



# College of Science

**Dr. Joseph Bragin, Dean**  
**Dr. Harold W. Elmore, Associate Dean**

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## **Division of Biological Sciences**

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[www.marshall.edu/biology/](http://www.marshall.edu/biology/)

## **Division of Physical Sciences**

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[www.marshall.edu/chemistry](http://www.marshall.edu/chemistry)

## **Division of Mathematics and Applied Science**

**Dr. Ralph Oberste-Vorth, Division Head** ([oberstevorth@marshall.edu](mailto:oberstevorth@marshall.edu))

[www.marshall.edu/math](http://www.marshall.edu/math)

The College of Science was established in 1976 and is composed of three divisions: Biological Sciences, Physical Sciences, and Mathematics and Applied Science. The three divisions contain the college's six academic units (Biological Sciences, Chemistry, Geology, Mathematics, Physics and Physical Sciences, and Integrated Science and Technology).

Biological Sciences, Chemistry, Physics and Physical Sciences, and Geology are housed in the Science Building. Mathematics is located in Smith Hall, and Integrated Science and Technology is in Prichard Hall. Course offerings by all departments within the college are available to science majors and to students in other disciplines who are interested in broadening their skills and knowledge in basic science, mathematics, and computers.

## **MISSION OF THE COLLEGE**

Scientific and technologically trained people are essential to our nation's health and prosperity in a rapidly expanding global economy. Students majoring in baccalaureate degree programs in the College of Science receive a broad education conducive to pursuing a wide range of career options. Course requirements include solid grounding in the student's chosen area of scientific interest along with studies in humanities and the social

sciences. Students receive instruction in a learning environment that encourages competency in written and oral communication skills along with the ability to work in groups. Special emphasis is placed on experiential learning through participation in activities such as undergraduate research and internships. For non-science majors, departments in the College of Science offer a series of courses which focus on enhancing science literacy through instruction in integrated science and practical applications of mathematics.

## ADMISSION REQUIREMENTS

College of Science admission requirements for students at the freshman level are higher than those required for general admission to the university. The ACT scores required for full admission to the College of Science are a minimum mathematics score of 21 and a minimum composite score of 21. For the SAT, a score of 500 in math and a 1000 composite score are required.

Students who do not meet these admission requirements but still wish to pursue a program in the College of Science may gain admission by enrolling in another college and completing the following requirements.

1. Completion of MTH 127 (or MTH 130) and ENG 101 with a grade of *C* or higher.
2. Completion of at least 15 credit hours of college work with a GPA of 2.0 or higher.
3. Transfer students must have a 2.0 GPA with a *C* or higher in MTH 127 (or MTH 130) and ENG 101, or meet the ACT or SAT requirements stated above.

## PROGRAMS

The following programs are available through the departments in the College of Science:

- Biological Science (B.S.)
- Chemistry (B.S., B.S. in Chemistry)
- Environmental Management (in cooperation with Duke University)
- Environmental Science (B.S.)
- Forestry (in cooperation with Duke University)
- Integrated Science and Technology (B.S.)
- Geology (B.S. and B.A.)
- Mathematics (B.S.)
- Physics (B.S.)

In addition to satisfying the requirements for a specific major, students must meet the college requirements outlined below and the university requirements as described in this catalog.

Students entering any baccalaureate degree program in the College of Science are responsible for meeting four requirements of the Marshall Plan, baccalaureate program initiatives approved by the faculty and the university president for all students. These include Writing Across the Curriculum, Computer Literacy, International and Multicultural Studies, and the Capstone Experience. Students in the College of Science are not required to satisfy the 4-hour Integrated Science requirement. Students are to consult with their academic/program advisors or the chairperson of their major departments for guidance in

determining the specific details of meeting the above referenced baccalaureate curricular initiatives.

## GENERAL COLLEGE REQUIREMENTS

1. Candidates for graduation must apply for graduation through the office of the dean.
2. Candidates for graduation must have a Grade Point Average of 2.0 or higher on all work attempted at Marshall University, and must have an average of 2.0 or higher in their major. Quality point deficiencies in the major cannot be reduced by taking lower division (100/200 level) courses within the major department, except as provided for by the *D/F Repeat Rule*; exceptions may be allowed by the department chair with the concurrence of the dean.
3. A minimum of 128 semester hours of credit is required for graduation. Forty-eight hours must be earned in courses numbered 300-499. Courses transferred from two-year or community colleges cannot be used to satisfy the upper division requirement.
4. The CR/NC option cannot be used: (1) for any course taken to meet the specific requirements for a B.A. or B.S. degree (see below); (2) for any course taken to fulfill the requirements for a departmental major; or (3) for any course taken to fulfill the requirements for a minor (item 5).
5. Candidates must earn at least 12 hours in a minor subject. Requirements for the minor are determined by the minor department. The minor field may be chosen from any department within the university outside of the major department.
6. During the junior year, and no later than the semester in which they have completed 90 semester hours, students should request an evaluation by the dean's office to determine if they are making satisfactory progress towards graduation.

### Specific Requirements for the B.A. and B.S. Degrees (Do not apply to Engineering Geology area of emphasis or Integrated Science and Technology)

#### HUMANITIES

##### Requirements

##### Credit Hours

- |                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| I. English 101 and 102, or 201H .....                                                                                                                                                                                                                                                                                                                                                                                                       | 6    |
| Students who take either 102 or 201H on a CR/NC basis are required to pass the English Qualifying Examination.                                                                                                                                                                                                                                                                                                                              |      |
| II. Foreign Language .....                                                                                                                                                                                                                                                                                                                                                                                                                  | 3-12 |
| Successful completion of 12-hour sequence ending with German 204, Greek 302, Latin 204, French 204, Spanish 204, or Japanese 204. Students with previous language experience should consult the prerequisites listed in the "Courses of Instruction" section of this catalog to determine the appropriate sequence of courses. International students may satisfy this requirement by consultation with the Department of Modern Languages. |      |

(continued)

- III. Communication Studies ..... 0-3 hrs.  
 Communication Studies 103, 104H or 305. Communication Studies 103 is not required for students who have had high school speech and who can pass a proficiency exam administered by the Communication Studies Department. Communication Studies 305 is open to juniors and seniors who have not had Communication Studies 103.
- IV. Literature ..... 6  
 Courses to be selected from the following:  
 Classics 230, 231, 232, 233, 234  
 English: any 300- or 400-level literature course (ENG 350, 354, 360, 377, 378, 402, 405, 408, 420, 444, 446, 455, 458, 475, 476, and 478 do not fulfill this requirement)  
 French 317, 318, 401, 402, 403, 404  
 German 301, 302, 417, 418  
 Latin-any 300 or 400 level course  
 Religious Studies 320, 325, 351  
 Spanish 411, 412, 413, 414, 415, 416
- V. Classics, Philosophy or Religious Studies ..... 3  
 One course to be selected from the following:  
 Classics-any course except 230, 231, 232, 233  
 Philosophy-any course  
 Religious Studies-any course except 304, 310, 320, 325, 351

**SOCIAL SCIENCES**

1. Courses to be distributed in at least three fields from Economics, Geography, History, Political Science, Psychology, and Sociology and Anthropology ..... 15  
 Economics-any course  
 Geography 100, 203  
 History-any course  
 Political Science-any course  
 Psychology-any course for which the student has the necessary prerequisite, except 223 and 417.  
 Sociology-Anthropology-any course for which the student has the prerequisite except SOC- 344, 345 and 445.

