

SCHOOL OF SCIENCE

Dean: Tim H. Lindblom

246 MARTIN HALL

Committed to Discovery. The School of Science at JSU offers a distinctive environment for investigation, learning, and discovery. In the classroom, laboratory, and field, our staff and faculty cultivate an atmosphere of inquiry. Alongside our students, we grapple with the big questions about our universe from a scientific perspective. With programs of study in three academic departments, we prepare undergraduate and graduate students to join the grand enterprise of discovery we call Science.

DEPARTMENT OF BIOLOGY (BY)

242 MARTIN HALL

Department Head: Lori Hensley

Professor: Al-Hamdani, Blair, Carter, Cline, Hamissou, Hensley, Lindblom, Meade, Murdock, Rayburn

Associate Professor: Sauterer, Tolley-Jordan, Triplett

Assistant Professor: Burns

Instructor: Watkins

The Department of Biology offers a diverse spectrum of undergraduate courses in the biological sciences that enable a student to develop an understanding and appreciation of life, from molecular to ecological, and to develop the strong academic background necessary for pursuing graduate study or a career in biology or the health professions. The department recognizes the importance of both content and process in science education and thus offers the opportunity to develop communication skills and engage in undergraduate research in the biological sciences.

The **Bachelor of Science** degree with a **major in Biology** requires an overall minimum of 120 hours with a minimum of 36 hours of 300/400 level courses. At least 12 hours of the 300/400 level courses must be taken in residence at JSU. Students must earn a "C" or better in biology coursework and maintain a 2.00 GPA overall and in the courses taken on campus. Once the student has met the requirements for the major, the hours remaining to complete the 120 hours overall will be classified as electives. The Bachelor of Science degree with a major in biology is for those who intend to pursue careers in health professions (medicine, dentistry, optometry, physical therapy, pharmacy, veterinary medicine, physician assistant, etc.), graduate programs (MS, PhD), biological education, biomedical sciences, biotechnology, conservation biology, environmental biology, organismal biology, marine biology, industrial professions (lab managers, consulting, etc.), or governmental professions (research scientist, NOAA, NMFS, etc.). After completing a common core of biology courses, the biology major may choose a concentration from the listing below. Students pursuing a BS degree in biology are not required to have a minor in another academic discipline.

Ecology and Environmental Biology is designed for those majors who plan to enter graduate school or have careers in ecological or environmental research, environmental assessment, or education.

Marine Biology is for majors who plan to enter graduate school or have careers in marine biology research, environmental assessment, or education. The department is an active member of Alabama's Marine Environmental Sciences Consortium. Summer study at the Dauphin Island Sea Lab is required.

Pre-Health Professional Biology is for those majors who intend to seek admission to such health professions as medicine, dentistry, physical therapy, etc., or graduate study in the biomedical sciences.

Organismal Biology is intended for those majors who plan graduate study in organismal biology (plant or animal biology), or who plan to pursue careers in biological education or conservation biology or as a naturalist.

Cellular and Molecular Biology is for those majors who plan graduate study in biotechnology, cell and molecular biology, or biochemistry or who plan to pursue careers in academic, industrial and/or biotechnology settings.

Advising—Students who plan to earn the BS degree in biology should consult with the Department of Biology for advisement early in their plan of study and every semester thereafter. To complete the biology degree program, the students majoring in biology must plan carefully, since science laboratories can cause scheduling conflicts. An advisor can alert students to potential problems and assist in minimizing such conflicts. It is recommended that the biology major complete the biology core of genetics, cell biology, ecology, and research in biology early in the course of study. Careful planning will facilitate the opportunity for undergraduate research.

Additional departmental, program, advising, and career information is available at www.jsu.edu/biology.

The **Bachelor of Arts** degree with a **major in Biology** requires a minimum of 120 hours with a minimum of 36 hours of 300/400 level courses. At least 12 hours of the 300/400 level courses must be taken in residence at JSU. Students must earn a "C" or better in biology coursework and maintain a 2.00 GPA overall in the courses taken on campus. Once the student has met the requirements for the major, the hours remaining to complete the overall 120 hours will be classified as electives. At the beginning of the sophomore year, students considering this degree program (BA vs. BS) should consult with the biology department head or their biology faculty advisor. Students pursuing a BA degree in biology are not required to have a minor in another academic discipline.

The Major in Biology (BS)

The requirements in biology for the major are:

a. Freshman Biology sequence: BY 101, 102, 103 and 104	8 hrs
b. Biology Core Courses: BY 322 (Genetics), BY 332 (Ecology), and BY 373 (Cell Biology)	12 hrs
c. Introduction to Research: BY 370.....	2 hrs
d. Biology courses to be selected from each of the following groups:	
Group I — Approved courses in cellular, physiological or developmental biology	4 hrs
Group II —Approved courses in organismal biology	4 hrs
e. Senior Seminar: BY 496	1 hr
f. BY 300/400 Electives	8 hrs
TOTAL Hours in Biology	39 hrs
g. Freshman Chemistry sequence: CY 105, 106, 107 and 108	8 hrs
h. Organic Chemistry sequence: CY 231 and 232.....	8 hrs
i. Mathematics: MS 113 or 125 or higher	3-4 hrs
j. Computer Science: CS 201	3 hrs
k. Physics sequence: PHS 201, 202, 203 and 204	8 hrs
TOTAL Hours in Support Courses	30-31

The approved Group I and II courses required for the biology major vary according to the specific concentration chosen and are outlined in the “Plan of Study” which follows below. **No more than one hour each of BY 327, 397, 427, and 489 can be applied to the biology major.**

The Major in Biology (BA)

The requirements in biology for the major are:

a. Freshman Biology sequence: BY 101, 102, 103 and 104	8 hrs
b. Biology Core Courses: BY 322 (Genetics), BY 332 (Ecology) and BY 373 (Cell Biology)	12 hrs
c. Introduction to Research: BY 370.....	2 hrs
d. Biology courses to be selected from each of the following groups:	
Group I — Approved courses in cellular, physiological or developmental biology	4 hrs
Group II —Approved courses in organismal biology	4 hrs
e. Senior Seminar: BY 496	1 hr
f. BY 300/400 Electives	8 hrs
TOTAL Hours in Biology	39 hrs
g. Freshman Chemistry sequence: CY 105, 106, 107 and 108	8 hrs
h. Foreign Language sequence: FH 101/102 or SH 101/102.....	6 hrs
i. Mathematics: MS 113, 125 or 204.....	3-4 hrs
j. Computer Science: CS 201	3 hrs
k. Wellness: FCS 215, HPE 109, MSC 113 or MSC 115.....	3 hrs
TOTAL Hours in Support Courses	23-24 hrs

The approved Group I and II courses required for the biology major are outlined in the “Plan of Study” which follows below. **No more than one hour each of BY 327, 397, 427, and 489 can be applied to the biology major.**

MINOR IN BIOLOGY

A **Minor in Biology** comprises a minimum of 24 hours that shall include BY 101, 102, 103, 104, 322, 332, 373 and four additional hours of approved biology courses at or above the 300 level. A minor in biology may not be taken in conjunction with a major in biology.

PLANS OF STUDY
BACHELOR OF SCIENCE
MAJOR: BIOLOGY

I. Plan of Study: CONCENTRATION IN ECOLOGY AND ENVIRONMENTAL BIOLOGY

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 101 3	EH 102 3
BY 101 3	BY 102 3
BY 103 1	BY 104 1
CY 105 3	CY 106 3
CY 107 1	CY 108 1
MS 112 3	MS 113 or higher 3
STU 101 0	
14	14

SOPHOMORE YEAR

Fall	Spring
EH Literature ¹ 3	EH Literature ¹ 3
HY sequence ² 3	HY sequence ² 3
BY Core ³ 4	BY Core ³ 4
BY 370 2	CS 201 or higher 3
CY 231 4	CY 232 4
16	17

JUNIOR YEAR

Fall	Spring
EH 141 3	BY Group II ⁶ 4
BY Core ³ 4	BY 300+ Electives 4
BY Group I ⁴ 4	Social/Behavioral Science ⁷ 3
PHS 201 ⁵ 3	PHS 202 ⁵ 3
PHS 203 1	PHS 204 1
15	15

SENIOR YEAR

Fall	Spring
BY 300+ Electives 4	Electives 13
Social/Behavioral Science ⁷ 3	BY 496 1
Fine Arts ⁸ 3	
Electives 5	
15	14

TOTAL HOURS: 120

¹ Select two from EH 201, 202, 203, 204, 219, 220, 231, or 232.

² Select from HY 101 and 102 or 201 and 202.

³ Select from BY 322, 332, or 373.

⁴ BY Group I: Select from BY 412, 413, 434, 445, 473, or 479.

⁵ Students may elect to take calculus-based PHS 211/212 in place of PHS 201/202.

⁶ BY Group II: Select from BY 320, 323, 406, 407, 422, 442, 451, 452, 453, 458, 460 or 476.

⁷ Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221.

⁸ Select from ART 202, MU 233, DR 242, or FL 101.

II. Plan of Study: CONCENTRATION IN MARINE BIOLOGY

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
BY 1013	BY 1023
BY 1031	BY 1041
CY 1053	CY 106.....3
CY 1071	CY 1081
EH 101.....3	EH 1023
MS 112 or higher3	MS 113 or higher3
STU 101.....0	
<hr/> 14	<hr/> 14

SOPHOMORE YEAR

Fall	Spring
EH Literature ¹3	EH Literature ¹3
HY sequence ²3	HY sequence ²3
BY Core ³4	BY Core ³4
BY 3702	CY 2314
CY 232.....4	
<hr/> 16	<hr/> 14

JUNIOR YEAR

Fall	Spring
EH 141.....3	CS 201 or higher.....3
BY Core ³4	Electives4
PHS 201 and 203 ⁴4	PHS 202 and 204 ⁴4
Social/Behavioral Science ⁵3	Social/Behavioral Science ⁵3
<hr/> 14	<hr/> 14

**SUMMER BETWEEN JUNIOR AND SENIOR YEAR
IN RESIDENCE AT DAUPHIN ISLAND SEA LAB**

MBY 486, 487, or 4814
MBY 415 or 4614
<hr/> 8

SENIOR YEAR

Fall	Spring
Electives7	Electives7
Fine Arts ⁶3	BY 4961
<hr/> 10	<hr/> 8

**SUMMER FOLLOWING SENIOR YEAR
IN RESIDENCE AT DAUPHIN ISLAND SEA LAB**

MBY 411, 423, or 4394
MBY Elective ⁷4
<hr/> 8

TOTAL HOURS: 120

¹ Select two from EH 201, 202, 203, 204, 219, 220, 231, or 232.

² Select from HY 101 and 102 or 201 and 202.

³ Select from BY 322, 332, or 373.

⁴ Students may elect to take calculus-based PHS 211/212 in place of PHS 201/202.

⁵ Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221.

⁶ Select from ART 202, MU 233, DR 242, or FL 101.

⁷ MBY elective (see marine biology program advisor for current list of approved courses).

III. Plan of Study: CONCENTRATION IN PRE-HEALTH PROFESSIONAL BIOLOGY *

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations

FRESHMAN YEAR

Fall	Spring
EH 1013	EH 1023
BY 1013	BY 1023
BY 1031	BY 1041
CY 1053	CY 1063
CY 1071	CY 1081
MS 112 or higher3	MS 113 or higher ²3
STU 1010	
14	14

SOPHOMORE YEAR

Fall	Spring
HY sequence ¹3	HY sequence ¹3
Social/Behavioral Science ²3	Social/Behavioral Science ²3
CY 2314	CY 2324
BY Core: BY 322 or 3734	BY Core: BY 322 or 3734
BY 3702	CS 201 or higher3
16	17

JUNIOR YEAR

Fall	Spring
EH 1413	EH Literature ⁴3
BY Group I: BY 3204	BY Group II: BY 4344
BY 300+ elective4	BY 300+ elective4
PHS 201 ³3	PHS 202 ³3
PHS 2031	PHS 2041
15	15

SENIOR YEAR

Fall	Spring
EH Literature ⁴3	Fine Arts ⁵3
BY Core: BY 3324	Electives11
Electives7	BY 4961
14	15

TOTAL HOURS: 120

¹ Select from HY 101 and 102 or 201 and 202.

² Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221

³ Student may elect to take calculus-based PHS 211/212 in place of PHS 201/202

⁴ Select two from EH 201, 202, 203, 204, 219, 220, 231, or 232

⁵ Select from ART 202, MU 233, DR 242, or FL 101

* Also recommended: BY 323, 402, 403, 450; CY 362; minor in chemistry

IV. Plan of Study: CONCENTRATION IN ORGANISMAL BIOLOGY

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 1013	EH 1023
BY 1013	BY 1023
BY 1031	BY 1041
CY 1053	CY 1063
CY 1071	CY 1081
MS 112 or higher3	MS 113 or higher3
STU 1010	
14	14

SOPHOMORE YEAR

Fall	Spring
HY sequence ²3	HY sequence ²3
EH Literature ¹3	EH Literature ¹3
BY Core ³4	BY Core ³4
BY 3702	CS 201 or higher3
CY 2314	CY 2324
16	17

JUNIOR YEAR

Fall	Spring
EH 1413	BY Group II ⁶4
BY Core ³4	BY 300+ Elective4
BY Group I ⁴4	Social/Behavioral Science ⁷3
PHS 201 ⁵3	PHS 202 ⁵3
PHS 2031	PHS 2041
15	15

SENIOR YEAR

Fall	Spring
BY 300+ Elective4	Electives12
Social/Behavioral Science ⁷3	BY 4961
Fine Arts ⁸3	
Electives6	
16	13

TOTAL HOURS: 120

¹Select two from EH 201, 202, 203, 204, 219, 220, 231, or 232.

²Select from HY 101 and 102 or 201 and 202.

³Select from BY 322, 332, or 373.

⁴BY Group I: Select from BY 403, 412, 413, 434, 445, 473, 478, 479.

⁵Students may elect to take calculus-based PHS 211/212 in place of PHS 201/202.

⁶BY Group II: Select from BY 320, 323, 406, 407, 422, 442, 451, 452, 453, 458, 460, 476.

⁷Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221.

⁸Select from ART 202, MU 233, DR 242, or FL 101.

