



BIOLOGY

Professor Mark R. Fregeau, Chairperson

Professors: Susan M. Case, Larry M. Lewis, Alan M. Young

Associate Professors: Juditha C. A. Burchsted, Joseph K. Buttner, Esteban L. Cuebas-Incle, Paul Kelly, Gwen E. Scottgale, T. Nelson Scottgale

Assistant Professors: David W. Tapley, Tracy L. Ware

Laboratory Instructor: Christine M. Maney

Faculty Emeriti

Professors: Alfred L. Borgatti, Elvin M. Fowell, Antonio E. HARRISES, Richard P. Keville, Virginia F. Keville, Rita N. McCauley, Johnes K. Moore, Thomas I. Ryan, James B. Schooley, Edward F. Sweeney

PROGRAMS OFFERED

Bachelor of Arts – Biology

Bachelor of Science – Biology

Concentrations

Aquaculture
Cell and Molecular Biology
Environmental Biology
Marine Biology
Medical Technology
Nuclear Medicine Technology
Tracy L. Ware, Program Director
Robert E. Belliveau, M.D., Medical Director
Anthony L. Mazzola, Technical Director

Minors

Biology
Human Biology
Secondary Education-leading to:
State Teacher
Certificate #18
Teacher of Biology

Special Programs

Honors
Pre-dental
Pre-medical
Pre-veterinary
Marine Studies Consortium

Biology Programs

Students in any Biology program (BA or BS) complete a strong, general series of Biology and support courses which allows pursuit of a wide variety of careers such as professional work (e.g. physician, dentist, veterinarian), governmental work, (e.g. E.P.A., National Fisheries), field work (e.g. oceanographer, wildlife specialist), high school teaching, industrial or clinical research, aquaculture etc. Many Biology majors continue into graduate programs in a specialized subfield.

It is the goal of the department to provide solid Biology degrees which expose students to all areas of Biology while allowing each student flexibility when entering the job market. The five areas identified are: Plant Biology, Animal Biology, Cell & Molecular Biology, Structure & Function, and Ecology & Evolution.

Students are introduced to all areas of biology in a two-semester introductory sequence (BIO 131 Introduction to Organisms and BIO 132 Introduction to Cells), followed by three courses in the second year that expand on these areas in greater detail and introduce social and ethical issues to some extent. This second group of courses includes BIO 208 (Environmental Problems), BIO 212 (Cell Biology) and BIO 220 (Evolutionary Morphology). In their junior/senior year all students are required to take BIO 402 (Genetics) and either BIO 415N (Biology Seminar), BIO 417N

(Environmental Biology Seminar) or NMT 415 (Nuclear Medicine Seminar), depending on their specific program. Students complete their program by taking BIO electives at the 300-400 level. They generally must have one course from each of the five major areas (although there are some exceptions in specialty concentrations), plus other major electives that can be chosen from any group or from internship, directed study or research courses. To ensure that students develop more advanced lab skills, several programs limit the Cell & Molecular Biology elective to either BIO 406 (Microbiology) or BIO 409 (Biological Chemistry). Some specialty concentrations also specify courses in one or more of the other major areas. A complete listing of 300-400 level courses included in each group is provided below.

BIO 300-400 level courses in each group

Plant Biology

BIO 300 Botany
BIO 326 Marine Botany

Animal Biology

BIO 305 Comparative Vertebrate Anatomy
BIO 308 Entomology
BIO 310 Invertebrate Zoology
BIO 315 Natural History of Vertebrates
BIO 316 Parasitology
BIO 323 Fish Biology
BIO 341 Biology of Marine Mammals
BIO 342N Biology of Whales
BIO 406 Microbiology

Cell & Molecular Biology

BIO 312N Developmental Biology
BIO 313 Molecular Biology
BIO 330 Molecular Forensics
BIO 406 Microbiology
BIO 409 Biological Chemistry
BIO 423 Experimental Methods in Molecular Biology

Structure & Function

BIO 305 Comparative Vertebrate Anatomy
BIO 312N Developmental Biology
BIO 314 Histology
BIO 340 Pathology
BIO 400 Neuroanatomy
BIO 405 General Physiology
BIO 411 Immunology
BIO 412 Endocrinology
BIO 421 Comparative Animal Physiology

