

BIOLOGY

Professors: James R. Triplett*, *Chairperson*; Hugh T. Campbell*, James T. Dawson*, R. Leon Dinkins*, Steven D. Ford*, R. Harvard Riches*
 Associate Professors: Joseph A. Arruda*, Nancy L. Brooker*, Stephen L. Timme*, Chester G. Twitchell*
 Assistant Professors: Cynthia S. Ford, William H. Lorowitz*, Daniel M. Zurek*

*Graduate Faculty

Telephone: 316-235-4732

UNDERGRADUATE DEGREE PROGRAMS

- Bachelor of Science Degree with a Major in Biology
- Bachelor of Arts Degree with a Major in Biology
- Bachelor of Science in Education Degree with a Major in Biology
- Bachelor of Science in Medical Technology Degree

Minors:

- Minor in Biology
- Minor in General Science
- Minor in Natural History
- Minor in Environmental Management
- Minor in Cell Biology

Bachelor of Science (Biology Major)

<i>General Education Degree Requirements*</i>		<i>Hours</i>
Basic Skills.....		15
Core Courses.....		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society.....		3
		41

*Courses must be taken from the list approved by the General Education Committee. See page 47.

**Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>		<i>Hours</i>
BIOL 215 General Zoology.....		4
BIOL 218 General Botany.....		4
BIOL 311 Cell Biology.....		3
BIOL 322/323 Genetics/Laboratory.....		5
BIOL 330 Principles of Ecology.....		3
BIOL 371/372 General Microbiology/Laboratory.....		5
Upper Division Physiology (choose one).....		5
BIOL 656/657 Human Physiology/Laboratory.....		5
BIOL 675/676 Microbial Physiology/Laboratory.....		5
BIOL 685/686 Plant Physiology/Laboratory.....		5
BIOL 699 Senior Seminar and Assessment.....		1
Biology electives.....		10
		40

<i>Chemistry Requirements</i>		<i>Hours</i>
CHEM 215/216 General Chemistry/Laboratory.....		5
CHEM 320/326 Introductory Organic Chemistry/Laboratory or		
CHEM 325/326 Organic Chemistry I/Laboratory.....		5
		10

Minor (10 hours if chemistry is chosen as minor)..... 10-20

<i>Electives</i>		<i>Hours</i>
Electives.....		13-23
TOTAL.....		124

A total of 45 hours which includes a 20-hour minor must be taken outside the department. Although other minors are available, a chemistry minor is recommended.

A minimum of 40 hours of upper division credit must be included in the program with 20 of these upper division hours being in biology.

Students with strong backgrounds in high school

mathematics are urged to substitute MATH 150 Calculus I for MATH 113 College Algebra.

Bachelor of Arts (Biology Major)

The difference between this program and the Bachelor of Science (Biology Major) listed above is that the student must complete a minimum of 10 hours in one foreign language.

Bachelor of Science (Biology Major with Emphasis in Pre-Medical and Pre-Dental)

The program listed below is a *suggested* curriculum for pre-medical and pre-dental students. The program meets all of the requirements for a baccalaureate degree with a major in biology and a minor in chemistry at Pittsburg State University. Early contact with the pre-medical advisor is imperative.

<i>General Education Degree Requirements*</i>		<i>Hours</i>
Basic Skills.....		15
Core Courses.....		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society.....		3
		41

*Courses must be taken from the list approved by the General Education Committee. See page 47.

**Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>		<i>Hours</i>
BIOL 105 Pre-Med Orientation I.....		0.5
BIOL 205 Pre-Med Orientation II.....		0.5
BIOL 215 General Zoology.....		4
BIOL 218 General Botany.....		4
BIOL 305 Pre-Med Orientation III.....		0.5
BIOL 311 Cell Biology.....		3
BIOL 322/323 Genetics/Laboratory.....		5
BIOL 330 Principles of Ecology.....		3
BIOL 371/372 General Microbiology/Laboratory.....		5
BIOL 656/657 Human Physiology/Laboratory.....		5
BIOL 699 Senior Seminar and Assessment.....		1
Biology electives (suggested courses follow)***.....		8.5
BIOL 490 Honors Research in Biology.....		3
BIOL 564 Human Histology.....		5
BIOL 570/571 Pathogenic Bacteriology/Laboratory.....		5
BIOL 572 General Virology.....		3
BIOL 660 Human Anatomy and Dissection.....		5
BIOL 671/672 Immunology/Laboratory.....		5
BIOL 711 Cell and Molecular Biology.....		3
		40

<i>Physical Sciences Requirements</i>		<i>Hours</i>
CHEM 215/216 General Chemistry/Laboratory.....		5
CHEM 225/226 General Chemistry and Qualitative Analysis/Laboratory.....		5
CHEM 325/326 Organic Chemistry I/Laboratory.....		5
CHEM 335/336 Organic Chemistry II/Laboratory II.....		5
PHYS 100/130 College Physics I, Elementary Physics Laboratory I,		
PHYS 101/131 College Physics II/Elementary Physics Laboratory II,		
or		
PHYS 104/130 Engineering Physics I/Elementary Physics Laboratory I,		
PHYS 105/131 Engineering Physics II/Elementary Physics Laboratory II.....		10
		30

Minor: 20 hours included above if Chemistry or Physical Science minor, otherwise more hours needed.

<i>Electives</i>		<i>Hours</i>
Electives.....		13
		124

*** These courses are suggested electives; other options are available. See advisor.

Bachelor of Science (Biology Major with Emphasis in Physical Therapy)

To meet requirements at KU and WSU for admission to a Master of Science program

<i>General Education Degree Requirements *</i>		<i>Hours</i>
Basic Skills**.....		13
Core Courses.....		17
Natural Sciences***.....		0
Languages and Cultures@.....		0
Fine Arts.....		3
Economy and Society.....		3

*Courses must be taken from the list approved by the General Education Committee. See page 47.
 **CSIS 130 Computer Information Systems requirement satisfies CSIS 101 Computer Applications.
 ***Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).
 @Satisfied by SOSCI 105 Ethics requirement.