V. Plan of Study: CONCENTRATION IN CELLULAR AND MOLECULAR BIOLOGY *

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
BY 1013	BY 1023
BY 1031	BY 1041
CY 1053	CY 1063
CY 1071	CY 1081
EH 1013	EH 1023
MS 112 or higher3	MS 113 or higher3
STU 101.....0	
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14	14

SOPHOMORE YEAR

Fall	Spring
EH Literature ¹3	EH Literature ¹3
HY sequence ²3	HY sequence ²3
BY Core 322 or 3734	BY Core 322 or 3734
BY 3702	CS 201 or higher3
CY 2314	CY 232 4
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16	17

JUNIOR YEAR

Fall	Spring
EH 141.....3	BY Group II ⁵4
BY Core 3324	BY 300+ Electives4
BY Group I ³4	Social/Behavioral Science ⁶ 3
PHS 201 ⁴3	PHS 202 ⁴3
PHS 2031	PHS 2041
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15	15

SENIOR YEAR

Fall	Spring
Fine Arts ⁷3	BY 4961
BY 300+ Elective4	Social/Behavioral Science ⁶3
Electives.....8	Electives10
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15	14

TOTAL HOURS: 120

¹ Select two: EH 201, 202, 203, 204, 219, 220, 231, or 232.

² Select from HY 101 and 102 or 201 and 202.

³ BY Group I: Select from BY 412, 413, 434, 473.

⁴ Student may elect to take calculus-based PHS 211 /212 in place of PHS 201/202.

⁵ BY Group II: Select from BY 323 or 450.

⁶ Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221.

⁷ Select from ART 202, MU 233, DR 242, or FL 101.

* A chemistry minor, including Biochemistry (CY 362 and/or 363) is highly recommended for students intending to pursue a graduate degree in cellular and molecular biology.

**PLAN OF STUDY
BACHELOR OF ARTS
MAJOR: BIOLOGY**

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 101.....3	EH 1023
BY 1013	BY 1023
BY 1031	BY 1041
MS 112 or higher3	MS 113, 125 or 2043
Social/Behavioral Science ¹3	Wellness ²3
STU 101.....0	Elective3
13	16

SOPHOMORE YEAR

Fall	Spring
HY sequence ³3	HY sequence ³3
CY 1053	CY 1063
CY 1071	CY 1081
BY Core ⁴4	BY Core ⁴4
Social/Behavioral Science ¹3	CS 201 or higher3
	BY 3702
14	16

JUNIOR YEAR

Fall	Spring
EH Literature ⁵3	EH Literature ⁵3
Foreign Language sequence ⁶3	Foreign Language sequence ⁶3
BY Core ⁴4	BY Group I ⁷4
EH 1413	BY 300+ Elective4
Elective3	
16	14

SENIOR YEAR

Fall	Spring
BY Group II ⁸4	BY 300+ Elective4
Electives 300+5	BY 4961
Electives7	Electives10
16	15

TOTAL HOURS: 120

¹Select from AN 224, EC 221, EC 222, GY 120, GY 220, PSC 100, PSY 201, PSY 222, or SY 221.

²Select from MSC 113, 115, FCS 215, or HPE 109.

³Select from HY 101 and 102 or HY 201 and 202.

⁴Select from BY 322, 332, 373.

⁵Select two from EH 201, 202, 203, 204, 219, 220, 231, or 232.

⁶See academic advisor when selecting foreign language sequence; select from FH 101/102 or SH 101/102 (this will count as Fine Arts requirement).

⁷BY Group I: Select from BY 403, 412, 413, 434, 445, 473, 478 or 487.

⁸BY Group II: Select from BY 301, 302, 320, 323, 406, 407, 422, 442, 451, 452, 453, 458, 460, 475, or 476.

BIOLOGY (BY)
COURSE DESCRIPTIONS

- 101. Introductory Biology I (3).** *Corequisite: BY 103.* An introduction to the concepts of biology, including cellular structure and function, bioenergetics, patterns and mechanisms of inheritance, the processes of evolution, and ecology. For majors and non-majors.
- 102. Introductory Biology II (3).** *Prerequisite: BY 101. Corequisite: BY 104.* An introduction to biodiversity, from bacteria through plants and animals, with an emphasis on their structure, function, and ecological interactions. For majors and non-majors.
- 103. Introductory Biology Lab I (1).** *Corequisite: BY 101.* One two-hour laboratory per week. This course reinforces lecture materials and must be taken concurrently with BY 101.
- 104. Introductory Biology Lab II (1).** *Prerequisite: BY 103. Corequisite: BY 102.* One two-hour laboratory per week. This course reinforces lecture material and must be taken concurrently with BY 102.
- 105. Honors Introductory Biology I (3).** *Prerequisite: Admission to the Honors Program or permission of instructor. Substitutes for BY 101. Corequisite: BY 107.* An advanced introduction to the concepts of biology, including chemistry as related to biology, cell structure and function, energy pathways, cellular reproduction, genetics, genetic techniques, evolution and ecology. For majors and non-majors.
- 106. Honors Introductory Biology II (3).** *Prerequisite: Successful completion of BY 105 or permission of instructor. Substitutes for BY 102. Corequisite: BY 108.* An advanced introduction to diversity in the living world. Emphasis is on structure, function, and ecological interactions of living organisms beginning with bacteria and viruses and progressing through plants and animals. For majors and non-majors.
- 107. Honors Introductory Biology Lab I (1).** *Prerequisite: Admission to the Honors Program or permission of instructor. Substitutes for BY 103. Corequisite: BY 105.* One two-hour laboratory per week. This course reinforces lecture materials with hands-on creative laboratory exercises and must be taken concurrently with BY 105.
- 108. Honors Introductory Biology Lab II (1).** *Prerequisite: Admission to the Honors Program or permission of instructor. Substitutes for BY 104. Corequisite: BY 106.* One two-hour laboratory per week. This course reinforces lecture materials with hands-on creative laboratory exercises and must be taken concurrently with BY 106.
- 263. Human Anatomy and Physiology I (4).** *Prerequisite: BY 101 and 103.* Lecture and laboratory. The first of a two-course sequence of human anatomy and physiology, with an emphasis on the skeletal, muscular, respiratory and circulatory systems. For students in health-related majors; no credit allowed toward biology major or minor.
- 264. Human Anatomy and Physiology II (4).** *Prerequisite: BY 263.* Lecture and laboratory. The second of a two-course sequence of human anatomy and physiology, with an emphasis on the digestive, urinary, reproductive and endocrine systems. For students in health-related majors; no credit allowed towards biology major or minor.
- 283. Health Microbiology (4).** *Prerequisite: BY 101 and 103.* Lecture and laboratory. The study of viruses, bacteria, protozoa and fungi that cause diseases in humans. For students in health-related majors; no credit for biology major or minor.
- 301. Field Zoology (3).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture, laboratory, and field study. Collecting and identifying animals and noting ecological conditions.
- 302. Field Botany (3).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture, laboratory, and field study. The laboratory work will involve the collection and identification of native plants of Alabama.
- 303. Biological Conservation (3).** *Prerequisites: BY 101, 102, 103, and 104.* A contemporary and historical study of biological conservation in America. Topics include national and global biodiversity, threats to biodiversity, conservation ethics and economics, habitat loss and degradation, habitat fragmentation, overexploitation, invasive species, conservation genetics, and conservation policy. Also addressed are the management of species and population dynamics, ecosystem conservation, restoration of degraded ecosystems, and sustainable development.
- 320. Comparative Vertebrate Anatomy (4).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture and laboratory. The comparative study of vertebrate organ systems supplemented in laboratory with the dissection of selected vertebrates.
- 322. Genetics (4).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture and laboratory. Important facts, laws, theories, and methods used in the study of genetics.
- 323. Microbiology (4).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture and laboratory. General microbiology, including methods of culture and identification of some of the most common types of microorganisms.
- 327. Directed Studies in Biology (1).** *Prerequisite: BY 322 or 332 or 373. Recommended: BY 370.* May be duplicated for credit for a total of three (3) semester hours, but only one hour may be applied to the major. A laboratory, field or library research investigation dealing with an aspect of the biological sciences. Biology sponsor required for topic approval and supervision. Grade of Pass/Fail only.
- 331. Principles of Animal Nutrition (3).** *Prerequisites: BY 101, 102, 103, and 104.* The classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.

332. **Ecology (4).** *Prerequisites: BY 101, 102, 103, and 104. Prerequisite or corequisite: MS 112 or higher.* Lecture, laboratory, and field study. The association and distribution of organisms in relation to the major environmental factors.
340. **Discovering Genomics and Bioinformatics (3).** *Prerequisite: BY 101.* The course provides fundamental background in bioinformatics, both theoretical (bioinformatics algorithms) and practical (databases and web-based tools used to study problems in biology), to students in computer science or in biological sciences. Introduction to the biological problems addressed in this course will be provided, as well as a formal definition of the computational problems and deep exploration of the algorithms for solving these problems. Practical use of topics introduced in class is demonstrated by laboratory exercises and homework problems. Students are grouped for class projects such that each group contains at least one life scientist and one computer scientist. (BY 340 is cross-listed with CS 340, but only one course can be counted for credit.)
370. **Introduction to Research in Biology (2).** *Corequisite: BY 322 or 332 or 373.* Lecture and discussion. An introduction to research in biology, including discussion of the scientific method; reading, analyzing, and interpreting biological literature; experimental design and use of statistics; building and interpreting figures and tables; ethics; and developing a basic proposal for undergraduate research in biology.
373. **Cell Biology (4).** *Prerequisites: BY 101, 102, 103, and 104.* Lecture and laboratory. The study of prokaryotic and eukaryotic cells, with an emphasis on their chemical and structural organization, bioenergetics and reproduction.
397. **Biology Internship (1).** *Prerequisites: BY 101, 102, 103, and 104; either BY 322, 332 or 373; and permission of instructor required.* May be duplicated for credit for a total of three (3) semester hours, but only one hour may be applied to the major. The student will spend a minimum of 25 hours gaining practical experience at a public or private institution or business. Grade of Pass/Fail only.
399. **Study Tour (3).** Topics, excursions, and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.
402. **Medical Microbiology (4).** *Prerequisite: BY 283 with permission of instructor or BY 323.* Lecture and laboratory. The study of pathogenic bacteria, viruses, fungi, and parasites of humans and some domestic animals. Emphasis on identification of pathogens, disease processes, and public health.
403. **Immunology (3).** *Prerequisite: BY 373. Recommended: BY 323.* The study of immunity and how the immune system responds to specific infectious and non-infectious agents. Includes comparative immunology of invertebrate and vertebrate animals, immunological disorders, and application of immunological techniques.
405. **Animal Behavior (3).** *Prerequisite: BY 332.* Lecture, discussion, demonstration, and library study. The genetic and anatomical basis of behavior, with an emphasis on the impact of behavior on the ecology of animals.
406. **Ornithology (4).** *Prerequisite: BY 332.* Lecture, laboratory, and field study. The history, classification, anatomy, physiology, ecology, and distribution of birds, with an emphasis on field identification and ecology.
407. **Mammalogy (4).** *Prerequisite: BY 332.* Lecture, laboratory, and field study. Aspects of the biology, ecology, taxonomy, and distribution of Southeastern mammals.
408. **Public Policy and Ecosystems (4).** *Prerequisite: BY 332.* Lecture, laboratory, and field study. The course will address the history, evolution, and recent developments in natural resource policy and how it influences ecosystem structure and function. Topics will include fish and wildlife conservation, forest planning and management, agricultural policies, public lands (Bureau of Land Management lands, national forests, national wildlife refuges, national parks, and wilderness areas), endangered species, and policies that influence private lands. The relationship between policies and ecosystem structure and function will be addressed in class and in labs by debates and field exercises.
412. **Plant Reproduction and Development (4).** *Prerequisites: BY 322 and 373. Recommended: CY 105, 106, 107, and 108.* Lecture and laboratory. A study of structural and functional aspects of reproductive and developmental phenomena in vascular plants.
413. **Animal Reproduction and Development (4).** *Prerequisites: BY 322 and 373. Recommended: CY 105, 106, 107, and 108.* Lecture and laboratory. A study of the structural and functional aspects of reproductive and developmental phenomena in animals, with an emphasis on the cellular and molecular mechanisms involved.
415. **Biometrics (3).** *Prerequisites: BY 322, 332, or 373 and MS 204.* An introduction to statistics for biology majors. This course will introduce students to appropriate statistics for analyzing biological data. This course will include how to select random samples, use basic statistical package(s), post-hoc statistical testing and the use of linear regression. The students will be introduced to real-world examples of statistics in ecological, toxicological, and physiological research.
422. **Biology of Cryptogams (4).** *Prerequisites: BY 332 and 373.* Lecture, laboratory, field, and library study. The study of blue-green algae, algae, slime molds, bryophytes, and lichens. Extensive field and laboratory identifications.
427. **Independent Studies in Biology (1).** *Prerequisite: BY 370.* May be duplicated for credit for a total of three (3) semester hours, but only one hour may be applied to the major. A laboratory or field research project dealing with an aspect of the biological sciences. Biology sponsor required for topic approval and supervision. Grade of Pass/Fail only.