Ecology & Evolution

BIO 315 Natural History of Vertebrates
BIO 320 General Ecology
BIO 322 Biological Oceanography
BIO 401 Vertebrate Evolution
BIO 414N Evolutionary Theory

Some students select one of the specialized concentrations offered under the Biology BS major:

The **Aquaculture Concentration** focuses on the controlled cultivation and harvest of aquatic plants and animals. Students will gain practical skills in the husbandry of aquatic organisms through applying knowledge gained from courses in Biology, Chemistry, Business, and other disciplines. Skills learned will provide graduates a hands-on appreciation of the aquatic environment and aquaculture systems. Graduates will possess the skills needed to set-up and operate their own facility, to work at a private or public hatchery, and to pursue employment in a parallel field such as resource management, fisheries biology, marine or environmental science.

The **Cell and Molecular Biology Concentration** places this field within a broad context while focusing on both the theoretical and practical skills needed in the study of cell and molec-



ular biology. A choice of some support courses allows the student to explore different applications such as chemistry and bioinformatics in greater depth.

The Environmental Biology Concentration includes courses in both Biology and other environmentally-related fields such as geology, geography, ethics, and the social sciences. In the process of completing a degree in biology in this concentration, each student has the opportunity to select courses in other related areas which support the specific goals and interests of the student.

The Marine Biology Concentration provides a broad science background supported by observations of marine organisms and their environment. The ocean and marshes of the North Shore offer a unique learning laboratory.

Students in the **Medical Technology Concentration** will have completed, upon graduation, all necessary "pre-clinical" courses as required by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) for such a program. Students who intend to become certified as Medical Technologists, [MT (ASCP)] or [CLS (NCA)], may apply for admission to a hospital-based medical technology program for their clinical experience which takes place following completion of the B.S. Biology (Medical Technology Concentration) degree. Placement in hospital-based programs is competitive and cannot be guaranteed by the College; however, the College makes every effort to recommend qualified students (generally minimum 2.75 quality point average in science and mathematics courses) for suitable hospital placement.

Students following the **Nuclear Medicine Technology Concentration** complete the on-campus component in 3 years and spend their 4th year (and preceding summer) in the Nuclear Medicine laboratories of affiliated hospitals. Registration for the summer component is through the Division of Graduate and Continuing Education. Completion of the program leads to a B.S. in Biology with a Concentration in Nuclear Medicine Technology and prepares the student for examinations leading to national certification as a Nuclear Medicine Technologist.

Students in the **Nuclear Medicine Technology Concentration** are required to achieve and maintain a 2.75 quality point average in science and mathematics courses. Grades for courses taken at other institutions will not be used in computing this average. At least half of these required courses must be completed at Salem State College. An NMT student may not repeat any more than two of the preclinical science or math-

ematics courses nor any one of these courses more than once to achieve the 2.75 GPA. During the second semester of the sophomore year, the student's performance will be evaluated by the Nuclear Medicine Technology Advisory Committee which makes recommendations concerning continuation in the program.

Final admission to the clinical phase of this program is competitive and requires completion of a formal, separate admissions application in January prior to potential entry into clinical courses. The NMT Program officials use this application, the student's college record, and the number of available spaces to determine admission into the clinical courses.

The Salem State College Nuclear Medicine Program is accredited by the Committee on Allied Health Education and Accreditation in cooperation with the Joint Review Committee on Educational Programs in Nuclear Medicine Technology.

All students participating in clinical aspects of the Nuclear Medicine Concentration will be expected to carry their own personal liability insurance (cost approximately \$35) and should be prepared to provide their own transportation to clinical agencies. They will also be required to have Hepatitis B vaccination before entering the clinical phase.

Also see page 330 regarding procedures for students involved in off-campus accidents.

SPECIAL PROGRAMS

Pre-medical, Pre-dental, Pre-veterinary programs

Medical, dental and veterinary schools typically require applicants to include general biology, general and organic chemistry, physics and one year of college mathematics in their undergraduate preparation. A student in the B.S. Biology degree program satisfies these minimum admissions requirements, and, in addition, takes numerous content courses such as Genetics and General Physiology which are of help in preparing for standardized entrance examinations and professional courses.

Whether or not a student majors in Biology in preparation for these health professions, every student interested in such a career should contact the Pre-Professional Advisor no later than the end of the sophomore year regarding the complex admissions process.