<i>Biology Requirements</i>	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
BIOL 311 Cell Biology.....	3
BIOL 322/323 Genetics/Laboratory.....	5
BIOL 330 Principles of Ecology.....	3
BIOL 371/372 General Microbiology/Laboratory.....	5
BIOL 656/657 Human Physiology/Laboratory.....	5
BIOL 660 Human Anatomy and Dissection.....	5
BIOL 699 Senior Seminar and Assessment.....	1
Biology electives.....	5
	40

<i>Emphasis Requirements</i>	
CSIS 130 Computer Information Systems.....	3
MATH 122 Plane Trigonometry.....	3
MATH 143 Elementary Statistics.....	3
CHEM 215/216 General Chemistry/Laboratory.....	5
CHEM 225/226 General Chemistry and Qualitative Analysis/Laboratory.....	5
CHEM 320/326 Introductory Organic Chemistry/Laboratory.....	5
PHYS 100/130 College Physics I/Elementary Physics Laboratory I.....	5
PHYS 101/131 College Physics II/Elementary Physics Laboratory II.....	5
PSYCH 263 Developmental Psychology.....	3
PSYCH 571 Abnormal Psychology.....	3
HPER 266 First Aid and CPR.....	2
HPER 469 Physiology of Exercise.....	3
SOSCI 105 Ethics.....	3
	48

Minor: 20 hours included above if physical science minor, otherwise more hours needed..... 0-20
 TOTAL.....124

Additional Requirements for Wichita State University
 Three hours chosen from: Art, Music, Theatre, History, Foreign Language, Communication.
 Three hours chosen from: Geography, Women's Studies, Psychology, Political Science, Sociology, after general education.

Recommended Courses/Areas
 Business/Management
 Physiology-Psychology
 Kinesiology
 Muscle-Nerve Physiology
 Biochemistry
 Embryology

Recommended Minors Include:
 Athletic Training
 Psychology
 Recreation
 Physical Science
 Chemistry

Other Requirements include:
 1. Three Recommendations
 2. Personal Interview
 3. Grade Point Average of 3.0000+
 4. The Graduate Record Exam
 5. Brief Internship

Bachelor of Science (Biology Major with Emphasis in Pre-Fisheries and Wildlife)

The program listed below is a suggested curriculum for pre-fisheries and wildlife students. The program meets all of the requirements for a baccalaureate degree with a major in biology at Pittsburg State University. Early contact with the pre-fisheries and wildlife advisor is imperative. This curriculum prepares the student to pursue a graduate program in Fisheries and Wildlife which includes the technical courses required for entry as a biologist in most agencies.

The attainment of a relevant skill is quite helpful to compete in the current tight job market. Examples: competence in computers, statistics, communication skills, mechanics, art, photography, GIS. On-the-job experience is almost mandatory. The department offers diverse co-op (intern) opportunities to help meet these needs.

<i>General Education Degree Requirements*</i>		Hours
Basic Skills**.....		12
Core Courses.....		17
Natural Sciences***.....		0

Languages and Cultures.....	3
Fine Arts.....	3
Economy and Society.....	3
	38

*Courses must be taken from the list approved by the General Education Committee. See page 47.
 **MATH 113 general education basic skills area can be satisfied by MATH 150 requirement listed below.
 ***Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>		Hours
BIOL 215 General Zoology.....		4
BIOL 218 General Botany.....		4
BIOL 304 Soils.....		3
BIOL 311 Cell Biology.....		3
BIOL 322/323 Genetics/Laboratory.....		5
BIOL 330 Principles of Ecology.....		3
BIOL 371/372 General Microbiology/Laboratory.....		5
BIOL 513 Resource Conservation.....		3
BIOL 535 Ornithology or		
BIOL 536 Mammalogy.....		3
BIOL 548 Taxonomy of Vascular Plants.....		3
BIOL 556/557 Comparative Anatomy/Laboratory.....		5
Aquatic Biology (choose one).....		3
BIOL 533 Ichthyology.....		3
BIOL 534 Herpetology.....		3
BIOL 633 Limnology.....		3

<i>Upper Division Physiology (choose one)</i>		Hours
BIOL 656/657 Human Physiology/Laboratory.....		5
BIOL 675/676 Microbial Physiology/Laboratory.....		5
BIOL 685/686 Plant Physiology/Laboratory.....		5
BIOL 699 Senior Seminar and Assessment.....		1
		50

<i>Emphasis Requirements</i>		Hours
CHEM 215/216 General Chemistry/Laboratory.....		5
CHEM 225/226 General Chemistry and Qualitative Analysis/Laboratory.....		5
CHEM 320/326 Introductory Organic Chemistry/Laboratory.....		5
MATH 150 Calculus I.....		5
PHYS 160/165 Physical Geology/Laboratory.....		5
		25

<i>Electives</i>		Hours
Electives.....		11
TOTAL.....		124

A minor is required. (Recommended minors are chemistry, physical science, political science or communication).

Bachelor of Science (Biology Major with Emphasis in Environmental Management)

Environmental management is a broad field that includes managing natural resources, regulating environmental protection, and measuring environmental quality. Qualified graduates can go on to careers in commercial laboratories, government, industry, and the business of consulting. The courses offered in the environmental management emphasis are designed to introduce you to current issues and methods involved in natural resource management, in regulating environmental protection, and in measuring environmental quality.

<i>General Education Degree Requirements*</i>		Hours
Basic Skills.....		12
Core Courses.....		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society.....		3
		41

*Courses must be taken from the list approved by the General Education Committee. See page 47.
 **Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>		Hours
BIOL 215 General Zoology.....		4
BIOL 218 General Botany.....		4
BIOL 311 Cell Biology.....		3
BIOL 322/323 Genetics/Laboratory.....		5
BIOL 330 Principles of Ecology.....		3
BIOL 371/372 General Microbiology/Laboratory.....		5
Physiology (choose one).....		5
BIOL 656/657 Human Physiology/Laboratory.....		5
BIOL 675/676 Microbial Physiology/Laboratory.....		5
BIOL 685/686 Plant Physiology/Laboratory.....		5
BIOL 699 Senior Seminar and Assessment.....		1
		30

<i>Emphasis Requirements</i>		Hours
BIOL 304 Soils.....		3
BIOL 513 Resource Conservation.....		3
BIOL 548 Taxonomy of Vascular Plants.....		3
PHYS 160/165 Physical Geology/Laboratory.....		5
Field Biology (3 hours chosen from).....		3

BIOL 533 Ichthyology	3
BIOL 534 Herpetology.....	3
BIOL 535 Ornithology.....	3
BIOL 536 Mammalogy.....	3
BIOL 615 Environmental Protection.....	3
BIOL 691 Independent Study in Environmental Management.....	3
TOTAL	23

<i>Chemistry Requirements</i>	
CHEM 215/216 General Chemistry/Laboratory	5
CHEM 320/326 Introductory Organic Chemistry/Laboratory or	
CHEM 325/326 Organic Chemistry I/Laboratory	5
TOTAL	10

Minor**(10 hours if chemistry is chosen as minor.)..... 10-20

<i>Electives</i>	
Electives.....	10
TOTAL	124

** Chemistry will be the minor of choice for most students: Analytical chemistry or biochemistry could be taken to complete the 20 credit requirement. Other relevant minors include political science, technical writing, history, physical science, and journalism/communication.