434. **Animal Systems Physiology (4).** *Prerequisites:* BY 373, CY 105, 106, 107, and 108. *Recommended:* CY 109 or 231 and 232; one semester of physics. Lecture and laboratory. A systematic survey of organ system physiology in vertebrates, with an emphasis on systems analysis, biophysics, and bioengineering.
435. **Landscape Ecology and Management (4).** *Prerequisites:* BY 332 and MS 204. Lecture, laboratory, and field study. The role of spatial and temporal heterogeneity in the management of wildlife and natural resources is emphasized. Topics addressed include detection and description of heterogeneity, landscape dynamics and models, ecosystem management, adaptive management, genetics in conservation and management, population dynamics, community management, landscape-level conservation, managing biodiversity, and human interactions with ecosystems.
438. **Freshwater Biology (4).** *Prerequisite:* BY 332. Lecture, laboratory, and field study. An analysis of the unique ecology and biology of the freshwater ecosystems, with extensive field work and a research project involved.
440. **Evolutionary Biology (4).** *Prerequisite:* BY 322. Lecture, laboratory, and field study. A study of the processes and mechanisms which lead to evolutionary change in the biota.
442. **General Entomology (4).** *Prerequisite:* BY 332. Lecture, laboratory, and field study of insects and other arthropods, with an emphasis on the taxonomy, morphology, physiology, and ecology of the insects.
445. **Ecotoxicology (4).** *Prerequisites:* BY 332 and 373. *Recommended:* BY 322. Lecture, laboratory and field study. This course is a survey of ecotoxicology: study of the integration of the major processes involved with transport, exposure and response of biological systems to xenobiotics; study of how toxicants mediate interactions between organisms and their biotic and abiotic environments; study of the impact and toxic effects of pollutants on diversity, growth and metabolism of living organisms, populations, communities, and the ecosystem.
450. **Molecular Biology (4).** *Prerequisites:* BY 322 and 373 or permission of the instructor. Lecture and laboratory. A study of the processes involved in the expression of biological information at the molecular level. The laboratory includes methods in recombinant DNA technology.
451. **Plant Anatomy (4).** *Prerequisite:* BY 373. Lecture and laboratory. The comparative structural organization of the vegetative and reproductive parts of seed plants, from cells to tissues to systems.
452. **Plant Taxonomy (4).** *Prerequisite:* BY 322 or 332. Lecture, library, laboratory, and field study. Survey of plant nomenclature, identification systems, description, evolution, and classification, with an emphasis on vascular plants.
453. **Dendrology (4).** *Prerequisite:* BY 332. Lecture, laboratory, and field study. The identification, taxonomy, ecological characteristics, distribution, and economic importance of trees native to North America and ornamentals.
454. **Tropical Biology (3).** *Prerequisites:* BY 101, 102, 103, and 104 and permission of instructor. An extensive field trip to study the flora and fauna of tropical regions. Advance deposit required.
455. **Plant Ecology (4).** *Prerequisite:* BY 322 or 332. Lecture, laboratory, library, and field study. The study of the major plant communities of the southeastern U.S. and their relationships with major abiotic features, including autecological field studies of plant species and populations.
458. **Herpetology (4).** *Prerequisite:* BY 332. *Recommended:* BY 320. Lecture, laboratory, and field study. The study of the taxonomy, ecology, physiology, and external anatomy of amphibians and reptiles, with an emphasis on conservation and field methodology.
460. **Ichthyology (4).** *Prerequisite:* BY 332. Lecture, laboratory, and field study. An overview of the evolution, ecology, behavior, physiology, and conservation of fishes.
473. **Advanced Cell Biology (4).** *Prerequisite:* BY 373. *Recommended:* BY 322, CY 231, 232, 362, and 363. Lecture and laboratory. A study of molecular aspects of cell structures and their functions using both descriptive and biochemical approaches.
475. **Economic Botany (4).** *Prerequisites:* BY 101, 102, 103, and 104. Lecture, laboratory, and field study. The collection, identification, culture, and preservation of plants for illustration and utilization in the classroom and laboratory.
476. **Invertebrate Zoology (4).** *Prerequisite:* BY 332. Lecture, laboratory, and field study. The study of the systematics, ecology, physiology, and phylogenetic relationships of invertebrate animals.
477. **Cell and Tissue Culture (4).** *Prerequisites:* BY 373 and CY 105-108. *Recommended:* BY 322, 412, 431 and CY 231. Lecture and laboratory. The study of *in vitro* manipulation of cells, tissues, and organs, both solid and suspension culture, and their application to biotechnology.
478. **Endocrinology (3).** *Prerequisites:* BY 373 and CY 231. General introduction to vertebrate endocrine systems and the variety of chemical messengers involved in the regulation of physiological processes. Topics will include discussions of the history and methodologies of endocrinology, hormone synthesis, physiological effects of hormones, and the mechanisms of actions for various hormones.
479. **Plant Physiology (4).** *Prerequisite:* BY 373. *Recommended:* BY 451. Lecture and laboratory. The study of mineral nutrition, water relations, photosynthesis, metabolism, and transport in vascular plants.
480. **Advanced Topics in Biology I (1).** *Prerequisites:* BY 322, 332, and 373. Lecture and discussion. Topics to be posted in the biology department.
481. **Advanced Topics in Biology II (1).** *Prerequisites:* BY 322, 332, and 373. Lecture and discussion. Topics to be posted in the biology department.

- 488. Laboratory Practicum I (2).** *Prerequisites: BY 322, 332, and 373 and permission of instructor.* Lecture and laboratories. The design, organization, and implementation of laboratory exercises, the use of appropriate equipment and instructional materials, and laboratory safety and supervision. Offered fall term only.
- 489. Laboratory Practicum II (1).** *Prerequisites: BY 322 or 332 or 373, and permission of the instructor.* The organization and implementation of laboratories, including the use of appropriate equipment and instructional materials. Grade of Pass/Fail only.
- 496. Senior Seminar (1).** *Prerequisites: BY 370 and senior standing.* The capstone course in biology includes a written report, an oral presentation in a symposium format, satisfactory completion of a comprehensive exam for the major, and participation in departmental assessment. Required for biology major; should be taken in the last semester.

MARINE BIOLOGY (MBY)

In addition to the requirements for the BS in biology, the Marine Biology concentration requires 16 credit hours of MBY courses which are offered during the **summer only** at the Dauphin Island Sea Lab (DISL). The following courses are required:

MBY 411 Marine Ecology or MBY 461 Marine Behavioral Ecology

MBY 481 Marine Mammals, MBY 486 Marine Vertebrate Zoology, or MBY 487 Marine Invertebrate Zoology

MBY 415 Marine Botany, MBY 423 Marsh Ecology, or MBY 439 Coastal Wetland Ecology

4 hours of MBY at the 300 or 400 level.

MBY electives must be approved by the JSU marine biology advisor. Students interested in marine biology must consult with the biology department's marine biology advisor for information about the concentrations, actual summer offerings at DISL, JSU Sea Lab Scholarships, application, and registration. Special fees and course availability are determined by DISL. Registration for DISL courses occurs during February each year.

MARINE BIOLOGY (MBY) COURSE DESCRIPTIONS

- 309. Marine Biology (4).** *Prerequisites: BY 101, 102, 103, and 104.* A general survey of the invertebrates, vertebrates, and marine plants as communities with emphasis on local examples of these principal groups. Students will have an opportunity to examine marshland, estuarine, beach, dune, inlet and neritic habitats, and niches. Lecture, laboratory, and field work will be included.
- 411. Marine Ecology (4).** *Prerequisites: BY 101, 102, 103, and 104, one year of general chemistry, one semester of general physics.* Bioenergetics, community structure, population dynamics, predation, competition, and speciation in marine ecosystems will be studied. Lecture and laboratory work will be included, although considerable time will be spent in field work. Students who have not previously had marine courses may enroll; however, Marine Invertebrate Zoology (MBY 487) or Marine Biology (MBY 309) would be very helpful. Individual species will be studied as they relate to ecological principles which they exemplify, thus providing both a taxonomic and ecologic background.
- 415. Marine Botany (4).** *Prerequisites: BY 101, 102, 103, and 104.* A general survey of coastal and marine flora with emphasis on taxonomy, morphology, physiology, ecology, and distribution. Community structure in various ecosystems will be studied. Students will have an opportunity to examine pelagic, marshland, estuarine, beach, sand dune, and inlet niches. Lecture and laboratory work will be included, and a collection will be required.
- 416. Introduction to Oceanography (4).** *Prerequisites: One year of general biology or one year of general zoology and one year of general botany; one year of general chemistry; one semester of physics; and one semester of college algebra.* An introduction to biological, chemical, geological, and physical aspects of the sea.
- 423. Marsh Ecology (4).** *Prerequisite: Advanced undergraduate standing in biology.* A study of the floral and faunal elements of various marine marsh communities with an emphasis on the interaction of physical and biological factors. Lecture, lab, and field trips.
- 427. Marine Technical Methods I (2).** *Prerequisite: Advanced undergraduate standing.* An introduction to instruments and procedures normally utilized aboard a marine research vessel. These include physical, biological, chemical, and geological parameter measurements and sample collections. Basic positioning and communication procedures are included.
- 428. Marine Technical Methods II (2).** *Prerequisite: Advanced undergraduate standing.* An introduction to the laboratory methodology associated with the usual chemical parameters of nutrient analysis. The laboratory approach will be pursued, ship-board and specific practical skills developed.
- 435. Coastal Zone Management (2).** *Prerequisite: Advanced undergraduate standing.* A review of ecological features and of management policies for coastal communities with a description of relevant federal and state programs.

439. **Coastal Wetlands Ecology (4).** *Prerequisites: BY 101, 102, 103, and 104.* This course will focus on coastal and near shore wetlands, with an emphasis on biogeochemical processes, ecological function, and conservation. Lecture and laboratory.
459. **Shark and Ray Biology (2).** *Prerequisites: BY 101, 102, 103, 104.* This course provides an introduction to the biology of sharks and rays, with special emphasis on regional shark fauna and field techniques. Topics covered include, but are not restricted to, evolution and systematics of chondrichthyan fishes, physiology, reproduction and life history, diet, ecology, and conservation biology. Lecture and lab experiences.
460. **Dolphins and Whales (2).** *Prerequisites: BY 320 and MBY 486.* This course enables students to make rapid, accurate, and thoughtful use of a customized reference file and laboratory and field notes to respond to questions about the classification, anatomy, and ecology of marine mammals of the order Cetacea. Lecture and laboratory. (Not open to students with credit in MBY 481.)
461. **Marine Behavioral Ecology (4).** *Prerequisite: BY 332. Recommended: MS 204.* This course examines how animal behavior is influenced by and interacts with its environment, and the ecological and evolutionary significance of these behaviors in a marine setting. Lecture, laboratory, and field exercises (some overnight).
462. **Marine Protozoology (4).** *Prerequisites: BY 101, 102, 103, and 104 or MBY 309.* A study of the major groups of protists from a variety of marine habitats, including their taxonomy, structure, and ecology of methods of identification. Lectures, laboratory, and field trips.
464. **Introduction to Neurobiology (4).** *Prerequisite: Advanced undergraduate standing.* An introduction to the neuroanatomy and neurophysiology of marine invertebrates and vertebrates. A neurosim computer package is used to help illustrate the basic principles and to allow a detailed exploration of neurophysiology and neural networks. Lecture and lab.
465. **Biology and Conservation of Marine Turtles (2).** *Prerequisites: BY 101, 102, 103, and 104.* This course will cover the identification, distribution, nesting behavior, migratory behavior, population biology and genetics, evolution, and conservation of marine turtles. Lecture and laboratory. Overnight field trip and special fees apply.
481. **Marine Mammals (4).** *Prerequisites: BY 101, 102, 103, and 104.* This course will cover the evolutionary history, taxonomy/classification, anatomy, physiology, behavior, conservation/management issues, and research techniques related to marine mammals. Lecture and laboratory. (Not open to students with credit in MBY 460.)
486. **Marine Vertebrate Zoology (4).** *Prerequisites: BY 101, 102, 103, and 104.* A study of marine fishes, reptiles and mammals, with an in-depth, comprehensive treatment of their systematics, zoogeography, and ecology. Lectures will encompass subject matter on a nonregional basis. Field and laboratory work will stress the vertebrate fauna of the northern Gulf of Mexico. Most of the courses will be devoted to fishes. Students will have an opportunity to assemble a collection of vertebrate species.
487. **Marine Invertebrate Zoology (4).** *Prerequisites: BY 101, 102, 103, and 104.* An examination of the systematics, ecology, physiology, and phylogenetic relationships of locally occurring marine invertebrate taxa. Lecture, laboratory, and field work required. Opportunity to acquire collections of local fauna.
491. **Directed Research (2).** *Prerequisite: Consent of instructor.* Students may enroll by special arrangement to do research in any of the subject areas of marine science currently being offered at the Sea Laboratory.

**DEPARTMENT OF MATHEMATICAL, COMPUTING,
AND INFORMATION SCIENCES (MCIS)**

**Computer Science and Computer Information Systems Programs
Accredited by the Computing Accreditation Commission of ABET, Inc.**

119 AYERS HALL

**Department Head: Vijaya Gompa
Professor: Case, Dempsey, Dodd, Francia, Gompa, J. Kim, Y. Kim,
Krishnaprasad, Leathrum, E. Smith, J. S. White
Associate Professor: Franklin, Garrett, K. Kim, Thornton, Trifas
Instructor: Alam, Chukwuemeka, Cochran, DaParma, C. Jensen, J. Jensen,
McDivitt, D. Smith, Snellen, A. White**

Three majors are available: 1) Mathematics with one of three concentrations—Theoretical, Applied, and General; 2) Computer Science with one of three concentrations—Information Assurance, Game Development, and General; and 3) Computer Information Systems with one of three concentrations—Information Assurance, Web Development, and General.

The **Mathematics (MS) major** consists of prescriptive common courses, prescriptive concentration courses, and elective courses. Concentrations available are: 1) **Theoretical**—emphasizes course work to prepare the student for graduate work in mathematics and a career in mathematics (39 hours); 2) **Applied**—emphasizes course work to prepare the student for graduate work in applied mathematics and a career supported by significant applied mathematics (39 hours); and 3) **General**—emphasizes course work designed to give the student sound fundamental skills and to

integrate these fundamental skills into a broad knowledge of the content and methods of mathematics as a liberal art (39 hours).

Each concentration requires completion of the following **common courses** with a “C” or better: MS 125, 126, 227, 300, 344, 352, and 415.

Each concentration requires completion of the following **concentration courses** with a “C” or better: *Theoretical*: MS 416, 441, and any two of 442, 451, 480, or 484; *Applied*: MS 304, 309, 390, 416, and any one of 403, 404, 451, 480, 484, or 499; *General*: MS 302, 305 or 309, 323, 441, and 475.

Each concentration requires **elective courses** selected from the departmental list of approved mathematics electives as follows: *Theoretical*: at least one additional MS course numbered above 300, excluding 322; *General and Applied*: none required.

In addition to the common, concentration, and elective courses, each concentration requires the following **support courses**: CS 230 and 231, and the physics sequence PHS 211 and 212 with labs.

The **Mathematics minor** requires a minimum of 21 hours and consists of the calculus sequence and three mathematics courses numbered 300 or above.

The **Computer Science major** emphasizes the development of large software systems. It consists of prescriptive courses and elective courses. The **prescriptive courses** are CS 230, 231, 232, 234, 304, 310, 331, 333, 350, 450, 462, 488, and 491, and must be completed with a “C” or better. **Three concentrations** are available based on elective courses pursued that must be completed with a “C” or better: (1) **Information Assurance**: CS 307, 308, 425 or 461, and 470; (2) **Game Development**: CS 339, 439, and two of the following courses: 430, 432, 444; and (3) **General**: Four **elective courses** must be completed from the departmental list of approved computer science electives: two numbered 300 or above and two numbered 400 or above. Courses in the major may not be taken until all prerequisites are completed with a grade of “C” or better.