**SCIENCE AND MATHEMATICS**

- I. Natural and Physical Sciences ..... 12  
 Courses to be distributed in at least two fields from biological sciences, chemistry, geology and physics.

(continued)

II. Mathematics, minimum requirement: Completion of one of the following:

MTH 130 or equivalent and one of the of the following:

MTH 122, 140, 225, or MTH 229

See individual program descriptions for specific requirements. All students whose Math ACT score is less than 19 are required to take MAT 097. Credit received in MAT 097 cannot be applied toward the 128 hours required for graduation.

## **DEGREE PROGRAMS**

### **ACADEMIC POLICIES**

For students transferring from another institution into Marshall, the College of Science will permit the application of any appropriate transfer credits accepted by the university to meet general education requirements. For coursework to be accepted as fulfilling upper division requirements, that work must have been earned at institutions accredited to offer junior/senior level courses.

### **BIOLOGICAL SCIENCES**

**Dr. Laura Jenki, Chair**

[www.marshall.edu/biology](http://www.marshall.edu/biology)

[biology@marshall.edu](mailto:biology@marshall.edu)

#### **Professors**

Adkins, Binder, Brumfield, Elmore, Evans, Fet, Gain, Gilliam, Harrison, Hight, Jenki, Joy, May, Pauley, Seidel, Strait-Holman, Valluri

#### **Associate Professors**

Mallory, Somerville

#### **Assistant Professor**

Blough, Collier, Georgel, LoCascio, Zhu

Courses offered by the Department of Biological Sciences are intended to meet the needs of students preparing themselves for careers in the biological and related sciences, or who want a knowledge of the life sciences as part of their general education and/or to satisfy science requirements in other departments or programs.

Majors in the life sciences provide preparation that can lead directly to a variety of careers in industry, government agencies, and the basic and applied health fields. They also provide excellent preparation for pursuing graduate studies leading to professions in the biological and health sciences. All majors require a minimum of 40 hours of coursework in the Department of Biological Sciences. These include 20 hours of core courses, a 2 hour capstone experience requirement (BSC 491) and a minimum of 18-20 hours of electives chosen under the guidance of the faculty advisor to satisfy one of the following majors: Biology; Botany; Environmental Biology; Microbiology; Physiology/Molecular Biology; Zoology. Additional requirements include the specific requirements of the College of Science in humanities and social sciences, and support courses in chemistry, physics, and mathematics listed below:

## CORE COURSES

Biological Science 120, 121*, 320, 322, 324 .....	20 hrs.
Biological Science 491** (Capstone) .....	2 hrs.
Chemistry 211, 212, 217, 218, 355, 356, 361 .....	19 hrs
Physics 201, 202, 203, 204 .....	8 hrs.
Mathematics 132 or 229 or .....	5-8 hrs.
two of the following: MTH 122, 130 (or 127), 140, 225	

\* Students who earn a grade of *A* or *B* in BSC 104 and/or 105 prior to declaring a Biology Major may substitute these courses for BSC 120 and/or 121. Students must earn a grade of *C* or better in BSC 120 & 121 (*B* or better in BSC 104, 105) and a *C* or better in CHM 211 and 212 before they can enroll in any upper-level BSC course except BSC 227, 228 and 250.

\*\*CAPSTONE EXPERIENCE: It is the responsibility of each student to consult his/her advisor regarding details of meeting the capstone requirement. The capstone may be a traditional independent study research project under the supervision of a faculty member selected by the student, or the development and implementation of an internship, co-op, or community-based project.

## MAJORS

### Biology

The biology major is intended for students wanting a broadly based, flexible background in the life sciences. Any BSC course at the 200 level or above (except 227, 228, 250, or 485-488) can be used to satisfy the minimum of 18 hours of electives.

### Botany

A major in botany prepares students who wish to enter graduate programs which emphasize plant biology and it is an appropriate major for those who seek positions in government agencies where a special knowledge of plant science is required. Botany majors must complete a minimum of 18 hours selected from the courses listed below:

- BSC 365 - Introductory Biochemistry
- BSC 405 - Economic Botany
- BSC 415 - Plant Morphology
- BSC 416 - Plant Taxonomy
- BSC 417 - Biostatistics
- BSC 418 - Mycology
- BSC 419 - Plant Anatomy
- BSC 420 - Plant Physiology
- BSC 421 - Phycology
- BSC 430 - Plant Ecology

### Environmental Biology

The major in environmental biology offers opportunities for careers in areas such as environmental health, resource management, and basic and applied ecological research. Eighteen hours of electives must be selected from the following courses:

BSC 302 - General Bacteriology  
BSC 365 - Introductory Biochemistry  
BSC 401 - Ichthyology  
BSC 406 - Herpetology  
BSC 408 - Ornithology  
BSC 409 - Mammalogy  
BSC 410 - Remote Sensing/GIS Appl.  
BSC 411 - Dgtl Image Proc/GIS Model  
BSC 413 - Principles of Organic Evolution  
BSC 415 - Plant Morphology  
BSC 416 - Plant Taxonomy  
BSC 417 - Biostatistics  
BSC 420 - Plant Physiology  
BSC 421 - Phycology  
BSC 422 - Animal Physiology  
BSC 424 - Animal Parasitology  
BSC 430 - Plant Ecology  
BSC 431 - Limnology  
BSC 445 - Microbial Ecology  
BSC 446 - Microbial Ecology Lab  
BSC 460 - Conservation of Forests, Soil, & Wildlife

### **Microbiology**

Students completing the major in Microbiology will be prepared for career opportunities in environmental, pharmaceutical, and industrial microbiology. Students will also be prepared to continue specialization at the graduate level in clinical, food and dairy, soil and sanitary bacteriology, as well as industrial microbiology. Eighteen hours of electives must be selected from the following courses:

BSC 302 - General Bacteriology  
BSC 303 - Readings in Immunology  
BSC 304 - Methods in General Bacteriology  
BSC 365 - Introductory Biochemistry  
BSC 417 - Biostatistics  
BSC 418 - Mycology  
BSC 421 - Phycology  
BSC 424 - Parasitology  
BSC 442 - Advanced Microbiology  
BSC 445 - Microbial Ecology  
BSC 446 - Methods in Microbial Ecology  
BSC 448 - Introductory Immunology  
BSC 450 - Molecular Biology  
BSC 452 - Molecular Biology Lab Techniques