Bachelor of Science (Biology Major with Emphasis in Natural History)

The program listed below is a suggested curriculum for natural history students. The program meets all of the requirements for a baccalaureate degree with a major in biology at Pittsburg State University.

A student interested in a career in teaching through a nature center, a natural resources state or federal agency, or a natural history organization may want to consider the natural history emphasis. This program would also satisfy requirements for a student who would like to pursue a higher degree in field biology or taxonomic studies.

<i>General Education Degree Requirements*</i>		<i>Hours</i>
Basic Skills.....		15
Core Courses.....		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society.....		3
TOTAL		41

*See page 47 for specific general education course requirements.
**Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
BIOL 311 Cell Biology.....	4
BIOL 322/323 Genetics/Laboratory	3
BIOL 330 Principles of Ecology.....	3
BIOL 371/372 General Microbiology/Laboratory	5
Upper Division Physiology (choose one).....	5
BIOL 656/657 Human Physiology/Laboratory	5
BIOL 675/676 Microbial Physiology/Laboratory.....	5
BIOL 685/686 Plant Physiology/Laboratory	5
BIOL 699 Senior Seminar and Assessment.....	1
TOTAL	30

<i>Emphasis Requirements</i>	
BIOL 535 Ornithology.....	3
BIOL 548 Taxonomy of Vascular Plants.....	3
BIOL 561 General Entomology.....	3
BIOL 643 Natural History Interpretation.....	3
Terrestrial field course (choose one).....	3
BIOL 536 Mammalogy.....	3
Available field topics.....	3
Aquatic field course (choose one).....	3
BIOL 533 Ichthyology.....	3
BIOL 534 Herpetology.....	3
BIOL 781 Freshwater Algae.....	3
BIOL 513 Resource Conservation.....	3
TOTAL	21

<i>Chemistry Requirements</i>	
CHEM 215/216 General Chemistry/Laboratory	5
CHEM 320/326 Introductory Organic Chemistry/ Laboratory or	
CHEM 325/326 Organic Chemistry I/Laboratory	5
TOTAL	10

<i>Electives</i>	
Electives.....	13-14
BIOL 633 Limnology and BIOL 304 Soils would be helpful. One communication techniques and one art techniques course are highly recommended.	

Minor: A minor is required. (Recommended minors are physical science or communication)*..... 20

TOTAL.....124

*Depending on minor selected, some of the 20 hours can be met by chemistry requirements or recommended communication electives.

Other Pre-Professional Programs

The Department of Biology also offers pre-professional work in optometry and veterinary medicine. Consult the chairperson of the department for details concerning these programs.

Bachelor of Science in Education (Biology Major)

<i>General Education Degree Requirements for Students Preparing to Teach</i>		<i>Hours</i>
Basic Skills		18
Core Courses		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society		3
TOTAL		44

*Courses must be taken from the list of general education degree requirements for students preparing to teach secondary school. See page 48. Also see scholastic achievement requirements on common core courses for admission to teacher education for secondary teaching majors, page 174.

**Eight hours of general education natural sciences are satisfied by course requirements in biology (BIOL 215) and physical science (PHYS 171/172 or PHYS 100/130).

<i>Professional Education Requirements</i>	
PSYCH 263 Developmental Psychology.....	3
PSYCH 357 Educational Psychology.....	3
SSLS 510 Overview of Education for Exceptional Students	3
CURIN 305 Explorations in Education**.....	2
CURIN 306 Pre-Professional Laboratory I**	1
CURIN 520 Middle and Secondary Reading.....	3
Professional Semester.....	17
CURIN 458 Methods and Curriculum	3
CURIN 462 Secondary and Middle Level Education.....	2
CURIN 464 Foundations of Measurement and Evaluation.....	2
CURIN 480 Supervised Teaching in the Secondary School	3
CURIN 482 Supervised Teaching in the Secondary School	5
BIOL 579 Supervised Student Teaching and Follow-Up of Teachers.....	2
TOTAL	32

**Concurrent enrollment required in CURIN 305 and 306.

<i>Biology Requirements</i>	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany	4
BIOL 257/258 Anatomy and Physiology/Laboratory.....	5
BIOL 300 Assisting in the Biology Laboratory	1
BIOL 322/323 Genetics/Laboratory.....	5
BIOL 330 Principles of Ecology	3
BIOL 371/372 General Microbiology/Laboratory.....	5
BIOL 479 Techniques for Teaching Biology.....	3
Biology electives (including 3 hr. field course).....	8
TOTAL	38

<i>Minor Requirements***</i>	
PHYS 100/130 College Physics I/Elementary Physics Laboratory I or	
PHYS 171/172 Physical Science/Laboratory****.....	5
CHEM 105/106 Introductory Chemistry/Laboratory or	
CHEM 215/216 General Chemistry/Laboratory.....	4-5
CHEM 320/326 Introductory Organic Chemistry/Laboratory.....	5
Additional hours chosen from chemistry or physics.....	5-6
TOTAL	20
TOTAL	134

*** NOTE: This curriculum assumes a physical science minor. Other minors are available. Those persons interested in biology as a second teaching field should contact the BSED advisor in the Department of Biology or the Director of Teacher Education, Hughes Hall, for specific requirements.

****PHYS 171/172 hours do not count toward 20 hour physical science minor total.

Bachelor of Science in Medical Technology (Biology-Medical Technology Major)

<i>General Education Degree Requirements*</i>		<i>Hours</i>
Basic Skills		15
Core Courses		17
Natural Sciences**.....		0
Languages and Cultures.....		3
Fine Arts.....		3
Economy and Society		3
TOTAL		41

*Courses must be taken from the list approved by the General Education Committee. See page 47.
**Eight hours of general education natural sciences are satisfied by course

requirements in biology (BIOL 215) and chemistry (CHEM 215/216).

<i>Biology Requirements</i>	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
BIOL 221 Principles of Heredity or.....	3
BIOL 322/323 Genetics/Laboratory.....	5
BIOL 257/258 Anatomy and Physiology/Laboratory.....	5
BIOL 371/372 General Microbiology/Laboratory.....	5
BIOL 570/571 Pathogenic Bacteriology/Laboratory.....	5
BIOL 671/672 Immunology/Laboratory.....	5
BIOL 699 Senior Seminar and Assessment.....	1
	32 or 34
<i>Chemistry Requirements</i>	
CHEM 215/216 General Chemistry/Laboratory.....	5
CHEM 225/226 General Chemistry and Qualitative Analysis/Laboratory.....	5
CHEM 320/326 Introductory Organic Chemistry/Laboratory.....	5
CHEM 445/446 Analytical Chemistry/Laboratory or.....	5
CHEM 575/576 Introductory Biochemistry/Laboratory.....	5
	20
<i>Electives</i>	
Electives.....	2
Clinical year at a school of medical technology affiliated with Pittsburg State University.....	30
TOTAL.....	125-127

Only four of the 94 required hours in the first three years may be in ROTC or physical education activity courses. The student should consult the medical technology advisor for the determination of additional electives. A student must complete the first three years (94 hours) at an accredited college or university with the last 30 of these hours being in residence at Pittsburg State University. The fourth year must be completed in a NAACLS accredited school of medical technology affiliated with this university. This university is currently affiliated with the following schools: L. E. Cox Medical Center, Springfield, Missouri; St. John's Medical Center, Joplin, Missouri; University of Kansas Medical Center, Kansas City, Kansas; other clinical programs are open to PSU students by arrangement. The student should consult the medical technology advisor for details.

