Minimum Hours for Minor:** 18

The minor in industrial sciences requires a minimum of 18 semester hours (half of which must be upper division 300- or 400-level). The purpose of the minor in industrial sciences is to provide students with technical preparation that will support their career goals in their current major. Each program of study will include a balance of basic and advanced courses. Programs must be planned in advance with their academic advisor.

**Minor in Land Surveying**

**Program Coordinator:** J. Wilson

**Reference Number:** 405

**Minimum Hours for Minor:** 26

The land surveying minor provides the student with the basic knowledge and skills needed to accomplish land surveying tasks for entry-level employment. These tasks include boundary surveys, topographic mapping, leveling, stakeouts, traversing, field note taking, distance and angle measurements, plus proper techniques and use of surveying equipment (total stations, EDMs, and levels).

The following courses are currently required for the land surveying minor (26 hours): AMS 163, CE 160 and CE 161, CE 380 and CE 381, CE 378 and CE 379, GISC 316, and GISC 317, and GISC 414.

**Minor in Systems Engineering**

**Program Coordinator:** R. Choate

**Reference Number:** 476

**Minimum Hours for Minor:** 21-21.5

Systems engineering is a robust approach to the design, creation, and operation of systems. The minor requires 21 hours for CE and ME majors and 21.5 hours for EE majors. Students must complete 12 or 12.5 hours of required courses and choose a minimum of 9 hours from elective courses. The following courses are required: EE 210 or EM 221 or EM 222, STAT 301 or CE 305, ENGR 400, and CE 498 or EE 401 or ME 412. Nine hours of electives should be taken from: CE 303/CE 304, EE 460, EM 313, any CE 400-level technical elective, any EE 400-level technical elective, or ME 49x technical electives. The technical elective must incorporate or expand on systems engineering principles as outlined in ENGR 400. Technical elective courses currently meeting this intent include but are not limited to: CE 300, CE 326, CE 360, CE 361, CE 378, CE 379, CE 380, CE 381, CE 383, CE 384, CE 426, CE 436, CE 440, CE 476, CE 486, EE 410/EE 411, EE 443, EE 431, EE 432, EE 461, EE 443, and ME 49x courses taken in consultation with your advisor.

**Automation Certificate**

**Program Coordinator:** B. Reaka

**Reference Number:** 1726

**Minimum Hours for Certificate:** 12

This certificate program provides an understanding of the skills of direction, definition, design, development / application, deployment, documentation and support systems, software and equipment used in control systems, manufacturing information systems, systems integration, and operational consulting as they apply automation professionals. This 12-hour program consists of three required courses: AMS 328, AMS 343, and AMS 370. In addition, one elective should be chosen from AMS 301, AMS 342, AMS 352, AMS 356, AMS 394, or AMS 396. Each course, except AMS 328 and AMS 301, is also offered online as a sequence of three 1-hour modules.

**CNSS 4011 Certificate**

**Program Coordinator:** R. Yang

**Reference Number:** 1719

**Minimum Hours for Certificate:** 6

The CNSS 4011 certificate requires a minimum of six semester hours. It is designed for students wishing to gain knowledge in the information assurance area. The student pursuing the certificate must complete the following course sequence with a grade of "C" or better in each course: CS 157 and CS 257.

**Food Processing and Technology Certificate**

**Program Coordinator:** J. Khouryieh

**Reference Number:** 1718

**Minimum Hours for Certificate:** 12

The certificate in Food Processing and Technology will provide professionals working in the food industry with the necessary knowledge in food processing, quality assurance, and food safety to succeed, and advance their careers in the food industry. The certificate requires 12 hours. The required courses are AMS 301, AMS 303, AMS 352, and AMS 395. Students may be required to take additional hours to complete course prerequisites.

**Land Surveying Certificate**

**Program Coordinator:** J. Wilson

**Reference Number:** 1700

**Minimum Hours for Certificate:** 15

Undergraduate students majoring in civil engineering or post-graduate students with baccalaureate degrees in civil engineering, mining, or agricultural engineering accredited by the Accreditation Board of Engineering and Technology (ABET) may obtain a Certificate in Land Surveying (reference number 1700) in order to pursue licensure as a professional surveyor in the state of Kentucky by completing the following courses (15 hours): AMS 163, CE 160 and CE 161, CE 380 and CE 381, and CE 378 and CE 379.

Post-graduate students with baccalaureate degrees in majors other than civil engineering, mining or agricultural engineering may obtain a Certificate in Land Surveying in order to pursue licensure as a professional surveyor in the state of Kentucky by completing the same courses as listed for the minor in land surveying (26 hours). See minor in land surveying.

**Manufacturing and Logistics Certificate****Program Coordinator:** B. Reaka**Reference Number:** 1727**Minimum Hours for Certificate:** 12

This certificate program provides an understanding of the relationships between the process and product requirements of a manufacturing activity in order to analyze design and develop the concepts needed to assemble integrated systems. The focus is on distribution, warehousing, and material handling. This 12-hour program consists of three required courses: AMS 356, AMS 394, and AMS 396. In addition, students must take a one elective chosen from: AMS 163/AMS 205, AMS 301, AMS 310, AMS 342, AMS 352, AMS 371, AMS 390, or AMS 430. Each course, except AMS 163 and AMS 301, is also offered online as a sequence of 1-hour modules.

**Manufacturing Processing and Technology Certificate****Program Coordinator:** B. Reaka**Reference Number:** 1728**Minimum Hours for Certificate:** 12

This certificate program prepares individuals to apply manufacturing processing and technology skills in support of industrial operations. It focuses on the requirements and selection criteria for the integration of technology into simple and complex industrial activities. The 12-hour program consists of three required courses: AMS 342, AMS 371, and AMS 396. In addition, students must take one elective from: AMS 217, AMS 227, AMS 271, AMS 301, AMS 343, AMS 352, AMS 356, AMS 370, or AGMC 371 and AGMC 372. Each course, except AMS 271, AMS 301 and AGMC 371 and AGMC 372, is also offered online as a sequence of three 1- hour modules.

**Six Sigma and Quality Certificate****Program Coordinator:** M. Doggett**Reference Number:** 1729**Minimum Hours for Certificate:** 12

Six sigma lean principles for quality assurance have been applied successfully in business, engineering, health services, sciences, education and media. Industry offers substantial compensation to six sigma certificate holders. This 12-hour program consists of three required courses: AMS 271, AMS 371, and AMS 394. In addition, one elective must be chosen from: AMS 227, AMS 310, AMS 342, AMS 352, AMS 356, AMS 390, AMS 396, and AMS 430. Each course, except AMS 271, is also offered online as a sequence of 1-hour modules.

**Graduate Programs** – The School of Engineering and Applied Science offer a Master of Science in Engineering Technology Management and a graduate certificate in Lean Sigma. For additional information, see [www.wku.edu/graduate](http://www.wku.edu/graduate) or contact SEAS.

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## Department of Geography and Geology

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**Dr. Fredrick D. Siewers, Chair****Environmental Sciences and Technology Building,  
Office 304****Phone:** 270-745-4555**Website:** [www.wku.edu/geoweb](http://www.wku.edu/geoweb)**Professors:** K. Algeo, S. Foster, M. Gripshover,  
C. Groves, D. Keeling, M. May, J. Yan**Associate Professors:** J. Durkee, X. Fan, N. Gani,  
R. Gani, G. Goodrich, L. North, J. Polk, F. Siewers,  
A. Wulff**Assistant Professors:** J. Brown,**Instructor I:** P. Kambesis, J. Oglesby**Instructor II:** W. Blackburn, K. Cary, M. Crowder,  
S. Dobler, A. Nemon

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Programs offered by the Department of Geography and Geology are designed to meet the career goals of students in a wide variety of geoscience areas. Over the past decade, most of our program graduates have found employment in their preferred professions, and many have gone on to advanced graduate programs.

Geography courses provide a scientific foundation for the investigation and understanding of the physical and biological environments, the nature of social, political and economic activity, and the interaction between humans and the environment.

Collectively, these courses offer basic professional training for geographers, environmental scientists, and spatial analysts, as well as providing geographic training for prospective elementary, middle, and high school teachers. They are also an essential component of international programs offered by the university in Latin American, Asian, African, and Canadian studies, and in International business. Geography is considered an essential life skill.

Professional degrees in Geography and Environmental Studies, Meteorology, and Geographic Information Science (GIS) prepare students for service as water and environmental resource managers, city and regional planners, industrial and commercial consultants, meteorologists and climatologists, cartographers, G.I.S. analysts, educators, and government employees in a wide range of national, state, and local agencies. Environmental Planning, Resource Management, and Sustainable Development are interdisciplinary specialties of the Department and many graduates work for the National Park Service, National Forest Service, and other management agencies. Majors in Meteorology and GIS prepare students for professional careers in the atmospheric sciences and in positions that demand sophisticated spatial analytical techniques.

Geology courses provide the basic professional foundation for the scientific investigation of the Earth as well as geological education for the prospective teacher. Geology majors may enter positions in industry and government agencies. Many geologists work in interdisciplinary fields such as hydrology, energy, environmental and engineering geology, geophysics, and geochemistry. Geologists are needed in many areas for basic Earth research, for exploration and development of natural resources, and to address various environmental problems. Students are prepared for a variety of interesting and important career positions in federal and state agencies, engineering and environmental firms, and other areas of private industry, including oil, gas, and coal companies. In addition to the professional B.S. degree in Geology, majors may also select A.B. degree options in earth and space science or general geoscience. The geology program also prepares students for eventual certification as a Professional Geologist.

When planning a program of study in this department, each student should be aware of the University's academic requirements and regulations contained in this catalog in the chapter, "Academic Information." Specific attention should be given to the subsections in the chapters entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations. Students should be aware that some academic programs may require additional scholastic regulations and standards not specified in the catalog. To obtain a copy of these regulations, students should contact the department head.

A five-year bachelors/masters in geography, geology, meteorology, or GIS and geoscience (JUMP program) is available so that motivated students can focus their research interests and gain a Master's degree in an expedited time frame. Five-year bachelors/masters programs can be tailored to meet other research interests for motivated students.

### **Major in Geographic Information Science**

**Reference Number:** 576

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 53

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/geographic\\_info\\_science\\_576.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geographic_info_science_576.pdf)

The major in Geographic Information Science focuses on the concepts and principles of GISystems, along with its four components: (1) input, corrections, and collection of geospatial data; (2) storage and retrieval of geospatial data; (3) manipulation and analysis of geospatial data; and (4) maps and other forms of presentation of geospatial data. The major in geographic information science requires a minimum of 53 semester hours of GIS courses. The following 10 hours are foundation requirements: CS 170, GEOG 103 or GEOL 103 or GEOL 111 or METR 121, GEOG 110, and GEOG 499. The following 15 hours are technique requirements: GEOG 300, GEOG 391, and GISC 316, GISC 317. The following 28 hours are professional requirements: GISC 414, GISC 417, GISC 418, GISC 419, GISC 443, GISC 477 or GISC 423, GEOG 492 or GEOG 480 or GEOG 350, and GEOG 475 or GEOG 495. Required support courses are CE 160/CE 161, CS 180 or CS 270 or AMS 163, MATH 118 (or MATH 116 + MATH 117) and MATH 183. GIS courses require a course fee.

### **Major in Meteorology**

**Reference Number:** 578

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 48

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/meteorology\\_578.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/meteorology_578.pdf)

The major in Meteorology leads to a Bachelor of Science in Meteorology and requires a minimum of 48 semester hours of meteorology, geography, and computer science. A minor program is not required. Other required courses in physics and mathematics total an additional 25 semester hours.



Students majoring in meteorology will learn the key concepts and skills necessary to qualify as a meteorologist for the National Weather Service, and to meet the standards of the American Meteorological Society.

The following 36 hours are required: METR 121, METR 122, CS 170, GEOG 300, GISC 316, METR 324, GEOG 391, METR 431, METR 432, METR 433, METR 437, and GEOG 499. In addition, students should select 12 hours from any 200-level or above METR course. Examples include METR 325, METR 335, METR 422, METR 438, METR 439, and METR 440 to meet the 48 unduplicated hours required. The following are additional courses required outside of the major: PHYS 255/PHYS 256, PHYS 265/PHYS 266, MATH 136, MATH 137, MATH 237, and MATH 331.

### **Major in Geography and Environmental Studies**

**Reference Number:** 675

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 52

**Degree:** Bachelor of Science

#### **Sample Degree Path for Concentration:**

*Geography:* [http://wku.edu/degreepaths/18-19/documents/ocse/geography\\_environmental\\_studies\\_cultural\\_geo\\_675.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geography_environmental_studies_cultural_geo_675.pdf)

*Tourism and Development:*

[http://wku.edu/degreepaths/18-19/documents/ocse/geography\\_environmental\\_studies\\_tourism\\_development\\_675.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geography_environmental_studies_tourism_development_675.pdf)

*Climate Systems:*

[http://wku.edu/degreepaths/18-19/documents/ocse/geography\\_environmental\\_studies\\_climate\\_systems\\_675.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geography_environmental_studies_climate_systems_675.pdf)

*Karst and Water Resources:*

[http://wku.edu/degreepaths/18-19/documents/osce/geography\\_environmental\\_studies\\_karst\\_geoscience\\_water\\_res\\_675.pdf](http://wku.edu/degreepaths/18-19/documents/osce/geography_environmental_studies_karst_geoscience_water_res_675.pdf).