## **Physiology/Molecular Biology**

The major in Physiology/Molecular Biology provides preparation for careers in animal physiology, plant physiology, cell biology, medicine and/or medical research. In addition to the biology courses in this major, Introductory Biochemistry (CHM 365) and Introductory Biochemistry Lab (CHM 366), are strongly recommended as supplements. Eighteen hours are required from the following courses:

- BSC 300 - Histology
- BSC 301 - Vertebrate Embryology
- BSC 302 - General Bacteriology
- BSC 303 - Readings in Immunology
- BSC 304 - Methods in General Bacteriology
- BSC 365 - Introductory Biochemistry
- BSC 417 - Biostatistics
- BSC 420 - Plant Physiology
- BSC 422 - Animal Physiology
- BSC 442 - Advanced Microbiology
- BSC 445 - Microbial Ecology
- BSC 446 - Methods in Microbial Ecology
- BSC 448 - Introductory Immunology
- BSC 450 - Molecular Biology
- BSC 452 - Molecular Biology Lab Techniques

## **Zoology**

The major in Zoology prepares students who have career or graduate school interests that emphasize animal biology. It is appropriate for those who plan to enter medicine, wildlife biology, or related fields. Students may select either Invertebrate Zoology (BSC 212) or Vertebrate Zoology (BSC 214) and at least 8 hours from each of the following blocks:

### *Block 1: Taxonomy/Ecology*

- BSC 401 - Ichthyology
- BSC 406 - Herpetology
- BSC 408 - Ornithology
- BSC 409 - Mammalogy
- BSC 414 - Entomology
- BSC 417 - Biostatistics
- BSC 431 - Limnology

### *Block 2: Structure/Function*

- BSC 300 - Histology
- BSC 301 - Vertebrate Embryology
- BSC 310 - Comparative Vertebrate Anatomy
- BSC 365 - Introductory Biochemistry
- BSC 422 - Animal Physiology
- BSC 424 - Animal Parasitology
- BSC 426 - Medical Entomology

## Computer Skills

The Marshall Plan computer literacy requirement is satisfied by basic computer skills learned, experience with statistical applications, and allocations of computer modeling in the two-semester Principles of Biology sequence and the core courses.

## Minor Requirements in Biological Sciences

A student may qualify for a minor in Biological Sciences by successfully completing, with at least a *C* average, the following courses: BSC 120, 121, and a minimum of 8 additional hours above the 100 level, including at least one course at the 300-400 level. This is a total of 16 hours.

## CHEMISTRY

**Dr. Daniel Babb, Chair**

*www.marshall.edu/chemistry*

*chemistry@marshall.edu*

### Professors

Anderson, Babb, Castellani, Hubbard, Larson, Norton, Schmitz

### Associate Professor

Morgan, Price

### Assistant Professors

Bush, Chai, Frost

Courses offered by the Department of Chemistry provide a program of studies that allows the individual to:

1. Obtain high quality instruction in chemistry as a scientific discipline.
2. Obtain a sound background in preparation for advanced studies.
3. Meet the qualifications of professional chemists and accrediting agencies.
4. Prepare for a professional career in medicine, dentistry, pharmacy, medical technology, engineering, nursing and other fields.

High school students planning to major in chemistry are advised to take one year of high school chemistry, one year of high school physics, and at least three years of high school mathematics (including geometry, algebra, and trigonometry).

The curriculum and facilities of the department have been approved by the Committee on Professional Training of the American Chemical Society.

## Curricula in Chemistry

***B.S. Degree, Major in Chemistry:*** This major in chemistry is intended for students needing a broadly based, flexible science background. The requirements are:

### *Requirements*

### *Credit Hours*

A. Science ..... 64

Chemistry 211, 212, 217, 218, 355, 356, 361,  
307 or 358, 345, 432, 448

31-35

*(continued)*

Upper division Chemistry electives	3
Capstone Experience - Chemistry 490 or 491	2-4
Mathematics through 229 or 140	3-8
Physics 201-204	8
Science and Mathematics electives	10-19
B. General Humanities and Social Science Requirements .....	42-54
C. General Electives from any college .....	10-22
Students interested in careers in technical sales, management, and marketing in the chemical industry are encouraged to take the following courses as electives: Economics 250, 253, Marketing 340, 440 or 442; Management 320.	
Total .....	128

**B.S. Degree, Major in Chemistry, Forensics Emphasis:** This major is intended for students who wish to pursue a career in fields involving forensics. The requirements are:

<i>Requirements</i>	<i>Credit Hours</i>
A. Science .....	71-78
Chemistry 211, 212, 217, 218, 355, 356, 361, 345, 307 or 358, 365, 428, 411, 432	43
Upper division Chemistry electives	3
Capstone Experience – Chemistry 491	2-4
Mathematics through either 229 or 140 and 225	7-12
Physics 201-204	8
Biology 120, 121 and either 322 or 324	12
B. General Humanities and Social Science Requirements .....	42-54
Criminal Justice 321 and either 323 or 422 .....	6
C. General Electives from any college .....	10-22
Total .....	128

**B.S. In Chemistry Degree:** This curriculum meets the standards of the American Chemical Society and is recommended for students intending to enter the chemical profession or intending to pursue graduate work in chemistry. Students who successfully complete the requirements for the B.S. in Chemistry degree will receive a certificate from the American Chemical Society indicating that their degree meets the standards of the Committee on Professional Training. The requirements for this degree are:

<i>Requirements</i>	<i>Credit Hours</i>
A. Chemistry .....	51-52 hours
Principles of Chemistry 211, 212, 217, 218	10
Organic Chemistry 355, 356, 361, 362	12
Physical Chemistry 357, 358	8
Analytical Chemistry 345 and either 411 or 453	7-8

Chemical Information Retrieval 305	1
Inorganic Chemistry 448	4
Capstone Experience - Chemistry 491	6
Seminars 331, 332, 431, 432	CR
Advanced electives	3
B. Physics 211, 202, 203, 204 or equivalent .....	10
C. Mathematics through 231 .....	13-16
D. General College Humanities and Social Science Requirements .....	42-54
E. General Electives .....	0-14
Total .....	128

**Grade Point Average:** A Grade Point Average of 2.0 in all required Chemistry courses as well as an overall 2.0 in all Chemistry courses will be required for either degree program.

**Computer Skills:** Students in either degree program are required to demonstrate their proficiency in the use of computers in chemical applications. This requirement may be met by either passing an exemption exam (given by the department each semester) or by taking CHM 223 or by taking a programming course for a scientifically useful computer language. Any student who fails to pass the exemption exam on the second attempt will be required to fulfill the requirement by completing CHM 223 or an appropriate programming course.

**Honors, Research, and Special Programs in Chemistry:** The department offers a number of unique enrichment programs outside the above curricula that are open to students in either degree program. All entering students in chemistry should contact either the department office or their advisor for full details.