Minor Sequences

<i>Hours</i>	
I. Biology	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
BIOL 221 Principles of Heredity.....	3
BIOL 257/258 Anatomy and Physiology/Laboratory.....	5
BIOL 371/372 General Microbiology/Laboratory.....	5
	21

Those persons interested in biology as a second teaching option should contact the BSED advisor in the Department of Biology or the Director of Teacher Education, Hughes Hall, for specific requirements.

II. General Science

BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
CHEM 215/216 General Chemistry/Laboratory.....	5
PHYS 100/130 College Physics I/Elementary Physics Laboratory I.....	5
PHYS 160 Physical Geology or.....	
PHYS 175 Descriptive Astronomy or.....	
PHYS 575 Introductory Astrophysics.....	3
Biology electives.....	3
	24

Those persons interested in general science as a second teaching option should contact the BSED advisor in the Department of Biology or the Director of Teacher Education, Hughes Hall, for specific requirements.

III. Natural History

Program of Study (20 Hours of Undergraduate Credit)	
BIOL 215 General Zoology.....	4
BIOL 218 General Botany.....	4
BIOL 330 Principles of Ecology.....	3
BIOL 513 Resource Conservation.....	3
Topics in Biology I.....	1
(BIOL 537 Regional Natural History and BIOL 643 Natural History Interpretation suggested).....	6
	20

Those persons interested in the above minor should contact Dr. Cynthia Ford or the Department of Biology for information.

IV. Environmental Management

BIOL 113/114 Environmental Life Science/Laboratory.....	5
---------------------------------------------------------	---

CHEM 105/106 Introductory Chemistry/Laboratory or.....	4-5
CHEM 215/216 General Chemistry/Laboratory.....	4-5
BIOL 330 Principles of Ecology.....	3
BIOL 513 Resource Conservation.....	3
BIOL 615 Environmental Protection.....	3
BIOL 691 Independent Study in Environmental Management.....	3
	21-22

Those persons interested in the above minor should contact Dr. Joseph Arruda or the Department of Biology for information.

V. Cell Biology

BIOL 311 Cell Biology.....	3
BIOL 322 Genetics.....	3
BIOL 323 Genetics Laboratory.....	2
BIOL 371 General Microbiology.....	3
BIOL 372 General Microbiology Laboratory.....	2
BIOL 711 Cell and Molecular Biology.....	3
BIOL 712 Recombinant DNA Techniques Laboratory.....	2
One of the following groups of Biology electives:.....	3 or 5
BIOL 627 Genetics of Microorganisms or.....	3
BIOL 656/657 Human Physiology/Laboratory or.....	5
BIOL 675/676 Microbial Physiology/Laboratory or.....	5
BIOL 685/686 Plant Physiology/Laboratory.....	5
Total.....	21-23

This minor is intended to provide biology courses for students pursuing a Chemistry major with an emphasis in biochemistry. Those persons interested in this minor should contact Dr. Daniel Zurek or the Department of Biology for information.

GRADUATE DEGREE PROGRAMS

Master of Science with a Major in Biology

Students who begin work in biology for the degree of Master of Science must have completed a minimum of 25 hours of acceptable undergraduate courses in biology. These should include fundamental courses in botany, ecology, zoology, genetics, microbiology, and physiology. A cumulative total of 13 hours of chemistry, including organic chemistry is required. However, a student may apply certain senior-graduate or graduate level chemistry on the degree requirements upon the recommendation of the advisor. In addition, it is advisable that a student have work in physics and geology. While a knowledge of a foreign language and of computing is not required, it is strongly advised.

Three options are available in biology:

Option I: Thesis. A minimum of 30 hours including BIOL 801 Introduction to Research, at least one hour in BIOL 800 Seminar and BIOL 890 Research and Thesis (4-6 hours) is required. All full-time graduate students are required to attend seminar. With the approval of the advisor and chairman, up to nine hours may be taken outside the Department of Biology.

Option II: Problem. A minimum of 32 hours including BIOL 801 Introduction to Research, at least one hour of BIOL 800 Seminar and BIOL 891 Research Problem (3 hours) is required. All full-time graduate students are required to attend seminar. With the approval of the advisor and chairman, up to 15 hours may be taken outside the Department of Biology. This option is primarily recommended for science teachers at the secondary school level.

Option III: Seminar. A minimum of 36 hours including BIOL 892 Grant Writing Seminar I, 3 hours, and BIOL 893 Grant Writing Seminar II, 3 hours, is required. Instead of writing a thesis or a scholarly paper on a problem, the student must complete the two grant writing seminar courses and submit a grant for external funding. With the approval of the advisor and chairman, up to 15 hours may be taken outside the Department of Biology with a maximum of six hours of courses in

education. This option is primarily recommended for science teachers at the secondary school level. At least 15 hours should be in courses numbered 800-899, and 30 hours must be in courses numbered 700 -899.

Specialist in Education - Biology

The degree of Specialist in Education with biology as the major teaching field for secondary and community college teachers is offered by the Department of Special Services and Leadership Studies in cooperation with the Department of Biology. Details concerning this degree are available from the Department of Biology.

DESCRIPTION OF COURSES

UNDERGRADUATE

BIOL 105. Pre-Med Orientation I. 0.5 hours. Acquaint freshmen with the requirements of medical schools and guide their curricula to enable them to succeed in their chosen career path. Required for all freshmen pre-meds. Prerequisites: Freshman standing and pre-med emphasis. Offered on a Pass-Fail basis only.

BIOL 111. General Biology. 3 hours. Designed to acquaint the student with the fundamental principles and processes of life as found in animals and plants and their relation to the everyday life of man. Not open to students with credit in BIOL 113/114 Environmental Life Science/Laboratory, or BIOL 215 General Zoology, or BIOL 218 General Botany. Corequisite: BIOL 112 General Biology Laboratory.