*Environment and Sustainability:*

[http://wku.edu/degreepaths/18-19/documents/ocse/geography\\_environmental\\_studies\\_environment\\_climate\\_675.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geography_environmental_studies_environment_climate_675.pdf)

The Bachelor of Science major in Geography and Environmental Studies requires a minimum of 52 semester hours. Incoming freshmen are encouraged to take GEOG 175 (University Experience) as preparation for the major.

Students pursuing the major in Geography and Environmental Studies must take the following 26 hours of core coursework: GEOG 103\*, GEOG 110\*, GEOG 300, GISC 316, GISC 317, GEOG 391, GEOG 495 or GEOG 452 or GEOG 475, and GEOG 499. In addition, students must select one of the following concentrations:

#### **Climate Systems Concentration:**

- Completion of the common core (26 hours)
- METR 121\*, METR 322\*, and GEOG 455 (10 hours)
- Elective courses selected from any GEOG, GISC, or METR at the 200 level or above, with advisor approval. Examples include METR 121\*, GEOG 226\*, METR 322\*, GEOG 328, GEOG 344, GISC 414, GEOG 459, GEOG 471, GEOG 474, GEOG 487, etc., to meet the 52 unduplicated hours required. At least 26 hours in the program must be at the upper division level.
- Additional requirements not included in the 52 hours are MATH 115\* OR MATH 116\* and MATH 183\*.

#### **Environment and Sustainability Concentration:**

- Completion of the common core (26 hours)
- GEOG 210, GEOG 280\*, and GEOG 380 (10 hours)
- Elective courses selected from any GEOG, GISC, or METR at the 200 level or above, with advisor approval. Examples include METR 121\*, GEOG 226\*, METR 322\*, GEOG 328, GEOG 344, GISC 414, GEOG 459, GEOG 471, GEOG 474, GEOG 487, etc., to meet the 52 unduplicated hours required. At least 26 hours in the program must be at the upper division level.
- Additional requirements not included in the 52 hours are MATH 115\* OR MATH 116\* and MATH 183\*.

#### **Geography Concentration:**

- Completion of the common core (26 hours)
- GEOG 330\* and GEOG 430 (6 hours)
- Elective courses selected from any GEOG, GISC, or METR at the 200 level or above, with advisor approval. Examples include METR 121\*, GEOG 226\*, METR 322\*, GEOG 328, GEOG 344, GEOG 414, GEOG 459, GEOG 471, GEOG 474, GEOG 487, etc., to meet the 52 unduplicated hours required. At least 26 hours in the program must be at the upper division level.
- Additional requirements not included in the 52 hours are MATH 115\* OR MATH 116\* and MATH 183\*.

**Karst and Water Resources Concentration:**

- Completion of the common core (26 hours)
- GEOG 280\*, GEOG 310 or GEOL 310, GEOG 461 and GEOG 475 (13 hours)
- Elective courses selected from any GEOG, GISC, GEOL, or METR at the 200 level or above, with advisor approval. Examples include GEOG 226\*, METR 322\*, GEOG 328, GEOG 344, GISC 414, GEOG 459, GEOG 471, GEOG 474, GEOG 487, etc., to meet the 52 unduplicated hours required. At least 26 hours in the program must be at the upper division level.
- Additional requirements not included in the 52 hours are MATH 136, MATH 183\*, PHYS 201 or BIOL 122\*, and CHEM 120\*.

**Tourism and Development Concentration**

- Completion of the common core (26 hours)
- GEOG 330\* and GEOG 481 (6 hours)
- Elective courses selected from any GEOG, GISC, or METR at the 200 level or above, with advisor approval. Examples include GEOG 200\*, GEOG 210, GEOG 226\*, GEOG 280\*, GEOG 344, GEOG 350, GEOG 352, GEOG 385\*, GEOG 471, GEOG 474, GEOG 487, etc., to meet the 52 unduplicated hours required. At least 26 hours in the program must be at the upper division level.
- Additional requirements not included in the 52 hours are MATH 115\* OR MATH 116\* and MATH 183\*.

\* Denotes a Colonnade course

**Four-Year Degree Program** – By taking the courses required of all majors during the freshman, sophomore, and junior years and the courses required for the specific concentrations during the sophomore, junior, and senior years, a student may graduate in four years.

**Major in Geology**

**Reference Number:** 577

**Minimum Hours for Major:** 52

**Minimum Hours for Degree:**120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/geology\\_577.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geology_577.pdf)

The professional major in geology is for students seeking careers as a professional geologist and requires a minimum of 52 semester hours and leads to a Bachelor of Science degree. This major provides students with a solid background in all traditional areas of geology for entry-level employment or graduate school. Incoming freshmen are encouraged to take GEOG 175 (University Experience) as preparation for the major.

**Professional Extended Major (reference number 577)**

- Program Requirements (43-46 hours): GEOL 103/GEOG 103 or GEOL 111, GEOL 112, GEOL 113, GEOL 114, GEOL 270 or GEOL 432, GEOL 408, GISC 316, GISC 317, GEOL 330, GEOL 350, GEOL 360, and GEOL 499.
- In addition students should take one of the following options: (1) GEOL 380 and GEOG 452; (2) six hours of GEOG 452; or (3) GISC 417 and GISC 419.
- Program Electives - -8-9 hours selected from any GEOL 200-level course or above. Examples include GEOL 270, GEOL 310, GEOL 311, GEOL 315, GEOL 325, GEOL 330, GEOL 350, GEOL 399, GEOL 405, GEOL 415, GEOL 420, GEOL 430, GEOL 432, GEOL 440, GEOL 465, GEOL 470, GEOL 475, and from GEOG 310, GEOG 391, GISC 417, GISC 419, and BIOL 122/BIOL 123.

Additional requirements include the following hours: MATH 136, CHEM 120/121, PHYS 180/181 or PHYS 201, and GEOG 300\*\*.

To graduate with Geology Honors, students should take an additional 12 hours of GEOL courses beyond the minimum required for the major and maintain a GPA of 3.25 or higher.

\*\*Note: Satisfies Colonnade Foundations *Writing in the Disciplines* requirement effective Fall 2014.

**Major in Earth Science**

**Reference Number:** 678

**Minimum Hours for Major:** 33

**Minimum Hours for Degree:**120

**Degree:** Bachelor of Arts

**Sample Degree Path:**

[http://wku.edu/degreepaths/18-19/documents/ocse/geography\\_environmental\\_studies\\_earth\\_science\\_678.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/geography_environmental_studies_earth_science_678.pdf)

The major in Earth Science degree is for students who either seek the content knowledge needed to qualify for teacher certification in Kentucky in Earth and Space Science or who do not intend to practice professional geology. This major leads to a Bachelor of Arts degree, and it requires a minor program.

Program Requirements (27 hours): GEOL 103/GEOG 103 or GEOL 111, GEOL 112, GEOL 113, GEOL 114, GEOL 310/GEOG 310, GEOL 311, GEOL 325, GEOL 360, GEOL 408, and GEOL 499.

Program Electives (6 hours) selected from any GEOL 200-level course or above: GEOL 270, GEOL 315, GEOL 330, GEOL 380, GEOL 399, GEOL 405, GEOL 415, GEOL 420, GEOL 440, GEOL 465, GEOL 470, GEOL 475, GEOL 485; and from GEOG 226, GEOG 280, GEOG 391, GEOG 420, GEOG 452, METR 121, and GISC 316.

Additional requirements include: GISC 316, MATH 117, CHEM 105, CHEM 106, BIOL 122/BIOL 123 or PHYS 201 or PHYS 180/PHYS 181, GEOG 300\*\* and a minor field.

\*\*Note: Satisfies Colonnade Foundations *Writing in the Disciplines* requirement effective Fall 2014

### Minor in Geography

**Reference Number:** 374

**Minimum Hours for Minor:** 18

The minor in geography requires a minimum of 18 semester hours. Required courses are GEOG/GEOL 103,110 and 12 hours of upper-division electives chosen in consultation with your advisor.

Department advisors should be contacted to develop a course of study compatible with the department's philosophy and the student's needs.

### Minor in Geology

**Reference Number:** 377

**Minimum Hours for Minor:** 21

The minor in geology requires a minimum of 21 semester hours. Required courses are GEOL 111, GEOL 112, GEOL 113, and GEOL 114. Two additional courses must be selected from GEOL 408, GEOL 330, GEOL 350, GEOL 380, GEOL 405, GEOL 360. Additional geology courses, to total a minimum of 5 hours, are to be chosen in consultation with a geology advisor.

### Minor in Earth Science

**Reference Number:** 353

**Minimum Hours for Minor:** 23

The minor in earth science is designed for geology or physical geography majors, earth science teachers, and for anyone interested in understanding basic earth systems. The minor requires a minimum of 23 semester hours, with at least 50% of the hours earned at the 300-400 level. Required courses are GEOL 111, GEOL 113, GEOL 112, GEOL 114, and METR 121. Student should take 12 hours of electives selected from: ASTR 104, GEOL 408, GEOL 311, GEOL 325, GEOL 405, GEOL 420, GEOL 360, or GEOG 328.

### Minor in Water Resources

**Reference Number:** 491

**Minimum Hours for Minor:** 21

This 21-hour minor program provides a foundation in the physical and social science aspects of water resource management and policy. The minor is appropriate for students interested in careers in applied hydrology and/or water resources management and policy. Required courses (9-10 hours) include GEOG 103/GEOL 103 or GEOL 111/GEOL 113, GEOL 310/GEOG 310, and GEOG 427. Restricted elective courses (12 hours) include GEOL 415, GEOL 440, GEOL 445, GEOG 428, GEOG 452, GEOG 459, GEOG 461, GEOG 474, METR 121, METR 422.

### Minor in Geographic Information Systems

**Reference Number:** 366

**Minimum Hours for Minor:** 26

This minor program provides a foundation in Geographic Information Systems (GIS). The minor is appropriate for students interested in careers utilizing GIS as a tool in areas such as geography, geology, biology, political science, business, journalism and broadcasting, engineering, and public health, or for students pursuing GIS as a profession in a related discipline such as Computer Science or Computer Information Systems. A minimum of 26 hours is required, including 6 foundation hours, 14 technique hours, and at least 6 elective hours. Foundation courses (6 hours) include GEOG 103/GEOL 103 or GEOL 111 or METR 121, and GEOG 110. Technique requirements (14 hours) include the following: GISC 316, GISC 317, GISC 417, GISC 419. Six-hours of electives should be selected from: GISC 414, GISC 418, GISC 423, GISC 443, GISC 477, or GEOG 492.

### **Minor in Environmental Studies and Sustainability**

**Reference Number:** 479

**Minimum Hours for Minor:** 22

The minor in sustainability requires 22 semester hours. The minor provides students with the environmental science knowledge and the theoretical foundation to approach decision making in a way that is sustainable for the long term. They will understand how both individual and societal decision-making impacts the environment. Completion of the minor will enable students to examine objectively the impact of specific human activities on the environment and how to mitigate the negative ramifications.

The following courses are required for the 22 hours in the minor (12 hours must be upper level):

Foundation Courses: GEOG 280, GEOG 380, and GISC 216.

Elective courses (at least two disciplines must be represented): AGRO 454, AMS 470, ANTH 442, ECON 430, GEOG 210, GEOG 328, GEOG 344, GEOG 378, GEOG 385/EDU 385, GEOG 427, GEOG 452, GEOG 471, GEOG 474, GEOG 481, GEOG 486, GEOG 487, GEOG 489, GISC 414, PH 385, SOCL 470 or other advisor-approved electives.

### **Geographic Information Systems Certificate**

**Reference Number:** 174

**Minimum Hours for Certificate:** 20

Geographic Information Systems technology is widely used in business and industry, government, and education. This certificate is designed for students in a variety of disciplines that involve the analysis, mapping, and interpretation of geographic data. Students who complete the program will have a solid foundation that spans the collection, management, analysis, interpretation, and display of data using geographic information systems. They will gain practical experience by completing projects that require the use of sophisticated GIS functions. Finally, they will learn how to develop and implement customized GIS applications.

The program is housed in the Department of Geography and Geology. It consists of a series of four courses taken for a total of 20 credit hours. The courses are GEOG 103 or GEOL 103 or GEOL 111 or METR 121, GISC 316, GISC 317, GISC 417, and GISC 419.

**Graduate Programs** – The Master of Science in geoscience programs are designed to provide advanced training for those students pursuing administrative and other higher level employment or who plan to continue their graduate education at other universities offering Ph.D. degrees. The department also offers a JUMP (Joint Undergraduate Master's Program) in which students can earn a Bachelor of Arts and a Master of Science in five years. While the specializations in the geosciences are similar to those offered at the undergraduate level, emphasis is placed on independent research under the guidance of a graduate advisor. There are many funded research projects within the Department for qualified students. Graduate students are required to write a Master's thesis that derives from independent research in a topic of their choosing. The department also offers a graduate certificate in Geographic Information Science. The department also cooperates with the College of Education in offering a Master of Arts in Education – Geography Education for Teacher Leaders degree with emphases on cultural geography for social studies teachers and earth science for STEM teachers.