In addition to the major courses, **support courses** required are MS 125, 126, 227, 302, 352, one of the following natural science sequences: the physics sequence PHS 211 and 212 with the associated labs, the chemistry sequence CY 105 and 106 with the associated labs, or the biology sequence BY 101 and 102 with the associated labs and one additional science course with a lab component emphasizing the scientific method, either in physics, chemistry, or biology. Note that a minimum of 12 hours of natural science needs to be taken.

The **Computer Information Systems major** emphasizes the development and maintenance of business software systems. It consists of prescriptive courses and elective courses. The **prescriptive courses** are CS 230, 231, 232, 304, 309, 310, 311, 333, 350, 370, 450, 462, 488, and 491, and must be completed with a “C” or better. **Three concentrations** are available based on elective courses pursued that must be completed with a “C” or better: (1) **Information Assurance**: CS 307, 308, 412 or 425 or 461, and 470; (2) **Web Development**: CS 315, 325, 425, and 415; and (3) **General**: Four **elective courses** must be completed from the departmental list of approved computer information systems electives: two numbered 300 or above and two numbered 400 or above. Courses in the major may not be taken until all prerequisites are completed with a grade of “C” or better.

In addition to the major courses, **support courses** required are ACC 200, EC 221, FIN 301, MGT 301, MKT 301, MS 120 or MS 125, and MS 302.

The **Computer Science minor** requires 21 hours consisting of CS 230, 231, 232, 310, 333, 350, and 488. The **Computer Information Systems minor** requires 21 hours consisting of CS 230, 231, 232, 310, 311, 370, and 488. The **Applied Information Processing minor** requires 21 hours consisting of CS 230 and six CS courses selected from CS 231, 300, 302, 305, 307, 309, 310, 315, 322, and 339. Courses in each of these minors must be completed with a “C” or better. Also, courses in these minors may not be taken until all prerequisites are completed with a grade of “C” or better.

To satisfy the general studies curriculum, general courses from the areas listed in the “Plan of Study” for each major and concentration must be completed. The “Plan of Study” is located before the “Course Descriptions” for each major. All students, especially transfer students, must note the specific courses required in their “Plan of Study.” For specific requirements in each major/minor see the department head or an advisor. Students may also use the internet to obtain an outline of the specific courses required for their chosen major and concentration. The URL is <http://www.jsu.edu/mcis>.

PLANS OF STUDY
BACHELOR OF SCIENCE
MAJOR: MATHEMATICS (MS)

NOTE: This schedule reflects the mathematics program beginning with Calculus I (MS 125). Freshman mathematics majors needing additional preparation before beginning calculus will be placed in the appropriate algebra or precalculus courses that provide this preparation. See advisor.

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
MS 1254	MS 1264
CS 2303	CS 2313
EH 1013	EH 1023
HY 101 or 2013	HY 102 or 2023
Social/Behavioral Science3	Social/Behavioral Science 3
STU 101.....0	
16	16

SOPHOMORE YEAR

Fall	Spring
MS 2274	MS 3003
EH Literature3	MS 3523
PHS 211 and 2135	EH 1413
Fine Arts3	EH Literature3
	PHS 212 and 214 5
15	17

CONCENTRATION: THEORETICAL

JUNIOR YEAR

Fall	Spring
MS 3443	MS 3903
MS 403 or 404 or 451 or 480 or 484 or 499.....3	MS 4153
Minor/Electives10	Minor/Electives10
16	16

SENIOR YEAR

Fall	Spring
MS 3043	MS 3093
MS 4163	Minor/Electives13
Minor/Electives10	
16	16

TOTAL HOURS: 128

CONCENTRATION: APPLIED

JUNIOR YEAR

Fall	Spring
MS 3443	MS 3903
MS 403 or 404 or 451 or 480 or 484 or 499.....3	MS 4153
Minor/Electives 10	Minor/Electives 10
16	16

SENIOR YEAR

Fall	Spring
MS 3043	MS 3093
MS 4163	Minor/Electives13
Minor/Electives10	
16	16
TOTAL HOURS: 128	

CONCENTRATION: GENERAL

JUNIOR YEAR

Fall	Spring
MS 3233	MS 305 or 3093
MS 3443	MS 4413
Minor/Electives10	Minor/Electives10
16	16

SENIOR YEAR

Fall	Spring
MS 3023	MS 4753
MS 4153	Minor/Electives13
Minor/Electives10	
16	16
TOTAL HOURS: 128	

**MATHEMATICS (MS)
COURSE DESCRIPTIONS**

NOTE: Information regarding placement in an initial mathematics course may be found on the MCIS department web page. The placement criteria found on the web page are subject to change. Students will be placed based on the criteria current at the time of enrollment in their initial mathematics course.

- 100. **Intermediate Algebra (3).** *Prerequisite: Satisfactory score on the departmental placement test.* Operations and properties of real numbers, rates and proportions, units and measurement, elementary plane geometry, linear equations and inequalities, exponents and polynomials, factoring algebraic expressions, graphing in the cartesian plane, systems of equations and inequalities, rational and radical expressions, and functions. (May not be repeated. Institutional credit only.) Grades: P, NC.
- 110. **Finite Mathematics (3).** *Prerequisite: Satisfactory score on the departmental placement test or satisfactory performance in MS 100 or LS 106.* Systems of equations and matrices, matrix applications, sets and counting, probability, probability distributions, and statistics.
- 111. **Honors Finite Mathematics (3).** *Prerequisite: Satisfactory score on the departmental placement test or satisfactory performance in MS 100 or LS 106 or by advisement.* Advanced study of systems of equations and matrices, matrix applications, sets and counting, probability, probability distributions, and statistics with an emphasis on writing, projects, and technology.
- 112. **Precalculus Algebra (3).** *Prerequisite: Satisfactory score on the departmental placement test or satisfactory performance in MS 100 or LS 106.* First and second degree equations and inequalities, linear and quadratic functions and graphs, polynomial and rational functions, exponential and logarithmic functions, conic sections, and systems of equations.
- 113. **Precalculus Trigonometry (3).** *Prerequisite: MS 112 with a "C" or better or satisfaction of MCIS department placement criteria (see the MCIS department website).* Trigonometric functions and inverses, applications, graphs, identities and equations, laws of sines and cosines, vectors and complex numbers.
- 115. **Precalculus Algebra and Trigonometry (4).** *Prerequisite: MS 112 with a "C" or better or MS 113 with a "C" or better or satisfaction of MCIS department placement criteria (see the MCIS department website).* The course is an algebra-trigonometry composite providing the student with a mathematical foundation required for calculus or other courses requiring a similar mathematical background.

117. **Advanced Technical Mathematics I (2).** *Prerequisite:* MS 112 with a “C” or better or satisfactory score on ACT/ SAT or departmental placement test. Selected topics from: unit conversions, geometry, trigonometry, differential and integral calculus. Applications emphasize solving problems in technology. Open only to students in the technology program, except by instructor permission. Student cannot receive credit for both this course and AE 302. (Department credit not given for mathematics majors or minors.)
119. **Advanced Technical Mathematics II (2)** *Prerequisite:* MS 117 with a “C” or better. Selected topics from: unit conversions, geometry, trigonometry, differential and integral calculus. Applications emphasize solving problems in technology. Open only to students in the technology program, except by instructor permission. Student cannot receive credit for both this course and AE 302. (Department credit not given for mathematics majors or minors.)
120. **Calculus and Its Applications (3).** *Prerequisite:* MS 112 with a “C” or better or satisfaction of MCIS department placement criteria (see the MCIS department website). Topics in differential and integral calculus with business applications, functions of several variables, partial derivatives with business applications, Lagrange Multipliers, and multiple integration.
125. **Calculus I (4).** *Prerequisite:* MS 113 with a “C” or better or MS 115 with a “C” or better or satisfaction of MCIS department placement criteria (see the MCIS department website). Introduction to analytic geometry, functions and limits, differentiation with applications, indeterminate forms, antiderivatives, definite integrals, numerical integration, calculus of transcendental functions.
126. **Calculus II (4).** *Prerequisite:* MS 125 with a “C” or better. Applications of integration, techniques of integration, improper integrals, infinite series, vectors in the plane and in 3-space.
133. **Mathematical Concepts I (3).** *Prerequisite:* MS 112. Preparation for implementation of standards set by the National Council of Teachers of Mathematics. Problem solving, set theory, number theory, real number operations, historical development and structure of number systems. (Enrollment by advisement only.) Two hours lecture and two hours lab.
134. **Mathematical Concepts II (3).** *Prerequisites:* MS 112 and 133. A thorough study of geometry, measurement, and statistics as recommended by the NCTM. Problem solving and application are emphasized. (Enrollment by advisement only.) Two hours lecture and two hours lab.
135. **Mathematical Concepts III (3).** *Prerequisites:* MS 112 and 133. Further study in NCTM recommended math content to include logic, probability, principles of counting, algebraic reasoning and representation. (Enrollment by advisement only.) Two hours lecture and two hours lab.
204. **Basic Statistics (3).** *Prerequisite:* Satisfactory score on the departmental placement test or satisfactory performance in MS 100 or LS 106. Numerical descriptive methods, axioms of probability, random variables, statistical inference, point and interval estimation of mean, and hypothesis testing.
227. **Calculus III (4).** *Prerequisite:* MS 126 with a “C” or better. Polar coordinates, parametric equations, vector-valued functions, multivariate functions, multiple integrals, vector analysis.
250. **Introduction to Linear Algebra (3).** *Prerequisite:* MS 113 or 115. Basic theory of linear equations, matrices, real vector spaces, bases, dimension, linear transformations, determinants, eigenvalues, eigenvectors, inner product spaces, and the diagonalization of symmetric matrices.
300. **Introduction to Advanced Mathematics (3).** *Prerequisite:* MS 126 with a “C” or better. Mathematical writing, including methods of proof, and fundamentals of sets and functions. May also include selected topics in algebra, analysis, number theory, or discrete mathematics. Students will be required to demonstrate mastery of selected precalculus material by independently completing a mastery-based tutorial and testing program with a satisfactory score.
302. **Applied Probability and Statistics (3).** *Prerequisite:* MS 120 with a “C” or better or MS 125 with a “C” or better. Provides a summary of introductory probability and statistics centered around data analysis examples and computer simulations. Includes discrete and continuous probability distributions, estimation, and hypothesis testing.
304. **Mathematical Statistics I (3).** *Prerequisite:* MS 126 with a “C” or better. Probability rules, discrete and continuous random variables and their probability distributions, expected value, variance, moment generating functions, multivariate probability distributions, and covariance.
305. **Number Theory (3).** *Prerequisite:* MS 126 with a “C” or better. An introduction to the principal topics of elementary number theory, including divisibility, linear Diophantine equations, distribution of primes, congruences, Fermat’s Theorem, and number theoretic functions.
309. **Combinatorics (3).** *Prerequisite:* MS 126 with a “C” or better. An introduction to counting techniques, such as permutations and combinations, the inclusion-exclusion principle, recurrence relations, and generating functions. May also include topics from graph theory, combinatorial design, and discrete probability.
322. **Selected Survey of Secondary School Mathematics (3).** *Prerequisites:* MS 112 and 113 or equivalents. For students pursuing certification in mathematics. Overview of secondary school mathematics for prospective and in-service teachers of mathematics. (Department credit not given for mathematics majors or minors.)
323. **College Geometry (3).** *Prerequisite:* MS 300. Euclidean geometry, including synthetic and analytic proofs, geometric constructions, properties of the triangle and circle; an introduction to non-Euclidean geometry.

331. **Peer Educator (1).** Academic credit given to advanced undergraduate students who provide tutorial assistance in the mathematics department. Students will work under the guidance of an experienced mathematics instructor. Permission of department head required. (Department credit not given for mathematics majors or minors. MS 331 and MS 332 may be repeated for credit up to a maximum combined total of six semester hours. Course graded Pass/Fail.)
332. **Peer Educator (2).** Academic credit given to advanced undergraduate students who provide tutorial assistance in the mathematics department. Students will work under the guidance of an experienced mathematics instructor. Permission of department head required. (Department credit not given for mathematics majors or minors. MS 331 and MS 332 may be repeated for credit up to a maximum combined total of six semester hours. Course graded Pass/Fail.)
344. **Differential Equations (3).** *Prerequisite: MS 126 with a "C" or better.* The methods of solving differential equations of first or second order and higher order linear equations, including series solutions and selected applications.
352. **Linear Algebra (3).** *Prerequisite: MS 126 with a "C" or better.* Matrices, linear systems, vector spaces with emphasis on algebraic structures.
390. **Numerical Analysis (3).** *Prerequisites: MS 352 and CS 231 with a "C" or better in both.* Numerical analysis and computing with emphasis on methods adaptable to electronic computing machinery.
397. **Directed Readings in Undergraduate Mathematics (1).** *Prerequisites: Advanced standing and approval of instructor.* This course may be repeated for credit up to a maximum of three hours.
399. **Study Tour (3).** Topics, excursions, and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.
403. **Vector Analysis (3).** *Prerequisite: MS 227.* The algebra and calculus of vectors; applications to geometry, electricity, harmonic functions, and potentials.
404. **Mathematical Statistics II (3).** *Prerequisites: MS 227 and 304.* A continuation of MS 304. The Central Limit Theorem, order statistics, functions of random variables, properties of estimators, confidence intervals, hypothesis testing, and least squares regression models.
415. **Advanced Calculus I (3).** *Prerequisites: MS 227 and 300.* Real number system, elementary point set theory, limits, theory of continuous functions, differentiable functions.
416. **Advanced Calculus II (3).** *Prerequisite: MS 415.* Selected topics from advanced calculus, including differentiable functions, the Riemann integral, and sequences and series of functions.
423. **A Survey of Geometries (3).** *Prerequisite: MS 323.* Selected topics from advanced Euclidean geometry, finite geometries, Non-Euclidean geometry, and other related topics.
441. **Abstract Algebra I (3).** *Prerequisites: MS 300 and 352.* Algebraic structures, rings, and fields. The axiomatic approach.
442. **Abstract Algebra II (3).** *Prerequisite: MS 441.* Introduction to group theory and related topics.
451. **Functions of a Complex Variable (3).** *Prerequisites: MS 227 and 300 and 415.* Fundamental operations with complex numbers, differentiation and integration theorems, mappings, series, and residues.
475. **Senior Seminar in Mathematics (3).** *Prerequisites or corequisites: MS 415 or 441 or 451, and senior standing.* A capstone course in advanced mathematics. Goals include examining deeply the fundamental ideas of mathematics and connections among various branches of mathematics, exploring the historical development of major concepts, and further developing the habits of mind that define mathematical approaches to problems.
480. **Introductory Topology (3).** *Prerequisite: MS 415.* Basic topological concepts to include topological spaces, mapping, compactness, connectedness, and separation axioms.
484. **Partial Differential Equations (3).** *Prerequisites: MS 227 and 344.* Standard methods of solution: separation of variables, Fourier Series, Laplace Transforms. Selected applications.
499. **Undergraduate Research in Mathematics (3).** *Prerequisites: MS 302 or 304 or 415 or 441, senior standing, and permission of instructor.* A guided independent investigation of a topic outside the department's normal course offerings, to culminate in a written paper and oral presentation to the faculty.

