

Richard A. Henson

Henson School of Science and Technology

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Majors & Minors

Bachelor of Science

- Biology
 - Dual Degree: Biology and Environmental Science
- Chemistry
- Computer Science
- Earth Science
- Geography
- Mathematics
- Physics
 - Dual Degree: Engineering Transfer
- Urban and Regional Planning

Minors

- Actuarial Science
- Biology
- Chemistry
- Computer Science
- Data Science
- Earth Science
- Geographic Information Science
- Geography
- Mathematics
- Mechanical Engineering
- Physics
- Statistics
- Urban and Regional Planning

Master of Science

- Applied Biology
- Geographic Information Systems Management
- Mathematics Education



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School Information

The mission of the Richard A. Henson School of Science and Technology is to provide an outstanding student-centered learning environment in which expert faculty empower students with knowledge and skills in the sciences, mathematics and engineering. The Henson School prides itself in recruiting diverse faculty and students and providing a highly collaborative environment in the classroom, laboratory, field and clinical settings. Additionally, the Henson School collaborates with employers and post-graduate institutions in order to support successful career pathways for its graduates. Within Henson School majors, students develop the knowledge and skills they need to function as professionals within their disciplines and as informed citizens.

The curricula provide sound foundations for science, mathematics and computer science majors and include courses supporting the University’s General Education mission. In addition to its integral role in liberal arts education, the school provides core courses in science for several programs in other schools at the University.

Students in the Henson School of Science and Technology work closely with their advisors on coursework, program planning and career development. In addition to traditional majors in the sciences, students can select from a variety of interdisciplinary, dual-degree and pre-professional programs. Students are encouraged to engage in undergraduate research projects, internships and cooperative learning experiences. Faculty coordinators are available in each department to assist students in arranging internships and co-op experiences. Graduates from the school typically begin careers in science, technology and secondary education or continue their education in graduate or professional schools.

There are several scholarships for students enrolled in majors in the Henson School of Science and Technology. The endowment of the school established the Richard A. Henson Scholars Program. These scholarships are available to high ability students majoring in any department within the school and can be renewed annually. More information is available in the "Financial Aid" section of this catalog.

Specific programs within the Henson School of Science and Technology are accredited by the following professional organizations:

American Chemical Society Committee on Professional Training

Richard A. Henson, founder and chairman of Henson Aviation, endowed the School of Science in 1988 creating the Richard A. Henson School of Science and Technology. An avid pilot, he founded the Henson Flying Service in his hometown of Hagerstown, MD, in 1931 when he was only 21 years old. During World War II he was a test pilot for Fairchild Industries in Hagerstown, then developing and manufacturing training and fighting planes for the nation's wartime flyers. After the war he turned his ideas and expertise as a flyer toward civil aviation and in 1967 started the first commuter service for Allegheny Airlines connecting Hagerstown to Baltimore and Washington, D.C. In 1981 he moved his corporate headquarters to Salisbury describing this as "the model commuter city in the United States." After a period of phenomenal growth he sold the airline to Piedmont Aviation Inc. in 1983, which in turn was bought out by USAir in 1987. Over the years, Henson has given numerous substantial financial gifts to other local educational institutions as well as the YMCA, the Boy Scouts of America, the Peninsula Regional Medical Center and the Greater Salisbury Committee. The Richard A. Henson Foundation made a generous gift to support the recently established Richard A. Henson Foundation Medical Simulation Center at Salisbury University.

HENSON SCHOOL COURSE REPEAT POLICY

Students may repeat courses offered by the Henson School of Science and Technology one time at SU without special permission. This policy applies to all undergraduate courses offered in the Henson School of Science and Technology. Details for the policy are found in Appendix F.

Departments

BIOLOGICAL SCIENCES

www.salisbury.edu/biology

Majors: Biology, Biology and Environmental Science (dual degree with UMES)

Minors: Biology

Graduate: M.S. Applied Biology

(See "Undergraduate Minors" section for details.)

Chair

Professor F. Les Erickson, Ph.D.; University of Texas at Dallas

Associate Chair

Professor Elizabeth A.B. Emmert, Ph.D.;

University of Wisconsin Madison

Professors

Ann M. Barse, Ph.D.; University of Maryland College Park

Christopher H. Briand, Ph.D.; University of Guelph

Mark F. Frana, Ph.D.; University of Kansas

Stephen C. Gehrlich, Ph.D.; Tufts University

Samuel Geleta, Ph.D.; Oklahoma State University

Mark A. Holland, Ph.D.; Rutgers University

Kimberly L. Hunter, Ph.D.; University of Nevada Las Vegas

Ryan C. Taylor, Ph.D.; University of Louisiana-Lafayette

E. Eugene Williams, Ph.D.; Arizona State University

Associate Professors

Philip D. Anderson, Ph.D.; Case Western Reserve University

Patti T. Erickson, Ph.D.; University of California, Berkeley

Aaron S. Hogue, Ph.D.; Northwestern University

Eric Liebgold, Ph.D.; University of Virginia

Victor A. Miriel, Ph.D.; Old Dominion University

Jennifer F Nyland, Ph.D.; State University of New York

Upstate Medical University

Dana L. Price, Ph.D.; Ph.D., Rutgers University

Assistant Professors

Anna Jo J. Auerbach, Ph.D.; University of Tennessee

Christina J. Bradley, Ph.D.; University of Hawaii Manoa

Michael Carter, Ph.D.; The Ohio State University

Xuan Chen, Ph.D.; Louisiana State University

Jessica Kennett Clark, Ph.D.; Florida State University

Jeremy R. Corfield, Ph.D.; University of Auckland

Visiting Assistant Professor

Kim Quillin, Ph.D.; University of California Berkeley

Senior Lecturers

Claudia Morrison-Parker, Ph.D.; Indiana University

Wanda Perkins, M.S.; Salisbury University

Betty Lou Smith, Ph.D.; University of Maryland College Park

Lecturers

Roie L. Cordrey, M.S.; Salisbury University

Mary R. Gunther, M.S.; John Hopkins University

Krispen L. Laird, M.S.; Salisbury University

Kumudini Munasinghe, Ph.D.; University of Maryland Eastern Shore

The Department of Biological Sciences offers degrees in the biological sciences and, through cooperation with the University of Maryland Eastern Shore, a program leading to dual degrees in biology and environmental science. The department's mission is threefold:

1. Assist students majoring in biology and associated health disciplines and environmental science prepare for advanced degree work or postgraduate employment.
2. Assist students not majoring in science develop an appreciation and fundamental knowledge of the principles governing life.
3. Nourish in all students the ability to apply the scientific process and to think critically about contemporary problems in the biological sciences.

The department shares the University's commitment to

developing in students the fundamental communication skills that characterize educated persons and the technical knowledge and skills that will allow them to become outstanding professional biologists.

The biology major includes a required core, which introduces students to the basic concepts of modern biology. The core will allow students to prepare for careers as professional biologists in many prominent subdisciplines. The environmental/marine science dual degree program is an applied program leading to graduate school or employment in these areas. A program leading to secondary teacher education certification is also available.

The Department of Biological Sciences operates under the guidelines "Resolutions on the Use of Animals in Research, Testing and Education" as adopted in 1990 by the American Association for the Advancement of Science (AAAS).

CHEMISTRY

www.salisbury.edu/chemistry

Major: Chemistry

Minor: Chemistry

(See "Undergraduate Minors" section for details.)

Chair

Professor David F. Rieck, Ph.D.; University of Wisconsin Madison

Associate Chair

Associate Professor Robert D. Luttrell, Ph.D.; University of Tennessee

Professors

Stephen A. Habay, Ph.D.; University of Pittsburgh

Katherine Miller, Ph.D.; Washington University

Associate Professors

Anita Brown, Ph.D.; University of Delaware

Alison Dewald, Ph.D.; The University of Virginia

Seth Friese, Ph.D.; University of California, San Diego

Assistant Professors

José Juncosa, Ph.D.; Purdue University

David Keifer, Ph.D.; Indiana University Bloomington

Anthony Rojas, Ph.D.; Massachusetts Institute of Technology

Joshua Sokoloski, Ph.D.; Pennsylvania State University

Lena Woodis, Ph.D.; University of Wisconsin Madison

Senior Lecturer

Mindy Howard, B.S.; University of Oklahoma at Norman

Lecturers

Brent Alogna, B.S.; Salisbury University

Danielle Kanouse, B.S.; Salisbury University

William Oloo, Ph.D.; University of Maryland College Park

Cynthia Watson, M.Ed.; Salisbury University

The Chemistry Department offers different tracks leading to the Bachelor of Science in chemistry, including two American Chemical Society (ACS)-certified programs and a program leading to secondary education teacher certification.

The department's curricula foster the development and expression (verbal and written) of rational thought. The faculty attempt to impart an understanding and appreciation of chemistry along with the knowledge, safe laboratory skills and personal integrity necessary for students to be productive members of the larger community of professional chemists. Because chemistry is an experimental discipline, the laboratory experience fosters a sense of self-confidence and independence, as well as an appreciation for the importance of original investigation. Since the study of chemistry is discovery-based, the department is committed to providing meaningful and interesting research experiences in well-equipped laboratories.

GEOGRAPHY AND GEOSCIENCES

www.salisbury.edu/geography

Majors: Earth Science, Geography,

Urban and Regional Planning

Minors: Earth Science, Geographic Information

Sciences, Geography,

Urban and Regional Planning

(See "Undergraduate Minors" section for details.)

Upper-Division Certificate: Geographic Information

Science Fundamentals

Graduate: M.S. GIS Management

Chair

Associate Professor Daniel W. Harris, Ph.D.;

University of Maryland College Park

Associate Chair

Professor Brent R. Skeeter, Ph.D.; University of Nebraska-Lincoln

Professors

Amal K. Ali, Ph.D.; Florida State University

Xingzhi Mara Chen, Ph.D.; University of Iowa

Mark de Socio, Ph.D.; University of Cincinnati

Arthur Lembo, Ph.D.; State University of New York College of

Environmental Science and Forestry

Fulbert Namwamba, Ph.D.; Iowa State University

Darren B. Parnell, Ph.D.; University of South Carolina

Michael S. Scott, Ph.D.; University of South Carolina

Brent J. Zaprowski, Ph.D.; Lehigh University

Associate Professors

Gina Bloodworth, Ph.D.; Pennsylvania State University

Thomas Cawthern, Ph.D.; University of New Hampshire

Stuart E. Hamilton, Ph.D.; University of Southern Mississippi

Visiting Assistant Professor

Andrea Presotto, Ph.D.; University of Sao Paulo &

Ph.D.; University of Georgia

Lecturers

Keota Silaphone, M.S.; University of Cincinnati

Vanessa Smullen, M.S.; The Johns Hopkins University

The Department of Geography and Geosciences offers a program leading to a Bachelor of Science in geography, a discipline which examines the spatial patterns and interactions of natural, cultural and socioeconomic phenomena on the earth's surface. Geography embraces aspects of the physical sciences, social sciences and spatial data management techniques. The department also offers a Bachelor of Science in earth science and urban and regional planning. Additionally, the department offers a graduate program in Geographic Information Systems (GIS) Management that focuses on the management and administration of geospatial data in a public context.

MATHEMATICS AND COMPUTER SCIENCE

www.salisbury.edu/mathcsc

**Majors: Computer Science, Data Science,
Mathematics**

**Minors: Actuarial Science, Computer Science,
Data Science, Mathematics, Statistics**
(See “Undergraduate Minors” section for details.)