A number of assistantships are available to outstanding graduate students. For further information see The Graduate School's website at [www.wku.edu/graduate](http://www.wku.edu/graduate).

### **Joint Undergraduate-Master's Degree Programs (JUMP)**

The Geography and Geology Department's JUMP program provides academically outstanding students the opportunity to complete both a Bachelor of Science (BS) and Master of Science (MS) degree in approximately five years. Students can complete a BS in Geography and Environmental Studies, Geology, Meteorology, or Geographic Information Science and an MS in Geoscience degree concurrently.

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## Department of Mathematics

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**Dr. Bruce Kessler, Head**

**Professor Mark Robinson, Asst. Department Head**  
**Professor David Neal, Lead Advisor**

**College High Hall, Office 4124**

**Phone: 270-745-3651; Fax: 270-745-3699**

**Email: [math@wku.edu](mailto:math@wku.edu)**

**Website: [www.wku.edu/math](http://www.wku.edu/math)**

**Professors:** F. Atici, C. Ernst, N. Iraniparast,  
 B. Kessler, D. Lanphier, D. Neal, L. Nguyen,  
 T. Richmond, M. Robinson, J. Spraker

**Associate Professors:** M. Autin, T. Bhattacharya,  
 J. Brockman, K. DuCloux, M. Dunkum,  
 E. Emanuel, M. Jackson, M. Jones, M. Khenner,  
 H. Marchionda, S. Munasinghe, N. Nguyen, A. Por,  
 R. Schugart

**Assistant Professors:** D. Clark, N. Gerstenschlager,  
 O. Ozer

**Instructor I:** J. Brown, T. Miick, L. Plumlee,

**Instructor II:** R. Ayers, E. Billingsley, L. Wells

**Transitional Retirees:** L. Fitzpatrick

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Mathematics courses at the University are designed with the interests and needs of varying groups of students in mind.

Mathematics majors are available to those planning to pursue careers in secondary and middle grades education, as well as to those whose preparation is being directed toward positions in business and industry, or toward further work in mathematics at the graduate level. In addition, several courses are offered to meet the demands for the mathematical training of students whose major educational objectives are not directly related to mathematics. Mathematics majors are assigned advisors from among the departmental faculty and are required to consult with these advisors before each registration period.

When planning a program of study in this department, each student should be aware of the University's academic requirements and regulations contained in this catalog in the chapter "Academic Information." Specific attention should be given to the sub-sections in the chapter entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations.

Some academic programs may require additional scholastic regulations and standards not specified in the catalog. To obtain a copy of these regulations, students should contact the department head.

This department offers the following majors and minors:

- **Major:** Non-teacher certifiable major in mathematics (reference number 728)
- **Major:** Mathematics extended major for employment in industry and/or graduate studies in mathematics (reference number 528)
- **Major:** Mathematics major certifiable for teaching secondary level mathematics (reference number 728)
- **Major:** Middle grades mathematics (reference number 730)
- **Major:** Mathematical Economics (reference number 731)
- **Minor:** Mathematics (reference number 417)
- **Minor:** Applied Statistics (reference number 313)

### Admission Requirements

To be fully admitted to the majors in mathematics with reference numbers 728 or 528, students must complete the following admission requirements:

- Earn a "C" or better in each of the following courses: MATH 136, MATH 137, and MATH 307 (or MATH 310).
- Have an overall GPA of at least 2.4 in the mathematics program courses completed prior to admission (MATH 136, MATH 137, and MATH 307 (or MATH 310)).
- Note: If a course is repeated, then the second grade is used to compute the GPA. If a course is repeated multiple times, then the average of all grades after the first attempt is used to compute the GPA. **Students can earn a grade in a course a maximum of three times.**

**Major in Mathematics**

**Program Coordinator:** Tom Richmond

**Reference Number:** 728P (seeking admission)  
728 (officially admitted)

**Minimum Hours for Degree:** 120  
**Degree:** Bachelor of Arts

**Minimum Hours for Major:** 36-39

**Sample Degree Path for Concentration:**

*Non-Teacher Certifiable:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_nonteacher\\_728.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_nonteacher_728.pdf)

*Teacher Education:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_teacher\\_cert\\_728.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_teacher_cert_728.pdf)

**Reference Number:** 528P (seeking admission)  
528 (officially admitted)

**Minimum Hours for Degree:** 120  
**Degree:** Bachelor of Arts

**Minimum Hours for Major:** 51

**Suggested Programs of Study Per Concentration:**

*Fundamentals of Analysis & Discrete Mathematics:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_fund\\_analysis\\_discrete\\_528.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_fund_analysis_discrete_528.pdf)

*Fundamentals of Applied Math:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_fund\\_applied\\_math\\_528.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_fund_applied_math_528.pdf)

*Fundamentals of Math Studies:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_fund\\_math\\_studies\\_528.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_fund_math_studies_528.pdf)

A major in mathematics provides a Bachelor of Arts degree and requires either a minimum of 36-39 semester hours for a general major with a minor or second major or a minimum of 51 semester hours for an extended major. Note: All mathematics courses listed as prerequisites for other mathematics courses must have been completed with a grade of "C" or better.

Students who wish to declare a 728 or 528 mathematics major will initially be designated as "seeking admission" until the following requirements have been satisfied:

- Complete MATH 136, MATH 137, and MATH 307 or MATH 310, with a grade of "C" or better in each course.
- Have an overall GPA of at least 2.4 in mathematics program courses (MATH 136 and above) completed prior to admission.

The general major (728) offers two options: (1) Non-teacher certifiable Major in Mathematics; (2) Major Certifiable for Teaching Secondary Level Mathematics. The extended major (528) offers only the first option. Option 1 students in the general major (728) are required to satisfy a computational requirement by completing either one course chosen from CS 180, CS 181, PHYS 316, or PHYS 318, while those in the extended major (528) are required to satisfy a computational requirement by completing two courses chosen from CS 180, CS 181, MATH 371, PHYS 316, or PHYS 318. [If MATH 371 is selected for this requirement, it cannot also be used as an elective in the extended major (528).] Option 2 students are required to complete either CS 170 or CS 180.

**Option 1: Non-Teacher Certifiable Major in Mathematics**

**(A) General Major (728):** The student must complete a minimum of 39 hours of mathematics with a minor or second major giving a total of at least 59 hours (53 unduplicated) with the following requirements:

1. MATH 136, MATH 137, MATH 237, MATH 307, MATH 310, MATH 317, MATH 337, MATH 498.
2. Two courses from: MATH 405, MATH 406, MATH 415, MATH 417, MATH 423, MATH 431, MATH 435, MATH 439, MATH 450, MATH 470, MATH 473, MATH 482.
3. Six elective hours from: MATH 275 (up to 3 hours), STAT 301, MATH 305, MATH 315, MATH 323, MATH 331, MATH 370, MATH 371, MATH 382, MATH 398 (up to 3 hours), MATH 405, MATH 406, MATH 415, MATH 417, MATH 423, MATH 435, MATH 439, MATH 450, MATH 470, MATH 475 (up to 6 hours), MATH 482.
4. Students may take certain 500-level mathematics courses for undergraduate credit with the approval of the Dept. Head in place of courses listed in items 2 or 3.
5. Note: This major is not intended to prepare students adequately for graduate mathematics. Students intending to seek a graduate degree should pursue major 528.



**(B) Extended Major (528):** To prepare for graduate study in mathematics, the student must complete a minimum of 51 hours of mathematics with the following requirements:

1. MATH 136, MATH 137, MATH 237, MATH 307, MATH 310, MATH 317, MATH 337, MATH 431, MATH 498.
2. Have a concentration in one of the following areas: B1, B2, or B3.

B1: Fundamentals of Analysis and Discrete Mathematics:

- i. MATH 417, MATH 439, MATH 450
- ii. Two courses from: MATH 315, MATH 323, MATH 415, MATH 423, MATH 473
- iii. Six additional elective hours from: MATH 275 (up to 3 hours), STAT 301, MATH 305, MATH 315, MATH 323, MATH 331, MATH 370, MATH 371 (provided MATH 371 was not used to satisfy the computational requirement), MATH 382, MATH 398 (up to 3 hours), MATH 405, MATH 406, MATH 409, MATH 415, MATH 423, MATH 435, MATH 470, MATH 473, MATH 475 (up to 6 hours), MATH 482.

B2: Fundamentals of Applied Mathematics

- i. MATH 331, MATH 370, MATH 382, MATH 405.
- ii. Two courses from: MATH 305, MATH 406, MATH 435, MATH 470, MATH 482
- iii. Three credit hours from MATH 275, STAT 301, MATH 305, MATH 315, MATH 323, MATH 371 (provided MATH 371 was not used to satisfy the computational requirement), MATH 398, MATH 406, MATH 409, MATH 415, MATH 417, MATH 423, MATH 435, MATH 439, MATH 450, MATH 470, MATH 473, MATH 475, MATH 482.

B3: Fundamentals of Mathematical Studies

- i. MATH 450
- ii. Two courses from: MATH 405, MATH 406, MATH 409, MATH 415, MATH 417, MATH 423, MATH 435, MATH 439, MATH 470, MATH 473, MATH 482.
- iii. Twelve additional elective hours from MATH 275 (up to 3 hours), STAT 301, MATH 305, MATH 315, MATH 323, MATH 331, MATH 370, MATH 371 (provided MATH 371 was not used to satisfy the computational requirement), MATH 382, MATH 398 (up to 3 hours), MATH 405, MATH 406, MATH 409, MATH 415, MATH 423, MATH 435, MATH 470, MATH 473, MATH 475 (up to 6 hours), MATH 482.

3. Students may take certain 500-level mathematics courses for undergraduate credit in place of courses listed in items B1i, B1ii, B2i, B2ii, B3i, or B3ii with the approval of the mathematics department head. No minor or second major for the extended major is required.
4. Also required is PHIL 215 or EE 180.

**Option 2: Major Certifiable for Teaching Secondary Level Mathematics General Certifiable Major (reference number 728):** The student must complete a minimum of 36 hours of mathematics with a second major in Science and Mathematics Education (SMED) and with the following requirements:

1. MATH 136, MATH 137, MATH 237, MATH 304, MATH 307, MATH 310, MATH 317, MATH 323, MATH 498; STAT 301. Before the "professional semester," the student must complete each of these courses with a grade of "C" or better and achieve a GPA of at least 2.5 in required mathematics courses.
2. At least 3 hours of 400-level mathematics from the following list: MATH 405, MATH 406, MATH 409, MATH 415, MATH 417, MATH 421, MATH 423, MATH 431, MATH 435, MATH 439, MATH 450, MATH 470, MATH 482.

Students in this option must have a second major in science and mathematics education (SMED). In addition, students must attain a grade of "C" or better in each required mathematics course and a 2.5 GPA for all required mathematics courses.

**Major in Middle Grades Mathematics**

**Program Coordinator:** Natasha Gerstenschlager Wilson

**Reference Number:** 730P (seeking admission)  
730 (officially admitted)

**Minimum Hours for Degree:** 120  
**Degree:** Bachelor of Science

**Minimum Hours for Major:** 34

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_middle\\_grades\\_teacher\\_cert\\_730.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_middle_grades_teacher_cert_730.pdf)

A major in Middle Grades Mathematics is for students who plan to teach mathematics in grades 5-9 only. The degree requires a second major in science and mathematics education (SMED). Upon successful completion of both majors, the student will receive a Bachelor of Science degree.

Students who wish to declare a 730 middle grades mathematics major will initially be designated as “seeking admission” until the following requirements have been satisfied:

- Complete 3 of the following with a “C” or better in each course: MATH 136, MATH 183, MATH 205, MATH 206, MATH 225.
- Have an overall GPA of at least 2.5 in all middle grades mathematics program courses (MATH 136 and above) completed prior to admission.
- Note: If a course is repeated, then the second grade is used to compute the GPA. If a course is repeated multiple times, then the average of all grades after the first attempt is used to compute the GPA.

The student must complete a minimum of 34 hours in mathematics by taking the following required courses: MATH 136, MATH 183 or STAT 301, MATH 205, MATH 206, MATH 225 or MATH 310, MATH 304, MATH 308, MATH 403 or MATH 323, MATH 411 or MATH 421, MATH 413, and 3 hours of MATH 490 or MATH 498. Students must attain a grade of “C” or better in each required course and must have a 2.75 GPA overall in required mathematics courses.