PLANS OF STUDY
BACHELOR OF SCIENCE
MAJORS: COMPUTER SCIENCE (CS) AND
COMPUTER INFORMATION SYSTEMS (CIS)

NOTE: This schedule reflects the computer science program beginning with Calculus I (MS 125) and the computer information systems program beginning with Calculus and Its Applications (MS 120) or Calculus I (MS 125). Freshman computer science majors needing additional preparation before beginning calculus will be placed in the appropriate algebra or precalculus courses that provide this preparation. See advisor.

COMPUTER SCIENCE

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall		Spring	
CS 201	3	CS 231	3
CS 230	3	CS 234	3
EH 101	3	EH 102	3
Fine Arts	3	EH 141	3
Natural Science sequence	4-5	Natural Science sequence	4-5
STU 101	0		
	16-17		16-17

SOPHOMORE YEAR

Fall		Spring	
CS 232	3	CS 331	3
CS 304	3	CS 333	3
MS 125	4	MS 126	4
HY 101 or 201	3	HY 102 or 202	3
CS Elective*	3	CS 310	3
	16		16

JUNIOR YEAR

Fall		Spring	
CS 488	3	CS 350	3
MS 227	4	CS 491	3
CS Elective*	3	Natural Science	4
EH Literature	3	EH Literature	3
Social/Behavioral Science	3	Social/Behavioral Science	3
	16		16

SENIOR YEAR

Fall		Spring	
CS 450	3	CS 462	3
CS Elective*	3	CS Elective*	3
MS 302	3	MS 352	3
Minor/Electives	6-8	Minor/Electives	6
	15-17		15

TOTAL HOURS: 128

*Refer to specific elective requirements for each concentration

COMPUTER INFORMATION SYSTEMS

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
CS 2013	CS 2313
CS 2303	CS 3093
EH 1013	EH 1023
Fine Arts3	EH 1413
Natural Science sequence 4-5	Natural Science sequence4-5
STU 101.....0	
16-17	16-17

SOPHOMORE YEAR

Fall	Spring
CS 232 3	CS 3113
CS 304 3	CS 3333
MS 120 or 125..... 3-4	EC 2213
ACC 200 3	HY 101 or 2013
CS Elective*3	CS 310 3
15-16	15

JUNIOR YEAR

Fall	Spring
CS 370 3	CS 3503
CS 488 3	CS 4913
CS Elective* 3	MGT 3013
EH Literature 3	HY 102 or 2023
Minor/ Electives 3	EH Literature.....3
Minor/ Electives3	
18	15

SENIOR YEAR

Fall	Spring
CS 450 3	CS 4623
CS Elective* 3	CS Elective*3
MS 302 3	FIN 3013
MKT 3013	PSY 2013
Minor/ Electives 3	Minor/ Electives3-6
15	15-18

TOTAL HOURS: 128

*Refer to specific elective requirements for each concentration

COMPUTER SCIENCE (CS) COURSE DESCRIPTIONS

- 201. Introduction to Information Technology (3).** A brief exposure to theory and operations of information technology. Concepts presented include computer systems, hardware and software. Hands-on experience with selected productivity software packages. (Department credit not given for CS/CIS majors and/or minors.)
- 202. Honors Introduction to Information Technology (3).** *Prerequisite: ACT score of 24 or above or SAT of 520 or above and basic computer proficiency.* Advanced coverage of the theory and operations of information technology. Hands-on experience with selected popular software packages for web and program design. (Department credit not given for CS/CIS majors or minors.)

230. **Fundamentals of Computing (3).** Lecture/1 hour; Lab/1 hour. Sets, functions, propositional logic, number systems, data representation, binary arithmetic. Problem solving tools and techniques. Control structures. Data structures. Implementation using a high-level language. (Open to any major, but required for CS/CIS majors.)
231. **Computer Programming I (3).** Lecture/2 hours; Lab/1 hour. *Prerequisites:* CS 230 and overall GPA of 2.00 or higher and MS 112 or higher level mathematics (excluding MS 113) or satisfactory score on the departmental placement test. Algorithmic problem solving. Modular programming. Strings, multi-dimensional arrays, records, dynamic linked lists. Documentation. Testing and debugging. Developing robust, user-friendly programs. Integral, scheduled laboratory.
232. **Computer Programming II (3).** Lecture/2 hours; Lab/1 hour. *Prerequisite:* CS 231. Advanced problem solving. Efficiency and reuse. Abstract Data Types. Object-Oriented programming. Dynamic data structures: linked lists, queues, stacks. Recursive functions and procedures. Integral, scheduled laboratory.
234. **Discrete Computational Structures (3).** *Prerequisites:* CS 230 and MS 112 or higher. Introduction to the concepts, terminology and manipulative skills associated with combinatorial structures and logic. Sets and functions, partially ordered sets, trees and graphs, algorithms and induction. Boolean algebra and introduction to symbolic logic.
300. **Microcomputing (3).** *Prerequisite:* CS 231. Examination of micro-computers and their role in small to medium firms. Emphasis on applications, I/O operations and file handling in a laboratory environment.
302. **Database Applications (3).** *Prerequisite:* CS 231. Introduction to database management systems using a current DBMS package; development of menu-driven database applications.
304. **Technical Writing for Computer Science (3).** *Prerequisites:* CS 230 and EH 102. Introduction to the writing tasks necessary of computer technology professionals. Covers skills necessary to prepare the technical reports, presentations, and documentation specific to the information technology environment.
305. **Spreadsheet Modeling (3).** *Prerequisites:* CS 201 and MS 112 or higher. The use of spreadsheet software in modeling business problems. Extensive hands-on use of spreadsheets is required. (Department credit not given for CS/CIS majors or minors.)
307. **Management of Information Security and Forensics (3).** *Prerequisite:* CS 201. Study of information security and digital forensics using practical case studies. Emphasis is on developing security policies, security management and practices, utilization of digital forensic tools and techniques, risk management, security project management, and protection mechanisms. Major components of the course are hands-on projects on digital forensic investigation and security management case studies. (CS 307 is cross-listed with EM 325, but only one course can be counted for credit.)
308. **Embedded and Control Systems Security (3).** *Prerequisite:* CS 231. A study of embedded system architectures, security, and digital forensics; the role of hardware abstraction layers and middleware; real-time OS issues, such as concurrency, synchronization, and resource management; and the components and applications of industrial control systems. Laboratory activities include: ladder logic programming, embedded systems programming, and digital forensics for microcontrollers, mobile computing platforms, and industrial control systems.
309. **Introduction to E-Commerce (3).** *Prerequisite:* CS 201. This course focuses on a rich variety of models and strategies for connecting individuals, businesses, governments, and other organizations to each other. The topics covered in the course will span value and supply chain concepts, varying business relationship types, as well as obligations for protection of individual privacy and organizational security.
310. **Software Engineering I (3).** *Prerequisite:* CS 232. Introduction to the systems development life cycle, software development models, analysis and design techniques and tools, and validation and verification testing. Emphasis and experience will be on software engineering within a team environment.
311. **Management Information Systems (3).** *Prerequisite:* CS 309. Study of the systems concept and its relationship to information requirements for decision making and management in traditional and e-commerce environments.
312. **Software User Documentation (3).** *Prerequisites:* CS 310 and EH 102. Introduction to writing, analyzing, and evaluating effective software documentation. Exposure to proposal writing. Emphasis on writing software user manuals.
315. **Introduction to Web Design (3).** *Prerequisite:* CS 201. Step-by-step process of creating a well-designed website. Emphasizes web design techniques resulting in fast-loading and well-placed graphics, cohesive color and typography across platforms and browsers, clear navigational interface, and appropriate use of sound and video. Includes studio component where students analyze, design, and implement websites.
322. **Document Management (3).** *Prerequisite:* CS 304. Trains students to manage dynamic documents, as well as apply document imaging technologies to achieve a paperless office environment. Students will learn about the technology of scanning, importing, transmitting, organizing, indexing, storing, protecting, locating, controlling, authenticating, retrieving, viewing, printing, and preserving documents for document imaging systems and digital libraries. This course has direct implications for project management and information assurance, among other topics that will be addressed.
325. **Web Scripting (3).** *Prerequisite:* CS 231 or 315. A practical hands-on introduction to web scripting for writing client-side scripts. Topics include fundamentals of scripting as a web programming language, scripting techniques and

programming concepts, such as control structures, data structure, objects, event handling and functions. Multiple scripting languages will be used for the hands-on projects.

331. **Data Structures and Algorithms (3).** *Prerequisite:* CS 232. Design, analysis, and implementation of fundamental data structures: trees, heaps, and graphs. Basic algorithmic analysis and strategies. Basic computability and introduction to distributed algorithms.
333. **Computer Organization and Architecture (3).** *Prerequisite:* CS 232. Digital logic; instruction set architecture and computer organization; memory systems; functional organization; interfacing and communication; multiprocessing and alternative architectures.
339. **Game Design I (3).** *Prerequisites:* EH 102 and CS 201 or 230. Principles of game design. Covers analysis of genres; gameplay; conceptual design; story and character development; effects of art, lighting, and sound; interface design; level design; and the business of game development.
340. **Discovering Genomics and Bioinformatics (3).** *Prerequisite:* CS 230. The course provides a fundamental background in bioinformatics, both theoretical (bioinformatics algorithms) and practical (databases and web-based tools used to study problems in biology), to students in computer science or in biological sciences. Introduction to the biological problems addressed in this course will be provided, as well as a formal definition of the computational problems and a deep exploration of the algorithms for solving these problems. Practical use of topics introduced in class is demonstrated by laboratory exercises and homework problems. Students are grouped for class projects such that each group contains at least one life scientist and one computer scientist. (CS 340 is cross-listed with BY 340, but only one course can be taken for credit.)
350. **Fundamentals of Computer Operating Systems (3).** *Prerequisite:* CS 232. Overview of operating system concepts and structures. Study of process management, including synchronization techniques for cooperating processes, main memory management, including virtual memory systems, system resource allocation and deadlocks, file system implementation, secondary storage management and input/output subsystems.
370. **COBOL for Information Systems (3).** Lecture/3 hours; Lab/1.5 hours. *Prerequisite:* CS 232. An introduction to solving business problems using structured programming techniques and methodology for both interactive and batch processing. Integral, scheduled laboratory.
399. **Study Tour (3).** Topics, excursions and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.
400. **Business Information Management (3).** *Prerequisite:* CS 201 or equivalent. Study of terminology and concepts of computer-based management information systems. Emphasis on applications for developing and managing world-wide web page information. (Department credit not given for CS/CIS majors and/or minors.)
412. **Disaster Response and Recovery (3).** *Prerequisite:* CS 201. How people, groups, organizations, communities, and governments manage disasters in the immediate aftermath and recover from their effects, including social, physical, business, and infrastructure problems as well as intra- and inter-organizational issues. (CS 412 is cross-listed with EM 411, but only one course can be counted for credit.)
415. **Dynamic Web Application (3).** *Prerequisite:* CS 488. The course will present dynamic web based application architecture, web scripting languages syntax, principles and techniques for developing database driven web applications using multiple web scripting languages. Students will gain experience in web scripting programming via the completion of a series of practical dynamic website projects.
420. **Algorithms Design/Analysis (3).** *Prerequisite:* CS 331. Survey of design and analysis of efficient algorithms. Introduces methods of describing algorithm time and space complexity and various problem-solving techniques.
425. **Web Application Development Using Web Services (3).** *Prerequisite:* CS 310. Introduction to technologies and tools for developing web applications using Web Services, emphasizing organizational issues, challenges, and security concerns related to the effective deployment of those applications.
430. **Human-Computer Interaction (3).** *Prerequisite:* CS 232. Human-computer interface, human performance, diversity, and mental models, interaction devices, dialog styles, interface styles, error handling, documentation, and evaluation of software interface designs.
432. **Computer Graphics (3).** *Prerequisites:* CS 232 and MS 113 or equivalent. Hardware and software components of computer graphic systems, input representation, and transformation of graphic information. Two-dimensional and three-dimensional transformations; perspective, hidden-line algorithms, shading. Interactive graphics. Survey of applications.
438. **Introduction to Business Intelligence and Data Mining (3).** *Prerequisite:* CS 488. Introduction to business intelligence and data mining methodologies and tools that enable users to analyze big data and develop insight for decision making. This course provides students thorough conceptual framework and practical experience in business intelligence and related topics. Topics covered include business intelligence, data mining methods, predictive analysis, information quality and data warehousing management. Hands-on assignments will apply the skills learned.
439. **Game Design II (3).** *Prerequisites:* CS 232 and 339. Principles of game development. Covers relevant game mathematics and data structures; selected artificial intelligence topics common to game development;

programming and optimization techniques; game engines; and software engineering and project management for game development.