Post-Baccalaureate Certificate:

Middle School Mathematics

Graduate: M.S. Mathematics Education

Chair

Professor Donald E. Spickler Jr., Ph.D.; University of Virginia

Associate Chair

Associate Professor Veera Holdai, Ph.D., Wayne State University

Professors

Michael J. Bardzell, Ph.D.; Virginia Polytechnic Institute
and State University

Jennifer A. Bergner, Ph.D.; University of Northern Colorado

Steven M. Hetzler, Ph.D.; Northwestern University

Enyue Lu, Ph.D.; University of Texas at Dallas

David L. Parker, Ph.D.; Indiana University

Kathleen M. Shannon, Ph.D.; Brown University

Barbara A. Wainwright, Ph.D.; University of Delaware

Xiaohong Sophie Wang, Ph.D.; University of Victoria (Canada)

Associate Professors

Jathan W. Austin, Ph.D.; University of Delaware

Troy V. Banks, Ph.D., University of Texas at Dallas

Lori Carmack, Ph.D.; University of California, Santa Barbara

Randall Cone, Ph.D.; Virginia Polytechnic Institute and State University

Steven T. Lauterburg, Ph.D.; University of Illinois at Urbana-Champaign

Kurt E. Ludwick, Ph.D.; Temple University

Sang-Eon Park, Ph.D.; University of Cincinnati

Melissa Stoner, Ph.D.; Lehigh University

Assistant Professors

Joseph Anderson, Ph.D.; The Ohio State University

Jiacheng Jason Cai, Ph.D.; University of Nevada

Giulia Franchi, Ph.D.; University of Rome Tre

Alexander Halperin, Ph.D.; Lehigh University

Lisa Schneider, Ph.D.; University of California, Riverside

Ryan Shifler, Ph.D.; Virginia Polytechnic Institute and State University

Yaping Jing, Ph.D.; Iowa State University

Visiting Professor

Sarah Wesolowski, Ph.D.; The Ohio State University

Senior Lecturers

Robert Barber, M.S.; American University

Bohdan G. Kunciw, Ph.D.; The Pennsylvania State University

Carvel LaCurts, M.Ed.; Salisbury University

Lecturers

Alfred Beebe, Ph.D.; University of Washington

Molly Ferretti, M.A., Stony Brook University

Erika Gerhold, M.S.; Louisiana State University

Theresa Manns, M.S.; Syracuse University

The Department of Mathematics and Computer Science offers programs leading to the Bachelor of Science in mathematics, including a concentration in statistics, to the Bachelor of Science in computer science and to the Master of Science in Mathematics Education. Also available are a track in actuarial science, a track in computational mathematical sciences and a program leading to secondary education teacher certification. The department introduces students to the beauty and utility of mathematics, statistics and computer science in an environment that enhances learning experiences inside and outside the classroom. The department provides up-to-date programs as well as undergraduate research, internships and consulting opportunities.

The major in mathematics encourages students to examine the relationships among pure mathematics, applied mathematics, statistics and computer science. It provides a foundation for graduate work or careers in applied

mathematics, statistics, computer science, actuarial science or secondary education. The major in computer science, which can be augmented to include a minor in mathematics with one additional course, emphasizes software development principles throughout the curriculum and prepares students for graduate study or for careers in computer science, software development or systems analysis. The major in data science encourages students to extract meaning from data by applying fundamental mathematical and computer programming skills to various scientific fields. The data science curriculum prepares students for graduate study or for careers in human and health sciences, physical sciences and engineering, or business and industry.

PHYSICS

www.salisbury.edu/physics

Major: Physics

Minor: Physics, Mechanical Engineering

(See “Undergraduate Minors” section for details.)

Chair

Associate Professor Matthew Bailey, Ph.D.; Utah State University

Associate Chair

Professor Gail S. Welsh, Ph.D.; The Pennsylvania State University

Professor

Asif Shakur, Ph.D.; University of Calgary

Associate Professors

Jeffrey Emmert, Ph.D.; University of Virginia

Joseph Howard, Ph.D.; University of Oklahoma at Norman

Mark W. Muller, Ph.D.; University of Hawaii

Assistant Professor

Steve Binz, Ph.D.; Iowa State University

Nicholas Troup, M.S.; University of Virginia

Senior Lecturer

Gerardo Vazquez, Ph.D.; Universidad Nacional Autonoma De Mexico

Lecturer

Vanessa Smullen, M.S.; The Johns Hopkins University

The Physics Department offers a multi-track program of study, giving students the flexibility to pursue a challenging curriculum of inspiring courses best suited to their individual interests and chosen careers. A major in physics prepares students for careers in a variety of high-technology fields and teaching and/or further graduate studies in physics, engineering, medicine and other fields. Students can complete the physics major in one of five ways: general physics track, microelectronics track, secondary education track, engineering physics track or dual-degree engineering transfer program.

The Physics Department also provides undergraduate research opportunities to advance student understanding, allowing the student to apply the techniques in an active hands-on environment. With close faculty mentoring during the research experience, students gain skills necessary to organize and communicate scientific results and become successful science professionals. Virtually all physics majors become involved in scientific research under active faculty, R&D sector or industry supervision. Students have conducted research on a variety of topics including extragalactic elemental abundances, stellar evolution and supernovae, robotics design and building, alternative energies such as wind and solar, computational surface physics, biomedical physics, quantum mechanics, remote sensing, high-altitude balloon electronics, and a plethora of other topics.

Undergraduate Majors

BIOLOGY

Department of Biological Sciences
www.salisbury.edu/biology

Dr. Les Erickson, Chair
410-677-5366

To graduate with a degree in biology, students must complete the 27-credit biology core and at least 17 additional credits in BIOL, ENVS (at UMES) and ENVH (totaling at least 44 credits), with an overall GPA of 2.0 or higher. At least 24 of these 44 credits must be at the 300-400 level. Approved courses include BIOL 115 and biology courses at the 200, 300 and 400 levels (except BIOL 205, 214, 217, 219, 220, 419 and 450). Approved courses also include ENVH 210, 301 and 302, and ENVS 202/203, 403/405, 498 and 499 (UMES).

Biology Core

Complete the following biology core:

	Credits
BIOL 210* Biology: Concepts and Methods.....	4
Three of the following:	
BIOL 211* Microbiology.....	4
BIOL 212* Introduction to Plant Biology.....	4
BIOL 213* Zoology.....	4
BIOL 310* Ecology.....	4

All of the following:	
BIOL 350 Cell Biology.....	4
BIOL 360 Genetic Analysis.....	4
or	
BIOL 370 Molecular Genetics.....	4
BIOL 375 Introduction to Evolution.....	3

* A C or better is required in these courses before taking any courses for which they are a prerequisite. In order to earn a degree in biology, students must earn a C or better in at least three of the following: BIOL 211, 212, 213 or 310.

Additional Requirements

1. Complete the following three chemistry courses:

	Credits
CHEM 121 General Chemistry I.....	4
CHEM 122 General Chemistry II.....	4
CHEM 221 Organic Chemistry I.....	4

2. Complete one of the following mathematics courses:

	Credits
MATH 155 Modern Statistics.....	3
MATH 198 Calculus I for Biology and Medicine.....	4
MATH 201 Calculus I.....	4

3. Complete one of the following physical science courses:

	Credits
GEOG 105 Introduction to Physical Geography.....	4
GEOG 401 Soil, Water and Environment.....	3
GEOG 103 Introduction to Physical Geology.....	4
PHYS 121 General Physics I.....	4
PHYS 221 Physics I.....	4

4. The following courses are highly recommended for all biology majors, as is a year of physics, since they are usually required for graduate study in the discipline:

	Credits
CHEM 222 Organic Chemistry II.....	4
CHEM 417 Biochemistry.....	4

5. Complete additional BIOL and ENVH courses to meet the

minimum of 44 credits for the major.

The following courses may be taken as general electives, but are not acceptable for credit toward a major in biology:

	Credits
BIOL 101 Fundamentals of Biology.....	4
BIOL 105 Biology and Society.....	3
BIOL 110 Human Biology.....	4
BIOL 150 Environmental Science: Concepts and Methods.....	4
BIOL 205 Fundamentals of Human Anatomy and Physiology.....	4
BIOL 214 Medical Physiology.....	3
BIOL 217 Nutrition.....	3
BIOL 219 Biology of Human Aging.....	3
BIOL 419 Biology Seminar.....	1
BIOL 450 Internship.....	1-3

Health Professions Students

Pre-professional students select their courses according to the admission requirements of the professional schools in their areas of interest with the advice of the health professions advisors of the Henson School of Science and Technology Health Professions Advising Program (HPAP). See the "Pre-professional Programs" section of this catalog for more information.

Teacher Certification

Students seeking certification to teach biology in secondary schools must meet all major requirements, BIOL 310 Ecology, and the following specific and additional requirements in related sciences.

Students majoring in biology, secondary education track, should obtain the program curriculum guide and seek advisement from the biological science education specialist in the Department of Educational Specialties.

	Credits
BIOL 115/ MDTC 101 Safety in the Biological, Chemical and Clinical Laboratory.....	1
or	
CHEM 207 Laboratory Safety.....	1

► Pre-professional Requirements

1. Complete the following pre-professional requirements with grades of C or better.

	Credits
EDFN 210 School in a Diverse Society.....	3
ENGL 103 Composition and Research.....	4
SCED 300 Development, Learning and Assessment.....	3

2. Show satisfactory results on Praxis Core, SAT or ACT examinations as defined by the Maryland State Department of Education. See education advisor regarding passing scores.

► Professional Program

In order to enroll in professional education program courses, students must meet the following requirements:

1. Complete an application for formal admission to the professional program. Obtain written approval of the application from both content and education advisors.
2. Complete a minimum of 56 college credits with a minimum of 2.50 GPA, including transfer credits.
3. Have a cumulative minimum GPA of 2.75 in the major, including transfer credits.
4. Complete all pre-professional requirements.
5. Complete four courses in the major field.

► Methods Requirements

To be eligible for internship, all students enrolled in a secondary or K-12 program must complete the appropriate methods courses for the content major and the following courses in education with grades of C or better:

	Credits
SCED 367 Inclusive Instruction for Secondary Teachers.....	3
SCED 374 Teaching Science in Grades 7-12 Part I	4
SCED 434 Classroom Management	4
SCED 438 Teaching Literacy in the Content Areas I	3
SCED 474 Teaching Science in Grades 7-12 Part II	4

► Internship and Seminar

Student interns will be assigned to a Professional Development School (PDS) for their internship experience. This internship will consist of a minimum of 100 days. In order to meet the 100-day requirement, interns are required to follow the calendar of the school district in which the PDS is located. Interns are responsible for their own transportation to the PDS site.

Candidates must meet the following requirements for internship:

1. Complete the written application for internship.
2. Complete a minimum of 90 credits including methods and at least eight courses of the academic major (secondary and K-12 programs).
3. Have an overall grade point average of at least 2.50 including transfer credit.
4. Have a minimum grade point average of at least 2.75 in the academic major courses, including transfer credits, as defined by each academic department.
5. Have a minimum average of 2.75 in professional education courses with no grade below C. Students may repeat education courses only once.
6. Obtain verification of completion of these requirements from the director of field experiences.

All secondary education majors are required to pass the following:

	Credits
SCED 426 Internship in Middle or High School Education	6
SCED 428 Internship in Middle or High School Education	6
SCED 433* Reflection and Inquiry in Teaching Practice	2

* Students are required to follow the University calendar with respect to attendance in SCED 433.

► Graduation Requirement

Official scores on all certification examinations required by the State of Maryland must be sent from the testing company to Salisbury University as a requirement for graduation. See education advisor regarding appropriate tests.

Dual Degree Program in Biology And Environmental Science

SU and UMES offer a four and a half year, dual-degree program in biology and environmental science. Students from SU who complete the program receive a Bachelor of Science in biology from SU and a Bachelor of Science in environmental science with the marine ecology option from UMES.

These students pursue their biology major at SU, completing all biology dual degree core requirements (BIOL

211, 212, 213, 310, 350, 360 or 370, and 375) as well as the following.