**Major in Mathematical Economics****Program Coordinator:** Ngoc Nguyen**Reference Number:** 731P (seeking admission)  
731 (officially admitted)**Minimum Hours for Degree:** 120  
**Degree:** Bachelor of Science**Minimum Hours for Major:** 49**Sample Degree Path for Concentration:***Actuarial Science:* [http://wku.edu/degreepaths/18-19/documents/ocse/math\\_mathematical\\_economics\\_actuary\\_731.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_mathematical_economics_actuary_731.pdf)*General Mathematical Economics:*[http://wku.edu/degreepaths/18-19/documents/ocse/math\\_mathematical\\_economics\\_general\\_731.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/math_mathematical_economics_general_731.pdf)

The major in Mathematical Economics requires a core of 18 hours in economics, 15 hours in mathematics, and 1 hour of an interdisciplinary senior seminar course. The concentration in general mathematical economics requires an additional 9 hours in economics and 6 hours in mathematics. The concentration in actuarial science requires an additional 3 hours in economics, 9 hours in mathematics, 12 hours in finance, and 3-4 hours in computer science. This major leads to a Bachelor of Science degree intended for students interested in graduate studies in economics, public policy, or business, as well as those students seeking a career as an actuary or analytical careers in economics that will require extensive mathematics backgrounds.

The program of study does not require completion of a second major or minor.

All majors must complete a 34-hour core consisting of ECON 202, ECON 203, ECON 206 (or STAT 301), ECON 302, ECON 303, ECON 465; MATH 136, MATH 137, MATH 237, MATH 307; and ECON 497 or MATH 497. Additionally, majors must choose a concentration in either General Mathematical Economics or Actuarial Science. Majors in the General Mathematical Economics concentration must complete ECON 306 or ECON 307, and ECON 464. Additionally, either MATH 331 or MATH 310 must be completed, and students must take three additional hours from either MATH 331, MATH 310, MATH 305, MATH 382, MATH 435, or MATH 405. The remaining 3 hours in economics for completion may be selected from other 300- and 400-level economics courses. Majors in the Actuarial Science concentration must complete ECON 307; MATH 310, MATH 382, and MATH 482; FIN 330, FIN 337, FIN 350, and FIN 437; and CS 170 or CS 180.

Admission to the mathematical economics major requires (1) the completion of MATH 136, ECON 202 and ECON 203, and ECON 206 or STAT 301 with a minimum GPA of 2.0 in the courses listed; and (2) completion of a minimum of 60 hours with a minimum GPA of 2.0 overall; and (3) completion of a minimum of 12 hours at Western Kentucky University with a minimum WKU GPA of 2.0. All mathematical economics majors will be required to enroll in an interdisciplinary senior seminar course prior to graduation (ECON 497 or MATH 497, 1 hour).

**Minor in Mathematics (Minor for Employment in Industry and/or Graduate Studies in Mathematics)****Reference Number:** 417**Program Coordinator:** Tom Richmond**Minimum Hours for Minor:** 24

A minor in mathematics requires a minimum of 24 semester hours. In addition to the foundational sequence (MATH 136, MATH 137, MATH 237, and either MATH 307 or MATH 370), the student is required to select at least nine hours from MATH 3XX\*, MATH 4XX\*, or STAT 301\*\*.

\*Students may not count MATH 304, MATH 308, MATH 403, MATH 411, MATH 413, MATH 421, or MATH 490 toward the minor. MATH 398 may count toward the minor only if the student completes MATH 498.

\*\* Students may not count both MATH 382 and STAT 301 in the minor.

### Minor in Applied Statistics

Program Coordinator: Ngoc Nguyen

Reference Number: 313

Minimum Hours for Minor: 19

A minor in applied statistics requires a minimum of 19 semester hours. This program is designed for a student seeking a career as a statistical programmer/analyst/consultant in a knowledge-based industry or in a research institution.

The student who elects a minor in applied statistics must complete a minimum of 16 required credit hours, as follows: MATH 136 or MATH 142, STAT 301, STAT 330, STAT 401, and STAT 402.

In addition, the student is required to take at least 3 credit hours of relevant elective coursework from the following: (1) any 300-level or 400-level STAT course other than STAT 301, STAT 330, STAT 401, and STAT 402; (2) MATH 482; (3) at least 3 credit hours of 300-400 level statistical coursework relevant to the student's area of study (with prior approval from the Statistics Education Committee of the Department of Mathematics).

**Grades K-5 Certification** – All students seeking grades K-5 certification must satisfy the Quantitative Reasoning course in the Foundations section of the Colonnade program prior to enrolling in the required courses: MATH 205, MATH 206, and MATH 308.

### Data Analysis using SAS® Certificate

Program Coordinator: Ngoc Nguyen

Reference Number: 1716

Minimum Hours for Certificate: 15

The Certificate in Data Analysis using SAS requires a minimum of 15 semester hours. This certificate is designed for a student seeking a career as a statistical programmer/analyst/consultant in a knowledge-based industry or in a research institution.

To be eligible for the program, the student must have completed MATH 136 (formerly MATH 126) or MATH 142 (or equivalent) with a grade of "C" or better. The student pursuing a Certificate in Data Analysis using SAS must complete a minimum of 12 credit hours of core statistics courses as follows: STAT 301, STAT 330, STAT 401, STAT 402. In addition, this student is required to take at least 3 credit hours of courses using SAS, selected from the following courses:

- Any 300-level or higher STAT course using SAS, other than STAT 301, STAT 330, STAT 401, and STAT 402.
- MATH 498. Students are required to provide an electronic copy of their paper to the Statistics Education Committee of the Department of Mathematics to verify the use of SAS software.
- Any 300-level or higher course using SAS in another department, with prior approval from the Statistics Education Committee of the Department of Mathematics.

**Graduate Programs** – The Department of Mathematics offers graduate courses for the Master of Arts and Master of Science in mathematics. We also provide a means for students to earn both their Bachelor of Arts and Master of Science in 5 years. Mathematics coursework is also provided for those seeking graduate degrees in elementary or middle grades education. Several assistantships are available for qualified graduate students. Additional information on admissions and graduate assistantships for the graduate programs in Mathematics can be obtained from [www.wku.edu/graduate](http://www.wku.edu/graduate) or Dr. Dominic Lanphier, Director of Graduate Studies in Mathematics (270-745-6233).

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## Department of Physics and Astronomy

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Dr. Michael Carini, Chair

Thompson Complex, Central Wing, Office 246

Phone: 270-745-4357; Fax: 270-745-2014

Email: [info@physics.wku.edu](mailto:info@physics.wku.edu)

Website: [www.wku.edu/physics](http://www.wku.edu/physics)

**William McCormack Professor of Physics:**

Charles H. McGruder, III

**Madole Professor of Physics:** Douglas Harper

**Professors:** M. Carini, V. Dobrokhotov, G. Emslie,

R. Gelderman, W. Van der Meer

**Associate Professors:** S. Bonham, S. Gibson,

S. Gupta, I. Novikov

**Assistant Professor:** A. Er

**Instructor I:** J. Boyles, T. Lee

**Professors Emeriti:** K. Andrew, D. Bryant, K.

Hackney, D. Humphrey, P. Womble, R. Scott

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The Department of Physics and Astronomy offers a Bachelor's of Science in Physics, with degree pathways tailorable to meet student career goals.

We have pathways designed for students who chose to pursue careers as physicists in government or industrial laboratories, for careers in engineering and other professional fields, for teaching in public schools, or, for entering advanced programs at the graduate level in Physics, Astronomy or related disciplines (e.g. Medical Physics). Our world renown faculty and state of the art research facilities allow us to provide opportunities for students to engage in hands-on research experiences where they apply their classroom knowledge to real world problems.

Physics laboratories and classrooms are located on the second floor of the Thompson Complex Center Wing (TCCW), the basement and first floor of Ogden College Hall (OCH) and the Applied Physics Institute (API, located at the Center for Research and Development). The Hardin Planetarium, located next door to TCCW, supports astronomy laboratories and demonstrations for classes, regular focused presentations of astronomy and the physical universe for school groups and the general public. The observatory on top of TCCW provides students with convenient access to the department's 12.5 inch Cassegrain reflector and several smaller telescopes and also provides monthly opportunities for public viewing. Faculty make use of the latest research-based physics teaching pedagogies in all our undergraduate classes. Our physics teaching laboratories are equipped with modern laboratory equipment and data acquisition interfaces using software that is standard in the physics and engineering community.

Modern laboratory facilities and equipment, rivaling those found at more research focused institutions, allow us to provide student centered research experiences for all Physics majors. The diversity of research engagement possibilities is a major strength of our undergraduate program, allowing students to benefit from a breath of available interest and specializations. Undergraduate students are strongly encouraged to participate in research opportunities with faculty members. Individual student research projects may start as early as the sophomore year, supported in most cases by available assistantships and/or formal course credit. The API houses an X-ray diffractometer, neutron generator, Auger spectrometer, Beowulf Computer Cluster and a Large Chamber Scanning Electron Microscope. The materials science lab houses a micro-Raman spectrometer and a thermal Chemical Vapor Deposition reactor for nano-carbons and other nanomaterials. The laser lab houses a nanosecond IR laser, excimer laser, spectrophotometer, gas chromatography, and ultrahigh vacuum chamber. The department also operates two research grade astronomical telescopes: the local 0.6m Bell Observatory located 12 miles southwest of WKU and the 1.3 meter Robotically Controlled Telescope (RCT) located outside Tuscon, AZ. Both facilities are available for, and in case of Bell Observatory, operated by undergraduate students. Descriptions of current research studies by faculty members and specific research opportunities available to undergraduate students are available on the department's website.

The department sponsors a local chapter of the nationally affiliated Society of Physics Students (SPS) for students interested in physics, as well as a section of the Sigma Pi Sigma honor society. The local SPS chapter sponsors or participates in a variety of social and service activities related to physics, including field trips, trips to scientific meetings, tutoring, and interacting with students from area schools.

The Hilltopper Astronomy Club provides support for students interested in astronomy both as a hobby and a science. Regular observing sessions, informal meetings, and various projects are some of the benefits available to members.

When planning a program of study in physics, each student should be aware of the University academic requirements and regulations contained in this catalog in the chapter, "Academic Information." Specific attention should be given to the sub-sections in the chapter entitled (a) Academic Programs, (b) Colonnade Requirements, and (c) Academic Requirements and Regulations. All students, from freshman to seniors, are required to meet with their department academic advisor (Dr. Richard Gelderman for freshman and sophomore level students; juniors and seniors are assigned a department advisor after completion of PHYSICS 321) each semester in order to plan their schedule for the following semester and/or to discuss and plan their career options.

### **Major in Physics**

**Reference Number:** 754

**Minimum Hours for Major:** 35

**Minimum Hours for Degree:**120

**Degree:** Bachelor of Science

#### **Sample Degree Plan for Concentration:**

No Concentration: [http://wku.edu/degreepaths/18-19/documents/ocse/physics\\_754.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/physics_754.pdf)

Physics Education: [https://www.wku.edu/degreepaths/18-19/documents/cebs/education\\_physics\\_754\\_774.pdf](https://www.wku.edu/degreepaths/18-19/documents/cebs/education_physics_754_774.pdf)

The major in physics requires a minimum of 35 semester hours and leads to a Bachelor of Science degree. A minor or second major is required. The foundation for the undergraduate major is provided by a core sequence of six lecture and five laboratory courses, requiring a total of 29 semester hours. This core sequence consists of the following:

- PHYS 180/PHYS 181 (4) Introductory Modern Physics and Lab
- PHYS 255/PHYS 256 (5) University Physics I and Lab
- PHYS 265/PHYS 266 (5) University Physics II and Lab
- PHYS 301 (1) Electrical Measurements Lab
- PHYS 302 (1) Atomic Lab
- PHYS 316 or PHYS 318 Computational Physics or Data Acquisition (3)
- PHYS 321 (3) Introductory Modern Physics II
- PHYS 350 (3) Classical Mechanics I
- PHYS 398 (.5) Junior Seminar
- PHYS 440 (3) Electricity and Magnetism I
- PHYS 498 (.5) Senior Seminar

The student majoring in physics must complete, in addition to this core, a minimum of 6 semester hours of selected upper division departmental courses. The selection is determined by the student's career aspirations, subject to approval by the student's departmental advisor. The upper division electives must be chosen from the courses listed for *Physics Majors* and *Minors*, excluding PHYS 389, PHYS 399, and PHYS 489. No more than 3 hours of PHYS 475 may be counted toward the 35 hour minimum requirement for the major. Support requirements include MATH 136, MATH 137, MATH 237, MATH 307 (or MATH 370 for applied physics track), and MATH 331; CHEM 120/CHEM 121. (Support requirements differ for teacher certification; see below.) The department has prepared several career-oriented tracks, which detail relevant departmental electives and additional or departmentally-approved substitute support courses. Advising tracks currently defined within the Bachelor of Science in physics program include the following:

1. The general physics track is designed for those students who wish to pursue careers as physicists or are preparing for graduate study in physics.
2. The applied physics track combines extensive technical knowledge, related problem-solving skills, and computer techniques and internship opportunities to prepare students for positions in industrial and governmental laboratories.
3. The physics and astronomy track prepares students for careers in astronomy/space science and for graduate study in these areas.
4. The teacher certification track prepares students for careers teaching physics at the secondary school level. The student must also complete professional education requirements as specified by the School of Teacher Education. Students in this option must have a second major in science and math education (SMED).
5. Other - There are some specified programs such as a suggested pre-medicine curriculum for students wishing to major in physics. Course recommendations for these tracks are available from the departmental academic advisor. In all cases, the student must work closely with the departmental advisor from the beginning to plan a program of study that meets departmental and University requirements and that maximizes preparation to meet career goals.