444. **Artificial Intelligence (3).** *Prerequisite: CS 331 or 350 or permission of instructor.* An introduction to the principles and methods used in artificial intelligence programs with a focus on autonomous agents. Offered every two years during fall semester.
450. **Computer Networking (3).** *Prerequisite: CS 350.* Study of computer interconnection and protocols with emphasis on network layers, error detection/correction, data compression, and topologies. Project approach utilized.
453. **Theory of Languages and Automata (3).** *Prerequisite: CS 232.* Formal representations for language syntax, semantics, and underlying language theory. Study of automata theory: finite automata, pushdown automata, and Turing machines.
461. **Critical Infrastructure (3).** *Prerequisite: CS 201.* Identifies what constitutes critical infrastructure, including cyber as well as physical infrastructure. Evaluation of strategies for promoting vulnerability assessments and risk reduction, and protection of critical infrastructures are examined. (CS 461 is cross-listed with EM 461, but only one course can be counted for credit.)
462. **Ethics and Legal Issues (3).** *Prerequisite: CS 310 or permission of instructor.* An overview of legal, ethical, global and professional issues in computing.
464. **Honors Ethics and Legal Issues (3).** *Prerequisite: Completion of CS 310 (with "B" or above) or permission of the instructor.* This course is an advanced (honors) course that provides an overview of the legal, ethical, global and professional issues in computing. This course will enable students to identify ethical issues in technology, perform ethical analyses using a variety of ethical theories, and to critically read professional literature in the field. Students will develop an awareness of ethical issues in technology, including, but not limited to, the internet (e.g. freedom of expression on the internet), intellectual property rights, privacy, security, reliability, professional ethics, employment issues and technology, and plagiarism, and apply ethical theories to issues in those domains.
470. **Computer Security (3).** *Prerequisite: CS 350.* Study of network security architectures and models, cryptography, authentication and authorization protocols, secure application and systems development, and federal regulations and compliance. Emphasis is on security professional certification.
488. **Database Systems (3).** *Prerequisite: CS 232.* Concepts and terminology associated with data structure, file organization, access methods, packaged systems, database design and database systems.
491. **Software Engineering II (3).** *Prerequisite: CS 310.* This course is a continuation of software engineering that emphasizes the entire software process, developing and using process and product metrics, and managing software projects. Both individual and team projects will develop student expertise.
499. **Special Topics (1-6).** *Prerequisites: Senior standing and permission of department head.* Exposes student to current or developing topics in computer science or computer information systems. Projects/topics are jointly selected by student and computer science instructor. This course can be taken multiple times of variable credit hours up to a total maximum of six credit hours.

DEPARTMENT OF CHEMISTRY AND GEOSCIENCES (CYGS)

206 MARTIN HALL

Department Head: Joe Morgan

Professor: Gryko, Hill, Holstein, Mwebi,
Nichols, Sewastynowicz, Steffy, Zettili

Associate Professor: Helms, Morgan, Weinkauff

Assistant Professor: McGowin, Perygin, Tinnon, Tsikalas

The Department of Chemistry and Geosciences offers a broad base and diverse spectrum of undergraduate courses in multiple fields of study. We offer majors in chemistry and geography and minors in anthropology and physics. Our departmental interests span from subatomic particles to the fate of oceans and mountains, highlighting the importance of contemporary scientific questions. In Chemistry and Geosciences, the synergy between natural and social science enables cutting edge, high-quality education.

ANTHROPOLOGY

Anthropology is a broad-based field of study. Its subject matter ranges from the analysis of primitive and modern cultures throughout the world (cultural anthropology) to the examination of ancient peoples and civilizations (archaeology) to the study of human biological evolution derived from the fossil record of Africa, Europe, and Asia (physical anthropology). Students may study anthropology to develop expertise leading to careers in archaeology or applied cultural research or to supplement a liberal arts education.

ANTHROPOLOGY MINOR. A minor in Anthropology requires a minimum of 18 semester hours, which must include AN 224, 225, 345, 350, and six hours of anthropology electives.

ANTHROPOLOGY (AN) COURSE DESCRIPTIONS

224. **Introduction to Anthropology (3).** Surveys the field of anthropology, including cultural anthropology, archaeology, and physical anthropology.
225. **Introduction to Archaeology (3).** A study of the history, methodology, problems, and theory of archaeology, including an outline of prehistoric cultural development in both the New and Old Worlds.
299. **Archaeology Field Techniques (3).** Introduction to techniques and theory of conducting archaeological excavation. Four days per week field experience.
344. **Principles of Archaeology (3).** An examination of the ways in which the archaeologist recovers archaeological data. Methods, theory, actual field work, and field trips to archaeological sites will be included in this course.
345. **Cultural Anthropology (3).** A global survey of the dynamics of cultural systems, including subsistence, kinship, marriage, sex and gender, politics, and religion. Covers both modern and primitive societies.
347. **Current Social Issues (3).** An examination of how anthropology offers insight into national and international problems and events. Topics include environmental issues, poverty, crime, warfare, gender, and racism.
348. **North American Indians (3).** Uses archaeological and ethnographic data to describe the diversity and ingenuity of traditional North American Indian societies and their contributions to contemporary American culture.
349. **Middle American Indians (3).** Surveys the growth and development of Indian cultures in Mexico and Central America from prehistoric times to the present.
350. **Physical Anthropology (3).** An examination of human origins covering evolutionary theory, the fossil record of human ancestry, primatology, genetics, and other pertinent topics.
361. **Anthropology of Sexual Behavior (3).** A cross-cultural survey of sexual behavior, gender roles, and male-female relations among the world's societies, including biological and cultural influences on sexual phenomena.
399. **Anthropology Study Tour (3).** *Prerequisite: AN 224 or permission of instructor.* Topics, excursions, and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.
410. **Archaeological Field School (3).** This course is designed to provide the student field experience in methodology and techniques of archaeological data recovery. May be duplicated for credit for a total of six semester hours.
490. **Advanced Seminar in Anthropology (3).** *Prerequisite: AN 224.* An examination of current issues in anthropology. The content of this course will vary each semester. Students seeking admission must have advanced standing and secure approval of instructor. May be duplicated for credit for a total of nine semester hours.
493. **Independent Study (1).** An opportunity for students with advanced standing to engage in special research projects in anthropology. Approval of instructor and department head required. Pass/Fail grade only. May be duplicated for credit for a total of three semester hours.

CHEMISTRY (CY)

A Bachelor of Science in Chemistry prepares students for a diversity of careers. All majors complete general education and chemistry courses to satisfy the degree requirements. The Bachelor of Science degree with a major in chemistry requires an overall minimum of 120 hours with a minimum of 36 hours of 300/400 level courses. At least 12 hours of the 300/400 level courses must be taken in residence at JSU. Students must earn a "C" or better in chemistry coursework and maintain a 2.00 GPA overall and a 2.00 GPA in courses taken on campus. Once the student has met the requirements for the major, the hours remaining to complete the overall 120 hours will be classified as electives. Majors may choose a concentration from either professional chemistry with ACS Certification or applied chemistry. Students pursuing a BS in chemistry are not required to have a minor in another academic discipline.

Bachelor of Science in Professional Chemistry with the American Chemical Society Certification (ACS): This concentration is for students seeking careers as chemists or seeking admission to graduate programs in chemistry. This program is designed for the student who intends to become a professional chemist.

Bachelor of Science in Applied Chemistry: This concentration is designed for students with interests in the application of chemistry in other fields, such as pharmacology, medicine, dentistry, veterinary science, forensics, education, patent or environmental law, technical writing, art conservation, sales, marketing or management in a chemical-related industry.

To complete the chemistry degree program, the students majoring in chemistry must plan carefully, since science laboratories can cause scheduling conflicts. An advisor can alert students to potential problems and assist in minimizing such conflicts. It is recommended that the chemistry major complete the chemistry core of General Chemistry I and II, Organic Chemistry I and II, Quantitative Analysis, and Biochemistry I early in the course of study. Careful planning will facilitate the opportunity for undergraduate research.

A. Bachelor of Science in Professional Chemistry w/ ACS Certification

Requirements for the Bachelor of Science degree in professional chemistry with ACS certification are:

CY 105/107 General Chemistry I	4 hrs
CY 106/108 General Chemistry II	4 hrs
CY 231 Organic Chemistry I.....	4 hrs
CY 232 Organic Chemistry II	4 hrs
CY 321 Quantitative Analysis	5 hrs
CY 362 Biochemistry I.....	4 hrs
CY 341 Physical Chemistry I.....	4 hrs
CY 342 Physical Chemistry II	4 hrs
CY 411 Inorganic Chemistry	5 hrs
CY 421 Instrumental Analysis.....	5 hrs
CY 497 Chemistry Research.....	1 hr
CY 363 Biochemistry II or CY 430 Environmental Chemistry	4 hrs
Total Chemistry Hours.....	48 hrs

MS 125 Calculus I	4 hrs
MS 126 Calculus II	4 hrs
PHS 211/213 Physics for Scientists and Engineers I and Lab	5 hrs
PHS 212/214 Physics for Scientists and Engineers II and Lab.....	5 hrs
Total Support Course Hours.....	18 hrs

B. Bachelor of Science in Applied Chemistry

Requirements for the Bachelor of Science degree in applied chemistry are:

CY 105/107 General Chemistry I	4 hrs
CY 106/108 General Chemistry II	4 hrs
CY 231 Organic Chemistry I.....	4 hrs
CY 232 Organic Chemistry II	4 hrs
CY 321 Quantitative Analysis	5 hrs
CY 362 Biochemistry I.....	4 hrs
CY 347 Concepts of Physical Chemistry	4 hrs
12 hours of chemistry 300/400 electives from the following:	12 hrs
CY 363 Biochemistry II	4 hrs
CY 411 Intermediate Inorganic Chemistry	5 hrs
CY 421 Instrumental Analysis.....	5 hrs
CY 430 Environmental Chemistry	4 hrs
CY 435 Advanced Topics in Chemistry	3 hrs
CY 471 Toxicological Chemistry	3 hrs
Up to three semester hours may be taken from the following:	
CY 490 Internship.....	1 hr
CY 497 Chemistry Research.....	1 hr
Total Chemistry Hours.....	41 hrs

MS 113 Precalculus Trigonometry	3 hrs
PHS 201/203 College Physics I	4 hrs
PHS 202/204 College Physics II	4 hrs
Total Support Course Hours	11 hrs

CHEMISTRY MINOR. A minor in chemistry consists of a minimum of 24 hours of chemistry courses, including CY 105, 106, 107, 108, 231, 232 and an additional 8 hours of 300/400 level chemistry electives.

PLAN OF STUDY
BACHELOR OF SCIENCE
MAJOR: PROFESSIONAL CHEMISTRY WITH
AMERICAN CHEMICAL SOCIETY (ACS) CERTIFICATION

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 1013	EH 1023
Fine Arts ²3	EH 1413
MS 125 4	MS 1264
CY 1053	CY 1063
CY 1071	CY 1081
STU 1010	
14	14

SOPHOMORE YEAR

Fall	Spring
HY sequence ¹3	HY sequence ¹3
CY 2314	CY 3215
PHS 2114	CY 2324
PHS 2131	PHS 2124
Elective 100+3	PHS 2141
15	17

JUNIOR YEAR

Fall	Spring
CY 3414	CY 342 4
Social/Behavioral Science ⁴6	EH Literature ³3
EH Literature ³3	Elective 300+3
Elective 100+2	Elective 100+5
15	15

SENIOR YEAR

Fall	Spring
CY 3624	Electives 300+5
Elective 300+6	CY 363 or 4304
CY 4215	CY 4115
	CY 497 1
15	15

TOTAL HOURS: 120

PLAN OF STUDY
BACHELOR OF SCIENCE
MAJOR: APPLIED CHEMISTRY

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 1013	EH 1023
EH 141 3	Social/Behavioral Science ⁴3
MS 1133	CY 106.....3
CY 1053	CY 108.....1
CY 107.....1	Elective4
STU 101.....0	
13	14

SOPHOMORE YEAR

Fall	Spring
CY 231.....4	CY 232.....4
Elective4	CY 321.....5
PHS 201 3	PHS 2023
PHS 2031	PHS 2041
HY sequence ¹3	HY sequence ¹3
15	16

JUNIOR YEAR

Fall	Spring
Elective5	CY Elective 300+4
EH Literature ³3	EH Literature ³3
CY 347.....4	Fine Arts ²3
CY 362.....4	Electives 300+6
16	16

SENIOR YEAR

Fall	Spring
Electives 100+12	Electives 300+8
CY 300+ Elective4	CY Elective 300+3
16	14

TOTAL HOURS: 120

¹Choose either HY 101 and 102 or HY 201 and 202.

²Choose from ART 202, DR 242, MU 233, or FL 101.

³Choose from EH 201, 202, 203, 204, 219, 220, 231, or 232.

⁴Choose from AN 224, EC 221, 222, GY 120, 220, PSC 100, PSY 201, 222, or SY 221.

CHEMISTRY (CY)
COURSE DESCRIPTIONS

105. General Chemistry I (3). Lecture/3 hours. *Prerequisite: Appropriate ACT/SAT score for MS 112. Concurrent enrollment in CY 107 is required.* Part I of a two-semester sequence. General chemistry for science majors, including basic principles and laws of chemistry. Topics include measurements, dimensional analysis, reaction and stoichiometry, periodicity, atomic structure, bonding and molecular structure, and an introduction to organic chemistry.