Students in this program take a minimum of 30 semester credit hours on the UMES campus, including at least 17 hours of designated BIOL/ENVS courses. Students shall not begin environmental science coursework at UMES until they have completed BIOL 210; BIOL 211, 212 or 213; CHEM 121; and CHEM 122 with a C or better in all four courses. They complete registration for UMES courses by submitting an interinstitutional enrollment form available from their advisor or the Registrar's Office. Approved courses for the biology major include ENVS 202/203, 403/405, 498 and 499.

1. Complete the following environmental science courses:

	Credits
ENVS 201(lec)/203(lab)* Marine Biology	4
ENVS 202(lec)/204(lab)* Oceanography	4
ENVS 221(lec)/222(lab)* Principles of Environmental Science	4
ENVS 403(lec)/405(lab)* Marine Ecotoxicology	4
DNSC 400* Senior Proficiency Exam	1
BIOL 401 Wetland Ecology.....	4

Complete one of the following:

BIOL 410 Estuarine Ecology.....	4
BIOL 488* Marine and Estuarine Ecology	4

Complete one of the following:

BIOL 420 Independent Study	3
ENVS 498 Independent Study	3

Complete one of the following:

BIOL 415 Undergraduate Research	3
(must be taken for 3 credits to count toward the major)	
ENVS 499* Undergraduate Research	4

* offered at UMES only; C or better required

2. Complete the following required related science courses:

	Credits
CHEM 121* General Chemistry I	4
CHEM 122* General Chemistry II	4
CHEM 221 Organic Chemistry I	4
CHEM 222 Organic Chemistry II.....	4
MATH 155 Modern Statistics with Computer Analysis	3
MATH 202 Calculus II.....	4

* a C or better is required for CHEM 121 and CHEM 122 before taking any course for which they are a prerequisite as a requirement for graduation.

Complete one of the following:

PHYS 121 General Physics I.....	4
PHYS 221 Physics I	4

Complete one of the following:

PHYS 123 General Physics II	4
PHYS 223 Physics II	4

Complete one of the following:

MATH 198 Calculus for Biology and Medicine.....	4
MATH 201 Calculus I	4

Complete one of the following:

GEOG 104 Earth and Space Science.....	4
GEOG 105 Introduction to Physical Geography	4
GEOG 219 Map Analysis and Interpretation.....	4

NOTE: Because several courses are offered only in spring or fall, and because of other requirements of the program including a relatively large number of required credits, it is important that students check their program plans carefully with their advisors.

See the "Graduate Programs" section of this chapter for a complete description of the M.S. in applied biology.

General Information

► Transfer Students

Transfer students seeking the degree in biology must complete a minimum of 15 credit hours of courses in biology at Salisbury University.

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

CHEMISTRY

Department of Chemistry
www.salisbury.edu/chemistry

Dr. David Rieck, Chair
410-543-6480

The Chemistry Department offers a broad selection of tracks for students seeking careers in chemistry and the physical sciences. The Bachelor of Science in chemistry requires a minimum of 120 credits for graduation. Chemistry majors must have at least a C average in the math and science courses required by the major. Transfer students majoring in chemistry are required to complete at least 15 hours in chemistry at Salisbury University. With the proper selection of electives, a chemistry major can be used for entry into the professional programs of dentistry, medicine, veterinary medicine, pharmacy or patent law (see "Pre-professional Programs" section).

All chemistry majors must complete the following core courses. In addition, each major must satisfy the additional requirements for the chosen track as outlined below.

Chemistry Core Courses

	Credits
CHEM 121 General Chemistry I	4
CHEM 122 General Chemistry II	4
CHEM 221 Organic Chemistry I	4
CHEM 222 Organic Chemistry II	4
CHEM 321 Analytical Chemistry	4
MATH 201 Calculus I*	4
MATH 202 Calculus II	4
PHYS 221 Physics I**	4
PHYS 223 Physics II***	4

* Students in the pre-health professional track (described below) may take MATH 198 or MATH 201.

** Students in the accelerated professional - pharmacy track and the pre-health professional track (described below) may take PHYS 121 or PHYS 221

*** Students in the accelerated professional - pharmacy track and the pre-health professional track (described below) may take PHYS 123 or PHYS 223

In addition to completing these core courses, students must complete their major in one of the following tracks: traditional chemistry track, ACS chemistry track, biochemistry track, ACS biochemistry track, teacher certification track, pre-engineering track, pre-health professional track or accelerated professional - pharmacy track.

Traditional Chemistry Track

This is a baccalaureate track designed for direct entry into the chemistry profession.

	Credits
CHEM 207 Laboratory Safety	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
CHEM 342 Physical Chemistry II	4
CHEM 403 Principles of Chemical Research	3
or	
CHEM 413 Internship/Co-op in Chemistry	3
CHEM 441 Advanced Experimental Chemistry I	4
CHEM 442 Advanced Experimental Chemistry II	4
BIOL 210 Biology: Concepts and Methods.....	4

American Chemical Society Chemistry Track

The ACS-certified degree is widely recognized in the chemistry profession as a standard of excellence. This track is designed for motivated students with good scholastic records who intend to enter graduate programs in chemistry or closely related fields.

	Credits
CHEM 207 Laboratory Safety	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
CHEM 342 Physical Chemistry II	4
CHEM 403 Principles of Chemical Research	3
CHEM 410 Chemical Research	3
CHEM 417 Biochemistry I	4
CHEM 441 Advanced Experimental Chemistry I	4
CHEM 442 Advanced Experimental Chemistry II	4
BIOL 210 Biological Concepts and Methods	4

Biochemistry Track

The biochemistry track is designed for students interested in developing a deeper understanding of biochemical principles and engaging in more advanced biochemistry laboratory experiences. This track provides a diversified background for postgraduate health-related programs, such as dentistry, medicine or veterinary medicine (see "Pre-professional Programs" section). When coordinated properly, completion of this track satisfies the requirements of most medical schools.

	Credits
CHEM 207 Laboratory Safety	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
or	
CHEM 342 Physical Chemistry II	4
CHEM 403 Principles of Chemical Research	3
or	
CHEM 413 Internship/Co-op in Chemistry	3
CHEM 417 Biochemistry I	4
CHEM 418 Biochemistry II	3
CHEM 419 Biochemical Methods	4
CHEM 441 Advanced Experimental Chemistry I	4
BIOL 210 Biology: Concepts and Methods.....	4
BIOL 211 Microbiology	4
or	
BIOL 212 Introduction to Plant Biology.....	4
or	
BIOL 213 Zoology	4
BIOL 302 Bioinformatics I	4
or	
BIOL 350 Cell Biology.....	4
BIOL 3XX Biology Elective	3/4
or	
BIOL 4XX Biology Elective	3/4

American Chemical Society Biochemistry Track

The ACS-certified chemistry degree/biochemistry track is designed for highly motivated chemistry majors seeking a curriculum emphasizing biochemistry. This option is well suited for students who intend to enter graduate programs in biochemistry or closely related fields. When coordinated properly, completion of this track satisfies the requirements of most medical schools.

	Credits
CHEM 207 Laboratory Safety	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
CHEM 342 Physical Chemistry II	4
CHEM 403 Principles of Chemical Research	3
CHEM 410 Chemical Research	3
CHEM 417 Biochemistry I	4
CHEM 418 Biochemistry II	3
CHEM 419 Biochemical Methods	4
CHEM 441 Advanced Experimental Chemistry I	4
BIOL 210 Biology: Concepts and Methods.....	4
BIOL 211 Microbiology	4
or	
BIOL 212 Introduction to Plant Biology.....	4
or	
BIOL 213 Zoology	4
BIOL 302 Bioinformatics I	4
or	
BIOL 370 Molecular Genetics.....	4
BIOL 350 Cell Biology.....	4

Teacher Certification

The teacher certification track is a Maryland State Department of Education-approved teacher education program, which certifies students to teach chemistry in the secondary schools.

	Credits
CHEM 107 Chemistry: A Humanistic Perspective.....	4
or	
CHEM 109 Energy and the Environment	4
CHEM 207 Laboratory Safety	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 341 Physical Chemistry I	4
CHEM 342 Physical Chemistry II	4
CHEM 417 Biochemistry I	4
BIOL 101 Fundamentals of Biology	4

► Pre-professional Requirements

1. Complete the following pre-professional requirements with grades of C or better.

	Credits
EDFN 210 School in a Diverse Society	3
ENGL 103 Composition and Research	4
SCED 300 Development, Learning and Assessment.....	3

2. Show satisfactory results on Praxis Core, SAT or ACT examinations as defined by the Maryland State Department of Education. See education advisor regarding passing scores.

► Professional Program

In order to enroll in professional education program courses, students must meet the following requirements:

1. Complete an application for formal admission to the professional program. Obtain written approval of the application from both content and education advisors.
2. Complete a minimum of 56 college credits with a minimum of 2.50 GPA, including transfer credits.

3. Have a cumulative minimum GPA of 2.75 in the major, including transfer credits.
4. Complete all pre-professional requirements.
5. Complete four courses in the major field.

► Methods Requirements

To be eligible for internship, all students enrolled in a secondary or K-12 program must complete the appropriate methods courses for the content major and the following courses in education with grades of C or better:

	Credits
SCED 367 Inclusive Instruction for Secondary Teachers.....	3
SCED 374 Teaching Science in Grades 7-12 Part I	4
SCED 434 Classroom Management	3
SCED 438 Teaching Literacy in the Content Areas I	3
SCED 474 Teaching Science in Grades 7-12 Part II	4

► Internship and Seminar

Student interns will be assigned to a Professional Development School (PDS) for their internship experience. This internship will consist of a minimum of 100 days. In order to meet the 100-day requirement, interns are required to follow the calendar of the school district in which the PDS is located. Interns are responsible for their own transportation to the PDS site.

Candidates must meet the following requirements for internship:

1. Complete the written application for internship.
2. Complete a minimum of 90 credits including methods and at least eight courses of the academic major (secondary and K-12 programs).
3. Have an overall grade point average of at least 2.50 including transfer credit.
4. Have a minimum grade point average of at least 2.75 in the academic major courses, including transfer credits, as defined by each academic department.
5. Have a minimum average of 2.75 in professional education courses with no grade below C. Students may repeat education courses only once.
6. Obtain verification of completion of these requirements from the director of field experiences.

All secondary education majors are required to pass the following:

	Credits
SCED 426 Internship in Middle or High School Education	6
SCED 428 Internship in Middle or High School Education	6
SCED 433* Reflection and Inquiry in Teaching Practice	2

* Students are required to follow the University calendar with respect to attendance in SCED 433.

► Graduation Requirement

Official scores on all certification examinations required by the State of Maryland must be sent from the testing company to Salisbury University as a requirement for graduation. Taking appropriate certification exams is required for completion of secondary education certification and graduation. See education advisor regarding appropriate tests.

Dual Degree Chemical Engineering Transfer Track

This track provides a student an opportunity to earn both a degree in chemistry from SU and an engineering degree from the University of Maryland College Park (UMCP). In this track, typically students attend SU for three years and UMCP for two years (likely including the summer before the first fall semester).

While at SU, the student completes the chemistry core as well as additional courses identified here. Students also must complete all SU General Education requirements and at least 90 credit hours at SU. Students who transfer to SU must complete at least 60 credit hours of the track at SU.

To earn the degree from SU, the student must apply to and be accepted into the Chemical and Biomolecular Engineering Program at UMCP. Please note that completion of the SU requirements does not guarantee admission into the UMCP program. Additionally, please note that it is the student's responsibility to make certain that all prerequisites for the UMCP program are met.

In addition, to earn the degree from SU, as a student in the UMCP Chemical and Biomolecular Engineering Program, the student must complete at least 30 credit hours at UMCP, with at least 15 of these credit hours being chemical engineering (CHBE) courses with a grade of C or better. After completing the required courses at UMCP, if all other SU requirements have been met, the student may transfer credits to SU from UMCP and apply for graduation at SU.