Dr. Susan M. Case in the Biology Department, is the advisor for the health related professions. All students interested in applying to medical, dental, veterinary, or other professional health schools should consult her.





HONORS PROGRAM

Biology majors who are admitted to the College Honors Program should contact the Biology Department Chairperson immediately upon admission to the college. Biology Honors students follow the required Honors Curriculum described under the "Honors Program" including completion of a 3 credits Honors Biology, Research in Biology (BIO 408N) in the senior year.

Marine Studies Consortium

Salem State College is a member of the Marine Studies Consortium, an association of Massachusetts teaching and research institutions which share marine science and policy curricula. The Consortium currently offers five courses which are listed in this catalog and available for Salem State College credits: BIO 216 Introduction to Marine Mammals, BIO 342N Biology of Whales, IDS 211 Into the Ocean World, IDS 220 Water Resources Planning and Management, and IDS 325 Coastal Zone Management. Two additional courses, Biology of Fishes and Maritime History of New England, are not listed in this catalog with Salem State College course numbers but may be taken and transferred. Students interested in taking either of these two courses need to complete a "Request for Outside Course" form for approval by the relevant department, and register with and pay an additional tuition fee to the Consortium. Each course is taught one evening per week in either the Fall or Spring semester at one of the twenty member institutions. Interested students should contact the Marine Studies Consortium Campus Representative, Dr. Alan M. Young, for registration forms and more information.

Special Facilities

The Cat Cove Marine Laboratory

The Cat Cove Marine Laboratory managed by Salem State College and home to the Northeastern Massachusetts Aquaculture Center includes a 16 acre site, 8 acre tide pool and 5,500 square foot Wet Laboratory. Students can explore estuarine biology in a protected and managed tidal pool. The environmentally controlled Laboratory facilitates controlled experiments and propagation of both marine and freshwater aquatic organisms. Major emphasis targets shellfish culture and mariculture of fishes with aquaculture potential in New England. Freshwater fishes are maintained and reproduced for use in primary, middle and secondary school classrooms. The Laboratory is fully equipped with tanks, computers, analytical instrumentation, and all the materials needed to run a hatchery effectively. Resources are accessible to students through classes and independent studies. The primary function of NEMAC and the Cat Cove Marine Laboratory is to provide students with a hands-on learning experience and to nurture the development of a sustainable, environmentally/socially acceptable, commercial aquaculture industry on Massachusetts' North Shore.

MINORS

Biology Minor

15-18 hours of Biology courses as approved by the Biology Department Chairperson. At least one of these courses must be taken at Salem State College.

Human Biology Minor

This minor is specially designed for Nursing, SFL, Social Work, Sociology, and Psychology majors although a student with any major other than Biology may follow this minor.

A total of 15-16 hours of courses are required as follows:

1. BIO 105 or 122 or 132 4 credits
2. BIO 124 (Except Nursing Majors) 4 credits
(The above 2 courses also satisfy the lab science sequence requirement)
3. Human Anatomy and Physiology course(s)
4 or 8 credits
 - a. BIO 200 and 201 (8 credits)

OR

- b. BIO 206 (4 credits)

4. If needed for total minor credits, one more course from the following list: BIO 204, 208, 210, 215, 304, 324, 411, 412
3-4 credits

TOTAL 15-16 credits

See the Biology Chairperson to discuss selection of courses and for acceptance into the Human Biology Minor.

Secondary Education Minor

Students who wish to teach high school biology normally follow either the BA Biology major or BS Biology major curriculum and select the Secondary Education minor which leads to initial licensure. Candidates for teacher licensure in Massachusetts must now also take and pass the Massachusetts Teachers Test.

1. American Government. See Education Dept. listings.
2. Support Course
PSY 252 Adolescent Psychology 3 credits
3. Students in Secondary Education Minor must select BIO 320, General Ecology, as one of their Biology Electives. They must also select one course in the Geological Sciences.
4. *Education Component (27 Credits)

EDU 252A The Contemporary High School	3 credits
EDU 254A Teaching the Adolescent (Pre-practicum)	3 credits
EDU 256A Responding to Diversity in Contemporary Secondary Schools	3 credits
EDU 260A Reading and Writing Strategies in Secondary Education	3 credits
EDU 337S Secondary School Curriculum Materials and Methodology in Science (Biology)	3 credits
EDU 496 Practicum in Student Teaching in Secondary Education (9-12), Biology	12 credits

 Measurement and Evaluation standard will be met through the Student Teaching Seminars.