BIOL 112. General Biology Laboratory. 2 hours. Laboratory exercises to accompany BIOL 111 General Biology. Corequisite: BIOL 111 General Biology.

BIOL 113. Environmental Life Science. 3 hours. A basic ecological approach to the principles and processes of life with emphasis placed on human pressures and technology, and the effect of these on the organism-environment complex. Not applicable toward a biology major. Not open to students with credit in BIOL 111/112 General Biology/Laboratory or BIOL 215 General Zoology or BIOL 218 General Botany.

BIOL 114. Environmental Life Science Laboratory. 2 hours. Laboratory exercises to accompany BIOL 113 Environmental Life Science. Corequisite: BIOL 113 Environmental Life Science.

BIOL 202. Topics in Biology (____). 1-3 hours. Intensive study of selected topics in biology. Lecture and laboratory. May be repeated if subject matter is different. Each class limited to a single topic. Prerequisite: Permission of instructor.

BIOL 205. Pre-Med Orientation II. 0.5 hours. Exploring the health professions and what lies ahead. Required for all sophomore pre-meds. Prerequisites: Sophomore standing and pre-med emphasis. Offered on a Pass-Fail basis only.

BIOL 215. General Zoology. 4 hours. Fundamental principles and processes of animal life including relationships, morphology, life history, ecology, genetics and evolution. Laboratory exercises accompany lecture. Prerequisite: BIOL 111/112 General Biology/Laboratory or an ACT COMP score of at least 20.

BIOL 218. General Botany. 4 hours. A basic study of plants dealing with growth, physiology, morphology, reproduction, taxonomy and evolution. Laboratory exercises accompany lecture. Prerequisite: BIOL 111/112 General Biology/Laboratory or an ACT COMP score of at least 20.

BIOL 221. Principles of Heredity. 3 hours. The laws and theories of heredity with emphasis on man.

BIOL 257. Anatomy and Physiology. 3 hours. An integrated study of the structure and functions of the human body. May not be counted on the 40-hour major if the student elects human physiology for the upper division physiology requirement. Prerequisite: BIOL 111/112 General Biology/Laboratory or BIOL 215 General Zoology. Corequisite: BIOL 258 Anatomy and Physiology Laboratory.

BIOL 258. Anatomy and Physiology Laboratory. 2 hours. Laboratory exercises to accompany BIOL 257 Anatomy and Physiology. Corequisite: BIOL 257 Anatomy and Physiology.

BIOL 300. Assisting in the Biology Laboratory. 1 hour. For students intending to teach biology or general science in secondary schools. Assisting in the preparation and instruction in various biology course laboratories at the 100 and 200 levels. A minimum of four hours assisting per week is required. Prerequisite: Students must be in the teacher education curriculum; permission of the instructor.

BIOL 304. Soils. 3 hours. Lecture and laboratory. Fundamental chemical, physical, and biological properties of soils, their formation, fertility, and

management.

BIOL 305. Pre-Med Orientation III. 0.5 hours. Preparing for the MCAT and completing an AMCAS and/or ACOMAS application. Mock interviews. Required for all junior pre-meds. Prerequisites: Junior standing and pre-med emphasis. Offered on a Pass-Fail basis only.

BIOL 311. Cell Biology. 3 hours. Cell structure and function with emphasis on energy metabolism and use of genetic information. Prerequisites: 5 hours biology, 5 hours chemistry. May be taken for honors.

BIOL 322. Genetics. 3 hours. The principles of genetics with emphasis on the cytological mechanism of inheritance: physical basis, linkage mapping of genes and gene action. Intended primarily for biology majors. Prerequisite: BIOL 215 General Zoology, BIOL 218 General Botany, and 5 hours of chemistry. Corequisite: BIOL 323 Genetics Laboratory. May be taken for honors.

BIOL 323. Genetics Laboratory. 2 hours. Laboratory exercises to accompany BIOL 322 Genetics. Corequisite: BIOL 322 Genetics. May be taken for honors.

BIOL 330. Principles of Ecology. 3 hours. The theories which form our basic concepts of ecosystems. Abiotic, individual, species, population, community and ecosystem perspective of living systems. Human ecosystems and man as a member of natural systems. May be taken for honors.

BIOL 371. General Microbiology. 3 hours. Fundamentals of morphology, physiology, growth, taxonomy, and cultivation of bacteria and related microorganisms. Including a brief introduction to their role in industry, agriculture and medicine. Prerequisite: 5 hours of biology and 5 hours of chemistry. Corequisite: BIOL 372 General Microbiology Laboratory. May be taken for honors by permission of instructor.

BIOL 372. General Microbiology Laboratory. 2 hours. Laboratory experiences concerning the morphology, cultivation, physiology, and applied aspects of bacteria and related microorganisms. Corequisite: BIOL 371 General Microbiology. May be taken for honors with permission of instructor.

BIOL 402. Topics in Biology (____). 1-3 hours. Intensive study of selected topics in biology. Classroom and laboratory. May be repeated if subject matter is different. Each class limited to a single topic and for a specific number of credit hours.

BIOL 410. Biological and Medical Terminology. 2 hours. A self-study course. Covers the words and roots of words commonly used in the life sciences and medicine. No class meetings; 2 examinations each semester.

BIOL 479. Techniques for Teaching Biology. 3 hours. Techniques, methods, and course content used in teaching biology in the secondary school. Offered by the Department of Biology. To be taken before the professional semester. Prerequisites: Admission to teacher education and PSYCH 357 Educational Psychology.

BIOL 481. Clinical Microbiology. 1-8 hours. Theory and laboratory study of pathogenic bacteria, viruses, rickettsiae, fungi, and parasites. Includes morphology, physiology, taxonomy, and medical significance of the various groups; methods of collecting and treating specimens for the isolation and identification of the various types.

BIOL 482. Clinical Biochemistry. 1-8 hours. Theory and laboratory study of analytical biochemistry, incorporating routine and special chemical procedures in the analysis of body fluids and their significance in clinical medicine.

BIOL 483. Clinical Immunology. 1-6 hours. Theory and laboratory study of the fundamentals of antigen-antibody reactions, blood groups and types, cross-matches, blood components, AABB-approved transfusion practices, and serological procedures used in the determination of immunologic responses.

BIOL 484. Clinical Hematology. 1-6 hours. Blood cell derivation, maturation; and function; principles of hemostasis and blood coagulation. Methodology used in routine and special hematology studies and in the detection of hematological disorders.

BIOL 485. Topics in Medical Technology (____). 1-6 hours. General laboratory techniques including clinical microscopy, cytogenetics, urinalysis, nuclear medicine, histology, and a special project. May be repeated for a maximum of 6 hours.