Complete the following course requirements (in addition to the chemistry core and SU General Education requirements):

	Credits
CHEM 341 Physical Chemistry I	4
CHEM 342 Physical Chemistry II	4
CHEM 417 Biochemistry I	4
ENGR 100 Introduction to Engineering Design	3
ENGR 306 Introduction to MATLAB	1
MATH 310 Calculus III	4
MATH 311 Differential Equations I	4
PHYS 225 Physics III	3

Pre-Health Professional Track

The pre-health professional track is designed for students interested in pursuing postgraduate professional school programs. With the advice of the Henson School of Science and Technology Health Professions Advising Program (HPAP), these students select their courses according to the admission demands of the professional schools in their areas of interest while also completing the requirements for a B.S. in chemistry. See the "Pre-professional Programs" section of this catalog for more information.

In addition to the chemistry core courses, students are required to complete the following courses

	Credits
CHEM 207 Laboratory Safety	1
or	
MDTC 101 Safety in the Biological, Chemical and Clinical Laboratory.....	1
CHEM 306 Fundamentals of Inorganic Chemistry	4
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
or	
CHEM 342 Physical Chemistry II	4
CHEM 403 Principles of Chemical Research	3
or	
CHEM 413 Internship/Co-Op in Chemistry	3
CHEM 417 Biochemistry	4
CHEM 418 Biochemistry II	3
CHEM 419 Biochemical Methods	4
CHEM 441 Advanced Experimental Chemistry I	4
BIOL 210 Biology: Concepts and Methods.....	4

BIOL 213	Zoology	4
BIOL 350	Cell Biology.....	4
BIOL 370	Molecular Genetics.....	4
CMAT 100	Fundamentals of Communication.....	4
PSYC 101	General Psychology	4
SOCI 101	Introduction to Sociology	4

Accelerated Professional Track - Pharmacy

In this accelerated track a student completes three years of study at SU and then, if accepted, the student may enter the University of Maryland School of Pharmacy or the University of Maryland Eastern Shore School of Pharmacy during what would have been the fourth year of study at SU. While at SU, students complete the chemistry core courses identified here as well as the additional requirements that follow. Students must also complete all SU General Education requirements prior to entering pharmacy school. Please note, the completion of SU requirements does not guarantee admission into pharmacy school; additionally, it is the student's responsibility to make sure all pharmacy school prerequisites are met. After successful completion of the first year of study at pharmacy school, and if all other SU requirements have been met, students receive the baccalaureate degree in chemistry from SU. See the "Pre-Professional Programs" section of this catalog for more information

The SU requirements for this accelerated track (in addition to completion of the chemistry core and General Education requirements) are outlined here:

	Credits
CHEM 207 Laboratory Safety	1
or	
MDTC 101 Safety in the Biological, Chemical and Clinical Laboratory.....	1
CHEM 333 Instrumental Analysis	3
CHEM 341 Physical Chemistry I	4
or	
CHEM 342 Physical Chemistry II	4
CHEM 417 Biochemistry	4
MATH 155 Modern Statistics with Computer Analysis	3
or	
MATH 216 Statistical Thinking	4
BIOL 210 Biology: Concepts and Methods.....	4
BIOL 211 Microbiology	4
BIOL 215 Human Anatomy and Physiology I	4
BIOL 216 Human Anatomy and Physiology II	4
CMAT 100 Fundamentals of Communication.....	4
ECON 211 Principles of Microeconomics.....	3

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

COMPUTER SCIENCE

Department of Mathematics and Computer Science
www.salisbury.edu/mathcosc

Dr. Don Spickler, Program Director
 410-543-6145

The computer science major requires 18 courses (65-68 credits) arranged in four components:

- I. Mathematics Core for computer science (16 credits);
- II. Lower-Division Computer Science Core (16 credits);
- III. Upper-Division Computer Science Core (23 credits); and
- IV. Three upper-level electives (9-10 credits, selected with the guidance of a faculty advisor).

All required mathematics and computer science courses and all upper-level electives must be completed with grades of C or better (or pass if they are offered only on a pass-fail basis). No course may be taken until all prerequisite courses have been completed with grades of C or better.

Transfer students majoring in computer science are required to complete at least 12 hours of upper-level computer science courses with grades of C or better at Salisbury University (excluding those taken P/F).

Students may not receive credit for computer science courses which are prerequisites for or equivalent to computer science courses for which they have already received native or transfer credit.

► I. Mathematics Core for Computer Science

	Credits
MATH 201 Calculus I	4
MATH 202 Calculus II	4
MATH 210 Introduction to Discrete Mathematics	4
MATH 306 Linear Algebra	4

► II. Lower-Division Computer Science Core

	Credits
COSC 117 Programming Fundamentals	4
COSC 120 Computer Science I	4
COSC 220 Computer Science II	4
COSC 250 Microcomputer Organization	4

► III. Upper-Division Computer Science Core

	Credits
COSC 320 Advanced Data Structures and Algorithm Analysis	4
COSC 350 Systems Software	4
COSC 362 Theory of Computation	4
COSC 386 Database Design and Implementation	4
COSC 425 Software Engineering I	3
COSC 426 Software Engineering II	3
COSC 450 Operating Systems	3

► IV. Three Upper-level Electives

Choose three courses from the following:

	Credits
COSC 330 OO Design Patterns and GUI/ Event-Driven Programming	3
COSC 370 Computer Networks	3
COSC 380 Internship*	3
COSC 390 Undergraduate Research Project*	3
COSC 420 High-Performance Computing	4
COSC 422 Organization of Programming Languages	3
COSC 432 Compiler Construction	3
COSC 456 Computer Architecture	3
COSC 472 Network Security	3

COSC 482 Computer Graphics	4
COSC 490 Special Topics	3
COSC 495 Directed Consulting*	4
MATH 471 Numerical Methods**	4

or other COSC, INFO, MATH or PHYS courses approved by the chair, including those courses offered at other universities
 * COSC 380, 390 (taken for at least three credits) and 495 may be used to satisfy at most one of the upper-level electives
 ** these courses have prerequisites which are not listed among the courses required in the major

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

EARTH SCIENCE

Department of Geography and Geosciences
www.salisbury.edu/geography

Dr. Brent Zaprowski, Program Director
 410-543-6460

All courses applied to the major must be completed with grades of C or better. The Department of Geography and Geosciences recommends that the lower-division core courses (GEOG 201, 204, 219 and GEOL 103) be completed prior to GEOG 414.

Transfer students must complete a minimum of 15 semester hours with grades of C or better in geology/geography at Salisbury University, at least 12 semester hours of which must be at the 300/400 level. Earth science majors seeking certification for teaching in secondary school must meet additional requirements in education. Students pursuing secondary teaching certification should contact the Education Specialties Department for advisement early in their program.

Bachelor of Science requirements for an earth science major include the following:

1. Complete the following core courses:

	Credits
CHEM 121 General Chemistry I	4
GEOG 201 Weather and Climate	4
GEOG 204 Statistical Problem Solving in Geography	4
GEOG 219 Map Interpretation and Analysis	4
GEOG 319 Geographic Information Science	4
GEOG 414 Research and Writing	3
GEOL 103 Introduction to Physical Geology	4
GEOL 206 Historical Geology	4
GEOL 211 Sediment Analysis	1
GEOL 313 Mineralogy and Optical Petrology	4
GEOL 336 Stratigraphy and Sedimentology	4
GEOL 465 Earth Science Seminar	1
MATH 155 Modern Statistics with Computer Analysis	3
PHYS 121 General Physics I	4
or	
PHYS 221 Physics I	4

2. Complete one of the following tracks.

General Earth Science Track

The General Earth Science Track is designed for students who wish to complete a traditional liberal arts major in earth science. This track provides maximum flexibility in developing an individualized program, in consultation with a faculty advisor.

Complete at least three courses from the following

	Credits
GEOG 311* Coastal Processes	3
GEOG 312 Severe and Hazardous Weather	3
or	

GEOG 409	Dimensions of Climatic Change	3
or		
GEOG 410	Meteorology	3
or		
GEOG 413	Applied Climatology	3
GEOG 401	Soil, Water and Environment	3
GEOG 411	Geomorphology	4
GEOL 322*	Geological Oceanography	3
GEOL 405	Environmental Geology	4
GEOL 407	Hydrogeology	3
GEOL 420	Structural Geology	4

* Course has a prerequisite of GEOG 111

Geoenvironmental Science Track

The Geoenvironmental Science Track is focused on the application of geosciences to solve environmental problems and is designed for students who wish to pursue professional careers in geology, hydrology and environmental science.

Complete the following:

	Credits
GEOG 401 Soil, Water and Environment	3
GEOG 411 Geomorphology	4
GEOL 405 Environmental Geology	4
GEOL 407 Hydrogeology	3

Complete two courses from the following:

	Credits
BIOL 210 Biology: Concepts and Methods.....	4
GEOG 311* Coastal Processes	3
GEOG 402* Environmental Planning	3
GEOG 419 Advanced GIS	4
GEOL 420 Structural Geology	4

Complete one course from the following:

	Credits
BIOL 310* Ecology	4
CHEM 122 General Chemistry II	4
ENGR 100 Introduction to Engineering Design	3
MATH 201 Calculus I	4
PHYS 123 General Physics II	4
PHYS 223 Physics II	4

* Course has prerequisites not fulfilled by track requirements.

Marine Geosciences Track

The Marine Geosciences Track is focused on the application of geosciences in marine environments. The track is designed for students who wish to pursue professional careers in marine geology or physical oceanography.

Complete the following:

	Credits
BIOL 210 Biology: Concepts and Methods.....	4
BIOL 310 Ecology.....	4
GEOG 111 Introduction to Oceans and Coasts	3
GEOG 311 Coastal Processes	3
GEOL 322 Geological Oceanography	3

Complete two courses from the following:

	Credits
BIOL 401* Wetland Ecology.....	4
BIOL 410 Estuarine Ecology.....	3
GEOG 317 Atmospheric Data Analysis and Programming.....	4
GEOG 402 Environmental Planning	3
GEOG 419 Advanced GIS	4
GEOL 407 Hydrogeology	3

Complete one course from the following:

	Credits
CHEM 122 General Chemistry II	4
ENGR 100 Introduction to Engineering Design	3
MATH 201 Calculus I	4
PHYS 123 General Physics II	4
PHYS 223** Physics II	4

* Course has a prerequisite of BIOL 212

** Course has a corequisite of MATH 202

Teacher Certification

Complete at least three courses from the following

	Credits
GEOG 311* Coastal Processes	3
GEOG 312 Severe and Hazardous Weather	3
or	
GEOG 409 Dimensions of Climatic Change	3
or	
GEOG 410 Meteorology	3
or	
GEOG 413 Applied Climatology	3
GEOG 401 Soil, Water and Environment	3
GEOG 411 Geomorphology	4
GEOL 322* Geological Oceanography	3
GEOL 405 Environmental Geology	4
GEOL 407 Hydrogeology	3
GEOL 420 Structural Geology	4

* Course has a prerequisite of GEOG 111

Students seeking licensure to teach earth science in secondary schools must complete the following science requirements beyond the earth science core as well as the secondary education program requirements.

	Credits
BIOL 101 Fundamentals of Biology	4
PHYS 109 Principles of Astronomy	3

► SECONDARY EDUCATION PROGRAM REQUIREMENTS

Note: Students may repeat each education course only once.

► Pre-professional Requirements

1. Complete the following pre-professional requirements with grades of C or better.

	Credits
EDFN 210 School in a Diverse Society	3
ENGL 103 Composition and Research	4
SCED 300 Development, Learning and Assessment.....	3
2. Show satisfactory results on Praxis Core, SAT or ACT examinations as defined by the Maryland State Department of Education. See education advisor regarding passing scores.
3. Successful completion of an approved lab safety certification program. See education advisory regarding approved courses.

► Professional Program

In order to enroll in professional education program courses, students must meet the following requirements:

1. Complete an application for formal admission to the professional program. Obtain written approval of the application from both content and education advisors.
2. Complete a minimum of 56 college credits with a minimum of 2.50 GPA, including transfer credits.
3. Have a cumulative minimum GPA of 2.75 in the major, including transfer credits.
4. Complete all pre-professional requirements.
5. Complete four courses in the major field.