**Transfer of Credit** – Transfer courses are welcomed and approved through the Physics faculty and College Dean.

### **Minor in Astronomy**

**Reference Number:** 318

**Minimum Hours for Minor:** 20

The minor in astronomy is designed to provide a background in astronomy, astrophysics, and planetary science for students from a wide range of backgrounds. Students who intend to undertake graduate work in astronomy should complete a major in physics with a minor in mathematics. A minor in astronomy consists of at least 16 credit hours of required core courses and at least 4 credit hours from the list of restricted electives. The core requirements are ASTR 214 (4 hrs); ASTR 314 (4 hrs); and an introductory sequence of classical physics: PHYS 255/PHYS 256 and PHYS 265/PHYS 266 (10 hours); or PHYS 201 and PHYS 202 (8 hours); or PHYS 231/PHYS 232 and PHYS 332/PHYS 233 (8 hours). Physics majors must substitute GEOL 111/GEOL 113 for PHYS 255/PHYS 256. The actual number of elective credit hours required for an astronomy minor is dependent upon satisfaction of the university requirement that at least one-half of the credits required for each major or minor be earned in courses numbered 300 and above. The list of restricted electives includes: ASTR 305, ASTR 414, PHYS 316, PHYS 441/PHYS 404, PHYS 445, PHYS 450, PHYS 465, GEOL 325, GEOL 330, GEOL 350, GEOL 370, GEOL 420 or GEOL 465.

### **Minor in Biophysics**

**Reference Number:** 329

**Minimum Hours for Minor:** 18

The minor in biophysics requires a minimum of 18 semester hours. This course sequence is intended to serve students of the life sciences, that is, students of biology, pre-medicine and pre-dental, agriculture, environmental health, psychology, science teaching, environmental engineering, pre-veterinary, pre-pharmacy and pre-optometry. In general, this curriculum treats the physics of life processes and various applications of physics to biology and medicine. (See the Biophysics Minor section in this catalog.)

Required courses: PHYS 231/PHYS 232, PHYS 332/PHYS 233, and PHYS 335 or PHYS 337 or PHYS 431 or PHYS 359 or PHYS 379; and at least 6 hours of upper division electives selected from appropriate physics and/or biology courses approved by a biophysics advisor.

### **Minor in Physics**

**Reference Number:** 435

**Minimum Hours for Minor:** 23

The minor in Physics requires a minimum of 23 semester hours including the following courses: PHYS 180, PHYS 255, PHYS 265, PHYS 321, and a minimum of nine semester hours selected from the PHYS lecture courses in the course descriptions of this catalog, PHYS prefix, under the heading PHYSICS MAJORS AND MINORS.

### **Course Categories**

The courses offered by the Department of Physics and Astronomy belong to four categories according to clientele:

1. **Colonnade Courses**  
General courses treating a selection of coordinated topics in sufficient depth to be beneficial to the non-science students, which fulfill Colonnade general education requirements; 100-level.
2. **Science and Math Majors and Minors**  
Introductory courses for science and math students; mainly 200-level.
3. **Education Majors and Minors**  
Upper division courses for prospective teachers; 300- and 400-level.
4. **Physics Majors and Minors**  
Upper division courses for students following the program options of physics, physics education, dual-degree: 300- and 400-level.

**Teacher Certification Programs** – Students interested in high school or middle school certified teaching programs should refer to the SKyTeach program listed at the beginning of the section on Ogden College of Science and Engineering.

**Graduate Programs** – The Department of Physics and Astronomy offers the Master of Arts in Education (physics minor) and Master of Science in Homeland Security Sciences. For more information contact [info@physics.wku.edu](mailto:info@physics.wku.edu).

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## **Department of Psychological Sciences**

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**Dr. Kelly Madole, Chair**

**Gary Ransdell Hall, Office: 3074**

**Phone: 270-745-3918**

**Website:** <http://www.wku.edu/psychological-sciences/index.php>

**Facebook:**

[www.facebook.com/PsychologicalSciencesatWKU](http://www.facebook.com/PsychologicalSciencesatWKU)

**E-mail:** [psychsciences@wku.edu](mailto:psychsciences@wku.edu)

**Professors:** G. Baylis, R. Brown, E. Lemerise, K. Madole, S. Mutter, F. Norman, E. Shoenfelt

**Associate Professors:** L. Baylis, A. Brausch, L. Hahn, D. Lickenbrock, A. Mienaltowski, M. Shake, A. Wichman

**Assistant Professors:** J. Teeters

**Visiting Assistant Professor:** M. Woodward

**Instructor I:** M. Asriel

**Instructor II:** H. Norman

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The study of behavior is one of the most popular areas of interest for students worldwide. Studying human behavior from a scientific perspective offers numerous opportunities for students. A degree in Psychological Science can open up a wide variety of career options or serve as a foundation for graduate or professional study because, in addition to learning how to understand people, our curriculum emphasizes learning how to collect, analyze, and think critically about data.

Our B.S. degree in Psychological Science was designed to meet the American Psychological Association's guidelines for a high quality undergraduate psychology program by offering both the depth and breadth that students will need for additional graduate or professional study or in the workplace.



One of the most unique aspects of our program is the option to specialize in one of a number of thematic concentrations. Students also have outstanding opportunities to collaborate with faculty and other students on a wide range of research topics in psychology including neuroscience, cognition, developmental science, social psychology, clinical psychology, industrial/organizational psychology, perception, and experimental psychology.

### **Major in Psychological Sciences**

**Reference Number:** 747

**Minimum Hours for Degree:**120

**Minimum Hours for Major:** 38-50

**Degree:** Bachelor of Science

**Sample Degree Plan for Concentration:**

*Applied Psychological Science:* [http://wku.edu/degreepaths/18-19/documents/osce/psychological\\_sciences\\_applied\\_747.pdf](http://wku.edu/degreepaths/18-19/documents/osce/psychological_sciences_applied_747.pdf)

*Biobehavioral Psychology:* [http://wku.edu/degreepaths/18-19/documents/ocse/psychological\\_sciences\\_biobehavioral\\_747.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/psychological_sciences_biobehavioral_747.pdf)

*Clinical Psychological Science:* [https://wku.edu/degreepaths/18-19/ocse/psychological\\_sciences\\_clinical\\_747.pdf](https://wku.edu/degreepaths/18-19/ocse/psychological_sciences_clinical_747.pdf)

*Cognitive Psychology:* [https://wku.edu/degreepaths/18-19/documents/ocse/psychological\\_sciences\\_cognitive\\_747.pdf](https://wku.edu/degreepaths/18-19/documents/ocse/psychological_sciences_cognitive_747.pdf)

*General Psychology:*[https://wku.edu/degreepaths/18-19/documents/ocse/psychological\\_sciences\\_general\\_747.pdf](https://wku.edu/degreepaths/18-19/documents/ocse/psychological_sciences_general_747.pdf)

*Developmental Science:* [https://wku.edu/degreepaths/18-19/documents/osce/psychological\\_sciences\\_developmental\\_747.pdf](https://wku.edu/degreepaths/18-19/documents/osce/psychological_sciences_developmental_747.pdf)

*Quantitative Psychology:* [http://wku.edu/degreepaths/18-19/documents/ocse/psychological\\_sciences\\_quantitative\\_psych\\_747.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/psychological_sciences_quantitative_psych_747.pdf)

*Social Psychology:* [http://wku.edu/degreepaths/18-19/documents/ocse/psychological\\_sciences\\_social\\_747.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/psychological_sciences_social_747.pdf)

The Department of Psychological Sciences offers programs designed for students who are interested in a science – oriented degree that will prepare them for graduate study in psychology or a related field (e.g., medical school, pharmacy, physical therapy) or for employment in jobs where strong quantitative and research skills are required. The department provides two options for the Bachelor of Science degree. The first option requires a minimum of 38 credit hours and a minor or second major is required. The second option requires a minimum of 50 unduplicated credit hours and no minor or second major is required. For both options, students will complete a program of study that includes Core and Concentration components as well as a Laboratory Experience component. To complete the Core requirement, students will select a total of 25 to 28 credit hours from the following categories: Foundations of Psychology, Developmental Processes, Learning and Cognition, Individual Differences and Social Processes, Biological Bases of Behavior and Mental Processes, Research Methods and Statistics, and Integrative Science in Psychology. To complete the Concentration requirement, students will select courses from one or two of the seven thematic concentrations or they may design a general concentration (subject to approval by their advisor). To complete the Laboratory Experience component, students will complete one PSYS lab course or one PSYS lecture/lab course at the 300-level or above. Students in the 38-hour option will complete 12 credit hours from one thematic concentration, or design a custom concentration by selecting 12-24 hours from PSYS courses not used to satisfy their Core requirement. Students choosing the 50-hour option will complete 21-24 credit hours from two concentrations or 24 – 25 hours from the quantitative psychology concentration.

Students must maintain a minimum 2.50 GPA both overall and in the major. Either (1) MATH 116 and MATH 117, or (2) MATH 118 or higher is required; MATH 183 is recommended. Students who select the 50-hour option with the quantitative psychology concentration must complete MATH 136.

Students in the 38-hour option of the Psychological Science major can count no more than 3 credits of PSYS 490 toward the major. Students in the 50-hour option may count no more than 6 credits of PSYS 490 toward the major, with no more than 3 credits counting toward a single concentration's requirements.

**Applied Psychological Science.** This concentration focuses on how psychological science can be used to solve real-world problems in business, sports, or human engineering domains.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 333, PSYS 350, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490

**Concentration Courses:** Required: PSYS 413

Electives: Choose 9 hours from PSYS 353, PSYS 360 or PSYS 362 or PSYS 363, PSYS 370, PSYS 433, PSYS 473, PSYS 481, PSYS 490, PSYS 499, PSY 340, PSY 355, PSY 412, PSY 470.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Biobehavioral Psychology.** This concentration provides knowledge of the biological bases of behavior and thought.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331, PSYS 350 or PSYS 440, PSYS 360 or PSYS 362, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** Required: PSYS 363

Electives: Choose 9 hours from PSYS 333, PSYS 431, PSYS 462, PSYS 463, PSYS 465, PSYS 483, PSYS 490, PSYS 499.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Clinical Psychological Science.** This concentration focuses on mechanisms and etiologies of psychological health and dysfunction.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331 or PSYS 333, PSYS 440, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** Choose 12 hours from PSYS 350, PSYS 353, PSYS 360 or PSYS 362, PSYS 413, PSYS 423, PSYS 425, PSYS 442, PSYS 450, PSYS 451, PSYS 453, PSYS 462, PSYS 465, PSYS 482, PSYS 481, PSYS 490, PSYS 499.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Cognitive Psychology.** This concentration emphasizes the scientific study of mental processes such as attention, perception, memory, problem-solving, thinking, and language use.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 333, PSYS 350 or PSYS 440, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** Choose 12 hours from PSYS 331, PSYS 363, PSYS 423, PSYS 431, PSYS 433, PSYS 462, PSYS 490, PSYS 499, PSY 412.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Developmental Science.** This addresses the physical, emotional, intellectual, social, perceptual, and personality growth of humans throughout the lifespan.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331 or PSYS 333, PSYS 350 or PSYS 440, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** Choose 12 hours from PSYS 220, PSYS 321, PSYS 423, PSYS 424, PSYS 425, PSYS 431, PSYS 463, PSYS 482, PSYS 490, PSYS 499.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Social Psychology.** This concentration emphasizes the study of how social situations affect behavior.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331 or PSYS 333, PSYS 350, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** Required: PSYS 413.

Electives: Choose 9 hours from PSYS 353, PSYS 433, PSYS 440, PSYS 450, PSYS 451, PSYS 453, PSYS 463, PSYS 483, PSYS 490, PSYS 499, PSY 412.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**General Concentration.** This concentration allows students, with help from their advisor, to design an individualized theme.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331 or PSYS 333, PSYS 350 or PSYS 440, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration:** Course select 12-24 hours of electives from PSYS courses not used to satisfy Core requirements.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

**Quantitative Psychology.** This concentration focuses on the use of advanced data manipulation and statistical analysis techniques within psychological science to examine discipline-specific research questions. This concentration requires at least 49 hours, so students do not need a minor or second major. Also students in this concentration do not select another concentration within the Psychological Science Major.

**Core Courses:** PSYS 100 or PSYS 160, PSYS 220 or PSYS 321, PSYS 331 or PSYS 333, PSYS 350 or PSYS 440, PSYS 360 or PSYS 362 or PSYS 363, PSYS 210, PSYS 211, PSYS 313, PSYS 380 or PSYS 481 or PSYS 490.

**Concentration Courses:** CS 146 or CS 170 or CS 180, STAT 301, STAT 330, STAT 401 or STAT 402, PSYS 413, and 9 PSYS upper-level elective hours selected in consultation with an advisor.

**Laboratory Experience:** Select any one PSYS course with a laboratory or lecture/laboratory designation at the 300-level or above.