BIOL 490. Honors Research in Biology. 1-3 hours. Special research problem in one of the fields of biology. Results of this study are to be submitted in accepted form for publications as set up by American Institute of Biological Sciences. May be repeated for a total of 6 hours. A student may apply a total of 6 hours of credit in BIOL 490 Honors Research in Biology and BIOL 491 Special Problems in Biology on the 40-hour biology major. Prerequisite: 20 hours of biology, overall grade point average of 3.4, and permission of instructor. May be taken for honors.

BIOL 491. Special Problems in Biology. 1-3 hours. Special research problems in various fields of biology. May be repeated for a total of 6 hours. A student may apply a total of 6 hours of credit in BIOL 490 Honors Research in Biology and BIOL 491 Special Problems in Biology on the 40-hour biology major. Prerequisite: 20 hours of biology and permission of instructor.

BIOL 513. Resource Conservation. 3 hours. A survey of resource management methods for soil, water, air, toxic substances and waste, energy, and biological resources. Means of preventing and controlling pollution, restoring resource quality, and managing risk. Prerequisite: 20 hours of biology including BIOL 330 Principles of Ecology. May be taken for honors.

BIOL 533. Ichthyology. 3 hours. Lecture and laboratory. The class osteichthyes with special reference to fishes of North America. Prerequisite: BIOL 215 General Zoology. May be taken for honors.

BIOL 534. Herpetology. 3 hours. Lecture, laboratory, and field. Morphology, identification, distribution, evolution and ecology of the classes amphibia and reptilia. Pre-requisites: BIOL 215 General Zoology. BIOL 330 Principles of Ecology. May be taken for honors.

BIOL 535. Ornithology. 3 hours. Lecture and laboratory. Identification: life history, ecology, distribution, morphology, and evolution of birds. Emphasis on field studies of birds of southeast Kansas. Prerequisite: BIOL 215 General Zoology. May be taken for honors.

BIOL 536. Mammalogy. 3 hours. Lecture and laboratory. Morphology, classification, ecology, distribution, evolution and economic importance of mammals. Emphasis given to the mammals of Kansas. Prerequisite: BIOL 215 General Zoology. May be taken for honors.

BIOL 537. Regional Natural History. 3 hours. Classification, identification, ecology, and collection techniques emphasized in the survey of regional flora, fauna, and geological features. Prerequisite: Must complete general education requirements in the Life Sciences. May be taken for honors.

BIOL 542. Conservation Agencies: Administration and Management. 2 hours. Description and analysis of the administration and management of governmental and nongovernmental organizations engaged in conservation work at state, national, and international levels.

BIOL 548. Taxonomy of Vascular Plants. 3 hours. Lecture and laboratory. The scientific classification and identification of ferns and seed plants, with emphasis on the local flora. Methods of collection, preservation and preparation of herbarium specimens included. Prerequisite: BIOL 218 General Botany or permission of instructor. May be taken for honors.

BIOL 556. Comparative Anatomy. 2 hours. The comparative anatomy of vertebrates including dissection of a representation from each major group. Prerequisite: BIOL 215 General Zoology. Corequisite: BIOL 557 Comparative Anatomy Laboratory.

BIOL 557. Comparative Anatomy Laboratory. 3 hours. Laboratory exercises to accompany BIOL 556 Comparative Anatomy. Corequisite: BIOL 556 Comparative Anatomy.

BIOL 561. General Entomology. 3 hours. Lecture and laboratory. Structure, classification, physiology, ecology, and economic importance of insects. Prerequisite: BIOL 215 General Zoology. May be taken for honors.

BIOL 564. Human Histology. 5 hours. Microscopic structure of human tissues. Prerequisites: BIOL 215 General Zoology. Must have 60 hours passed. May be taken for honors.

BIOL 566. Vertebrate Embryology. 3 hours. The development of the frog, chick, and pig and applications to prenatal development of the human. Prerequisite: BIOL 556/557 Comparative Anatomy/Laboratory or permission of instructor. Corequisite: BIOL 567 Vertebrate Embryology Laboratory. May be taken for honors.

BIOL 567. Vertebrate Embryology Laboratory. 2 hours. Laboratory exercises to accompany BIOL 566 Vertebrate Embryology. Corequisite: BIOL 566 Vertebrate Embryology. May be taken for honors.

BIOL 570. Pathogenic Bacteriology. 3 hours. The isolation, identification, mechanisms of pathogenesis, host relations, immunity and public health aspects of disease producing bacteria and rickettsiae. Prerequisite: BIOL 371/372 General Microbiology/Laboratory. Corequisite: BIOL 571 Pathogenic Bacteriology Laboratory. May be taken for honors.

BIOL 571. Pathogenic Bacteriology Laboratory. 2 hours. Laboratory experiences concerning the isolation, cultivation and identification of disease-producing bacteria. Corequisite: BIOL 570 Pathogenic Bacteriology. May be taken for honors.

BIOL 572. General Virology. 3 hours. Basic concepts regarding the nature of viruses and their properties, together with techniques for their growth, characterization and identification with emphasis on the major groups of animal viruses. Prerequisite: BIOL 371/372 General Microbiology/Laboratory. May be taken for honors.

BIOL 579. Supervised Student Teaching and Follow-Up of Teachers. 2 hours. Departmental representatives will visit each student teacher during the professional semester. Additionally, departmental representatives will follow up with each area student during the first year of teaching with assistance and support. Concurrent enrollment in the professional semester is required. Offered on a Pass-Fail basis only.

BIOL 582. Plant Diversity. 3 hours. Lecture and laboratory. An overview of the major groups of plants with emphasis on morphological characteristics, evolution and distribution. Prerequisites: BIOL 218 General Botany or permission of instructor. May be taken for honors.

BIOL 602. Topics in Biology (____). 1-3 hours. Intensive study of selected topics in biology. Classroom and laboratory study. May be repeated if subject matter is different. Each class is limited to a single topic and for a specific number of credit hours. Prerequisite: 15 hours of biology and permission of instructor. May be taken for honors.

BIOL 612. Internship in Biology. 1-3 hours. A cooperative education experience in a career area in biology. Requires a formal agreement between the instructor and the immediate supervisor of the industry or agency. Prerequisite: 15 hours of biology and permission of instructor. May be repeated for a maximum of three hours.

BIOL 615. Environmental Protection. 3 hours. A review of the history of conservation and environmental law, the legal, political, social, and scientific aspects of environmental protection, and major federal environmental laws. Prerequisite: BIOL 513 Resource Conservation. May be taken for honors.