► Methods Requirements

To be eligible for internship, all students enrolled in a secondary or K-12 program must complete the appropriate methods courses for the content major and the following courses in education with grades of C or better:

	Credits
SCED 367 Inclusive Instruction for Secondary Teachers.....	3
SCED 374 Teaching Science in Grades 7-12 Part I	4
SCED 438 Teaching Literacy in the Content Areas I	3
SCED 434 Classroom Management	3
SCED 474 Teaching Science in Grades 7-12 Part II	4

► Internship and Seminar

Student interns will be assigned to a Professional Development School (PDS) for their internship experience. This internship will consist of a minimum of 100 days. In order to meet the 100-day requirement, interns are required to follow the calendar of the school district in which the PDS is located. Interns are responsible for their own transportation to the PDS site.

Candidates must meet the following requirements for internship:

1. Complete the written application for internship.
2. Complete a minimum of 90 credits including methods and at least eight courses of the academic major (secondary and K-12 programs).
3. Have an overall grade point average of at least 2.50 including transfer credit.
4. Have a minimum grade point average of at least 2.75 in the academic major courses, including transfer credits, as defined by each academic department.
5. Have a minimum average of 2.75 in professional education courses with no grade below C. Students may repeat education courses only once.
6. Obtain verification of completion of these requirements from the director of field experiences.

All secondary education majors are required to pass the following:

	Credits
SCED 426 Internship in Middle or High School Education	6
SCED 428 Internship in Middle or High School Education	6
SCED 433* Reflection and Inquiry in Teaching Practice	2

* Students are required to follow the University calendar with respect to attendance in SCED 433.

► Graduation Requirement

Official scores on all certification examinations required by the State of Maryland must be sent from the testing company to Salisbury University as a requirement for graduation. Taking appropriate certification exams is required for completion of secondary education certification and graduation. See education advisor regarding appropriate tests.

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

GEOGRAPHY

Department of Geography and Geosciences
www.salisbury.edu/geography

Dr. Daniel Harris, Chair
410-543-6460

All courses applied to the geography major must be completed with grades of C or better. The Department of Geography and Geosciences recommends that the lower-division core courses (GEOG 201, 204, 219 and GEOL 103) be completed prior to GEOG 414.

Transfer students must complete a minimum of 15 semester hours with grades of C or better in geography at Salisbury University, at least 12 semester hours of which must be at the 300/400 level.

While geography majors must satisfy departmental requirements, they are also encouraged to develop a program suitable to their individual needs. The department has five designated tracks: general geography, atmospheric science, physical geography, geographic information science, and environmental and land use planning. Each track is designed to provide flexible, yet directed preparation toward specific employment opportunities as well as appropriate background for related graduate work. Students seeking guidance about the tracks, graduate study or career programs should see a departmental advisor.

Bachelor of Science requirements for a geography major include the following:

1. Complete the following core courses:

	Credits
GEOG 101 World Geography: Europe and Asia.....	3
or	
GEOG 102 World Geography: Africa and the Americas	3
GEOG 201 Weather and Climate	4
GEOG 203 Economic Geography	3
GEOG 204 Statistical Problem Solving in Geography	4
GEOG 219 Map Interpretation and Analysis.....	4
GEOG 319 Geographic Information Science	4
GEOG 414 Research and Writing.....	3
GEOL 103 Introduction to Physical Geology	4

2. Complete the following statistics course:

	Credits
MATH 155 Modern Statistics with Computer Analysis	3

3. Complete one of the following tracks.

General Geography Track

The General Geography Track is designed for students who wish to complete a traditional liberal arts major in geography. This track provides maximum flexibility in developing an individualized program, in consultation with a faculty advisor. The track requirements include a minimum of 15 hours, of which at least 12 hours must be at the 300/400 level and must include at least six hours in human and/or physical geography and/or geology courses at the 300/400 level. No more than one field course (GEOG 389 or 399) may count toward the 15 hours.

Climatology Track

The Climatology Track is focused on the long-term changes in the atmosphere and is designed for students interested in careers and/or graduate school in climatology and climate change. The requirements are:

	Credits
GEOG 312 Severe and Hazardous Weather	3
GEOG 317 Atmospheric Data Analysis and Programming	4
GEOG 409 Dimensions of Climatic Change	3
GEOG 410 Meteorology	3
GEOG 413 Applied Climatology	3

Complete two courses from the following:

	Credits
GEOG 311 Coastal Processes	3
GEOG 314 Tropical Meteorology	3
GEOG 321 Remote Sensing of the Environment	4
GEOG 389* Regional Field Studies of the U.S.	3
GEOG 401 Soil, Water and Environment	3
GEOG 403 Environmental Hazards	3
GEOG 412 Weather Analysis and Forecasting	3
GEOG 417 Water Resources	3
GEOG 418 Atmospheric Dynamics.....	3

* If atmospheric science related

Geographic Information Science Track

The Geographic Information Science Track is focused on developing an understanding of the theory and application of spatial data management techniques, including geographic information systems (GIS), remote sensing and cartography. The requirements are:

	Credits
COSC 117 Programming Fundamentals	4
or	
COSC 118 Introductory Scientific Programming	4
or	
COSC 120 Computer Science I	4
GEOG 419 Advanced Geographic Information Science	4

Complete at least two courses from the following:

	Credits
GEOG 320 Cartographic Visualization	3
GEOG 321 Remote Sensing of the Environment	4
GEOG 435 GIS Programming.....	3

Complete two courses in human and/or physical geography at the 300/400 level.

Complete at least one course from the following:

	Credits
ART 227 Digital Design and Layout	4
COSC 220 Computer Science II	4
COSC 482 Computer Graphics	4
INFO 211 Information Systems Concepts for Management	3
INFO 386 Database Management Systems	3

Human Geography Track

The Human Geography Track focuses on spatial distributions of human phenomenon on the surface of the earth, including urban, economic, political and environmental processes and activities. The requirements are

	Credits
GEOG 100 Introduction to Human Geography	3
or	
GEOG 101* World Geography: Europe and Asia.....	3
or	
GEOG 102* World Geography: Africa and the Americas	3
GEOG/	
URPL 308 Principles of Planning.....	3
GEOG 325 Conservation and Resource Management.....	3
GEOG 327 Political Geography	3
GEOG/	
URPL 408 Seminar in Urban Theory	3

* If taking GEOG 101 or 102, student must take the one not used in the core requirements.

Complete at least two courses from the following:

	Credits
GEOG 301 World Regions	3
GEOG 403 Environmental Hazards	3
GEOG 406 Regional Economic Development	3
GEOG/	
URPL 416 Smart Growth	3
GEOG 417 Water Resources	3

Meteorology Track

The Meteorology Track is focused on the study of atmospheric processes and is designed for students wishing to pursue a career or graduate school in atmospheric science and/or meteorology. The requirements are:

	Credits
GEOG 312 Severe and Hazardous Weather	3
GEOG 314 Tropical Meteorology	3
GEOG 317 Atmospheric Data Analysis and Programming	4
GEOG 410 Meteorology	3
GEOG 412 Weather Analysis and Forecasting.....	3
GEOG 418 Atmospheric Dynamics.....	3
MATH 201 Calculus I	4
MATH 202 Calculus II.....	4
MATH 311 Differential Equations	4
PHYS 221 Physics I	4
PHYS 225 Physics III	4

Complete one course from the following:

	Credits
GEOG 321 Remote Sensing of the Environment	4
GEOG 389* Regional Field Studies of the U.S.	3
GEOG 401 Soil, Water and Environment	3
GEOG 403 Environmental Hazards	3
GEOG 409 Dimensions of Climatic Change	3
GEOG 413 Applied Climatology	3

* Must be a weather/climate course.

Physical Geography Track

The Physical Geography Track is focused on the study of all the major facets of physical geography including coursework in atmospheric science, geology, oceanography and natural resource management. The requirements are:

	Credits
GEOG 111 Introduction to Oceans and Coasts	3
GEOG 411 Geomorphology	4

Complete four of the following courses. At least one course must be a weather/climate course*:

	Credits
GEOG 311 Coastal Processes	3
GEOG 312* Severe and Hazardous Weather	3
GEOG 321 Remote Sensing of the Environment	4
GEOG 325 Conservation and Resource Management.....	3
GEOG 401 Soil, Water and Environment	3
GEOG 410* Meteorology	3
GEOG 413* Applied Climatology	3
GEOG 417 Water Resources	3
GEOG 405 Environmental Geology	4

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

MATHEMATICS

Department of Mathematics and Computer Science
 www.salisbury.edu/mathcosc

Dr. Donald E. Spickler, Chair
 410-543-6140

All students must complete the following mathematics major core:

	Credits
MATH 201 Calculus I	4
MATH 202 Calculus II.....	4
MATH 210 Introduction to Discrete Mathematics.....	4
MATH 216 Statistical Thinking	4
MATH 306 Linear Algebra	4
MATH 310 Calculus III	4

Students then complete their major in one of six ways: traditional option, applied option, actuarial science track, computational mathematical sciences track, statistics concentration or teacher certification. By proper choice of electives, it is possible to complete both the traditional option and the applied option without additional credit hours. (See the department for appropriate checklists and advisement.) All required mathematics and computer science courses, including prerequisite courses, must be completed with grades of C or better. Some concentrations or tracks may accept the nontraditional courses MATH/COSC 380, 390, 495, but in no case may more than one or the repetition of one count toward the requirements for the major in mathematics.

Traditional Option

In addition to completing the mathematics major core, students must complete these four courses:

	Credits
COSC 117 Programming Fundamentals	4
or	
COSC 120 Computer Science I	4
MATH 311 Differential Equations I	4
MATH 441 Abstract Algebra I.....	4
MATH 451 Analysis I	4

Students also must complete a two-semester sequence at the 400-level by taking one of the following:

	Credits
MATH 414 Mathematical Statistics II	4
MATH 442 Abstract Algebra II	4
MATH 452 Analysis II	4

In addition, students must take four more upper-level MATH electives, at least three at the 400 level.

Applied Option

In addition to completing the mathematics major core, students must complete these four courses:

	Credits
COSC 117 Programming Fundamentals	4
or	
COSC 120 Computer Science I	4
MATH 311 Differential Equations I	4
MATH 413 Mathematical Statistics I.....	4
MATH 451 Analysis I	4

Students must also complete a two-semester sequence at the 400-level by taking one of the following:

	Credits
MATH 414 Mathematical Statistics II	4
MATH 452 Analysis II	4

Students must study the application of mathematics by completing two of these courses:

	Credits
MATH 465 Mathematical Models and Applications	4
MATH 471 Numerical Methods.....	4
MATH 475 Dynamics and Chaos	4
MATH 493 Advanced Topics in Statistics	4

In addition, students must take two upper-level MATH electives, one of which is at the 400 level.

Actuarial Science Track

In addition to completing the mathematics major core, students must complete these 12 courses:

	Credits
ACCT 201 Introduction to Financial Accounting.....	3
COSC 117 Programming Fundamentals	4
or	
COSC 120 Computer Science I	4
ECON 211 Micro-Economics Principles	3
ECON 212 Macro-Economic Principles	3
FINA 311 Financial Management	3
FINA 312 Risk Management and Insurance.....	3
MATH 215 Introduction to Financial Mathematics	4
MATH 314 Regression Analysis	4
MATH 413 Mathematical Statistics I.....	4
MATH 414 Mathematical Statistics II	4
MATH 415 Actuarial and Financial Models	4

Students must also take one additional 400-level mathematics course

Computational Mathematical Sciences Track

In addition to completing the mathematics major core, students must complete the following courses:

	Credits
COSC 117 Programming Fundamentals	4
COSC 120 Computer Science I	4
COSC 220 Computer Science II.....	4
COSC 320 Advanced Data Structures and Algorithm Analysis	4
COSC 420 High-Performance Computing	4
MATH 311 Differential Equations	4
MATH 471 Numerical Methods.....	4
or	
MATH 472 Numerical Linear Algebra	4

Complete one of the following:

MATH 475 Dynamics and Chaos	4
MATH 465 Math Models and Applications	4
MATH 447 Cryptography	4
MATH 471 Numerical Methods (if not previously taken)	4
MATH 472 Numerical Linear Algebra (if not previously taken)	4

Students must also complete one additional upper-level COSC course or 400-level MATH course. COSC 380, COSC 390 and MATH 495 do not satisfy this requirement.