106. **General Chemistry II (3).** Lecture/3 hours. *Prerequisite:* CY 105. *Concurrent enrollment in CY 108 is required.* Part II of a two-semester sequence. Continuation of CY 105. Topics include states of matter, solutions, kinetics, equilibrium, acid-base theory, thermodynamics, and electrochemistry.
107. **General Chemistry Laboratory I (1).** Lab/3 hours. *Concurrent enrollment in CY 105 is required.* Basic principles of matter will be explored. Topics of experimentation include obtaining accurate measurements, identifying unknown substances from their physical and chemical properties, purifying matter, exploring gas laws, and performing an acid-base titration.
108. **General Chemistry Laboratory II (1).** Lab/3 hours. *Concurrent enrollment in CY 106 is required.* Topics of experimentation include qualitative analysis, exploring reaction rates, ionic equilibria, and synthesis.
115. **Concepts of General Chemistry I (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* *Appropriate ACT/SAT score for MS 112.* Part I of a two-semester sequence. General chemistry for students who are not planning to take any higher level courses in chemistry. This course in the basic principles and laws of chemistry is designed to cover a broad range of topics. Topics include measurements, the periodic table, ionic and covalent compounds, chemical reactions, energy changes, gases, liquids and solids, acids and bases and nuclear chemistry.
116. **Concepts of General Chemistry II (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* CY 115. Part II of a two-semester sequence. General chemistry for students who are not planning to take any higher level courses in chemistry. This course is the second semester in the basic principles and laws of chemistry. Topics include organic molecules, functional groups, molecular configurations, aldehydes and ketones, carboxylic acids and derivatives, neurotransmitters, and metabolism.
231. **Organic Chemistry I (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* CY 106. Part I of a two-semester sequence. Structure and properties of aliphatic hydrocarbons and their halo derivatives, emphasizing nomenclature, isomerism, synthesis, reactions, mechanisms and applications.
232. **Organic Chemistry II (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* CY 231. Part II of a two-semester sequence. Structure and properties of aromatic compounds, halides, carbonyl compounds, alcohols, ethers and amines, their nomenclature, synthesis, reactions, mechanisms, spectroscopy and applications.
321. **Quantitative Analysis (5).** Lecture/3 hours. Lab/6 hours. *Prerequisites:* CY 106 and 108. Theory and practice of gravimetric, volumetric, potentiometric, and colorimetric methods of analysis.
341. **Physical Chemistry I (4).** Lecture/3 hours. Lab/3 hours. *Prerequisites:* CY 106, MS 125, PHS 211 and 212 are required. Chemical thermodynamics with emphasis on understanding physical properties of pure substances and mixtures. The course covers fundamentals of classical thermodynamics with applications to phase transitions, colligative properties, and chemical equilibria.
342. **Physical Chemistry II (4).** Lecture/3 hours. Lab/3 hours. *Prerequisites:* CY 106, CY 341, MS 126, PHS 211 and 212 are required. Fundamentals of quantum chemistry and spectroscopy. The course concentrates on fundamentals of quantum mechanics with applications to chemistry. The course also covers theoretical basis of spectroscopy, focusing on infrared, Raman, visible, and nuclear magnetic resonance techniques.
347. **Concepts of Physical Chemistry (4).** Lecture/3 hours. Lab/3 hours. *Prerequisites:* MS 113, PHS 202, and CY 106. This algebra-based course covers fundamentals of chemical thermodynamics and molecular structure with emphasis on life-science applications.
362. **Biochemistry I (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* CY 231. Biochemical evolution, protein structure and function, flow of genetic information, enzymes, and enzyme kinetics.
363. **Biochemistry II (4).** Lecture/3 hours. Lab/3 hours. *Prerequisite:* CY 232 and 362. Metabolism, signal transduction, glycolysis and gluconeogenesis, citric acid cycle, oxidative phosphorylation, photosynthesis, glycogen and fatty acid metabolism.
411. **Intermediate Inorganic Chemistry (5).** Lecture/3 hours. Lab/6 hours. *Prerequisites:* CY 106, 232, and PHS 202. Fundamental topics in inorganic chemistry, including atomic structure, chemical bonding, periodic relationships, acid-base theories, non-aqueous solvents, and reaction mechanisms.
421. **Instrumental Analysis (5).** Lecture/3 hours. Lab/6 hours. *Prerequisites:* CY 106, 321, and PHS 202 or PHS 212. The operating principles and techniques involving the use of analytical instruments.
430. **Environmental Chemistry (4).** Lecture/3 hours. Lab/3 hours. *Prerequisites:* CY 232 and 321. Introduction to water, air, and soil quality and their measurements. Introduction to the problems, regulations, treatment, and ultimate disposal of hazardous and toxic waste materials. Spill clean-up, groundwater transport, land disposal, incineration, and treatment technologies are discussed.
435. **Advanced Topics in Chemistry (3).** *Prerequisite:* CY 232. Advanced study of various topics in chemistry and chemistry related fields. This course is intended to be offered once per year, and topic selections will vary from year to year. See instructor. May be duplicated for credit for a total of 12 semester hours.
471. **Toxicological Chemistry (3).** Lecture/3 hours. *Prerequisite:* CY 232. A study of the principles of toxicology, including identification of, characterization of, and risk from environmental exposures to toxic substances.
490. **Internship (1).** *Prerequisite:* *Consent of instructor and availability of placement.* Student will gain on-the-job experience with a firm or government agency. Student is expected to devote a minimum of 20 hours/week to this course. Pass/Fail grade only.

497. Chemistry Research (1). *Prerequisite: Permission of instructor.* The student is assigned a simple piece of fundamental research. May be duplicated for credit for a total of three semester hours. Pass/Fail grade only.

GEOGRAPHY (GY)

Geography serves as a bridge between the physical and social sciences. Emphasis is on the nature and distribution of environmental systems, human activities, relations between them, and their variation from place to place. Geography’s uniqueness is not derived from the subject matter studied, but from the discipline’s technical and methodological approach to the locational analysis of phenomena.

The Bachelor of Science in Geography degree offered by the Department of Chemistry and Geosciences requires an overall minimum of 120 semester hours with a minimum of 36 hours of 300/400 level courses. At least 12 hours of 300/400 courses must be taken in residence at JSU. Students must earn a “C” or better in geography coursework and maintain a 2.00 GPA overall and a 2.00 GPA in courses taken on campus. Once the student has met the requirements for the major, the hours remaining to complete the overall 120 hours will be classified as electives. The major requires 35 hours of Geography, including 21 hours of 300/400 level geography courses (this includes GY 307). Any hours remaining to meet the 120 hour minimum will be classified as electives.

Geography Major. Students should work closely with an advisor in selecting electives appropriate to their goals.

GY 208 - Map Reading	3
GY 220 - Human Geography	3
GY 250 and 251 - Physical Geography and Labs (252, 253) OR	
GL 241 and 242 - Physical and Historical Geology and Labs (243, 244)	8
GY 307 - Geographic Information Systems	3
GY Electives - 300/400 Level	21
Total Hours	38

Geography Minor. A minor in Geography requires a minimum of twenty-three (23) semester hours and must include the following courses:

GY 120 or 220	3
GY 250/252 and 251/253 or GL 241/243 and 242/244	8
GY 208	3
GY Electives - 300/400 Level	9

PLAN OF STUDY

**BACHELOR OF SCIENCE
MAJOR: GEOGRAPHY**

In addition to courses noted below, candidates for graduation must successfully complete all JSU Academic Regulations.

FRESHMAN YEAR

Fall	Spring
EH 101	EH 102
MS 110/112	EH 141
GY 250	MS 204
GY 252	GY 251
Social/Behavioral Science ⁵	GY 253
STU 101	
_____	_____
13	13

SOPHOMORE YEAR

Fall	Spring
HY sequence ¹	HY sequence ¹
Fine Arts Elective ²	GY 220
Social/Behavioral Science ⁵	CS 201 or higher
GY 208	Elective 100+
Science Elective w/ Lab ⁴	GY 307
_____	_____
16	15

JUNIOR YEAR

Fall	Spring
EH Literature ³3 GY Elective 300+9 Elective 300+4 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> 16	EH Literature ³3 GY Elective 300+3 Electives 300+10 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> 16

SENIOR YEAR

Fall	Spring
GY Elective 300+3 Electives 12 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> 15	GY Electives 300+6 Electives 300+10 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> 16

TOTAL HOURS: 120

¹ Choose either HY 101 and 102 or HY 201 and 202.

² Choose from ART 202, DR 242, MU 233, or FL 101.

³ Choose from EH 201, 202, 203, 204, 219, 220, 231, or 232.

⁴ Choose from BY 101 and 103, CY 105 and 107, GL 242 and 244, or PHS 201 and 203.

⁵ Choose from GY 120, AN 224, EC 221, EC 222, PSC 100, PSY 201, PSY 222, or SY 221.

GEOGRAPHY (GY) COURSE DESCRIPTIONS

- 120. **World Regional Geography (3).** This course examines major world regions, each the unique result of interaction between an environmental setting and human social and economic activity.
- 208. **Map Reading (3).** An introduction to basic map reading and analysis involving symbol identification, coordinate location, and direction and distance measurement. Emphasis is upon using the topographic map.
- 210. **Earth and Space Science (3).** The study of earth systems, including weather, climate, the lithosphere, soils and biomes.
- 220. **Human Geography (3).** The study of social and cultural patterns, emphasizing the arrangement and diversity of economic, social, political, religious, and demographic culture traits.
- 250. **Physical Geography I: Atmospheric Patterns and Processes (3).** *GY 252 is required, but not concurrently.* Study of the function and distribution of the interrelated processes that shape Earth's weather and the classification and distribution of Earth's climates.
- 251. **Physical Geography II: Landscape Patterns and Processes (3).** *GY 253 is required, but not concurrently.* Study of Earth's soils, biomes and physiographic regions with emphasis on the processes that formed them and their global patterns.
- 252. **Physical Geography Laboratory I (1).** *GY 250 is required, but not concurrently.* One two-hour lab per week. Experiments focus on weather, energy and moisture budgets, and climatic classification.
- 253. **Physical Geography Laboratory II (1).** *GY 251 is required, but not concurrently.* One two-hour lab per week. Exercises focus on study of the physical properties of soils, the analysis of biomes, the use of topographic maps to identify land surface features and the identification of physiographic regions.
- 302. **Principles of Remote Sensing (3).** *Prerequisite: GY 208.* An introduction to the electromagnetic spectrum, aerial photography and aerial photo interpretation and mapping.
- 307. **Geographic Information Systems (3).** *Prerequisite: GY 208.* Introduction to the cartographic acquisition, processing, management, manipulation, analysis, and generation of spatial digital data in a Geographic Information System.
- 320. **Political Geography (3).** A study of the spatial aspects of political phenomena from the international to the local scale. Suggested background: GY 220.
- 331. **Climatology (3).** A study of climates, how they are classified, and their effect upon human activity.
- 333. **Meteorology (3).** *Recommended: GY 250.* The study of weather types and their causes, weather instrumentation, the construction and interpretation of weather maps, analog and synoptic forecasting, and weather modification.
- 341. **Economic Geography (3).** A survey of the factors which influence the location of economic activities with emphasis on the application of various elementary techniques designed to determine the relative economic potential of any place.

351. **Advanced Regional Study (3).** Examination of the interrelations among various physical and cultural elements that make regions of the world distinctive. Regional focus varies. See instructor. May be duplicated for credit for a total of 12 semester hours.
361. **Geography of the Arab World (3).** This course employs a macro geographical (regional and systematic) approach that introduces the students to the process of social and political change in the Arab World. The focus will be on the political, social, environmental and economic positions and interaction of the major players within the region. We look at the complexity of the region and its historical-cultural specifics. From a geopolitical perspective, we survey recent socioeconomic and political exchanges and look at events that have begun to transform the contemporary Arab World, most notably the “Arab Spring” and the uprisings of summer and fall of 2012, and how these events are precursors to continued change.
398. **National Parks Interpretation (3).** Students will receive intensive training preparing them to work as student interns at Little River Canyon National Preserve. Several days of travel to Little River Canyon will be required.
399. **Geography Study Tour (3).** *Permission of instructor required.* Topics, excursions, and requirements determined by department. May be duplicated for credit; however, only three (3) credits may be applied toward any major or minor. Infrequently scheduled and subject to minimum and maximum numbers. Advance deposit required.
401. **Practicum in Geography (3).** *Permission of instructor required.* This course provides opportunity to gain on-the-job experience with a firm or government agency. May be duplicated for credit for a total of six semester hours. Pass/Fail grade only.
403. **Independent Study (1).** *Permission of instructor required.* This course gives the advanced student opportunity to pursue directed research. May be duplicated for credit for a total of three semester hours. Pass/Fail grade only.
406. **Digital Image Analysis (3).** *Prerequisite: GY 302.* Advanced instruction in multi-spectral, thermal and microwave sensing of the geographic environment. Emphasis on analysis of digital imagery.
407. **Geomorphology (3).** This course covers the erosional, transportation, and depositional processes responsible for shaping Earth's surface. Specifically, the course reviews hydrologic geomorphology (surface water, groundwater, and glacial ice), aeolian and desert geomorphology, plate tectonics, volcanism, and hillslope processes, such as landslides and avalanches.
431. **Topics in Physical Geography (3).** Advanced geographic study of various facets of the natural environment. Topic selection varies. See instructor. May be duplicated for credit for a total of 12 semester hours.
451. **Advanced GIS (3).** *Prerequisites: GY 307 and permission of instructor required.* Advanced training in selected geographic techniques. Topic selection varies. See instructor. May be duplicated for credit for a total of 15 semester hours.
453. **Analyzing Spatial Networks (3).** *Prerequisite: GY 307.* Introduction to topology theory and its employment in GIS network analysis. Emphasis on methods of determining efficient paths, modeling network flows, and creating efficient service areas for organization entities.
454. **Site Location Analysis (3).** *Prerequisite: GY 307.* Emphasis on evaluating existing site location efficiencies, determining of appropriate point site and area site locations for organizational entities, and analyzing environmental impact analyses using GIS.
455. **Organization and Management of Spatial Systems (3).** *Prerequisite: GY 307.* Fundamentals of GIS implementation and GIS management. Consideration in designing organization-wide GIS and the management of both special projects and organization-wide use of GIS.
456. **Spatial Data Layout and Display (3).** *Prerequisite: GY 307.* Fundamentals of map composition and layout, chart creation, data classification, and map design to produce meaningful maps and charts of the results of spatial analysis.
459. **Spatial Data Collection and Management (3).** *Prerequisite: GY 307.* Methods of capturing data, acquiring and importing existing spatial data into geographic information systems, deriving spatial information from remotely sensed data, and storing spatial data.
466. **Topics in Cultural Geography (3).** Advanced geographic study of various facets of human culture. Topic selection varies. May be duplicated for credit for a total of 12 semester hours.
475. **Natural Hazards (3).** *Prerequisites: GY 250 and GY 251 or GL 241.* An introduction to natural hazards, their causes, distribution and impacts. Focus on human perception, vulnerability and risk analysis.
490. **Colloquium (1).** *Prerequisite: A completed piece of research must be submitted prior to enrollment in this course.* Results of a basic research project in geography are presented in a conference setting using PowerPoint or equivalent software. Permission of instructor required. Pass/Fail grade only.

GEOLOGY (GL)

A two-semester sequence of geology is offered which can be used to meet the university general studies natural science requirement. Students interested in earth science are encouraged to consider a major/minor in geography.