## Minor in Chemistry

The Department of Chemistry awards a minor in chemistry to students who have completed the following courses with a minimum grade of C in each course: CHM 211, 212, 217, 218, and any two additional courses chosen from CHM 307, 345, 355, 356, 357, 358, or 448.

## ENVIRONMENTAL SCIENCE

The Environmental Science degree program prepares graduates for careers in environmental monitoring and impact assessment. Recent graduates have obtained jobs with state and federal regulatory agencies as well as private consulting firms. Other graduates are currently pursuing graduate degrees in environmental assessment and environmental education.

The Environmental Science degree is an integrated program requiring math, communication, and environmental studies courses from the Integrated Science and Technology program, basic science courses from Geology, Biology, Chemistry, and Physics departments, and course options in Business and Liberal Arts. Students in Environmental Science must complete the math and communication sequences in Integrated Science and Technology (IST) as well as 20 hours of Environmental Studies. Students must also complete 25 hours of basic sciences, 16 hours of upper level (300 or 400) science courses, and 18 hours of social science, art, literature, and humanities courses. Transfer students with prior college experience receive equivalent credit for required courses, if possible.

## **Required Courses for completion of the Environmental Science Degree:**

### *Math Requirement:*

IST 130, 131, 230, 231 or equivalents

### *Communication Requirement:*

IST 101, 120, 201, 220, 301 or equivalents

### *Basic Science Requirements:*

CHM 211, 217, 212, and 218

IST 111 or equivalent

IST 212 or PHY 201

GLY 200

IST 160

### *IST Environmental Studies Requirements:*

IST 321, 322, 323, 324, 423, 425, and 428 plus three hours of IST Environmental Studies Elective

Students must also complete 16 hours of 300 or 400 level course work from Chemistry, Biology, Geology, or Physics Departments.

### *Liberal Arts Requirements:*

Art...any course ..... 3 hours

Social Sciences ..... 9 hours

Literature ..... 3 hours

Humanities ..... 3 hours

## **FORESTRY AND ENVIRONMENTAL STUDIES Cooperative Plan of Study**

Marshall University and the Duke University School of the Environment have entered into an agreement whereby a student may spend three years at Marshall followed by two years at Duke. Students who are accepted by Duke for this program pursue one of two degrees: Master of Forestry (M.F.) or Master of Environmental Management (M.E.M.). At the end of the fourth year (minimum of 24 Duke credits) the student may be eligible for the B.S. degree with a major in Biological Sciences from Marshall University. Following the fifth year (minimum total of 48 Duke credits) students may qualify for one of the two professional Master's degrees.

Students are normally admitted only at the beginning of the fall term.

Applications to Duke University should be submitted by February 15 preceding the fall in which admission is desired. Duke requires the Graduate Record Examination (GRE) for admission. Students should arrange to take the GRE in the first semester of the junior year.

The curriculum outlined below shows the courses required of students who seek admission to Duke as biology majors at Marshall. Marshall requires a Grade Point Average (GPA) of 2.5 or higher for the three years of on-campus work. Students are strongly encouraged, however, to maintain a QPA of 3.0 or higher to qualify for acceptance into Duke. Students accepted into the program over recent years have had a mean GPA of approximately 3.3. In the fourth year a sufficient number of hours must be

successfully completed at Duke to total 128 when added to those already completed at Marshall.

Forestry and Environmental Studies majors are required to meet the Marshall University College of Science requirements for the B.S. degree and to take the following courses:

Biological Sciences 120 and 121	8 hrs.
Biological Sciences 320, 322, and 324	12 hrs.
Chemistry 211, 212, 355-356, and 361	15 hrs.
Chemistry 217 and 218	4 hrs.
Physics 201, 202, 203, and 204	8 hrs.
Mathematics 225 and 229	8 hrs.
Economics 250	3 hrs.

## **DEPARTMENT OF GEOLOGY**

**Dr. Ronald L. Martino, Chair**

*[www.marshall.edu/geology](http://www.marshall.edu/geology)*

*[geology@marshall.edu](mailto:geology@marshall.edu)*

### **Professors**

Ghosh, Martino, Sanderson

Programs of study offered by the Department of Geology are designed for individuals seeking a career as an earth scientist. The greatest numbers of geologists are employed by natural resource industries. These include metallic and non-metallic mining companies as well as petroleum, natural gas, and coal companies. New and challenging careers have recently developed in environmental and engineering geology. The majority of graduates in the past few years have found employment with environmental and geotechnical companies. Other employers include geological surveys, and local, state, and federal regulatory agencies. Career opportunities in the teaching profession at the high school and university level may also be available to those with advanced degrees.

The Department of Geology offers 2 degree programs (B.A. and B.S.) which have been recognized and approved by the American Institute of Professional Geologists, a national organization that certifies professional geologists.

The Bachelor of Arts degree in Geology is designed for those who prefer greater curriculum flexibility, are less certain of their career objectives, or who may wish to enter the teaching profession at the junior high or high school level.

The Bachelor of Science degree in Geology is intended for those who wish to directly enter the Geology/Earth Science profession upon completion of the degree or wish to further their education at the graduate level. Coursework can be tailored to emphasize environmental geoscience or fossil fuels.

In addition, the department offers a Bachelor of Science in Geology with emphasis in engineering geology. This area of specialization is one of several that can be pursued and has recently developed as a formal program with its own specific curriculum. It has been added in order to meet the increasing demand for geoscientists who are trained in the acquisition, interpretation, and use of earth materials (rock, soil, ground water) for the

solution of engineering problems. The program provides geologists with specific training that will enable them to effectively interact with and support engineers. Its curriculum involves a heavy emphasis of coursework in math, physics, and engineering. By completing this curriculum, candidates would automatically complete the requirements for a minor in engineering.

The department offers local and distant field trips to provide experience in a variety of natural geological settings. Students also have ample opportunity to participate in independent or cooperative research projects with faculty. The Geology Department currently has a working arrangement with the U.S. Army Corps of Engineers which allows students to work part time at the Corps while pursuing their degrees. Geology majors may also participate in Marshall University's cooperative program with the U.S. Army Corps of Engineers. A co-op student's schedule is crafted by the Department of Geology and the Division of the Corps that employs the student. Following the first year, the student alternates semesters of coursework with semesters of work experience. Completion of the cooperative program normally takes five years.

Geology majors can fulfill two requirements of the Marshall Plan with courses from the geology curriculum. Computer Methods in Geology (GLY 430) fulfills the computer literacy requirement. The capstone experience (GLY 491, 492) is an individualized research project or internship experience requiring a written report and an oral presentation.

High school students interested in geology as a career option are advised to take one year of chemistry, one year of physics or biology, and mathematics through at least geometry, algebra and trigonometry. Courses in physical or earth science are also highly recommended.