BIOL 627. Genetics of Microorganisms. 3 hours. Emphasis on microorganisms as a "tool" of genetics. Advantages and disadvantages of each organism to specific research areas are discussed. Prerequisite: (10 hours of biology including one course in genetics), BIOL 322/323 Genetics/Laboratory, BIOL 371/372 General Microbiology/Laboratory. May be taken for honors.

BIOL 633. Limnology. 3 hours. Lecture and laboratory. Biotic, physical and chemical characteristics of fresh water environments. Biological mapping of lakes and streams: productivity studies. Prerequisites: 15 hours of biology, 10 hours of chemistry. May be taken for honors.

BIOL 634. Fisheries Management. 5 hours. Lecture, laboratory and field. Fish population dynamics, methods of assessment and techniques for management of fisheries. Includes an actual field problem. Prerequisites: BIOL 215 General Zoology, BIOL 330 Principles of Ecology, BIOL 633 Limnology.

BIOL 635 Wildlife Ecology and Management. 3 hours. Lecture and laboratory. Application of ecological principles toward the manipulation of terrestrial wildlife populations. Laboratory sessions, stress techniques, local management practices and discussion with wildlife personnel. Prerequisites: BIOL 330 Principles of Ecology, BIOL 215 General Zoology. May be taken for honors.

BIOL 639. Field Ecology. 3 hours. Lecture, laboratory and field. Field techniques used to determine community structure of aquatic and terrestrial systems, including ecological assessment, design of projects, sampling of physical habitat, and biological data compilation, analysis and interpretation. Prerequisite: BIOL 330 Principles of Ecology. May be taken for honors.

BIOL 643. Natural History Interpretation. 3 hours. Communicating natural history through presentations, interpretive writing, exhibit design, and conducted activities. Application of these skills emphasized. Prerequisite: 13 hours of biology including ecology and field biology courses or permission of instructor.

BIOL 656. Human Physiology. 3 hours. Chemical and physical basis of human physiology. Emphasis on molecular mechanisms as they apply to understanding systems. Prerequisites: 10 hours of biology, 10 hours of chemistry, including organic, 5 hours of physics. Corequisite: BIOL 657 Human Physiology Laboratory. May be taken for honors.

BIOL 657. Human Physiology Laboratory. 2 hours. Laboratory exercises to accompany BIOL 656 Human Physiology. Corequisite: BIOL 656 Human Physiology. May be taken for honors.

BIOL 660. Human Anatomy and Dissection. 5 hours. The study of gross human structures. Students will dissect and study human cadavers. Anatomical models, a text, an atlas, and lecture material will be other sources of information. Prerequisite: Permission of instructor. May be taken for honors.

BIOL 662. Biomechanics. 2 hours. Problem-solving approach to biomechanics, the application of mechanical principles to the human body. Prerequisites: PHYS 101/131 College Physics II/Elementary Physics Laboratory II, and permission of instructor. May be taken for honors.

BIOL 671. Immunology. 3 hours. Principles of immunity and serology; immunochemistry and interactions of antigen and antibodies in vitro and in vivo; mechanisms of immunologic damage. Prerequisites: BIOL 570/571 Pathogenic Bacteriology/Laboratory and 5 hours of organic chemistry or consent of instructor. May be taken for honors.

BIOL 672. Immunology Laboratory. 2 hours. Selected recent laboratory experiments to accompany BIOL 671 Immunology. Prerequisite or corequisite: BIOL 671 Immunology. May be taken for honors.

BIOL 674. Industrial Microbiology. 3 hours. Lecture and laboratory. The role of microorganisms in industrial processes, including the production of foods and flavors, vitamins, antibiotics, steroids, alcohols and other solvents. Prerequisite: BIOL 371/372 General Microbiology/Laboratory. May be taken for honors.

BIOL 675. Microbial Physiology. 3 hours. The metabolic processes of micro organisms with emphasis on the bacteria. Prerequisite: 10 hours of biology including BIOL 371/372 General Microbiology/Laboratory. 10 hours of chemistry, including organic, or permission of instructor. Biochemistry strongly recommended. May be taken for honors.

BIOL 676. Microbial Physiology Laboratory. 2 hours. Laboratory experience to complement lecture and classroom work in microbial physiology, with emphasis on bacteria. Prerequisites: 10 hours of biology including BIOL 371/372 General Microbiology/Laboratory, 10 hours of biochemistry including organic or permission of the instructor. Biochemistry strongly recommended. May be taken for honors.

BIOL 685. Plant Physiology. 3 hours. The chemical and physical phenomena occurring in the living plant. Prerequisites: BIOL 218 General Botany. Ten hours of chemistry, including organic. Corequisite: BIOL 686 Plant Physiology/Laboratory. May be taken for honors.

BIOL 686. Plant Physiology Laboratory. 2 hours. Laboratory exercises to accompany BIOL 685 Plant Physiology. Corequisite: BIOL 685 Plant Physiology. May be taken for honors.

BIOL 691. Independent Study in Environmental Management. 3 hours. Directed readings or special field, lab, or library investigation as determined in conference by the student and faculty member. Project proposal must be submitted by second week of class. Prerequisites: BIOL 513 Resource Conservation and permission of instructor.

BIOL 699. Senior Seminar and Assessment. 1 hour. Individual reports and group discussion of problems and current research in the biological sciences. Includes an examination to assess the student's general understanding and knowledge of biological principles and facts. Prerequisite: Senior standing. Required of all graduating seniors, except BSED majors.

BIOL 711. Cell and Molecular Biology. 3 hours. The molecular basis of cell structures and function, with emphasis on the techniques of molecular study.

Prerequisites: BIOL 322/323 Genetics/Laboratory, BIOL 371/372 General Microbiology/Laboratory, 10 hours of chemistry. May be taken for honors.

BIOL 712. Recombinant DNA Techniques Laboratory. 2 hours. Laboratory manipulation of nucleic acids, including cloning, metagenesis, electrophoretic analysis, sequencing, polymerase chain reaction. Prerequisites: BIOL 322/323 Genetics/Laboratory, BIOL 371/372 General Microbiology/Laboratory, 10 hours of chemistry. Corequisite: BIOL 711 Cell and Molecular Biology.

BIOL 730. Evolution. 3 hours. Examines the current synthesis of evolutionary theory including prebiotic development of protein, microspheres and the potential modes of speciation of living organisms. Prerequisites: BIOL 322/323 Genetics/Laboratory, BIOL 371/372 General Microbiology/Laboratory (10 hours of biology). May be taken for honors.

BIOL 742. Biosystematics. 2 hours. Lecture and discussions. The study of modern taxonomic methodologies, employing descriptive and observational, analytical and experimental, and syncretical and theoretical approaches. Discussions of the species concept, classification methods, and the rules of nomenclature.