GEOLOGY (GL)
COURSE DESCRIPTIONS

241. **Physical Geology (3).** *GL 243 is required, but not concurrently.* Modern concepts of the Earth's physical composition, crustal structures, and the internal/external forces acting on them.
242. **Historical Geology (3).** *GL 244 is required, but not concurrently.* Study of the Earth's evolution, including changes in its crust, surface features, atmosphere, and life forms.
243. **Physical Geology Lab (1).** *GL 241 is required, but not concurrently.* One two-hour lab per week. Emphasis on rock/mineral identification and the study of landforms through topographic and geologic map interpretation.
244. **Historical Geology Lab (1).** *GL 242 is required, but not concurrently.* One two-hour lab per week. Study of Earth history using geologic maps and the fossil record of plant and animal development.

PHYSICS (PHS)

Jacksonville State University offers a minor in physics. Students in the sciences, mathematics and computer science will find this program a valuable complement to their majors.

PHYSICS MINOR. Requirements for a minor in physics include PHS 211, 213, 212, 214, 301 and nine hours in physics 300+. These courses will be selected in conference with a physics program advisor.

PHYSICS (PHS)
COURSE DESCRIPTIONS

COURSES WITH NO PHYSICS OR MATH PREREQUISITES

327. **Elementary Radiation Physics (3).** This course is intended for any student interested in radiation safety and specifically for students in physics, chemistry, pre-medicine, pre-dentistry, nursing, biology, and archaeology. The course objective is to provide individuals with the knowledge and procedures necessary to minimize exposures to ionizing and non-ionizing radiation and to understand the physiological and environmental effects of radiation. Instruction will include lectures, discussions, demonstration, and laboratory exercises.
350. **Physics in Music (3).** This course will explore the physics involved in music. A variety of questions with sound and music will be explored. What physical properties can be used to describe sound? How do musical instruments produce sound? What are the physical reasons that instruments playing the same note sound different? How does sound travel through space? Why does your voice sound so different on a recording? Students will be encouraged to generate and explore their own questions. Some class periods will be devoted to a hands-on look at ideas. This course is designed to be descriptive in nature rather than highly mathematical. No math or physics prerequisites.
371. **Astronomy (4).** Lecture/3 hours. Lab/3 hours. A survey of the structure and evolution of the universe, from planets to stars and galaxies. Questions about the nature of science, limits to current knowledge, and the influence of space science will be addressed. The course culminates in individual in-depth explorations of particular aspects of astronomy.

INTRODUCTORY PHYSICS COURSES AND THEIR MATH PREREQUISITES

201. **College Physics I (3).** *Prerequisite: MS 113 or 117. Concurrent enrollment in PHS 203 is required.* This course is the first half of a two-semester sequence that introduces basic concepts in physics. Beginning with mechanics and motion, we develop methods for mathematically describing the way objects move and predicting their future movement. The course proceeds to study wave motion with springs, strings, water, sound, and light. Does not count toward the physics minor. Credit will not be granted for both PHS 201 and 211.
202. **College Physics II (3).** *Prerequisite: PHS 201 and either MS 113 or 119. Concurrent enrollment in PHS 204 is required.* The second half of this sequence of courses begins by studying electricity and basic circuits, followed by magnetism. A section on light, including lenses and mirrors, follows. The behavior of light waves, such as rainbows and soap bubbles, will also be explored. Finally, topics from quantum mechanics and special relativity are introduced to give students a flavor of the revolutionary nature of these topics in their original scientific setting. Does not count toward the physics minor. Credit will not be granted for both PHS 202 and 212.
203. **College Physics Lab I (1).** *Concurrent enrollment in PHS 201 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in motion, mechanics, waves, and sound. Does not count toward the physics minor.
204. **College Physics Lab II (1).** *Concurrent enrollment in PHS 202 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in electricity, magnetism, optics, and modern physics. Does not count toward the physics minor.
211. **Physics for Scientists and Engineers I (4).** *Prerequisite: MS 125. Concurrent enrollment in PHS 213 is required.* This course is the first of two semesters designed to introduce the basic concepts of physics. The first semester will concentrate on the area of physics called Newtonian mechanics that is used to work with macroscopic (ordinary-

sized) objects. Beginning with mechanics and motion, we develop methods for mathematically describing the way objects move and predicting their future movement. The course proceeds to study wave motion with springs, strings, water, sound, and light. We will take advantage of the power of calculus to depict movement by weaving its structure into our physical laws and theories. Since the development of both calculus and Newtonian mechanics by Sir Isaac Newton, calculus and physics have been intertwined, and students in this course will see these close connections. Credit will not be granted for both PHS 201 and 211.

- 212. Physics for Scientists and Engineers II (4).** *Prerequisites: PHS 211 and MS 126. Concurrent enrollment in PHS 214 is required.* The second semester of this sequence begins by studying electricity and basic circuits, followed by magnetism. A section on light, including lenses and mirrors, follows. The behavior of light waves, such as rainbows and soap bubbles, will also be explored. Finally, topics from quantum mechanics and special relativity are introduced to give students a flavor of the revolutionary nature of these topics in their original scientific setting. Once again, calculus will be used throughout the course. Credit will not be granted for both PHS 202 and 212.
- 213. Elementary Laboratory Techniques I (1).** *Concurrent enrollment in PHS 211 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in motion, mechanics, waves, and sound.
- 214. Elementary Laboratory Techniques II (1).** *Concurrent enrollment in PHS 212 is required.* Two laboratory hours each week. Concepts of physics developed in the associated courses will be studied through the use of hands-on activities. Students will work in groups to explore topics in electricity, magnetism, optics, and modern physics.

COURSES FOR WHICH PHS 202 OR 212 ARE PREREQUISITES

- 383. Special Topics (3).** This course will explore a topic of current interest in the field of physics. May be taken twice for a total of six semester hours.

COURSES FOR WHICH PHS 211, 213, 212, AND 214 ARE PREREQUISITES

- 301. Modern Physics (3).** Explore the two 20th century revolutions in physics: quantum mechanics and special relativity. We will study the evidence that led to the acceptance of each of these theories and some of the implications of these theories. Both quantum mechanics and relativity have become part of the popular culture. This course offers the opportunity to understand their ideas in their original context and see how popular culture usage differs from scientific usage.
- 303. Classical Mechanics (3).** This course investigates various aspects of classical mechanics, including kinematics and dynamics of motion, rigid bodies, oscillatory motion, central forces and gravitation, and Lagrangian and Hamiltonian formulations of classical mechanics.
- 343. Electromagnetism I (3).** *Additional prerequisite: MS 227.* Electric and magnetic fields will be studied. What are their origins? What features of nature affect the nature and strength of the fields? What are some of their effects? Maxwell's equations uniting all of electricity and magnetism will be seen in their full glory.
- 491. Quantum Mechanics I (3).** *Additional prerequisites: PHS 301 and MS 344.* This course extends the investigation of quantum mechanics begun in PHS 301 to include the full mathematical development of the theory. Basic tools, including linear operators and matrices, will be used to explore physical systems, such as a particle in a box, a linear harmonic oscillator, the hydrogen atom, and a one-dimensional crystal.

COOPERATIVE EDUCATION PROGRAM

Cooperative education is a structured educational strategy integrating classroom studies with learning through productive paid work experiences in a field related to the student's academic or career goals. It provides progressive experiences in integrating theory and practice. Co-Op brings together the university, the business and professional community, and students in a collaborative effort with specified responsibilities for each party. Academic credit is not awarded for participation in the cooperative education program. A pass/fail notation is entered on the transcript upon completion of the semester's work experience.

In order to qualify for cooperative education, a student must meet the following qualifications:

1. The student must satisfactorily complete a minimum of 24 semester hours prior to entering the program. Employers may suggest a lower minimum hour requirement.
2. The student must meet and maintain a 2.50 (4.00 scale) grade point average. Employers may establish higher GPA requirements.
3. The student must have the recommendation of two professors and a completed file in the Career Services Office. To apply for the cooperative education program, contact the Career Services Office at 256-782-5092 or visit http://www.jsu.edu/careerservices/students/student_co_op.html. Upon approval of the cooperative education coordinator and the employer, the student will register for the following alternating or parallel cooperative education courses.

CEA-001 Through 012. Alternating Co-Op Education (0) Cooperative education experience of full-time employment (approximately 40 hrs./week) is equivalent to full-time student status, with the exception of financial aid. (Contact Financial Aid for additional information.)

CEP-001 Through 012. Parallel Co-Op Education (0) Cooperative education experience of part-time employment (15-30 hrs./week) in an approved Co-Op position while enrolled in a minimum of six semester hours.

DEPARTMENT OF LEARNING SKILLS

HOUSTON COLE LIBRARY BASEMENT

Department Head: Courtney Peppers-Owen
Instructor: Beckett, Gladen, Kirk, White

Learning skills courses assist students in developing their basic academic skills and their reasoning and studying skills. General, elective academic credit is awarded for successful completion of learning skills courses.

LEARNING SKILLS (LS) COURSE DESCRIPTIONS

- 101. Fast Track Lab (0).** This zero-credit lab is mandatory for students who have been conditionally accepted to JSU through the Fast Start Academy. The learning environment in the laboratory will be individualized and mastery-based for additional instruction in the areas of algebra, writing, reading, and first-year success. The objectives of this lab are tied to the two courses offered in the Fast Start Academy, MS 100 Intermediate Algebra and LS 104 Academic Success Skills.
- 103. Reinforcing Reading Skills (3).** Individualized development of reading and thinking skills.
- 104. Academic Success Skills (3).** Individualized freshman seminar providing supportive guidance in study skills, problem-solving, decision-making, and college adjustment. Open to freshmen only. Required for all conditionally admitted students. GRADES: A, B, C, NC.
- 106. Algebra Emporium (0).** Effective fall semester 2015, this zero-credit emporium is a mandatory laboratory for students who have received an "NC" in MS 100. The learning environment in the laboratory will be individualized and mastery-based to enable students to prepare for their first general education mathematics course. Prior to the beginning of the next semester or term after an "NC" in MS 100, students must register for LS 106 and remain in the laboratory until they have mastered the objectives of MS 100, including, if necessary, subsequent semesters or terms until the objectives have been met.
- 108. Finite Emporium (0).** Effective fall semester 2017, this zero-credit emporium is a mandatory laboratory for students who have received an "NC" in MS 107. The learning environment in the laboratory will be individualized and mastery-based to enable students to prepare for MS 110 Finite Mathematics. Prior to the beginning of the next semester or term after an "NC" in MS 107, students must register for LS 108 and remain in the laboratory until they have mastered the objectives of MS 107, including, if necessary, subsequent semesters or terms until the objectives have been met.
- 130. Critical Thinking Skills (3).** Individualized development of higher order thinking skills needed for academic study and career success.
- 301, 302, 303. Academic Performance Management (1-3).** *Prerequisite: Permission of instructor.* Realizing that fellow students can be effective teachers, the university offers academic credit to qualified students who serve as learning assistants in selected areas. Each section may be duplicated up to three times for a total of three, six, and nine hours for each course, respectively.

DIVISION OF STUDENT AFFAIRS

102 BIBB GRAVES HALL

Vice President for Student Affairs: Timothy B. King

The Division of Student Affairs offers seven elective courses aimed at leadership and career development. Students have an opportunity to apply for participation in the Peer Educators Program and GO Leaders Program for leadership development. All students are eligible to take career development courses.

STUDENT AFFAIRS (STU) COURSE DESCRIPTIONS

- 101. First Year Experience Course (0).** All students with less than 24 earned hours must take STU 101: First-Year Experience Course. Students will achieve course objectives related to their overall adjustment to being a successful student at JSU. Topics discussed include how to: declare a major and develop a relationship with an academic advisor; understand components of MyJSU; know and understand JSU policies; participate in the summer reading program; learn and become active in JSU activities for students; understand and develop appropriate behavior for

a college student; become familiar with student services; and acquire knowledge and skills necessary to prosper as a JSU student. Students 24 years of age or older are not required to take this class.

120. **Career Planning (1).** Individualized instruction in self-analysis of abilities, achievements, and interests to develop career goals and plans. Various career opportunities will also be explored.
210. **Resident Assistant Seminar (2).** All first-time resident assistants must take STU 210. This course examines residential living and the role of the resident assistant in guiding students through the transition to the university and assisting them in becoming successful members of the community. Resident assistants will learn to facilitate community development, academic and personal growth, leadership development, and resident accountability.
211. **Leadership House for Women Seminar I (1).** This course combines academics with outside-of-the-classroom learning. Students will live together and evaluate leadership and personal development. The course will incorporate readings, in-class and online discussions, service learning, group work, simulations, critical reflections, and lectures to expose students to a wide range of leadership concepts and models. Students will examine leadership on three levels: self-leadership, collaborative leadership, and leadership for change within the community. Over the course of the semester, each student will develop their philosophy of leadership and engage in the practice of socially responsible leadership.
212. **Leadership House for Women Seminar II (1).** This course combines academics with outside-of-the-classroom learning. Students will live together and evaluate leadership and personal development. The course will incorporate readings, in-class and online discussions, service learning, group work, simulations, critical reflections, and lectures to expose students to a wide range of leadership concepts and models. Students will examine leadership on three levels: self-leadership, collaborative leadership, and leadership for change within the community. Over the course of the semester, each student will develop their philosophy of leadership and engage in the practice of socially responsible leadership.
304. **Para Professional Training (3).** This course includes the choice of one of two training modules. One option involves training for students serving as peer educators in tutoring or assisting other students with life adjustment issues, such as drug and alcohol abuse and sexual harassment. The second option involves training for students serving as orientation peer counselors in knowledge of self, campus, orientation consumers, listening skills, public speaking, and decision making.
306. **Advanced Para Professional Training (3).** This course includes the option of one of two training modules. The first option involves advanced training for students serving as peer educators in tutoring or assisting other students with life adjustment issues, such as drug and alcohol abuse and sexual harassment. The second option involves advanced training for students serving orientation leaders. Gives students opportunity to enhance leadership, organizational, and human relations skills through supervisory responsibilities.
310. **Career Linkages (2).** Instruction is designed to increase student awareness and understanding of self-expression using career activities, recognizing individual differences and the importance of each in collaboration, personal and career exploratory activities. This course is centered on the career decision process appropriate to programs offered at the university and should be considered by students who have not decided on a major.
320. **Employability Skills (1).** Individualized instruction using a positive culture to cultivate leaders in the job search process; increasing awareness of professionalism in the workforce by developing problem solving in context, applying knowledge in practical ways through attending job fairs; developing personal autonomy and empowerment, composing and producing comprehensive writing of professional level correspondence, and enhancing job readiness for virtual and face-to-face interviews.