Students interested in this minor should contact the Coordinator of Secondary Education, Biology, and the Biology Department Chairperson. Selection of this minor is subject to approval by the Education Department Chairperson.

Biology teachers are in current critical need. More positions are becoming available, and there are numerous efforts underway to improve the economic picture for teachers. The Salem State College Teacher of Biology Program is approved by the Massachusetts State Department of Education, the National Council for the Accreditation of Teacher Education and falls under the Interstate Certification Compact.

* Students planning to pursue the Secondary Education minor should see page 258 in the Education Department section of the catalog for requirements for admission to teacher licensure.



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

BACHELOR OF ARTS
BIOLOGY

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
@ Reading Comprehension
@ Computer Literacy

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes ENG 101, ENG 102, SPC 101, SFL 194.

Physical Education Activities (1 cr. total)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes SFL courses.

Distribution Sequences (18-20 credits)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes Literature I/II, CHE 130/212, HIS 101.

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Blank rows for student selection.

Science/Mathematics (Division II)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes MAT 202N, 220, 247.

Social Sciences (Division III)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Blank rows for student selection.

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (39-40 CREDITS)

Freshman Year

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes BIO 131, 132.

Sophomore Year

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes BIO 208, 212, 320.

Junior/Senior Year

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes BIO elective, 402 Genetics, 415N Seminar.

ELECTIVES

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes BIO elective.

SUPPORT COURSES (8 credits)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Includes CHE 213, 231.

(Note: The above Chemistry courses together with CHE 130-212 satisfy a Minor as required for the B.A. degree.)

***FREE ELECTIVES /MINOR(minimum: 14-15 credits)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Blank rows for student selection.

FOREIGN LANGUAGE (12 credits)

Table with 5 columns: Course ID, Title, Credits, and checkboxes. Blank rows for student selection.

- @ Requirements so marked should be completed within the first 53 credits of study...
* These are required support courses...
** Electives within the major are to be chosen from 300 to 400 level courses...
*** B.A. Biology majors are strongly urged to elect a statistics course...
^ At least two of the following must have a lab...

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

**BACHELOR OF SCIENCE
BIOLOGY**

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
- @ Reading Comprehension
- @ Computer Literacy

@	ENG	101	Composition I	3	_____
@	ENG	102	Composition II	3	_____
@	SPC	101	(Speech)	3	_____

Physical Education Activities (1 cr. total)

@	SFL	_____	_____	_____	_____
@	SFL	_____	_____	_____	_____

Distribution Sequences (18-20 credits)

_____	_____	(Literature I)	3	_____	
_____	_____	(Literature II)	3	_____	
*	CHE	130	General Chemistry I	4	_____
*	CHE	212	Organic Chemistry I	4	_____
@	HIS	101	History of World Civilization I	3	_____
@	HIS	_____	(History II)	3	_____

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Science/Mathematics (Division II)

*	MAT	202N	Precalculus OR	_____	_____
*	MAT	220	Calculus I	3-4	_____
	MAT	247	Statistics I	3	_____

Social Sciences (Division III)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (54-55 CREDITS)

Freshman Year

BIO	131	Introduction to Organisms	4	_____
BIO	132	Introduction to Cells	4	_____

Sophomore Year

BIO	208	Environmental Problems	3	_____
BIO	212	Cell Biology	4	_____
BIO	220	Evolutionary Morphology	3	_____

Junior/Senior Year

BIO	402	Genetics	4	_____
BIO	406	Microbiology OR	4	_____
BIO	409	Biological chemistry	_____	_____
BIO	415N	Biological Seminar	2	_____
^	BIO	_____	Plant Biology Elective	4
^	BIO	_____	Animal Biology Elective	3-4
^	BIO	_____	Structure/Function Elective	3-4
^	BIO	_____	Ecology/Evolution Elective	3-4

ELECTIVES

**	BIO	_____	Elective	4	_____
**	BIO	_____	Elective	4	_____
**	BIO	_____	Elective	3	_____

SUPPORT COURSES (16 credits)

2 Semester sequence in physics

%	_____	_____	_____	_____	
	CHE	213	Organic Chemistry II	4	_____
	CHE	231	Quantitative General Chemistry	4	_____

FREE ELECTIVES (7-8 credits)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