BIOL 743. Tropical Biology. 3 hours. Lecture. An overview of forest types, physical characteristics, vegetative characteristics, species diversity, plant/animal interactions, ecology, evolution, and the impact of humans on tropical regions of the world. Prerequisite: BIOL 330 Principles of Ecology. May be taken for honors.

BIOL 744. Identification of Mosses, Liverworts and Ferns. 3 hours. Lecture, laboratory and field. Overview of characteristics, evolution and ecology of mosses, liverworts and ferns. Emphasis on identification of local and regional flora. May be taken for honors.

BIOL 745. Summer Flora. 3 hours. Lecture, laboratory and field. Overview of the basic characteristics of vascular plants. Emphasis on collecting and identifying the vascular flora during the summer months. Designed for teachers or botanical novice. Prerequisites: BIOL 111/112 General Biology/Laboratory or BIOL 218 General Botany or permission of instructor. May be taken for honors.

BIOL 759. Vertebrate Endocrinology. 3 hours. Chemical messengers, hormones, in vertebrates. The mechanisms of their synthesis, release, transport and actions. Emphasis will be placed on methodologies and interactions between systems. Prerequisites: 15 hours biology, 10 hours chemistry.

BIOL 774. Bacterial Diversity and Ecology. 3 hours. The diversity of bacteria as distinguished by their physiological, biochemical, and morphological properties and the biochemical ecology of bacterial communities. Laboratory work includes isolations and constructed cultures. Prerequisites: BIOL 371/372 General Microbiology/Laboratory, BIOL 675 Microbial Physiology recommended. May be taken for honors.

BIOL 781. Freshwater Algae. 3 hours. Descriptive, physiological and ecological aspects of locally represented algal divisions. Laboratory and field work will concentrate on collection, identification, and distribution of local algal flora. Prerequisite: BIOL 218 General Botany. May be taken for honors.

BIOL 788. Mycology. 3 hours. Lecture and laboratory. Taxonomy, morphology and physiology of representative fungi. Prerequisite: BIOL 218 General Botany, BIOL 371/372 General Microbiology/Laboratory. Organic chemistry recommended. May be taken for honors.

GRADUATE

BIOL 800. Seminar. 1 hour. Individual reports and group discussion of problems and current research in biology. May be repeated. Participation required of all regularly enrolled graduate students.

BIOL 801. Introduction to Research. 3 hours. Proposal preparation, research techniques, use of library, analysis and presentation of research data. Required for all graduate students.

BIOL 802. Advanced Topics in Biology (____). 1-3 hours. Intensive study of selected topics in biology. Classroom and laboratory study. May be repeated if subject matter is different. Each class limited to a single topic and for a specific number of credit hours. Prerequisites: 15 hours of biology and permission of instructor.

BIOL 803. Biometry. 3 hours. The application of statistical methods to data from various fields of biological research. Special emphasis placed on practical computational procedures and experimental design. Prerequisites: MATH 113 College Algebra or MATH 110 College Algebra with Review or MATH 126 Pre-Calculus and 20 hours of biology.

BIOL 810. Recent Literature in Biology (____). 1 hour. A survey of recent literature in specific areas of biology (for example, ecology, genetics, immunology, physiology, etc.). May be repeated for a maximum of 3 hours. Prerequisite: Permission of instructor.

BIOL 812. Internship in Biology. 1-3 hours. A cooperative education experience in a career area in biology. Requires a formal agreement between the instructor and the immediate supervisor of the industry or agency. Prerequisite: 15 hours of biology and permission of instructor.

BIOL 824. Problems in Genetics. 1-6 hours. Individual work in genetics. May be repeated for a total of 6 hours. Prerequisites: 25 hours of biology including one course in genetics.

BIOL 834. Fisheries Management. 5 hours. Lecture, laboratory and field. Fish population dynamics, methods of assessment and techniques for management of fisheries. Includes an actual field problem. Prerequisites: BIOL 215 General Zoology, BIOL 330 Principles of Ecology, BIOL 633 Limnology.

BIOL 835. Wildlife Ecology and Management. 3 hours. Lecture and laboratory. Application of ecological principles toward the manipulation of terrestrial wildlife populations. Laboratory sessions stress techniques, local management practices and discussion with wildlife personnel. Prerequisites: BIOL 330 Principles of Ecology, BIOL 215 General Zoology.

BIOL 836. Aquaculture Concepts. 3 hours. Lecture, project and field trips. The principles of aquatic animal husbandry with a primary emphasis on fish hatchery operations. Includes a project dealing with aquaculture and several field trips to a variety of fish production facilities. Prerequisites: BIOL 215 General Zoology, BIOL 330 Principles of Ecology.

BIOL 864. Problems in Zoology. 1-6 hours. Individual work on problems in taxonomy, morphology, ecology, and physiology, or other aspects of animals with emphasis on problems of local interest. May be repeated for a total of 6 hours. Prerequisites: 25 hours of biology including 10 hours of zoology. Permission of instructor required.

BIOL 874. Problems in Microbiology. 1-6 hours. Individual work on microbiological problems suited to the need and interests of the students, with emphasis on local problems. May be repeated for a total of 6 hours. Prerequisites: 25 hours of biology, including 10 hours of microbiology. Permission of instructor required.

BIOL 881. Orientation to College Teaching. 3 hours. Laboratory work in the biology classroom situation; work with instructional aids; and involvement in curriculum, test construction, and classroom instruction. Permission of instructor required.

BIOL 884. Problems in Botany. 1-6 hours. Individual work on problems of taxonomy, morphology, ecology, and physiology, or other aspects of plants with emphasis on those of local interest. May be repeated for a total of 6 hours. Prerequisites: 25 hours of biology, including 10 hours of botany.

BIOL 890. Research and Thesis. 1-6 hours, depending upon the problem and recommendation of the adviser. To be taken by students in Option I for Master of Science in biology. May be repeated.

BIOL 891. Research Problems. 1-3 hours. Field, laboratory or library research project for candidates for Option II for Master of Science in biology. May be repeated for a maximum of 3 hours.

BIOL 892. Grant Writing Seminar I. 3 hours. Basics of grant writing, including sources of funding. Taught in summers. Prerequisite: Bachelor of Science in biology.

BIOL 893. Grant Writing Seminar II. 3 hours. Helps in grant writing. The submission of a grant for external funding is required as part of this course. Taught in summers. Prerequisite: BIOL 892 Grant Writing Seminar I and Bachelor of Science in biology.

BIOL 894. Problems in Cell and Molecular Biology. 1-6 hours. Individual work on problems in cellular and molecular biology, with emphasis on regional plant crop species. May be repeated for a total of six hours. Prerequisites: Twenty-five hours of biology, including one course in cellular or molecular biology. Permission of instructor required.