Student must complete one of the following field experiences:

	Credits
MATH/ COSC 380 Internship	3
MATH/ COSC 390 Undergraduate Research Project.....	3
MATH 495 Directed Consulting	3

Statistics Concentration

In addition to completing the mathematics major core, students must meet the following requirements:

Complete the following courses:

	Credits
COSC 117 Programming Fundamentals	4
or	
COSC 120 Computer Science I	4
MATH 313 Survey Design and Sampling	4
MATH 314 Regression Analysis	4
MATH 411 Design and Analysis of Experiments	4
MATH 413 Mathematical Statistics I	4
MATH 414 Mathematical Statistics II	4
MATH 493 Advanced Topics in Statistics	4
MATH 3XX Math Elective	4
or	
MATH 4XX Math Elective	3/4
MATH 4XX Math Elective	3/4

MATH 380/390/495 may not be used to satisfy the above electives.

Satisfy one of the following field experiences:

	Credits
MATH 380 Internship	3
MATH 390 Undergraduate Research Project	3
MATH 495 Directed Consulting	4

Teacher Certification

Mathematics students will be certified to teach mathematics at the secondary level by completing the mathematics major core and by fulfilling the following requirements:

Complete five upper-level courses as follows:

	Credits
MATH 406 Geometric Structures	4
MATH 430 Mathematical Connections for Secondary School Teachers	4
MATH 441 Abstract Algebra I	4
MATH 451 Analysis I	4
MATH 465 Mathematical Models and Applications	4

► Pre-professional Requirements

1. Complete the following pre-professional requirements with grades of C or better.

	Credits
EDFN 210 School in a Diverse Society	3
ENGL 103 Composition and Research	4
SCED 300 Development, Learning and Assessment	3

2. Show satisfactory results on Praxis Core, SAT or ACT examinations as defined by the Maryland State Department of Education. See education advisor regarding passing scores.

► Professional Program

In order to enroll in professional education program courses, students must meet the following requirements:

1. Complete an application for formal admission to the professional program. Obtain written approval of the application from both content and education advisors.
2. Complete a minimum of 56 college credits with a minimum of 2.50 GPA, including transfer credits.
3. Have a cumulative minimum GPA of 2.75 in the major, including transfer credits.
4. Complete all pre-professional requirements.
5. Complete four courses in the major field.

► Methods Requirements

To be eligible for internship, all students enrolled in a secondary or K-12 program must complete the appropriate methods courses for the content major and the following courses in education with grades of C or better:

	Credits
SCED 367 Inclusive Instruction for Secondary Teachers	3
SCED 373 Teaching Mathematics in Grades 7-12 Part I	4
SCED 434 Classroom Management	3
SCED 438 Teaching Literacy in the Content Areas I	3
SCED 473 Teaching Mathematics in Grades 7-12 Part II	4

► Internship and Seminar

Student interns will be assigned to a Professional Development School (PDS) for their internship experience. This internship will consist of a minimum of 100 days. In order to meet the 100-day requirement, interns are required to follow the calendar of the school district in which the PDS is located. Interns are responsible for their own transportation to the PDS site.

Candidates must meet the following requirements for internship:

1. Complete the written application for internship.
2. Complete a minimum of 90 credits including methods and at least eight courses of the academic major (secondary and K-12 programs).
3. Have an overall grade point average of at least 2.50 including transfer credit.
4. Have a minimum grade point average of at least 2.75 in the academic major courses, including transfer credits, as defined by each academic department.
5. Have a minimum average of 2.75 in professional education courses with no grade below C. Students may repeat education courses only once.
6. Obtain verification of completion of these requirements from the director of field experiences.

All secondary education majors are required to pass the following:

	Credits
SCED 426 Internship in Middle or High School Education	6
SCED 428 Internship in Middle or High School Education	6
SCED 433* Reflection and Inquiry in Teaching Practice	2

* Students are required to follow the University calendar with respect to attendance in SCED 433.

► Graduation Requirement

Official scores on all certification examinations required by the State of Maryland must be sent from the testing company to Salisbury University as a requirement for graduation. Taking appropriate certification exams is required for completion of secondary education certification and graduation. See education advisor regarding appropriate tests.

General Information

► Prerequisites

Three units of high school mathematics (including Algebra II and geometry) or college algebra is a prerequisite for all other math courses.

Students may not receive credit for math courses which are prerequisites for or equivalent to math courses for which they have already received native or transfer credit.

No course may be taken until all prerequisite courses have been completed with grades of C or better.

► **Transfer Students**

Transfer students majoring in mathematics are required to complete at least 12 hours of upper-level courses in mathematics with grades of C or better at Salisbury University.

► **Departmental Honors**

To qualify for departmental honors, a student must meet all of the following criteria:

Academics

1. The student must qualify for institutional honors (cum laude or better).
2. The student must complete at least 18 hours of upper-division courses in mathematics and/or computer science at Salisbury University.
3. The student must earn a cumulative GPA of at least 3.75 in all upper-level courses in mathematics and/or computer science taken at Salisbury University.

Research

1. The student must assemble an Honors Advisory Committee consisting of an advisor and two additional faculty members. This committee must be approved by the department chair. The advisor must be on the faculty of the Department of Mathematics and Computer Science.
2. The student must write an honors thesis. This thesis must consist of original research in a subject area approved by the thesis committee.
3. The student must give a presentation of his/her research to the Department of Mathematics and Computer Science.
4. The student must be approved for departmental honors by an absolute majority of the Department of Mathematics and Computer Science faculty. (An “absolute majority” requires that the number of “yes” votes minus the number of “no” votes is not less than half of the total number of faculty voting, counting abstentions.) The faculty will make this decision based on both the student’s written thesis and the student’s research presentation.

Contact the Mathematics and Computer Science Department for additional information.

► **Checklist**

For a major checklist visit www.salisbury.edu/checklists.

PHYSICS

Department of Physics

www.salisbury.edu/physics

Dr. Matthew Bailey, Chair

410-543-6486

All required physics courses must be completed with a minimum overall GPA of 2.0. All physics majors must complete the following core:

	Credits
CHEM 121 General Chemistry I	4
CHEM 122 General Chemistry II	4
MATH 201 Calculus I	4
MATH 202 Calculus II	4
MATH 310 Calculus III	4
MATH 311 Differential Equations I	4
PHYS 221 Physics I	4
PHYS 223 Physics II	4
PHYS 225 Physics III	3
PHYS 309 Mathematical Physics	3
PHYS 311 Electrical Circuits and Electronics	4
PHYS 313 Introduction to Modern Physics	3
PHYS 314 Mechanics	3
PHYS 315 Electricity and Magnetism	3

Students can complete the physics major in one of four ways: general physics track, microelectronics track, secondary education track or the Dual Degree Engineering Transfer Program. See the department for appropriate checklists and advisement.

Transfer students majoring in mathematics are required to complete at least 12 hours of upper-level courses in physics with grades of C or better at Salisbury University.

General Physics Track

Students pursuing general physics must fulfill the following requirements beyond the physics core:

1. Complete the following courses:

	Credits
PHYS 316 Quantum Mechanics	3
PHYS 407 Senior Laboratory	3
PHYS 470 Senior Seminar	1
PHYS 490 Research in Physics	2

2. Satisfy three additional 300/400-level physics courses.

	Credits
PHYS 317 Astrophysics	3
PHYS 318 Semiconductor Physics	3
PHYS 319 Thermodynamics and Statistical Mechanics	3
PHYS 320 Waveoptics	3
PHYS 321 Analog Electronics	3
PHYS 322 Digital Electronics	4
PHYS 410 Advanced Math Physics	3
PHYS 413 Computer Architecture and Interfacing	3
PHYS 414 Advanced Mechanics	3
ENGR 482 Microwave Engineering	3

Engineering Physics Track

Physics majors pursuing the engineering physics track must complete the engineering physics core and select five courses from the engineering physics track in addition to the physics core:

1. Complete the following engineering physics core courses:

	Credits
ENGR 100 Introduction to Engineering Design	3
ENGR 110 Statics	3
PHYS 470 Senior Seminar	1

PHYS 490	Research	2
or		
ENGR 490	Research in Engineering	2

2. Complete five additional courses from the following:

	Credits	
ENGR 220	Mechanics of Materials.....3	
ENGR 221	Dynamics	3
ENGR 232	Thermodynamics	3
ENGR 331	Fluid Mechanics	3
ENGR 332	Heat Transfer	3
ENGR 361	Vibrations, Control and Optimization	3
ENGR 409	Acoustics	3
PHYS 318	Semiconductor Physics	3
PHYS 321	Analog Electronics	3
PHYS 322	Digital Electronics.....4	
PHYS 413	Computer Architecture and Interfacing.....3	

Microelectronics Track

Physics majors pursuing microelectronics must complete the following courses beyond the physics core:

	Credits	
PHYS 316	Quantum Mechanics.....3	
PHYS 318	Semiconductor Physics	3
PHYS 321	Analog Electronics	3
PHYS 322	Digital Electronics	4
PHYS 413	Computer Architecture and Interfacing.....3	
PHYS 470	Senior Seminar.....1	
PHYS 475	Capstone Design Project	2

Teacher Certification

Students seeking licensure to teach physics in secondary schools must complete the following science and education requirements beyond the physics core. Students must complete all academic major requirements with grades of C or better. Students may repeat education courses only once.

	Credits	
BIOL 101	Fundamentals of Biology	4
PHYS 108	Introduction to Astronomy.....4	
or		
PHYS 109	Principles of Astronomy	3
GEOL 103	Introduction to Physical Geology.....4	
or		
GEOG 104	Earth and Space Science.....4	

► Pre-professional Requirements

1. Complete the following pre-professional requirements with grades of C or better.

	Credits	
EDFN 210	School in a Diverse Society	3
ENGL 103	Composition and Research	4
SCED 300	Development, Learning and Assessment.....3	

2. Show satisfactory results on Praxis Core, SAT or ACT examinations as defined by the Maryland State Department of Education. See education advisor regarding passing scores.

3. Successful completion of an approved lab safety certification program. See education advisory regarding approved courses.

► Professional Program

In order to enroll in professional education program courses, students must meet the following requirements:

1. Complete an application for formal admission to the professional program. Obtain written approval of the application from both content and education advisors.
2. Complete a minimum of 56 college credits with a minimum of 2.50 GPA, including transfer credits.

3. Have a cumulative minimum GPA of 2.75 in the major, including transfer credits.

4. Complete all pre-professional requirements.

5. Complete four courses in the major field.

► Methods Requirements

To be eligible for internship, all students enrolled in a secondary or K-12 program must complete the appropriate methods courses for the content major and the following courses in education with grades of C or better:

	Credits	
SCED 367	Inclusive Instruction for Secondary Teachers.....3	
SCED 434	Classroom Management	3
SCED 438	Teaching Literacy in the Content Areas I	3
SCED 374	Teaching Science in Grades 7-12 Part I	4
SCED 474	Teaching Science in Grades 7-12 Part II	4

► Internship and Seminar

Student interns will be assigned to a Professional Development School (PDS) for their internship experience. This internship will consist of a minimum of 100 days. In order to meet the 100-day requirement, interns are required to follow the calendar of the school district in which the PDS is located. Interns are responsible for their own transportation to the PDS site.