@ Requirements so marked should be completed within the first 53 credits of study (i.e., before Junior status). Exceptions will be made for transfer students.
 * These are **required** support courses which may also be used to satisfy the indicated Distribution requirements. A student may choose to fulfill Distribution requirements with courses other than the ones listed, but these listed courses must still be taken.
 ** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324 and 328. A maximum 4 credits from BIO 407, 408N, 416, 418, 420 or 422 may be used to fulfill one BIO Elective; additional credits will count as Free Electives. Secondary Education minors must select BIO 320, General Ecology, and one course in Geological Sciences.
 ^ Three of the four group electives MUST have a lab.
 % The sequence can be chosen from PHS 211A and 212A, College Physics I and II, or Physics 221 and 222, General Physics with Calculus I and II.
 Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does **not** reduce the credit total required for graduation.

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

BACHELOR OF SCIENCE
BIOLOGY
AQUACULTURE CONCENTRATION

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
@ Reading Comprehension
@ Computer Literacy

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

Physical Education Activities (1 cr. total)
@ SFL _____ 3
@ SFL _____ 3

Distribution Sequences (18-20 credits)

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

Science/Mathematics (Division II)

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

Social Sciences (Division III)

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (54-55 credits)

Freshman Year

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

Sophomore Year

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

Junior/Senior Year

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

ELECTIVES

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

SUPPORT COURSES (19 credits)

Table with 5 columns: Course ID, Course Name, Credits, and a blank line for marking.

FREE ELECTIVES (minimum: 4-5 credits)

Table with 5 columns: Requirement symbol, Course ID, Course Name, Credits, and a blank line for marking.

- @ Requirements so marked should be completed within the first 53 credits of study...
. These are required support courses which may also be used to satisfy the indicated Distribution requirements...
** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324 and 328...
^ The Cell/Molecular elective must be chosen from BIO 405 General Physiology, BIO 406 Microbiology, BIO 409 Biological Chemistry or BIO 421 Comparative Animal Physiology.
Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does not reduce the credit total required for graduation.

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

**BACHELOR OF SCIENCE
BIOLOGY**
CELL AND MOLECULAR BIOLOGY

CORE REQUIREMENTS

Competency-Based Skills

- @☐ Basic College Math
- @☐ Reading Comprehension
- @☐ Computer Literacy

@	ENG	101	Composition I	3	_____
@	ENG	102	Composition II	3	_____
@	SPC	101	(Speech)	3	_____

Physical Education Activities (1 cr. total)

@	SFL	_____	_____	_____	_____
@	SFL	_____	_____	_____	_____

Distribution Sequences (18-20 credits)

_____	_____	_____	(Literature I)	3	_____
_____	_____	_____	(Literature II)	3	_____
*	CHE	130	General Chemistry I	4	_____
*	CHE	212	Organic Chemistry I	4	_____
@	HIS	101	History of World Civilization I	3	_____
@	HIS	_____	(History II)	3	_____

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Science/Mathematics (Division II)

**	MAT	220	Calculus I	4	_____
*	MAT	247	Statistics	3	_____

Social Sciences (Division III)

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (51-52 credits)

Freshman Year

BIO	131	Introduction to Organisms	4	_____
BIO	132	Introduction to Cells	4	_____
Bio	208	Environmental Problems	3	_____

Sophomore Year

BIO	212	Cell Biology	4	_____
BIO	220	Evolutionary Morphology	3	_____
BIO	313	Molecular Biology	4	_____

Junior/Senior Year

BIO	406	Microbiology	4	_____
BIO	409	Biological Chemistry	4	_____
BIO	411	Immunology	4	_____
BIO	402	Genetics	4	_____
BIO	415N	Biology Seminar	2	_____
BIO	423	Experimental Methods in Molecular Biology	4	_____
BIO	_____	Plant Biology Elective	4	_____

ELECTIVES

**	BIO	_____	Elective	3-4	_____
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SUPPORT COURSES (19-20 credits)

2 Semester sequence in physics

%	_____	_____	_____	_____	_____
%	_____	_____	_____	_____	_____
	CHE	213	Organic Chemistry II	4	_____
	CHE	231	Quantitative General Chemistry	4	_____
\$	_____	_____	Science/Mathematics Elective	3-4	_____

FREE ELECTIVES (MINIMUM: 6-8 credits)