## **Requirements**

### *All Majors:*

Chemistry 211, 212; labs. 217, 218

Biology or Physics -4 hrs. -Biological Science 120 or PHY 201-202

Geology 110 (minimum B grade required) or 200, 210L, 201, 211L, 212, 313, 314, 325, 430, 451, 451L, 491 and/or 492

### *Additional requirements for the B.A. Degree Program:*

7-8 additional hours of 300-400 level Geology courses and Math 122 and 130, or Math 132.

Total Geology hours: 39-42

### *Additional requirements for the B.S. Degree:*

Math 229; recommended: Mathematics 230, 231 - especially for those planning graduate work.

Biology or Physics -4 hrs. (Total: 8 hrs.) Biological Science 120 and/or 121 and/or Physics 201-203 and/or 202-204

Geology 421 or 423; plus an additional 11-12 hours selected from GLY 418, 421, 422, 423, 425, 426, 427, 455 and 455L, 456 and 456L, 457.

Total Geology hours: 47-50, depending on course selection

Elective Courses: Geology 280, 281, 282, 283, 485, 486, 487, 488.

GLY 485-488 may be substituted for required choices with approval from the Chairman of the Department of Geology.

## Requirements for Engineering Geology area of emphasis:

Mathematics 229, 230, 231 .....	13
Chemistry 211, 212, 217, 218 .....	10
Physics 211, 212 (or 202), 213, 214 (or 204) .....	10
Geology 200, 210L, 201, 211L, 212, 313, 314, 325, 430, 451, 451L, 455, 455L, 456, 456L, 457; 421 or 423; .....	45
Geology 491 and/or 492 .....	4
Engineering Mechanics 107, 213, 215, 216, 280, and 5 hours from 285-288 or GLY 485-488 with approval of GLY chair .....	14
English: 101 & 102 , 354 .....	9
Communication Studies 103 or 104H or 305 or proficiency .....	0-3
Literature courses to be selected from: .....	3
Classics 230, 231, 232, 233, 234	
English - any 300 or 400 level literature course, except ENG 354	
French 317, 318, 401, 402, 403, 404	
German 301, 302, 417, 418	
Latin - any 300 or 400 level course	
Religious Studies 304, 310, 320, 325, 351	
Spanish 318, 319, 321, 402, 403	
Classics/Philosophy or Religious Studies .....	3
One course to be selected from the following:	
Classics - any course <i>except</i> 230, 231, 232, 233	
Philosophy - any course	
Religious Studies - any course <i>except</i> 304, 310, 320, 325, 351	
Social Sciences: .....	15
Economics - any course	
Geography 100, 203	
History - any course	
Political Science - any course	
Psychology - any course with proper prerequisite <i>except</i> 233 and 417	
Sociology/Anthropology - any course with proper prerequisite except SOC 344, 345 and 445	

A total of 16 hours of engineering coursework is required. Other engineering courses may be substituted (maximum of 7 hours) for the required ones where deemed appropriate by the Geology and Engineering Department Chairs.

The engineering geology area of emphasis will require 4 hours of capstone experience (GLY 491 and/or 492) which will be devoted to a senior thesis or an internship. This will involve a research project that will involve the acquisition, analysis, and interpretation of data related to any topic within the scope of engineering geology. A written thesis and oral defense will be required which will need the approval by a majority of geology faculty, including the student's thesis director.

## Minor in Geology

The Department of Geology awards a minor in geology to any student who has successfully complete, with at least a C average, 12 hours of Geology coursework. At least 9 hours must be in courses at the 200 level or above.

## INTEGRATED SCIENCE AND TECHNOLOGY

**Dr. Ralph W. Taylor, Chair**

*[www.marshall.edu/isat/](http://www.marshall.edu/isat/)*

*[isat@marshall.edu](mailto:isat@marshall.edu)*

### Professors

Adkins (MTH), Bellis (PHY), Little (IST), Oberly (PHY), Silver (MTH), Taylor (IST), Valluri (BSC)

### Associate Professors

Blanchetot (IST), Denvir (MTH), Murray (IST)

### Assistant Professors

Brooks (MTH), Dementiev (IST), Dementieva (MTH), Gooding (IST), Lawrence (MTH), Morgan, (IST), Saveliev (MTH)

The B.S. degree in Integrated Science and Technology offers work in three concentrations:

- Biotechnology
- Computer and Information Technology
  - Software Development
  - Network Administration
  - Database Management
- Environmental Assessment and Policy

The Integrated Science and Technology degree program provides an alternative to traditional programs in science and technology. Individual courses have subject matter from different disciplines integrated into new configurations, moving beyond single-subject courses. In addition, the program itself integrates subjects into a unified sequence of courses that provides a conceptual whole for students. To accomplish this the IST program brings together faculty and subject matter from engineering, chemistry, physics, biological sciences, computer and information science, mathematics, English, communication studies, management, and medicine to create a unique degree program.

The IST degree program has the following objectives:

- To create a more effective method of engaging students by presenting the value and excitement of science and technology in today's world;
- To provide for the development of communication skills throughout the curriculum, thus enhancing each students' potential for successful employment,
- To demonstrate the importance of science and technology to the needs of society and relate the issues of society to those who engage in science and technology-  
(continued)

- To integrate the use of computers and expert systems as a curriculum tool to teach decision-making, information gathering, and communication
- To provide a broad, interdisciplinary curriculum that will more fully prepare graduates for changing employment opportunities;
- To create future employees who have solid backgrounds in science and technology as well as the communication and people skills necessary to work in a flexible and changing work environment.

**Admission Standards**

- A composite score on the ACT test of at least 21;
- A mathematics score on the ACT test of at least 21;
- Recommended are at least two years of study in a modern foreign language;
- In addition to two years of algebra, a unit of geometry and a unit of trigonometry or advanced mathematics is also recommended.

**Program Components**

The College of Science Social Science General Requirements do not apply to students in the Integrated Science and Technology program. Marshall Plan requirements do apply. The IST program has four major components:

- General education requirements that include communication courses, “connections” courses that examine the relationships between society and science and technology, courses in the liberal arts, social sciences, a modern foreign language, and a public service/volunteerism experience;
- Core courses consisting of analytical methods, instrumentation, and the Issues in Science and Technology block.
- Strategic Sector courses, taken in the Junior year, that allow students to begin work toward their concentration while examining other areas of the program, including courses in management.
- Concentration courses, which replace the traditional major, including a senior “capstone” project which can be a research project, development of software, a thesis, or other project that serves as the culmination of the student’s work in the field. Concentrations in Integrated Science and Technology are Biotechnology, Computer and Information Technology and Environmental Assessment and Policy.

The Integrated Science and Technology degree is a four-year program that requires 128 credit hours.