### **Minor in Neuroscience**

**Reference Number:** 434

**Minimum Hours for Minor:** 21

The minor in Neuroscience offers students the opportunity to study the intersection of brain and behavior in a manner that incorporates tools and perspectives from the psychological and biological sciences, and related disciplines. This minor will be an attractive option for students who are (1) planning to pursue advanced study in any of several fields related to neuroscience, including psychology, biology, medicine, counseling, or social work or (2) seeking relevant training for jobs related to the assessment, rehabilitation, and treatment of brain damage, brain diseases, and addiction.

The minor in Neuroscience requires a minimum of 21 credit hours of coursework. This includes 6 hours of the following required courses: PSYS 360 or PSYS 362, and BIOL 335. An additional 15 credit hours in electives may be selected from the following courses: PSYS 331, PSYS 333, PSYS 363, PSYS 462, PSYS 465, BIOL 319, BIOL 327, BIOL 334, BIOL 446/CHEM 446 or PHIL 332. Note: Students must choose at least 1 course from Biology and Psychological Sciences. Students must take PSYS 100 or PSYS 160 and BIOL 120/BIOL 121 prior to beginning their coursework in the minor (some courses available for the minor may have additional prerequisites).

### **Minor in Psychological Science**

**Reference Number:** 440

**Minimum Hours for Minor:** 22

The minor in Psychological Science provides graduates with a broad overview of the discipline as well as exposure to the foundations of the discipline. The Psychological Science minor focuses students on becoming more engaged and critical consumers of the science underlying psychology through courses informed by current research and practice in the scientific study of individual and collective behavior, the physical and environmental bases of behavior, and the analysis and treatment of behavioral problems. This minor might appeal to students who are in a pre-professional track (e.g., pre-med) or to students majoring in disciplines where psychological science can inform research and practice (e.g., biology, computer science, philosophy, religious studies, nursing, communication disorders, management, etc.).

The minor requires a minimum of 22 credit hours. The following 7 hours are required: PSYS 100 or PSYS 160, PSYS 210, and PSYS 211. Students must select 3 hours from the following Individual Differences and Social Processes (Category A) courses: PSYS 350, or PSYS 440. Another 3 hours must be selected from Learning, Cognition, and Biopsychology (Category B) courses: PSYS 331, PSYS 333, PSYS 360, PSYS 362, or PSYS 363.

Students must select 3 hours from the following Developmental Processes (Category C) courses: PSYS 220, PSYS 321, or PSYS 423. Six additional upper-level credit hours of PSYS courses are required, which can include the above restricted elective courses that were not taken to meet the requirements of Categories A, B and C or any other upper-level PSYS hours. These hours can include no more than 3 credit hours of PSYS 490.

### **JUMP (Joint Undergraduate Master's Program)**

A five-year Joint Undergraduate Masters Program (JUMP) is available in which students may earn a Bachelor of Science in Psychological Sciences and a Master of Science in Psychology concurrently. This program provides highly qualified students with an excellent opportunity for accelerated study. JUMP students take undergraduate coursework that is applied to the undergraduate degree and graduate coursework that can be applied to both the undergraduate and graduate degrees. Interested students should apply before the completion of 65 hours of undergraduate credit. For more information regarding the MS in Psychology, see [www.wku.edu/graduate](http://www.wku.edu/graduate) or contact the department.

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## **Pre-Professional and Interdisciplinary Programs**

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### **Pre-Chiropractic Advisement**

**Advisors:** Ken Crawford, Steve Huskey, Lynnita Glass

**Contact:** Dr. Ken Crawford  
Ogden College Hall, Office 1017  
**Phone:** 270-745-8894 or 270-745-4449  
**Email:** [hpa@wku.edu](mailto:hpa@wku.edu)  
**Website:** <http://www.wku.edu/wkuhpa>

WKU has a 3-year (90 semester hours) curriculum designed to prepare potential candidates for entry into a professional chiropractic college. Prior to application at a chiropractic college, candidates must have earned a minimum of 90 semester hours (including at least 48 semester hours in the courses listed below). The candidate is responsible for ensuring that he or she has met those specific and elective requirements of the school(s) to which they are applying.

Although the following requirements will meet current admission guidelines for most chiropractic programs, the student should check the pre-requisites for those schools to which they wish to apply. Completion of these pre-requisites will allow you to compete for available spaces in chiropractic programs, but will not guarantee admission.

- ENG 100 and ENG 300
- BIOL 120/BIOL 121; and BIOL 122/BIOL 123 [or BIOL 131]
- CHEM 120/CHEM 121; and CHEM 222/CHEM 223
- CHEM 314; [or CHEM 340/CHEM 341]
- MATH 116 and MATH 117
- PSY 100/PSYS 100
- PHYS 231/PHYS 232; and PHYS 332/PHYS 233 [or PHYS 201; and PHYS 202/PHYS 208]
- Humanities and Social Sciences: 15 hours of electives selected in consultation with your advisor.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Dentistry Advisement**

**Advisors:** Ken Crawford, Noah Ashley, Eric Conte, Darwin Dahl, Steve Huskey, Lynnita Glass, Les Pesterfield, Ajay Srivastava

**Contact:** Dr. Ken Crawford  
Ogden College Hall, Office 1017  
**Phone:** 270-745-8894 or 270-745-4449  
**Email:** [hpa@wku.edu](mailto:hpa@wku.edu)  
**Website:** <http://www.wku.edu/wkuhpa>

Students planning a career in dentistry should follow the pre-dentistry curriculum at WKU. All applicants to dental school must take the Dental Admission Test (DAT) approximately one year prior to intended matriculation. Most schools of dentistry have a requirement for observation/ shadowing a practitioner. Students should plan on completing their hours of required observation by the end of the junior year.

- ENG 100 and ENG 300
- BIOL 120/BIOL 121; BIOL 122/BIOL 123; and BIOL 226/BIOL 227
- BIOL 446 or CHEM 446
- CHEM 120/CHEM 121; and CHEM 222/CHEM 223
- CHEM 340/CHEM 341; and CHEM 342/CHEM 343
- MATH 116 and MATH 117
- PHYS 231/PHYS 232

It is highly recommended that students planning a dental career complete the entire four-year curriculum and receive the baccalaureate degree before entering a dental college. A few dental schools will accept students after three years of undergraduate work. One year of satisfactory work in dental school can then be transferred to WKU in order to receive the Bachelor of Science degree.

All requirements for the Colonnade Program and the core courses for a major and minor must be completed before leaving WKU. Courses taken in dental school may then (at the discretion of the department head) be accepted by the major and/or minor departments at WKU allowing the student to receive the bachelor's degree.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional schools of their choice.

### **Pre-Forestry Advisement**

**Advisor: Dr. Martin Stone**  
**Environmental Sciences & Technology Building, Office 258**  
**Phone: 270-745-5963**  
**Email: [Martin.Stone@wku.edu](mailto:Martin.Stone@wku.edu)**

Students interested in forestry as a career may enter Western Kentucky University and complete a plan of study comparable to the first two years of a four-year forestry degree program. The program outlined is designed to qualify students to transfer into the forestry program at the University of Kentucky. This program will permit students with grades of "C" or better to transfer to the degree program of Bachelor of Science in Forestry without loss of credits. Students desiring to attend schools other than the University of Kentucky should contact the pre-forestry advisor for specific requirements.

Required courses are: CHEM 105/CHEM 106, CHEM 107/CHEM 108 or CHEM 120/CHEM 121, CHEM 222/CHEM 223; ENG 100, ENG 300, BIOL 120/BIOL 121, BIOL 222/BIOL 223, BIOL 348; PHYS 101; MATH 116, MATH 117, MATH 119; COMM 145; AGRO 110, AGRO 350; SFTY 171; SPAN 101, GEOG 210; CE 160 / CE 161; AGECE 360; AGRI 291 and restricted electives.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Medicine Advisement**

**Advisors: Ken Crawford, Darwin Dahl, Lynnitia Glass, Steve Huskey, Elizabeth Lemerise, Les Pesterfield, Nancy Rice, Ajay Srivastava, Wieb Vandermeer, Robert Wyatt**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: 270-745-8894 or 270-745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

The pre-medicine curriculum has been developed with two objectives in mind. The first objective is to provide the undergraduate student with an academic background that will enable them to succeed in the medical school of their choice. The second objective is to provide the academic credits to earn the Bachelor of Science degree after four years of study. It is required that students planning a medical career complete the entire four-year curriculum and receive the Bachelor of Science degree before entering a medical college.

During the first two years of undergraduate work, the pre-medicine student should complete the majority of the basic science courses that constitute the minimal prerequisites for entrance into medical school.

- ENG 100 and ENG 300
- BIOL 120/BIOL 121; BIOL 122/BIOL 123; and BIOL 224/BIOL 225
- CHEM 120/CHEM 121; and CHEM 222/CHEM 223
- CHEM 340/CHEM 341; and CHEM 342/CHEM 343
- MATH 116, MATH 117 and MATH 136
- PHYS 231/PHYS 232; and PHYS 322/PHYS 233; [or PHYS 255 and PHYS 265]

In preparation for the Medical College Admission Test (MCAT), it is strongly recommended that the pre-medical student choose BIOL 446 or CHEM 446 and BIOL 382 or MATH 183 as electives. PSY 100/PSYS 100 or PSYS 220 and SOCL 100 are also recommended among Colonnade classes.

During the junior and senior years, students with direction from their pre-medical advisor, should complete courses to constitute a major and a minor in addition to completing the Colonnade Program requirements for a degree. All applicants to medical school must take the Medical College Admission Test (MCAT).

In February 2016, the University of Kentucky, School of Medicine announced its intention of opening a branch medical campus in Bowling Green, KY. In partnership with The Medical Center of Bowling Green and WKU, the first class matriculated in fall 2018. Pre-medical students have the opportunity to complete pre-medical studies and all four years of medical school in Bowling Green.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional schools of their choice.

### **Pre-Occupational Therapy Advisement**

**Advisors: Lynnitia Glass, Wendi Hulsey, Mark Schafer, Matthew Shake**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

Occupational therapists and occupational therapy assistants help people across the lifespan participate in the things they want and need to do through the therapeutic use of everyday activities (occupations). Common occupational therapy interventions include helping children with disabilities to participate fully in school and social situations, helping people recovering from injury to regain skills, and providing supports for older adults experiencing physical and cognitive changes.

Students may fulfill pre-occupational therapy requirements at Western Kentucky University and become eligible to submit applications for admission to any doctoral or master's level occupational therapy schools within the United States. These schools vary slightly in their requirements so students should decide after 4 or 5 semesters on the college(s) of occupational therapy to which they plan to submit an application for admission and arrange their schedules in accordance with the requirements of that particular school. Students applying to Occupational Therapy school should take the GRE.

The following courses are typically required:

- BIOL 131 and BIOL 231, Human Anatomy & Physiology I & II with lab
- MATH 183, PSY 210/PSY 211, PSYS 210/PSYS 211, or BIOL 382 Statistics
- PSY/PSYS 440, Abnormal Psychology
- SOC 100, Introduction to Sociology or ANTH 125, Introduction to Anthropology
- Additional Biology Class with Lab
- AH 290, Medical Terminology

Other courses often required: PSY/PSYS 220, CHEM 109, PHYS 201

Please note: Recommended courses are based on WKU's Assessment of specific professional school requirements. Student should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Optometry Advisement**

**Advisors: Ken Crawford, Lynnitia Glass, Wieb Vandermeer**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: 270-745-8894 or 270-745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

Students may fulfill pre-optometry requirements at Western Kentucky University and become eligible to submit applications for admission to any of the 23 optometry schools within the United States. These schools vary slightly in their pre-optometry requirements. Students should decide after 4 or 5 semesters on the college(s) of optometry to which they plan to submit an application for admission and arrange their schedules in accordance with the requirements of that particular school.

The professional optometric program requires four years of study in a school of optometry. This is in addition to the three or more years of pre-optometry requirements. Applicants to all of the optometry schools are required to take the Optometry Admission Test (OAT).

In the fall of 2016, the Kentucky College of Optometry (Pikeville, KY) welcomed their inaugural class. Through a Memorandum of Agreement between WKU and KYCO, qualified WKU students will have preferred admission status at KYCO.

The courses listed below are required as prerequisites for all optometry schools. Each science course must be accompanied by its appropriate laboratory: BIOL 120, BIOL 122, BIOL 226; CHEM 120, CHEM 222, CHEM 340; PHYS 231, PHYS 332 or PHYS 255, PHYS 265; MATH 116, MATH 117, and MATH 136; ENG 100, ENG 300; PSY 100/PSYS 100 and a course in statistics. There may be additional course requirements that vary with each optometry school.

All students in the curriculum are strongly encouraged to work toward a bachelor's degree, even though a degree is not required for admission to most optometry schools. One year of satisfactory work in optometry school can generally then be transferred to WKU in order to receive the Bachelor of Science degree. All requirements for the Colonnade Program and the core courses for a major and minor must be completed prior to matriculation to optometry school. Courses taken in optometry school may then (at the discretion of the department head) be accepted by the major and/or minor department at WKU allowing the student to receive the bachelor's degree.



Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Pharmacy Advisement**

**Advisors: Darwin Dahl, Lynnita Glass, Rodney King**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

Students planning a career in pharmacy should follow a pre-pharmacy curriculum at WKU. After completion of a minimum of 70 credit hours, the student may take the Pharmacy College Admissions Test (PCAT) and apply for admission to a school of pharmacy for the remaining four years of training.

The following curriculum contains courses required for admission to the University of Kentucky, College of Pharmacy. The courses required by other schools of pharmacy are much the same; however, the student should investigate the requirements of the school to which they plan to attend in order that every requirement may be included in their pre-pharmacy program.

Freshman year: BIOL 120/BIOL 121, BIOL 131; CHEM 120/CHEM 121, CHEM 222/CHEM 223; ENG 100; MATH 136; electives.

Sophomore year: BIOL 207/BIOL 208 or BIOL 226/BIOL 227 and BIOL 231; CHEM 340/CHEM 341, CHEM 342/CHEM 343; ECON 202 or ECON 203; ENG 300; MATH 183 or BIOL 382; electives.

Electives should include one course in psychology or sociology. COMM 145, HIST 101 or HIST 102 is also recommended. Note: Many pharmacy schools require a single semester of Physics that can be met by taking PHYS 231/PHYS 232 or PHYS 255.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Physical Therapy Advisement**

**Advisors: Steve Huskey, Gary English, Mark Schafer, Wendi Hulsey, Lynnita Glass**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

The pre-physical therapy program at Western Kentucky University is designed to prepare students for application to accredited programs in physical therapy. It is recommended that the student complete a baccalaureate degree while completing the pre-requisite requirements of the physical therapy schools to which they plan to apply. It should be noted that all physical therapy schools have adopted a Doctorate/Ph.D. level program, and as a result, a baccalaureate degree is required. Completion of the following prerequisites does not guarantee admission into a physical therapy school; it merely places the candidate into a competitive pool of applicants from which the successful candidates will be selected and interviewed.

Application to the physical therapy schools at WKU, the University of Kentucky and Bellarmine University requires applicants to have earned a bachelor's degree by the time they enter the program. A grade of "C" or better is required in all prerequisite courses. Applicants must also show evidence of having completed at least 50 hours of physical therapy observation and/or volunteer experience at two or more health care facilities. The following suggestions and requirements must be completed by the time the successful applicant enters the professional program:

#### *1. WKU Colonnade Suggestions*

- 2 semesters of English composition: ENG 100 & ENG 300
- 1 semester of Literature: ENG 200
- 1 semester of Arts & Humanities
- 1 semester of Speech Communication (COMM 145 )
- 2 semesters of Psychology: PSY 100/PSYS 100 & PSY 220/PSYS 220
- 1 semester of History (Western Civilization): HIST 101 or HIST 102
- Complete World Language Requirement

*II. Math/Science Requirements*

- BIOL 120/BIOL 121; BIOL 122/BIOL 123
- BIOL 131 and BIOL 231 [or BIOL 224/BIOL 225; BIOL 321 and BIOL 330 are strongly recommended for Biology majors]
- CHEM 120/CHEM 121; CHEM 222/CHEM 223
- PHYS 231/PHYS 232; PHYS 332/PHYS 233
- MATH 116 and MATH 117; (MATH 136 is recommended for the University of Kentucky)
- One semester of statistics or research methods: BIOL 382 [or PH 383 or MATH 183]

If not completed in Colonnade, Six (6) hours of social/behavioral sciences (psychology, sociology, anthropology, philosophy, ethics, etc.) are also required.

*III. Additional Suggestion*

- Medical Terminology: AH 290 (required by UK)
- 1 semester of ethics: PHIL 320 or PHIL 322

The GRE is also required and should be completed approximately a year in advance of intended matriculation to PT school. It is also strongly recommended that professional certification in first aid by the American Red Cross and in CPR by the American Heart Association be completed prior to entrance into the program. The community CPR course offered by the American Red Cross is NOT acceptable. Minimum overall GPA should be 2.75; minimum science core GPA should be 3.0 (4.0 scale). However, the competitive nature of the application process over the last several years indicates that overall and science GPA's should both be 3.4 or higher to seriously contend for entrance.

WKU graduated their inaugural DPT class in Spring 2016; for more information go to [www.wku.edu/physicaltherapy](http://www.wku.edu/physicaltherapy).

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

**Pre-Physician Assistant Advisement**

**Advisors: Ken Crawford, Lynnita Glass**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

A Physician Assistant (PA) is a healthcare provider that has earned a Master's Degree from an accredited PA school (typically earned in 27 months) and passes a national licensure exam (PANCE). They must practice under the supervision of a licensed physician. It is a relatively new health profession, which has grown tremendously over the last 20 years. There are currently 209 accredited PA Programs in the US (but only 3 in KY, University of Kentucky, Univ. of the Cumberlands and Sullivan Univ.). The US Bureau of Labor lists PA as the 2nd fastest growing occupation (expected to grow 30% from 2010 to 2020).

The successful candidate will have earned a bachelor's degree prior to matriculation, completed the pre-requisite coursework, take the Graduate Record Exam (GRE) as well as complete extensive shadowing and healthcare work experience (1000 hours, 500 at time of application). Due to the extensive health care experience required, students are encouraged to begin no later than the beginning of the junior year. The following pre-requisites are based on those at UK. The student should carefully examine the requirements at other schools to which they plan to apply.

- ENG 100 and ENG 300
- BIOL 120/BIOL 121; BIOL 122/BIOL 123; BIOL 224/BIOL 225; BIOL 226/BIOL 227 or BIOL 207/BIOL 208; BIOL 321 and BIOL 330 or BIOL 131 and BIOL 231
- CHEM 120/CHEM 121; CHEM 222/CHEM 223 and CHEM 314 or CHEM 340/CHEM 341
- MATH 116, MATH 117
- PSYS 100/PSY 100 and PSYS 220/PSY 220; SOCL 100
- BIOL 382 or MATH 183
- AH 290

**Pre-Podiatric Medicine Advisement**

**Advisors: Ken Crawford, Lynnita Glass**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

Students planning a career in podiatry should follow the pre-podiatric curriculum at Western Kentucky University that is basically the same as that outlined for pre-medicine students. All applicants to podiatry school must take the Medical College Admission Test.

Three years of undergraduate academic study are required; however, 97% of matriculants complete the B.S. degree and therefore it is recommended that students planning a career in podiatry complete the entire four-year curriculum and receive the Bachelor of Science degree before entering a college of podiatric medicine.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Pre-Veterinary Medicine Advisement**

**Advisors: Fred DeGraves, Mike Stokes, Steve Huskey,  
Lynnita Glass**

**Contact: Dr. Ken Crawford**  
**Ogden College Hall, Office 1017**  
**Phone: (270) 745-8894 or 745-4449**  
**Email: [hpa@wku.edu](mailto:hpa@wku.edu)**  
**Website: <http://www.wku.edu/wkuhpa>**

Kentucky students have the opportunity to attend veterinary medical school at reduced tuition at Auburn University, Auburn, AL or Tuskegee Institute, Tuskegee, AL. The Commonwealth of Kentucky has made this possible through its participation with the Southern Regional Education Board (SREB). The State of Kentucky pays approximately \$25,000 annually for each student at Auburn or Tuskegee. Each year the School of Veterinary Medicine at Auburn reserves 34-40 positions for students from Kentucky who meet admission requirements. If admitted, Kentucky students pay the same fees as Alabama residents. Two to six positions may also be available each year at Tuskegee Institute on the same basis.

The minimum education requirement for admission to the School of Veterinary Medicine, Auburn University, is the satisfactory completion of an approved curriculum at an accredited college or university. A minimum grade point average of 2.50 is required overall and for the required courses.

Students may apply to one or both institutions as they near completion of the pre-veterinary requirements. The GRE is required for both Auburn University and Tuskegee.

The following courses have been approved by Auburn University: ENG 100, ENG 200, and ENG 300; MATH 116 and MATH 117 or higher level; HIST 101 or HIST 102; CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 340/CHEM 341, and CHEM 342/CHEM 343; PHYS 231/PHYS 232, and PHYS 332/PHYS 233; BIOL 120/BIOL 121, and BIOL122/BIOL 123; ANSC 140/ANSC 141 and ANSC 345; BIOL 319/BIOL 322; BIOL 446/CHEM 446; ART 100 or MUS 120, or THEA 151; COMM 145; 6 hours of 300-400 level science electives; and 6 hours social science elective. This curriculum is planned for completion in three years. By choosing the correct electives in the pre-veterinary program and transferring credits for the first year of veterinary school to Western Kentucky University, students may receive the Bachelor of Science degree from WKU. This is a suggested curriculum; the sequence of courses may be varied to suit individual situations. Every effort is made to advise each student based upon the individual's background and academic capability.

Please note: Recommended courses are based on WKU's assessment of specific professional school requirements. Students should, in consultation with their advisor, review the requirements at the professional school of their choice.

### **Biochemistry**

#### **Advisors:**

**Dr. Sigrid Jacobshagen,**  
**Department of Biology**  
**Thompson Complex, Central Wing, Office 353**  
**Phone: 270-745-5994**

**Dr. Kevin Williams,**  
**Department of Chemistry**  
**Thompson Complex, Central Wing, Office 423**  
**Phone: 270-745-8899**

#### **Faculty**

**Department of Chemistry:** M. Kim, K. Williams,  
B. Williams

**Department of Biology:** C. Emani, S. Jacobshagen,  
N. Rice, C. Rinehart

Biochemistry is the study of the chemical basis of living organisms. The subject includes the investigation of the various classes of biomolecules (proteins, nucleic acids, lipids, and carbohydrates) and their metabolic interactions.

Training in biochemistry offers many exciting opportunities in teaching, research and public service. It provides excellent preparation for students intending to enter professional programs such as Dentistry and Medicine as well as graduate study in Biochemistry, Chemistry or Biology. The Biochemistry program is the only stand-alone Bachelor's Degree in Biochemistry at a public institution in the Commonwealth. It is administered jointly through the Departments of Biology and Chemistry. Students may enroll for biochemistry courses through either the Department of Biology or the Department of Chemistry, depending upon their major emphasis.

Biochemistry I (BIOL 446/CHEM 446) is strongly recommended for pre-medicine and pre-dentistry students as well as for chemistry and biology majors.

## Major in Biochemistry

**Reference Number:** 519

**Minimum Hours for Major:** 60

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry\\_519.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/biochemistry_519.pdf)

The major in biochemistry requires a minimum of 60 semester hours and leads to a Bachelor of Science degree. This sequence of required chemistry and biology courses along with elective courses from biology, chemistry, agriculture, and physics offer the student a unique opportunity for interdisciplinary training.

Required courses are CHEM 120, CHEM 121, CHEM 222, CHEM 223, CHEM 330, CHEM 340, CHEM 341, CHEM 342, CHEM 343; BIOL 120, BIOL 121, BIOL 122, BIOL 123, BIOL 319, BIOL 322, BIOL 411; BIOL 446/CHEM 446, BIOL 447/CHEM 447, BIOL 467/CHEM 467.

In addition to the required courses, students are expected to complete elective courses to total a minimum of 60 semester hours.

Electives: BIOL 212, BIOL 222, BIOL 223, BIOL 224, BIOL 225, BIOL 226, BIOL 227, BIOL 312, BIOL 316, BIOL 327, BIOL 337, BIOL 328, BIOL 330, BIOL 331, BIOL 335, BIOL 350, BIOL 382, BIOL 399, BIOL 400, BIOL 403, BIOL 404, BIOL 407, BIOL 412, BIOL 420, BIOL 440, BIOL 450, BIOL 464, BIOL 475, BIOL 495, BIOL 496

Electives: CHEM 320, CHEM 399, CHEM 420, CHEM 430, CHEM 435, CHEM 412 or (CHEM 450, CHEM 451, CHEM 452, CHEM 453), CHEM 462, CHEM 475.

Electives: AGRO 320, ANSC 344, ANSC 345, AGRO 350, AGRO 351, AGRO 352, AGRI 399, AGRO 409, AGRO 410, ANSC 437, ANSC 438, ANSC 448, AGRO 452, AGRO 455, AGRO 456.

Electives: PHYS 335, PHYS 431

In addition to the above 60 semester hours, the student is required to take (PHYS 231, PHYS 232, PHYS 233, PHYS 332) or (PHYS 255, PHYS 256, PHYS 265, PHYS 266) and MATH 136.

## Minor in Biochemistry

**Reference Number:** 324

**Minimum Hours for Minor:** 18

The minor in biochemistry requires a minimum of 18 semester hours and a major in either chemistry or biology. Required courses are BIOL 411; BIOL 446/CHEM 446, BIOL 447 / CHEM 447, BIOL 467/CHEM 467. Electives: BIOL 120, BIOL 121, BIOL 226, BIOL 227, BIOL 319, BIOL 322, BIOL 327, BIOL 330, BIOL 331, BIOL 400; CHEM 120, CHEM 314 or (CHEM 340, CHEM 341, CHEM 342, CHEM 343), CHEM 420, CHEM 435, CHEM 462; ANSC 437, ANSC 438, ANSC 448. Any course used in the student's major cannot be counted toward the biochemistry minor.