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

- @ Requirements so marked should be completed within the first 53 credits of study (i.e., before Junior status). Exceptions will be made for transfer students.
- * These are **required** support courses which may also be used to satisfy the indicated Distribution requirements. A student may choose to fulfill Distribution requirements with courses other than the ones listed, but these listed courses must still be taken.
- ** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324 and 328. A maximum 4 credits from BIO 407, 408N, 416, 418, 420 or 422 may be used to fulfill one BIO Elective; additional credits will count as Free Electives. Secondary Education minors must select BIO 320, (General Ecology), and one course in Geological Science.
- % The sequence can be chosen from PHS 211A and 212A, College Physics I and II or Physics 221 and 222, General Physics with Calculus I and II.
- \$ This elective must be chosen from the following courses: CHE 321 Quantitative Analysis; CHE 341 Physical Chemistry I; CHE 342 Physical Chemistry II; CHE 420 Instrumental Analysis for Clinical Chemists; CSC 200 Survey of Computer Science; CSC 201J Software Design and Programming; MAT 221 Calculus II.

Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does **not** reduce the credit total required for graduation.

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

BACHELOR OF SCIENCE
BIOLOGY
ENVIRONMENTAL BIOLOGY CONCENTRATION

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
@ Reading Comprehension
@ Computer Literacy

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes ENG 101, ENG 102, and SPC 101.

Physical Education Activities (1 cr. total)

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes SFL courses.

Distribution Sequences (18-20 credits)

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes Literature I/II, CHE 130, CHE 212, HIS 101, and HIS courses.

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

Table with 4 columns: #, Course ID, Title, Credits. Blank lines for entry.

Science/Mathematics (Division II)

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes MAT 202N, MAT 220, MAT 247, and another MAT course.

Social Sciences (Division III)

Table with 4 columns: #, Course ID, Title, Credits. Blank lines for entry.

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate

COURSES IN MAJOR (50-52 CREDITS)

Freshman Year

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes BIO 131 and BIO 132.

Sophomore Year

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes BIO 208, BIO 212, and BIO 220.

Junior/Senior Year

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes Plant Biology Elective, Animal Biology Elective, BIO 406, BIO 409, BIO 320, BIO 402, and BIO 417N.

ELECTIVES

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes BIO Elective courses.

SUPPORT COURSES (25-26 credits)

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Includes GLS 100, CHE 213, CHE 231, and PHS 211A.

FREE ELECTIVES (minimum: 0-3 credits)

Table with 4 columns: Course ID, Title, Credits, and a blank line for marking. Blank lines for entry.

- @ Requirements so marked should be completed within the first 53 credits of study...
* These are required support courses which may also be used to satisfy the indicated Distribution requirements...
** The BIO Elective must be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324 and 328...
*** Electives within the major are to be chosen from the following (minimum of two courses from Group A and a third course from either Group A or Group B):
At least one Division I or Division III distribution elective must be chosen from Group B.
Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place.

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

**BACHELOR OF SCIENCE
BIOLOGY
MARINE BIOLOGY CONCENTRATION**

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
- @ Reading Comprehension
- @ Computer Literacy

@	ENG	101	Composition I	3	_____
@	ENG	102	Composition II	3	_____
@	SPC	101	(Speech)	3	_____

Physical Education Activities (1 cr. total)

@	SFL	_____	_____	_____	_____
@	SFL	_____	_____	_____	_____

Distribution Sequences (18-20 credits)

_____	_____	(Literature I)	3	_____	
_____	_____	(Literature II)	3	_____	
*	CHE	130	General Chemistry I	4	_____
*	CHE	212	Organic Chemistry I	4	_____
@	HIS	101	History of World Civilization I	3	_____
@	HIS	_____	(History II)	3	_____

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Science/Mathematics (Division II)

*	MAT	202N	Precalculus		
			OR		
	MAT	220	Calculus I	3-4	_____
	MAT	247	Statistics I	3	_____
	_____	_____	_____	3	_____

Social Sciences (Division III)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (53-55 CREDITS)

Freshman Year

BIO	131	Introduction to Organisms	4	_____
BIO	132	Introduction to Cells	4	_____

Sophomore Year

BIO	208	Environmental Problems	3	_____
BIO	212	Cell Biology	4	_____
BIO	220	Evolutionary Morphology	3	_____