**BACHELOR OF SCIENCE DEGREE  
IN INTEGRATED SCIENCE AND TECHNOLOGY**

**GENERAL EDUCATION REQUIREMENTS**

**Hours**

Communications

IST 101 Fundamentals of Communication.....	4
IST 201 Advanced Communications .....	4

Connections	
IST 120 Connections 1 .....	2
IST 220 Connections 11 .....	2
Humanities, Arts, and Literature	
Classics, Philosophy, or Religious Studies .....	3
Literature .....	3
(A course in literature from English, Classics or those offered in Spanish, French or German, as well as an appropriate Honors course.)	
The Arts: ART 112, MUS 142, or THE 112 .....	3
Language and Cross-Cultural Experience .....	3-12
Students may meet the language and cross-cultural experience requirement by completing FRN 203 and 204, GER 203 and 204, SPN 203 and 204, or JPN 203 and 204.	
Students will be encouraged to meet this requirement through enrollment in a language study program, offered either by Marshall University or another institution, that includes intensive work in a modern foreign language.	
Social Science* .....	9
Social Science courses are to be distributed in at least three fields chosen from Economics, Geography, History, Political Science, Psychology, and Sociology/Anthro- pology.	
Economics: any course.	
Geography: Any course except 101	
History: any course	
Political Science: any course	
Psychology: any course except 223 and 417.	
Sociology/Anthropology: any course except SOC 344, 345, and 445.	
*In selecting a social science course students should be sure they meet the Interna- tional or Multicultural portions of the Marshall Plan.	
Public Service/Volunteer Experience	
IST 301 Public Service Experience .....	1
Each student will participate in a public service or volunteer experience, selected with permission from his or her advisor, which gives the student an experience working in a volunteer capacity with a group, organization, or agency that offers a service to the general public. Such experience should consist of at least 30 contact hours accumu- lated over a year or less and should be related to the area of concentration.	
Elective Course .....	3
Each student shall select an elective course, that is not a science or mathematics course, from among those offered by the university, with approval from his or her advisor.	
Total Required General Education Hours .....	40

## PROGRAM REQUIREMENTS

**Hours**

### CORE COURSES

Analytical Methods .....	16
IST 130 Analytical Methods I: Statistics	4
IST 131 Analytical Methods II: Differential Calculus	4
IST 230 Analytical Methods III: Integral Calculus	4
IST 231 Analytical Methods IV: Advanced Math Topics	4
Issues in Science and Technology .....	7
IST 111 Issues I: Living Systems	4
IST 212 Issues IV: Energy	3
Instrumentation .....	6
IST 160 Programming with Visual Basic*	3
IST 163 Programming Practicum with C++**	3
Total hours in Core Courses .....	34

\*Required of students in Computer and Information Technology.

\*\*Required of students in Biotechnology and Environmental Assessment and Policy.

### STRATEGIC SECTORS

Students should choose 24 hours from one or more of the following areas: Biotechnology, Computer and Information Technology, or Environmental Assessment and Policy; or from areas outside IST that complement their chosen concentration.

Total hours in Strategic Sectors: ..... 24

### CONCENTRATIONS

Students must take four courses, 12-14 hours, at the 300 or 400 level in one of the following concentrations: Biotechnology, Computer and Information Technology, or Environmental Assessment and Policy.

Students in Computer and Information Technology may take one of three tracks: Software Development, Network Administration, or Database Management.

Total hours from a Concentration .....	12-14
Senior Project .....	6
IST 490, Senior Project I	3
IST 491, Senior Project II	3

Science or Technical Electives..... 12-14

**TOTAL CREDIT HOURS FOR GRADUATION ..... 128**

### COMPUTER LITERACY

The Marshall Plan computer literacy requirement is met by work taken in IST 101 and 120, IST 130, and IST 160.

## MINORS IN INTEGRATED SCIENCE AND TECHNOLOGY

Students interested in a minor must complete 12 credit hours of work which may be from any courses offered by the IST program. For specific suggestions as to minor courses that might complement the work in the major, please consult the IST faculty.

### COURSE OF STUDY

#### YEAR ONE

<i>Fall Semester</i>		<i>Spring Semester</i>	
IST 101 Fund. of Communication .....	4	IST 131 Analytical Methods II: Differential Calculus .....	4
IST 120 Connections .....	2	IST 212 Issues: Energy .....	3
IST 130 Analytical Methods I: Statistics .....	4	*IST 163 Programming Practicum w/C++ .....	3
IST 111 Issues: Living Systems .....	4	**IST 241 Intro to DNA Cloning .....	4
IST 160 Programming with Visual Basic .....	3	General Education .....	<u>3-6</u>
UNI 101 New Student Seminar .....	<u>1</u>		17-20
	18		

#### YEAR TWO

<i>Fall Semester</i>		<i>Spring Semester</i>	
IST 230 Analytical Methods III: .....	4	IST 201 Advanced Communication .....	4
Integral Calculus .....	4	IST 220 Connections II .....	2
*IST 236 Data Structures .....	3	IST 231 Analytical Methods IV: Advanced Mathematical Topics .....	4
*IST 263 Web/Java Programming .....	3	*IST 238 Algorithms .....	3
*EG 221 Engineering Economy .....	3	**CHM 212 Prin. of Chemistry II .....	3
**CHM 211 Prin. of Chemistry I .....	3	General Education .....	3
*IST 342 Bioscience Res. Methods .....	2	IST 301 Public Service Experience .....	<u>1</u>
General Education Course .....	<u>3</u>		17
	**15/*16		

#### YEAR THREE

<i>Fall Semester</i>		<i>Spring Semester</i>	
Strategic Sector Courses .....	12	Strategic Sector Courses .....	12
General Education Courses .....	<u>6</u>	General Education .....	<u>3</u>
	18		16

#### YEAR FOUR

<i>Fall Semester</i>		<i>Spring Semester</i>	
Concentration Courses .....	6	Concentration Courses .....	6
Senior Project .....	3	Senior Project .....	3
General Education .....		General Education or Technical Electives .....	<u>6</u>
or Technical Electives .....	<u>6</u>		15
	15		

\*Courses required of CIT concentration.

\*\*Courses required of Environmental and Biotechnology concentrations.

All others are required of all majors.

Students interested in specific courses that would provide work in software development, network administration, database management, or work in various areas of Biotechnology or Environmental Assessment and Policy should consult with the faculty in the IST program or see the program's World Wide Web site ([www.marshall.edu/isat](http://www.marshall.edu/isat)).

## **MATHEMATICS**

**Dr. Ralph W. Oberste-Vorth, Division Head**

*www.marshall.edu/math/*

*math@marshall.edu*

### **Professors**

Adkins, Aluthge, Carlton, Cusick, Drost, Hatfield, Lancaster, Oberste-Vorth, Peele, Pupplo-Cody, Rubin, Silver

### **Associate Professors**

Horwitz, Lawrence, Mitchell

### **Assistant Professors**

Brooks, Dementieva, Sarra, Saveliev

The Department of Mathematics offers a Bachelor of Science degree program which prepares students for careers in the mathematical sciences and related disciplines. The program provides a solid mathematical foundation which enables students to perform successfully in industrial, business or government positions, or in graduate studies in mathematics or related areas such as engineering and economics. It may also be used to prepare for secondary mathematics certification or for professional programs such as law and medicine.