Candidates must meet the following requirements for internship:

1. Complete the written application for internship.
2. Complete a minimum of 90 credits including methods and at least eight courses of the academic major (secondary and K-12 programs).
3. Have an overall grade point average of at least 2.50 including transfer credit.
4. Have a minimum grade point average of at least 2.75 in the academic major courses, including transfer credits, as defined by each academic department.
5. Have a minimum average of 2.75 in professional education courses with no grade below C. Students may repeat education courses only once.
6. Obtain verification of completion of these requirements from the director of field experiences.

All secondary education majors are required to pass the following:

	Credits	
SCED 426	Internship in Middle or High School Education	6
SCED 428	Internship in Middle or High School Education	6
SCED 433*	Reflection and Inquiry in Teaching Practice	2

* Students are required to follow the University calendar with respect to attendance in SCED 433.

► Graduation Requirement

Official scores on all certification examinations required by the State of Maryland must be sent from the testing company to Salisbury University as a requirement for graduation. Taking appropriate certification exams is required for completion of secondary education certification and graduation. See education advisor regarding appropriate tests.

Dual Degree Engineering Transfer Program

The Dual Degree Engineering Transfer Program offers students the opportunity to earn both a degree in physics from Salisbury University and an engineering degree from an ABET (Accreditation Board for Engineering and Technology)-accredited engineering school. Under the program, a student normally attends SU for three years and an engineering school for two years. While at SU, a student must complete a minimum of 90 credit hours, including all required General Education courses, the physics core and appropriate engineering courses. Transfer students entering SU's dual-degree program are required to complete a minimum of 60 semester hours at SU. The dual-degree engineering student also must apply for admission and be accepted to an ABET-accredited engineering school. An additional 30 hours, including at least 15 hours in engineering or related courses, must be completed at the receiving institution and be transferred to SU to receive a physics baccalaureate degree from SU. To receive an engineering degree, additional coursework must be completed at the receiving institution according to the requirements of the engineering school attended. Please note, the completion of SU requirements does not guarantee admission into an engineering school. Additionally, it is the student's responsibility to make sure all engineering school prerequisites are met.

The courses at Salisbury University that are required for the Dual Degree Engineering Transfer Program are described in this catalog with other programs offered by the Physics Department in the Richard A. Henson School of Science and Technology.

Students in the Dual Degree Engineering Transfer Program may use credits and grades from the receiving institution as well as Salisbury University in meeting the requirements for graduating with honors.

► Checklist

For a major checklist visit www.salisbury.edu/checklists.

URBAN AND REGIONAL PLANNING

Department of Geography and Geosciences

www.salisbury.edu/geography

Dr. Amal Ali, Program Director

410-543-6460

All courses applied to the major must be completed with grades of C or better. Except for GEOG 204, 219, 304, 319 and 414 and URPL 308, 402, 408, the core courses may be taken in any order, and a student may register for more than one in any given semester. The Department of Geography and Geosciences recommends that the lower-division core courses (GEOG 204 and 219) be completed prior to GEOG 414.

Transfer students must complete a minimum of 15 semester hours with grades of C or better in URPL and GEOG courses at Salisbury University, at least 12 semester hours of which must be at the 300/400 level.

Bachelor of Science requirements for the major include the following:

1. Complete the core courses

	Credit
ECON 150 Principles of Economics	3
or	
ECON 211 Principles of Microeconomics.....	3
GEOG 100 Introduction to Human Geography	3
or	
GEOG 101 World Geography: Europe and Asia.....	3
or	
GEOG 102 World Geography: Africa and the Americas	3
GEOG 204 Statistical Problem Solving in Geography	4
GEOG 219 Map Interpretation and Analysis	4
GEOG 319 Geographic Information Science	4
GEOG 414 Research and Writing	3
MATH 155 Modern Statistics with Computer Analysis	3
POSC 202 State and Local Government in the U.S.	4
GEOG/	
URPL 308 Principles of Planning.....	3
GEOG/	
URPL 402 Environmental Planning	3
GEOG/	
URPL 408 Seminar in Urban Theory	3

2. Complete one of the following tracks.

3. Recommended minor areas: Select one area: CADR, ECON, ENVR, GEOG, GIS, HIST or POSC

Land-Use Planning Track

	Credits
GEOG 304 Decision Making with GIS	4
GEOG/	
URPL 328 Applied Planning.....	3
GEOG/	
URPL 416 Smart Growth	3

Complete at least two from the following:

GEOG 325 Conservation and Resource Management.....	3
GEOG 401 Soil, Water and Environment	3
GEOG 403 Environmental Hazards	3
POSC 360 Environmental Policy	4
POSC 460 Environmental Law	4

Complete at least one from the following:

GEOG 333 Global Development and Sustainability	3
POSC 311 Comparative Government of Developing Nations	4
URPL 363 Cities of the Middle East	3

Environmental Planning Track

Credits

Complete at least three from the following:

GEOG 325	Conservation and Resource Management.....	3
GEOG 401	Soil, Water and Environment	3
POSC 360	Environmental Policy	4
POSC 460	Environmental Law	4
GEOG/		
URPL 416	Smart Growth	3

Complete at least two from the following (must be different than taken above):

GEOG 304	Decision Making with GIS	4
GEOG 325	Conservation and Resource Management.....	3
GEOG 401	Soil, Water and Environment	3
GEOG 403	Environmental Hazards	3
POSC 360	Environmental Policy	4
POSC 460	Environmental Law	4
GEOG/		
URPL 328	Applied Planning.....	3
GEOG/		
URPL 416	Smart Growth	3

Complete at least one from the following:

GEOG 333	Global Development and Sustainability	3
POSC 311	Comparative Government of Developing Nations	4
URPL 363	Cities of the Middle East	3

4. Take at least one of the following:

Credits

► Checklist

For a major checklist visit www.salisbury.edu/checklists

Graduate Programs

MASTER OF SCIENCE IN APPLIED BIOLOGY

Department of Biological Sciences
www.salisbury.edu/biology

Dr. Dana Price, Program Director
410-543-6498

The M.S. in applied biology addresses the growing need for a technologically trained workforce with special skills in laboratory, biotech and environmental science.

The curriculum emphasizes skills development in a research setting and relates practical experiences to a strong background in theory. The department views the two-year thesis program as the principal choice for most students, especially for those who plan to continue their graduate study beyond the M.S. level. However, an optional non-thesis program and an accelerated 4+1 M.S. program for advanced undergraduates are also available. The choice of program options is made in consultation with a graduate advisor in the department.

Admission

Admission to the M.S. in applied biology at SU requires an application for graduate program admission, the application fee, official transcripts from all colleges and universities attended, the Residency/Domicile Information form (for those students applying for in-state tuition) and the following program-specific credentials:

- An undergraduate degree (in biology or related field) with a minimum cumulative GPA of 3.0 on a 4.0 point scale. In addition to coursework in biology, student transcripts should demonstrate the completion of prerequisite courses in chemistry (two courses in general chemistry and at least one semester of organic chemistry), at least one course in physics and a course in statistics.
- Three letters of recommendation from individuals qualified to judge the applicant's potential for success in a graduate program.
- A personal statement relating the applicant's goals and career objectives as well as research interests and potential graduate advisors in the department.
- Scores on the general Graduate Record Exam (GRE) at or above the 50th percentile. Scores on the biology GRE are optional but if submitted will be considered in admission decisions.
- All applicants (thesis and non-thesis) are encouraged to make contact with prospective graduate advisor(s) in the department prior to submission of an application for admission to the program. M.S. thesis students must make such contact and will not be admitted without the endorsement of a graduate advisor for their research.
- International students are referred to additional guidelines described in the current Salisbury University catalog.
- Students transferring to SU from other universities may

receive a maximum of six transfer credits for courses in which they have earned a grade of B or better. Each course will be individually assessed for program equivalency. Determination of allowable credit for work completed elsewhere will be made at the time of admission by the director of the graduate program.

Application materials should be received by the biology graduate program director by March 1 for full consideration.

Program Requirements

The complete program consists of 33 credit hours of graduate work, which will generally be completed in a two-year period. Two different program options are offered. These are:

- M.S. thesis
- M.S. non-thesis.

Both versions of the program include a substantial component of laboratory and/or field work and certification of an Allied Professional Skill. Graduate students must maintain a 3.0 GPA each semester. Students who earn a C will be required to meet with the departmental Graduate Committee. A student who earns a second grade of C will be dismissed from the program. Any grade of D or lower will result in dismissal from the program.

► Core Courses

Complete at least two (six hours) of the four core courses below:

	Credits
BIOL 502 Biology and Environment	3
BIOL 508 Science Communication	3
BIOL 575 Modern Molecular Biology	3
MATH 5XX Statistics	3

► Thesis Option

Complete the core courses (six hours) and 27 additional hours:

	Credits
BIOL 515 Research in Biology	12
BIOL 520 Graduate Professional Development Seminar	1
BIOL 601 Thesis Preparation	3
BIOL XXX Graduate Elective Courses*	11

► Non-Thesis Option

Complete the core courses (six hours) and 27 additional hours:

	Credits
BIOL 515 Research in Biology	6
BIOL 520 Graduate Professional Development Seminar	1
BIOL XXX Graduate Elective Courses*	20

► Graduate Electives*

Core courses also may be used to complete this requirement.

	Credits
BIOL 500 Wetland Ecology	4
BIOL 503 Contemporary Cell Biology	3
BIOL 504 Perspectives in Modern Genetics	3
BIOL 505 Ornithology	4
BIOL 507 The Biology of Fishes	3
BIOL 510 Estuarine Ecology	4
BIOL 512 Entomology	4
BIOL 521 Mammalogy	4
BIOL 522 Vertebrate Physiology	4
BIOL 523 Biology of Reptiles and Amphibians	4
BIOL 525 Toxicology	3
BIOL 530 Plant Physiology	4
BIOL 532 Immunology	3

BIOL 533 Environmental Microbiology	4
BIOL 535 Evolutionary Biology	3
BIOL 540 Contemporary Genetics	4
BIOL 541 Bioinformatics II	3
BIOL 545 Virology	3
BIOL 550 Internship in Biology	1-3
BIOL 552 Advanced Human Physiology/Pathophysiology	3
BIOL 560 Biology of Cell Membranes	3
BIOL 565 Advanced Cell Biology	3
BIOL 570 International Field Studies	3
BIOL 590 Special Topics in Biology	1-4

► Allied Professional Skills Requirement

Students completing the M.S. in applied biology must demonstrate their applied expertise by developing proficiency in an Allied Professional Skill. Allied Professional Skills include computer programming, geospatial analysis, foreign language, technical writing, etc. The choice of Allied Professional Skill is left to the student in consultation with the advising committee. Skills should be relevant to the student's research or career goals, should be chosen early in the student's program of study and are subject to approval of the Graduate Advisory Committee.

Allied Professional Skills must be certified by the completion of a course or by written certification from a faculty member who is expert at the skill chosen. If a course of instruction is necessary for certification of an Allied Professional Skill, the credits earned in that course may not be counted toward the number required for graduation. Students who develop their applied proficiency through directed study may register for a two-credit course: BIOL 590 Topics: Allied Professional Skill.

M.S. in Applied Biology 4+1 Program

The accelerated M.S. program in applied biology is designed to provide exceptional Salisbury University undergraduates of high ability and achievement the opportunity to begin their graduate studies during their senior year. The purpose of the accelerated program is two-fold. It recognizes excellence in undergraduate research by allowing that work to form the basis of a graduate master's in biology, and it enables the excellent student to complete both the B.S. biology and M.S. applied biology programs in approximately five years.

Students currently enrolled as undergraduates at SU are eligible to apply for the accelerated program during their junior year provided that they:

- a. have a 3.30 GPA at the end of the semester during which they apply,
- b. have engaged in significant undergraduate research with a faculty advisor who can endorse their application for admission to the program,
- c. meet all the requirements, including prerequisite course work, for post-graduate admission to the program by the end of the semester in which they are applying for admission to the accelerated program.