Junior/Senior Year

BIO	310	Invertebrate Zoology	4	_____	
BIO	322	Biological Oceanography	4	_____	
BIO	326	Marine Botany	4	_____	
BIO	323	Fish Biology			
		OR			
BIO	341	Biology of Marine Mammals	3-4	_____	
BIO	402	Genetics	4	_____	
BIO	415N	Biology Seminar			
		OR			
BIO	417N	Environmental Biology Seminar	2	_____	
^	BIO	_____	Cell/Molecular or Structure/Function Elective	4	_____

ELECTIVES

**	BIO	_____	Biology Elective	4	_____
**	BIO	_____	Biology Elective	3-4	_____
**	BIO	_____	Biology Elective	4	_____

SUPPORT COURSES (16 credits)

			2 Semester sequence in Physics		
%	_____	_____	_____	4	_____
%	_____	_____	_____	_____	_____
	CHE	213	Organic Chemistry II	4	_____
	CHE	231	Quantitative General Chemistry	4	_____

FREE ELECTIVES (minimum: 7-9 credits)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

@ Requirements so marked should be completed within the first 53 credits of study (i.e., before Junior status). Exceptions will be made for transfer students.
 * These are **required** support courses which may also be used to satisfy the indicated Distribution requirements. A student may choose to fulfill Distribution requirements with courses other than the ones listed, but these listed courses must still be taken.
 ** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324, and 328. A maximum 4 credits from BIO 407, 408N, 416, 418, 420 or 422 may be used to fulfill one BIO Elective; additional credits will count as Free Electives. Secondary Education minors must select BIO 320 (General Ecology), and one course in Geological Sciences.
 ^ The Cell/Molecular or Structure/Function elective must be chosen from 400-level courses AND have a laboratory.
 % The sequence can be chosen from PHS 211A and 212A, College Physics I and II or Physics 221 and 222, General Physics with Calculus I and II.
 Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does **not** reduce the credit total required for graduation.



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

BACHELOR OF SCIENCE
BIOLOGY
MEDICAL TECHNOLOGY CONCENTRATION
NON-CLINICAL OPTION

CORE REQUIREMENTS

Competency-Based Skills

- @ Basic College Math
@ Reading Comprehension
@ Computer Literacy

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Physical Education Activities (1 cr. total)
@ SFL _____

Distribution Sequences (20 credits)

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Science/Mathematics (Division II)

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Social Sciences (Division III)

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (48-49 credits)

Freshman Year

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Sophomore Year

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

Junior/Senior Year

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

ELECTIVES

** BIO _____ Biology Elective 3-4 _____

SUPPORT COURSES (24 credits)

2 Semester sequence in Physics

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

FREE ELECTIVES (minimum: 5-6 credits)

Table with 5 columns: Course code, Title, Credits, and two blank columns for grading.

- @ Requirements so marked should be completed within the first 53 credits of study...
* These are required support courses which may also be used to satisfy the indicated Distribution requirements...
** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324, and 328...
% The sequence can be chosen from PHS 211A and 212A, College Physics I and II, or Physics 221 and 222...
Note: If a course is used to satisfy two or more requirements... the credits are counted in only one place.

Total credits for graduation: 126

Effective: 9/04



Biology
Salem State College
Advisor: _____

Name: _____
Date admitted into Major: _____
Transfer credits: _____

**BACHELOR OF SCIENCE
BIOLOGY
NUCLEAR MEDICINE TECHNOLOGY
CONCENTRATION**

CORE REQUIREMENTS

Competency-Based Skills

- @☐ Basic College Math
 - @☐ Reading Comprehension
 - @☐ Computer Literacy
-
- | | | | | | |
|---|-----|-----|----------------|---|-------|
| @ | ENG | 101 | Composition I | 3 | _____ |
| @ | ENG | 102 | Composition II | 3 | _____ |
| @ | SPC | 101 | (Speech) | 3 | _____ |

Physical Education Activities (1 cr. total)

- | | | | | | |
|---|-----|-------|-------|-------|-------|
| @ | SFL | _____ | _____ | _____ | _____ |
| @ | SFL | _____ | _____ | _____ | _____ |

Distribution Sequences (18-20 credits)

- | | | | | | |
|-------|-------|-----------------|---------------------------------|-------|-------|
| _____ | _____ | (Literature I) | 3 | _____ | |
| _____ | _____ | (Literature II) | 3 | _____ | |
| * | CHE | 130 | General Chemistry I | 4 | _____ |
| * | CHE | 212 | Organic Chemistry I | 4 | _____ |
| @ | HIS | 101 | History of World Civilization I | 3 | _____ |
| @ | HIS | _____ | (History II) | 3 | _____ |

Distribution Electives (18 credits)

Among the distribution electives, the student must earn at least 3 but no more than 9 additional semester hours in each of the three divisions.