Mathematics also serves as an essential tool for many other majors, and it plays an important role in the general education of all students. The Department of Mathematics at Marshall University makes every effort to help students learn valuable critical thinking and problem-solving skills.

Majors must fulfill the general and specific requirements for the B.S. degree in the College of Science. Students should go to the College of Science dean's office, Science 270, in order to declare a mathematics major. Within the 128 semester hours required for the B. S. degree, the major in mathematics must complete the following coursework.

The program requires the following core courses for all majors:

1. MTH 229, 230, 231, 300, 301, 330, 427, 445, 450, and 491
2. A minimum of two electives from the following list: MTH 335, 340, 411, 415, 442, 443, 446, 448, or 449, at least one of which must be MTH 428 or MTH 446

Transfer students who wish to major in mathematics must complete at least nine hours of 300-400 level coursework at Marshall University.

The mathematics capstone course is MTH 491. In this course, students explore topics related to a theme chosen by the instructor and are given experience in researching, writing, and presenting mathematics. Students may substitute an internship in mathematics in lieu of the capstone course.

The American College Test score in Mathematics is utilized for the placement of students. Relevant information regarding such placement is included under prerequisites in the Courses of Instruction. Students wishing to challenge their placement in a mathematics course may do so by taking the Accuplacer Placement Exam administered from time to time by the Marshall Community and Technical College.

A student enrolled in Marshall may receive credit for certain courses in mathematics by successfully completing the appropriate examination of the College Level Examination Program (CLEP).

Advanced placement in mathematics is granted on the basis of Educational Testing Service Advanced Placement Test scores. Students who score 4 or 5 on the Calculus AB examination are given credit for Mathematics 130 and Mathematics 229, and those who score 4 or 5 on the Calculus BC examination are given credit for Mathematics 229 and Mathematics 230. Students who score 3 on BC are given credit for MTH 229; those who score 3 on AB are given credit for Mathematics 132.

### **Teacher Certification in Mathematics**

Students interested in pursuing teaching certification in mathematics should see the dean of the College of Education and Human Services.

### **Master of Arts**

The Department of Mathematics also offers an M.A. degree program in mathematics. Graduate assistantships carrying stipends and tuition waivers are available. Please contact the Mathematics department or consult the *Graduate Catalog* for further details.

### **Minor in Mathematics**

The Department of Mathematics offers a minor in mathematics available to all students at Marshall University. Students choosing this minor will find expanded job opportunities in business, education, government, and industry.

This minor can be helpful to students in pre-professional programs in the health sciences. A solid grounding in the fundamentals of mathematics is needed in order to perform satisfactorily on aptitude examinations that must be taken prior to admission to a professional school.

This minor can be used as an important component of a student's preparation for admission to law school.

A student may qualify for a minor in mathematics by successfully completing, with at least a C average, the following courses: MTH 229 (5 hours), 230 (4 hours), and a minimum of six additional hours of courses numbered MTH 225 or higher.

## **PHYSICS**

**Dr. Nicola Orsini, Chair**

[www.marshall.edu/physics](http://www.marshall.edu/physics)

[physics@marshall.edu](mailto:physics@marshall.edu)

### **Professors**

Bady, Bellis, Oberly, Orsini, Shanholtzer, Wilson

### **Associate Professor**

Vaseashta

The Department of Physics and Physical Science offers coursework leading toward the B.S. degree in physics. The physics major must complete all College of Science general requirements for the B.S. degree.

The physics major must complete the calculus sequence through differential equations and a minimum of 38 hours of required coursework in the major. The completion of the B.S. in physics prepares the graduate for graduate school in physics or engineering, medical school, or other professional programs; or for direct employment in government or industrial laboratories, and other technically related fields.

Among the coursework options open to physics and other science majors are applied physics courses which emphasize applications of optics (PHY 440), electronics (PHY 430), and radiation (PHY 450) to the medically related fields.

Additional related programs within the department lead to an A.B. degree with a specialization in physics and/or general science, and an M.S. degree in physical science.

The physics major working to complete a B.S. degree is required to complete:

1. Physics 211, 202, 213, 204, or equivalent.
2. Physics 300, 302, 320, 330, 442, and 491 (the capstone course).
3. Ten additional semester hours of 300-400 physics courses selected from the catalog, including at least 4 semester hours of advanced laboratory courses (Physics 405, 415, 421, 463).
4. Mathematics 229, 230, 231, 335.

Majors in physics must demonstrate to the department faculty fundamental skills in utilizing computers, which include using software packages for data analysis and word processing, interfacing experiments for data collection, and computer modeling. Students lacking these skills can fulfill this requirement by taking appropriate courses which have the approval of the Department of Physics and Physical Science.

### **Minor in Physics**

The Department of Physics awards a minor in physics to students who have completed the following courses with at least a C average: PHY 201 (or 211), 202, 203 (or 213), 204, and any two additional physics or physical science courses at the 300-400 level.

## **PREPARATION FOR PROFESSIONAL CAREERS IN THE HEALTH CARE PROFESSIONS**

Even though many freshmen plan to major in pre-medicine, it is not a major. It is a path through a major by which the student acquires a solid science background in preparation for application to the professional school of choice. Students interested in the health care professions may choose any major provided they complete the required science block. However, choosing a science major gives the applicant the advantage of greater scientific breadth and depth of knowledge over non-science majors on the Medical College Aptitude Test (MCAT) or other entrance exams. Since the required science courses coincide closely with requirements for the biology or chemistry major a large percentage of successful applicants choose one of those two areas. Many routes will prepare the student for the MCAT or other entrance exam and for the first two years of basic sciences in the medical or other health care curriculum.

Since the same required science block must be completed by students preparing for careers in medicine, osteopathic medicine, dentistry, pharmacy, podiatry, optometry, or veterinary medicine, flexibility can be maintained in the selection of a career choice until the junior year. Applicants must take the following:

### *Pre-Health Care Required Science Block*

BSC 120, 121

CHM 211, 217, 212, 218, 355, 356, 361

PHY 201, 202, 203, 204

The required science block must be regarded as a minimum. Building a science major around this nucleus of courses provides a sound science background. Additional required or recommended courses are subject to change and vary among schools and programs. The responsibility lies with the student to become aware of all requirements and course recommendations for the institutions to which he or she intends to apply and incorporate required courses into the curriculum. Elective courses can be chosen that simultaneously meet both the requirements for the major and admission to the professional school of choice. With careful planning the required and recommended courses can be combined with the coursework for the major directing the steady progress toward both application to professional school and graduation with the baccalaureate degree. Check with your advisor frequently for guidance and assistance.