## Biophysics

**Advisor:** Dr. Wieb van der Meer

**Thompson Complex, Center Wing, Office 227**

**Phone: 270-745-6205**

### Faculty

**Department of Physics and Astronomy:**

V. Dobrokhotov, I. Novikov, W. Van der Meer

**Department of Biology:** K. Crawford, S. Jacobshagen

**Department of Chemistry:** K. Williams

Biophysics studies the physics of life processes and explores the application of physics to biology and medicine. It combines a working knowledge of physics theory with an appreciation of the complexities of biological processes. Although only recently established as a separate discipline, it has rapidly taken position alongside those fields that are advancing the frontiers of scientific knowledge.

The minor in biophysics serves students of the life sciences: agriculture, biology, environmental engineering, environmental health, medical technology, pre-dentistry, pre-medicine, pre-optometry, pre-pharmacy, pre-veterinary medicine and psychological science.

**Goals of the Biophysics minor:** The purpose of the biophysics minor is to prepare students to meet the career goals listed below. It is expected that a student completing this minor will be proficient in the use of biological and medical instrumentation and will understand the underlying physical theory that make it work. In addition, the student will be exposed to two fundamental ways of looking at biology; first, from the point of view of the biologist who understands the complexity of life processes and second, from the point of view of the physicist who appreciates the basic simplicity of all the laws of nature.

**Career Opportunities:** The applicability of biophysics is so widespread that we can only outline some of the career opportunities. Medical doctors, dentists, pharmacists, optometrists, veterinarians, many researchers in the life sciences, physical therapists and nurses require an understanding of the principles and techniques involved in the use of modern instruments. Radiation treatment, medical imaging, genetic engineering, nanodevices, laminar flow rooms, cryosurgery and artificial organs have all been made possible due to rapid advances in biophysics.

Biophysics provides a helpful background for students interested in professional training in health related fields. It is also a valuable area for students interested in teaching biology or health at any level. Industrial, government or university laboratory work requires a thorough knowledge of both the theory and application of modern instrumentation. The federal government is currently funding training programs that combine biology and physics. Job opportunities are available for students with such a background and these openings are expected to increase over the next few decades.

### **Minor in Biophysics**

**Reference Number:** 329

**Minimum Hours for Minor:** 18

Students will be admitted into the program by the biophysics advisor. Individual counseling will guide the students to a proper choice of courses consistent with previous experience. Introductory Biophysics (PHYS 231, 332) requires high school level algebra, geometry, and trigonometry. The more advanced courses will require knowledge of PHYS 231 and PHYS 332. Additional mathematical training is encouraged.

The biophysics minor consists of a minimum of 18 credit hours. Required courses are (credit hours listed between parentheses) PHYS 231/PHYS 232 Introduction to Physics and Biophysics I with laboratory, (4 hours); PHYS 332/PHYS 233 Introduction to Physics and Biophysics II with laboratory, (4 hours); PHYS 335 General Biophysics (4), or PHYS 337 Medical Imaging (4), PHYS 359 Clinical Optics (4), or PHYS 379 Nanotechnology in Biophysics and Medicine (4), or PHYS 431 Radiation Biophysics (4). Optional upper division electives (minimum of 6 hours required) include but are not limited to the following: BIOL 399 or PHYS 399 Research Problems, 1-3 hours; BIOL 330 Animal Physiology, 3 hours; BIOL 331 Animal Physiology Laboratory, 1.5 hours; BIOL 404 Electron Microscopy, 4 hours; BIOL 411 Cell Biology, 3 hours.

### **Major in Medical Laboratory Science**

**Coordinator:** Dr. Kerrie McDaniel  
**Thompson Complex, Center Wing, Office 313**  
**Phone:** 270-745-6845  
**Email:** [Kerrie.McDaniel@wku.edu](mailto:Kerrie.McDaniel@wku.edu)

**Reference Number:** 5004

**Minimum Hours for Major:** 83

**Minimum Hours for Degree:** 120

**Degree:** Bachelor of Science

**Sample Degree Path:** [http://wku.edu/degreepaths/18-19/documents/ocse/medical\\_lab\\_science\\_5004.pdf](http://wku.edu/degreepaths/18-19/documents/ocse/medical_lab_science_5004.pdf)

With the aging of our population, it is estimated that health care will be a major service industry in our country. An important part of health care is Medical Laboratory Science, formally known as Medical Technology, a profession that includes well-trained, highly educated individuals who are the fact-finders of the medical world. Medical Laboratory Scientists typically analyze body fluids, examine tissues, and identify specific microorganisms to find evidence for and the cause of specific diseases such as AIDS, Diabetes, and Cancer. Some of the exciting new demands of the profession include tissue typing for organ transplantation, chromosomal studies as a basis for genetic counseling, identification of environmental pollutants, and screening tests for accidental poisoning and drug abuse. The demand for Medical Technologists is very high. The U.S. Bureau of Labor Statistics continues to project a need for new Medical Laboratory Scientists to meet medical demands of an aging population.

Although two-thirds of Medical Laboratory Scientists work in hospital laboratories, new sources of employment include laboratories in physician's offices, research facilities in universities and industries, public health centers and in veterinary clinics.

The Medical Laboratory Science program combines a minimum of three years (96 semester hours) of college courses at Western Kentucky University with a minimum of 12 calendar months (36 semester hours) of satisfactory clinical training in a school of Medical Laboratory Science (Medical Technology). This school must be approved by the Committee on Allied Health Education and Accreditation of the American Medical Association and by the medical technology coordinator at Western Kentucky University.

Coursework for this major requires a minimum of 83 hours (36 of which are completed at a Medical Laboratory Science school and transferred back to the Department of Biology) and leads to a B.S. degree in Medical Laboratory Science. No minor is required. A student must meet all of the Colonnade Requirements for the bachelor's degree at Western Kentucky University before admission to the school of medical technology.



Upon satisfactory completion of the course requirements in medical laboratory science, the Bachelor of Science degree will be awarded by Western Kentucky University. Graduates of the medical laboratory science program are eligible to take national credentialing examinations for medical technologists which result in membership in the American Society of Clinical Pathologists (A.S.C.P.). The program is affiliated with the following schools of medical technology: Bellarmine University, Louisville, KY; Owensboro Medical Health System, Owensboro, KY; Vanderbilt Medical Center, Nashville, TN; and St. Elizabeth Medical Center, Covington, KY.

Course requirements at Western Kentucky University include BIOL 120/BIOL 121, BIOL 122/BIOL 123, BIOL 224/BIOL 225, BIOL 226/BIOL 227, BIOL 319/BIOL 322 or BIOL 327/BIOL 337, BIOL 328; CHEM 120/CHEM 121, CHEM 222/CHEM 223, CHEM 314 or CHEM 340/CHEM 341, BIOL 446/CHEM 446, and MATH 118 or MATH 116 and MATH 117.

More detailed information including Colonnade (general education) requirements can be obtained from the coordinator. Students must consult the coordinator regarding applying for admission to the medical technology schools. Application is made 9 to 12 months in advance of the beginning date for the medical technology school. Admission to these schools is on a competitive basis, and maintenance of a good academic standing is required. Students are required to have liability insurance for their clinical years.

**Minor in Aerospace Studies (AFROTC)**

**Advisor: Dr. Ken Crawford**  
**Email: [Kenneth.Crawford@wku.edu](mailto:Kenneth.Crawford@wku.edu)**

**Reference Number:** 304

**Minimum Hours for Minor:** 20-23

The Air Force Reserve Officers Training Corps (AFROTC) provides pre-commission training for college men and women who desire to serve as commissioned officers in the United States Air Force. When combined with the academic disciplines offered at the college level, the program provides the student a broad-based knowledge of management, leadership, and technical skills required for a commission and subsequent active duty service in the Air Force. A minor in aerospace studies (reference number 304) is available to students. Students must take AERO 151, AERO 153, AERO 251, AERO 253, AERO 351, AERO 353, AERO 451, and AERO 453.

Graduates are commissioned as Second Lieutenants and are called to active duty within 60 days. Educational delays may be granted for non-flying graduates who desire to pursue advanced degrees prior to entry on active duty. The main objectives of producing officers through the AFROTC program are:

1. To procure officers with a broad educational base.
2. To provide a basic military education for college students.
3. To teach fundamentals and techniques of leadership, management and decision-making.
4. To develop, in conjunction with other academic disciplines, individual character and attributes required of a commissioned officer in the United States Air Force.

**Air Force ROTC Program:**

In cooperation with Tennessee State University, located in Nashville, TN, an opportunity is available for Western Kentucky University (WKU) students to participate in the Air Force ROTC Program. Simply call the detachment **(615.963.5979)** and ask for a Cross-Town Application. The program provides training and education that will develop skills and attitudes vital to the professional Air Force Officer. In this program students are eligible to compete for scholarships (2.5+ GPA) and receive the same benefits and privileges as full-time students enrolled at TSU. In addition to the above, Western Kentucky University grants two room and board scholarships each year to winners of four-year or three and one-half year AFROTC scholarships.

Students who participate in the Air Force ROTC program must be enrolled as a student at WKU (or other cross-town college). The student is also jointly enrolled as a TSU student and participates in Aerospace Studies at TSU. For more information, contact the Unit Admissions Officer at (615) 963-5931/5979 or check the website at <http://www.tnstate.edu/afrotc/>.

Curriculum - The General Military Course (GMC) is 1 credit hour and is composed of the first four semesters of aerospace studies (AERO) and is for freshmen and sophomores. The Professional Officer Course (POC) is 3 credit hours and constitutes the final four semesters of AFROTC study and enrolls juniors and seniors.

Civil Air Patrol Squadron - A centralized flying program for AFROTC cadets conducted at any time while they are enrolled in AFROTC. Training consists of eight hours of flying instruction in a light, single-engine aircraft. Objectives of the program are to train and motivate qualified cadets toward a rated (flying) career, and to introduce the cadets to the aviation career field. The Leadership Lab is also 1 credit hour.



### Aerospace Studies Courses

- **Freshman Year:** AERO 151/AERO 153 – The Foundations of the United States Air Force is a survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions, and organization of the Air Force.
- **Sophomore Year:** AERO 251/AERO 253 – The Evolution of USAF Air and Space Power features topics on Air Force heritage and leaders; introduction to air power through examination of the Air Force Core Functions; and continued application of communication skills. Its purpose is to instill an appreciation of the development and employment of air power and to motivate sophomore students to transition from AFROTC cadet to AFROTC officer candidate.
- **Junior Year:** AERO 351/AERO 353 - The United States Air Force Leadership Studies teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is placed on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.
- **Senior Year:** AERO 451/AERO 453 - National Security Affairs/Preparation for Active Duty is designed for college seniors and gives them the foundation to understand their roles as military officers in American society. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.

#### **POC Eligibility:**

The following are prerequisites for entry into the AFROTC Professional Officers Course (POC). The student must:

1. Have either completed the General Military Course (GMC) or the six-week Field Training Course. The GMC may be accredited for certain prior military service applicants who meet specific criteria.
2. Have two academic years of college remaining (either undergraduate, working on second degree, or graduate degree) as a full-time student.
3. Have achieved a qualifying score on the AFOQT.
4. Execute a written agreement to complete the program and successfully complete the applicable Field Training Course and accept an Air Force Reserve Commission, when tendered.
5. Be selected by the Professor of Aerospace Studies (PAS).
6. Meet certain specified age requirements.

**General Benefits:** All students enrolled in the AFROTC programs are provided textbooks and uniforms at no expense. POC students (juniors and seniors) and all scholarship students receive a monthly subsistence allowance of up to \$500 tax-free.

#### **Sponsored Activities:**

**Arnold Air Society** - A national society of AFROTC cadets who excel in character, academics, and exhibit interests in the study of aerospace technology meets at TSU.

**Professional Development Training** is provided during the summers to cadets interested in enhancing their knowledge of Air Force leadership and management opportunities, increasing their cultural awareness, and learning about specific career specialties.

**AFROTC Flight Orientation Program** is designed to allow all cadets, regardless of intended career field, the chance to fly in Civil Air Patrol aircraft. Everyone can experience the joy of flight.

### Brewing and Distilling Arts & Sciences Certificate

**Advisor: Dr. Cathleen Webb**  
**Email: [Cathleen.Webb@wku.edu](mailto:Cathleen.Webb@wku.edu)**  
**College High Hall, Office 2109**  
**Phone: (270) 745-6181**

**Reference Number: 1733**

**Minimum Hours for Certificate: 12-15**

Humans have been brewing alcohol since the dawn of recorded history, and distilling stretches back over a thousand years. Brewing and distilling play a major role in the Kentucky and U.S. economy. Industries as diverse as farming, tourism, construction, and retail all rely on, and contribute to alcohol production.

This multidisciplinary certificate is designed to complement an existing major in a related field, by providing a background understanding of topics related to the brewing and distilling industries—students need to become competitive in the marketplace.

Students will take the following four courses for the certificate: BDAS 300, ENT 312, HIST 341, and BDAS 495.