For students accepted into the accelerated program, up to nine credits of graduate course work may be taken during the senior year and applied to both the B.S. and M.S. programs.

MASTER OF SCIENCE IN GEOGRAPHIC INFORMATION SYSTEMS MANAGEMENT

Department of Geography and Geosciences
www.salisbury.edu/geography

Dr. Stuart Hamilton, Program Director
410-548-3518

The Master of Science in geographic information systems (GIS) management is designed to provide a theoretical and applied experience in administering and managing a GIS in a government, business or non-profit organization. To this end, the program also focuses on enhancing the GIS proficiency of professionals working in these areas to support their management objectives. With such experience, these professionals will be well equipped to fully integrate and advance the use of this new technology in their work environments.

This master's program is targeted at working professionals who could not or did not acquire an in-depth GIS background as part of their primary training and yet are expected to interact with GIS professionals and technicians as part of their job. The program is designed to meet students' needs while they continue to hold their professional position. Thus, the entirety of the program is offered online.

► Admission

Admission to the Master of Science in geographic information systems management (GISM) requires that the Application for Graduate Program Admission, application fee, transcripts from all colleges attended and Residency/Domicile Information form (if applying for in-state tuition as a Maryland resident) be submitted to the Office of Admissions. When the application and required transcripts arrive in the Office of Admissions, the application files are sent to the M.S. GISM program coordinator for admission consideration. Applicants must also submit an application directly to the M.S. GISM program with the following requirements:

1. An official transcript as evidence of completion of an earned baccalaureate degree from an accredited institution
2. Successful completion of undergraduate coursework in mathematics (college-level algebra or above) and elementary statistics
3. A professional resume showing:
 - a. At least two years of management or technical experience working in a professional capacity in business, government or non-government organizations
 - b. Knowledge of and recent (within the last three years) professional experience using GIS software, demonstrated by
 - i. At least one year or more of professional GIS experience or
 - ii. At least two semesters of geographic information science courses or
 - iii. Some combination of professional GIS experience and formal coursework
4. Three academic and/or professional recommendations addressing the applicant's qualifications to do graduate work
5. A personal statement of about 500 words that describes the applicant's goals related to the pursuit of this graduate program of study and to his/her overall career.

6. Fulfillment of the University requirements for international students as outlined in this catalog.

► Provisional Admission

Students without significant professional experience may be admitted provisionally if they have had an internship involving management experience, and/or have completed some combination of upper-division or graduate-level courses in human geography, land-use planning, GIS, public administration, business administration or government. Students seeking provisional admission are expected to submit acceptable results from the Graduate Record Examination (GRE). If the applicant does not meet the GIS experience requirement, they may be admitted provisionally and be required to make up the deficiency by completing leveling courses.

Provisionally admitted students who complete GEOG 519 and POSC 540 with no grade below a B are converted to full admission status.

► Program of Study

The Master of Science in GIS management requires the completion of at least 34 credit hours, of which at least 21 credit hours are earned at Salisbury University. The program must be completed with a cumulative average of a B (3.0) or higher, with no more than six credit hours below a grade of B and no grade lower than a C. The curriculum has a common set of core courses (25 credit hours) and allows for elective courses in professional areas of specialization (at least nine credit hours).

The master's degree program can be completed in 13 months with full-time study. Part-time study leading to the degree is also available. All courses are offered online only.

Courses in technology management (TMAN) are offered online to SU students by the University Maryland University College (UMUC). TMAN courses are taken via inter-institutional registration (see the "Inter-Institutional Registration" section of the Graduate Student Information chapter of this catalog for more information) and are treated as credits earned at SU. Upon entering the M.S. GISM program, students work closely with the program director to identify which electives meet their educational goals and are guided through the inter-institutional registration process.

Program requirements are as follows:

1. Complete the following 25 credit hours:

	Credits
GEOG 519 Advanced Geographic Information Science.....	4
POSC 540 Public Administration	3
INFO 686 Database Processing and Management	3
GEOG 619 Managing GISystems	3
GEOG 630 GISystems and Public Administration	3
GEOG 640 GISystems Co-operative Experience	6
GEOG 650 Capstone GISystems Seminar	3

2. Complete nine credit hours in elective courses chosen from the following:

	Credits
INFO 615 Project Management	3
GEOG 538 GIS Leadership.....	3
GEOG 550 Topics in Geography: Open Source GIS	3
TMAN 611 Principles of Technology Management.....	3
TMAN 614 Strategic Management of Technology and Innovation	3
TMAN 625 Economics and Financial Analysis for Technology Managers	3
TMAN 632 Organizational Performance Management.....	3
TMAN 633 Managing People in Technology Organizations.....	3

MASTER OF SCIENCE IN MATHEMATICS EDUCATION

Department of Mathematics and Computer Science and
 Department of Secondary and Physical Education
www.salisbury.edu/mathcosc

Dr. Jennifer Bergner, Program Director
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The Master of Science in Mathematics Education (M.S.M.E.) is a professional degree offered cooperatively by the Department of Secondary and Physical Education and the Department of Mathematics and Computer Science. The program is designed for candidates seeking advanced preparation in the teaching of mathematics in the middle and secondary schools. The curriculum includes fundamental, theoretical and practical experiences within mathematics and education. The M.S.M.E. program promotes continuing professional development and lifelong learning for teachers and mathematics education leaders. This is consistent with the recognition that capable and confident mathematics educators are necessary for all levels of mathematics instruction.

General objectives are as follows:

1. Provide candidates with an opportunity for personal and professional growth through graduate study in mathematics and in education.
2. Provide mathematics classroom teachers and mathematics educational specialists with an opportunity to develop and improve competencies in mathematics and mathematics education.
3. Provide mathematics educators with an opportunity for additional preparation needed for professional development and career advancement.

► Admission

Candidates who indicate on their application for graduate program admission form that they wish to pursue the Master of Science in Mathematics Education (M.S.M.E.) will be assigned an advisor in the Mathematics and Computer Science Department and an advisor in the Education Specialties Department and will receive M.S.M.E. application materials. Admission to the M.S.M.E. at SU requires an application for graduate program admission, the application fee, official transcripts from all colleges and universities attended. The Residency/Domicile Information form (if applying for in-state tuition as a Maryland resident) must be submitted to the Office of Admissions. The following additional application documents and requirements specified by the two collaborating departments must be sent to the Department of Mathematics and Computer Science:

1. Submit a written description of the reasons for pursuing graduate study in mathematics education and a statement of career goals within the discipline.
2. Submit two letters of recommendation supporting the ability to succeed in graduate study.
3. Complete and submit a plan of study signed and approved by the advisor.

4. Possess an undergraduate cumulative GPA of 2.75 or a previously completed master's degree from a regionally accredited institution of higher learning.

Following the review of these materials, the program director formally notifies candidates of admission or denial into the program.

Questions regarding the applicability of courses taken as a non-degree graduate student will be resolved by the two collaborating departments' graduate program directors.

► Provisional Admission

Candidates who have submitted all application materials but have not obtained a 2.75 cumulative grade point average upon the completion of baccalaureate degree may be admitted on a provisional basis. Provisionally admitted candidates must complete nine credit hours of graduate study at SU with no grade below B.

Upon successful completion of nine credit hours candidates may apply for full admission to the M.S.M.E. program. Following the review of application materials, the program director formally notifies candidates of admission or denial into the program.

Candidates who do not meet the provisional admission of achieving nine credit hours with grades of B or above are not eligible to apply for admission into the M.S.M.E. program.

To assist candidates who are provisionally admitted, an advisor will be assigned. Candidates are expected to meet with their advisors to clarify program requirements and to assure that courses for which they register will be appropriate for their programs of study.

► Program of Study

Prior to admission to the M.S.M.E. program and registration for courses, it is the candidate's responsibility to become familiar with the program requirements and to confer with assigned faculty advisors to develop programs of study. The program of study identifies core courses, courses in the specific tracks the candidate will follow, recommended electives and the intended capstone experience. Advisors must approve candidates' programs of study. Program changes must also be approved by advisors.

► Course Requirements

Candidates seeking the M.S.M.E. at Salisbury University must complete an approved program of study including at least 33 semester hours of graduate credit (a minimum of 24 hours completed at SU) with a cumulative GPA of 3.0 or higher, with no grade lower than a C, and no more than six credit hours of C or C+.

The M.S.M.E. program consists of 12 semester hours of education courses, 12 hours of mathematics courses in either the Middle School Track or High School Track, six hours of electives and three hours in a capstone experience.

► Education Courses (12 semester hours)

The curriculum is planned to emphasize mathematical teaching and learning within a context of research, scholarship and practice. Required courses are:

	Credits
EDUC 502 Introduction to Research	3
EDUC 504 Diversity in a Democracy	3
EDUC 506 Seminar in Teaching Mathematics	3
EDUC 541 Learning and Instruction.....	3

► Tracks

In addition to completing the courses in education, M.S.M.E. students select either the Middle School Track or the

High School Track. The candidate must complete the required mathematics courses for the track chosen. The required courses in both tracks are linked to the core learning goals in algebra, geometry and data analysis.

Middle School Track

(12 semester hours required)

Complete the following:

	Credits
MATH 541 Conceptual Algebra for Teachers	3
or	
MATH 555 The Cartesian Triad	3
(departmental approval required)	
and	
MATH 566 Geometry: From Euclid to Modern Day	3
MATH 503 Data Analysis	3
and	
MATH 501 Number Theory from a Multicultural and Historical Perspective	3
or	
MATH 565 Mathematical Modeling for Middle School Teachers ..	3

High School Track

(12 semester hours required)

Complete all of the following:

	Credits
MATH 507 Seminar: Algebra	3
MATH 508 Seminar: Geometry	3
MATH 500 Foundations of Number Theory	3
MATH 502 Applied Statistics	3

▶ Electives (6 semester hours)

The two elective courses may be taken from the graduate offerings in education, mathematics or science. See graduate advisors for recommended electives for each track.

Recommended electives are listed on the checklist for the program.

▶ Capstone Courses (3 semester hours)

All candidates for the M.S.M.E. will complete a capstone experience.

	Credits
EDUC 595 Research Seminar: Mathematics Education	3

POST-BACCALAUREATE CERTIFICATE IN MIDDLE SCHOOL MATHEMATICS

PLEASE NOTE: The Post-Baccalaureate Certificate in Middle School Mathematics Program has been temporarily suspended. The status of the program is being examined. New students will not be admitted into the program during the period of suspension.

The Certificate in Middle School Mathematics (C.M.S.M.) is a certificate in middle-school mathematics. This certificate is designed for school personnel seeking advanced study in mathematics content appropriate for teaching mathematics at the middle-school level.

For admission to the certificate program, candidates must possess a bachelor's degree with a 2.75 minimum grade point average in undergraduate work, or possess a higher degree, and hold a teaching certificate in a specified subject area. For admission consideration, students must submit the following documentation: To Admissions, an application, application fee and official transcripts from every college and university attended; To the Department of Mathematics and Computer Science, an application for admission to the M.S. program in mathematics education, two letters of recommendation supporting the applicant's ability to succeed in graduate study, and a completed plan of study signed by a program advisor.

Note: This certificate is not a teaching certificate. The award of this certificate does not carry certification to teach.

Course Requirements

Candidates seeking the C.M.S.M. must complete at least four of the following courses:

	Credits
MATH 501 Number Theory from a Historical Perspective	3
MATH 503 Data Analysis	3
MATH 510 Mathematical Reasoning	3
MATH 520 Middle School Mathematics in a Teaching Context with Instructional Technology	3
MATH 541 Conceptual Algebra for Teachers	3
MATH 555 The Cartesian Triad: Algebra, Geometry and Coordinates in the Plane	3
MATH 565 Mathematical Modeling for Middle School Teachers ..	3
MATH 566 Geometry: From Euclid to Modern Day	3