Undergraduate requirements, admissions testing, application processes, and the requirement for an interview vary considerably among the professional programs. Therefore, it is strongly recommended that pre-professional students discuss their programs at least once each semester with one of the following members of the Pre-Professional Advisory committee: Dr. Daniel R. Babb (Chemistry), Co-Chairman; Dr. James E. Joy (Biology), Co-Chairman; Dr. David Mallory (Biology); Dr. Suzanne Strait-Holman (Biology); Dr. Wayne Elmore (Biology); Dr. Ralph Taylor (Biology), or other assigned advisor. For current information, consult the preprofessional web page at [www.marshall.edu/preprof](http://www.marshall.edu/preprof).

## **PRE-HEALTH CARE PROFESSIONAL PROGRAMS**

The requirements listed below are based on the standards for admission to West Virginia health care professional programs or those of contract states with whom West Virginia has agreements for West Virginia students to attend out-of-state institutions.

Because there may be specific requirements that vary among institutions and are subject to change, students should use the lists only for comparison of programs during the initial selection of the career path to follow. Students should frequently consult the pre-health care professional web site at [www.marshall.edu/preprof/](http://www.marshall.edu/preprof/) to keep abreast of the requirements at the institutions and programs of interest. To increase the strength of the applicant's academic credentials, the completeness of the application, and to plan a strategy for successful admission frequent contact with the assigned pre-health care professional advisor is highly recommended.

### **PRE-DENTAL (3 or 4 years)**

*Courses:* Biological Science (BSC) 120, 121  
Chemistry (CHM) 211, 212, 217, 218, 355, 356, 361  
English (ENG) 101, 102  
Physics (PHY) 201, 202, 203, 204

*Exams:* DAT in the spring of sophomore year for 3-year students or during junior year for 4-year students

*Other Courses:* 12 hours from Art, English, Literature, Languages, Music, Philosophy, Religious Studies (must be distributed in at least three fields); 6 hours from Geography, History, Political Science, Psychology, Sociology, Anthropology

*Recommended Electives:* BSC 301 and CHM 365

### **PRE-MEDICINE (3 or 4 years)**

*Courses:* Biological Science (BSC) 120, 121

Chemistry (CHM) 211, 212, 217, 218, 355, 356, 361

English (ENG) 101, 102

Mathematics (MTH) 130 or 127 and 122

(requirement may also be met by 132, 140, or 229)

Physics (PHY) 201, 202, 203, 204

Social and Behavioral Science: PSY 201 and SOC 200  
are recommended

*Exams:* Applicants must complete the MCAT, preferably in fall before entry into the medical school. However, in some cases the exceptional student, after counseling with his/her advisor, may choose to take the MCAT during the spring semester of the sophomore year

*Other Courses:* Follow catalog for degree requirements B.S. or B.A.

*Recommended Electives:* BSC 301, 302, 310, 322, 422; CHM 365; PSY 408, 440

### **PRE-OPTOMETRY (3 years)**

*Courses:* Biological Science (BSC) 120, 121 and 250 or 302

Chemistry (CHM) 211, 212, 217, 218, 355, 356, 361

English (ENG) 101, 102

Mathematics (MTH) 140 or 229 (depending on placement, students may need 130 or 127 and 122); 225

Physics (PHY) 201, 202, 203, 204

Psychology (PSY) 201

*Exams:* The Optometry Admission Test (OAT) must be completed, preferably in fall before entry into the optometry program.

*Other Courses:* Check carefully catalog of Optometry College. Requirements vary.

*Recommended Electives:* BSC 227, 228, 300, 322, 324; CHM 365; PSY 311 or 440

### **PRE-PHARMACY (3 or 4 years)**

*Courses:* Biological Science (BSC) 120, 121

Chemistry (CHM) 211, 212, 217, 218, 355, 356, 361

Communications (CMM) 103

Economics (ECN) 250

English (ENG) 101, 102

Mathematics (MTH) 140 or 229 (depending on placement, students may need 130 or 127 and 122)

Physics (PHY) 201, 202, 203, 204

*Exams:* The Pharmacy College Admission Test must be completed, preferably in fall before entry into the pharmacy program.

*Other Courses:* 12 hours from Art, English, Literature, Languages, Music, Philosophy, Religious Studies (must be distributed in at least three fields); 6 hours from Geography, History, Political Science, Psychology, Sociology, Anthropology

### **PRE-PHYSICAL THERAPY (4 years)**

*Courses:* Biological Science (BSC) 120, 121, 227, 228

Chemistry (CHM) 211, 212, 217, 218  
English (ENG) 101, 102  
Mathematics (MTH) 130 or 127 and 122  
(requirement may also be met by 132, 140 or 229); 225  
Physics (PHY) 201, 202, 203, 204  
Psychology (PSY) 201, 311  
Medical Terminology (AH) 151

*Exams:* AHPAT – junior/senior year

*Other Courses:* 12 hours from Art, English Literature, Languages, Music, Philosophy, Religious Studies or Speech (must be distributed in at least three fields); 6 hours from Economics, Geography, History, Political Science, Sociology, Anthropology

*Other Requirements:* 60 hours of clinical volunteer or work experience in a physical therapy setting is required for admission.

### **PRE-VETERINARY MEDICINE (4 years)**

*Courses:* Biological Sciences (BSC) 120, 121, 250 or 302  
Chemistry (CHM) 211, 212, 217, 218, 355, 356, 365  
English (ENG) 101  
Genetics (BSC) 324  
Mathematics (MTH) 130 or 127 and 122  
(requirement can also be met by 132, 140, or 229)  
Physics (PHY) 201, 202, 203, 204

*Exams:* MCAT, VAT, or GRE plus GRE Advanced Biology Section

*Other Courses:* Follow catalog for degree requirements for a B.S. or B.A.

*Recommended Electives:* BSC 322, CL 200, SOC 200, BSC 301

### **COMBINED COLLEGE AND PROFESSIONAL DEGREES**

The vast majority of applicants graduate with their baccalaureate degrees before entering a health career preprofessional school. A few outstanding students with 90 or more hours may be admitted through early admission to medical schools or the other health care programs before the baccalaureate degree is completed. A student who gains early admission to a doctoral level program in medicine will be granted a leave of absence during the senior year at Marshall University. The student must file a written report in the College of Science Dean's Office immediately after gaining admission to the professional school and before the termination of coursework at Marshall University.

At the end of the first year in the professional school the student is then eligible for the baccalaureate degree from Marshall University, provided that all requirements for graduation are met except the completion of a major. At least 96 hours of study must have been completed with a Grade Point Average of 2.0 at Marshall University. An applicant for the baccalaureate degree must present certification from the professional school that he or she has successfully completed the first year of coursework, and that a sufficient number of semester hours has been completed to total 128 when added to the hours earned at Marshall University. Candidates for the degree must attend the regular Marshall University commencement, or have permission to graduate *in absentia*.