Humanities (Division I)

- | | | | | |
|-------|-------|----------------|-------|-------|
| PHL | 218 | Medical Ethics | 3 | _____ |
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

Science/Mathematics (Division II)

- | | | | | | |
|---|-----|------|-------------------|-----|-------|
| * | MAT | 247 | Statistics I | 3 | _____ |
| * | MAT | 202N | Precalculus
OR | | _____ |
| * | MAT | 220 | Calculus I | 3-4 | _____ |

Social Sciences (Division III)

- | | | | | |
|-------|-------|-------|-------|-------|
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

(Note: Courses allowable as distribution electives are marked 'D' in the College Catalog or indicated by appropriate footnotes.)

COURSES IN MAJOR (59 credits)

Freshman Year

- | | | | | |
|-----|-----|--------------------------|---|-------|
| BIO | 105 | Biological Systems | 4 | _____ |
| BIO | 200 | Anatomy and Physiology I | 4 | _____ |

Sophomore Year

- | | | | | |
|-----|-----|---------------------------|---|-------|
| BIO | 201 | Anatomy and Physiology II | 4 | _____ |
| BIO | 212 | Cell Biology | 4 | _____ |

Junior Year

- | | | | | |
|-----|-----|---------------------------------------|---|-------|
| NMT | 200 | Intro. to Nuclear Medicine Technology | 1 | _____ |
| BIO | 340 | Pathology | 3 | _____ |
| BIO | 402 | Genetics | 4 | _____ |
| BIO | 409 | Biological Chemistry | 4 | _____ |
| BIO | 411 | Immunology | 4 | _____ |

Summer of Junior Year

- | | | | | |
|-----|------|---------------------------------------|---|-------|
| NMT | 401A | Nuclear Medicine Clinical Practicum I | 3 | _____ |
|-----|------|---------------------------------------|---|-------|

Senior Year

- | | | | | |
|-----|------|---|---|-------|
| NMT | 402 | Nuclear Medicine Clinical Practicum II | 4 | _____ |
| NMT | 403 | Nuclear Medicine Clinical Practicum III | 4 | _____ |
| NMT | 410A | Clinical Nuclear Medicine (Radioimmunoassay) | 4 | _____ |
| NMT | 411 | Clinical Nuclear Medicine (Imaging) | 3 | _____ |
| NMT | 415N | Nuclear Medicine Seminar | 1 | _____ |
| NMT | 420 | Nuclear Instrumentation | 4 | _____ |
| NMT | 430 | Radiochemistry, Radiopharmaceuticals and Radiation Safety | 4 | _____ |

SUPPORT COURSES (19 credits)

2 Semester sequence in physics

- | | | | | |
|-----|-------|-----------------------------------|-------|-------|
| % | _____ | _____ | _____ | _____ |
| % | _____ | _____ | _____ | _____ |
| CHE | 213 | Organic Chemistry II | 4 | _____ |
| CHE | 231 | Quantitative General Chemistry | 4 | _____ |
| PHS | 315 | Introduction to Radiation Physics | 3 | _____ |

@ Requirements so marked should be completed within the first 53 credits of study (i.e., before Junior status). Exceptions will be made for transfer students.

* These are **required** support courses which may also be used to satisfy the indicated Distribution requirements. A student may choose to fulfill Distribution requirements with courses other than the ones listed, but these listed courses must still be taken.

** Electives within the major are to be chosen from 300 to 400 level courses, exclusive of BIO 302T, 304, 324, and 328. A maximum 4 credits from BIO 407, 408N, 416, 418, 420 or 422 may be used to fulfill one BIO Elective; additional credits will count as Free Electives. Secondary Education minors must select BIO 320 (General Ecology), and one course in Geological Sciences.

% The sequence can be chosen from PHS 211A and 212A, College Physics I and II or Physics 221 and 222, General Physics with Calculus I and II.

Note: If a course is used to satisfy two or more requirements (for example, a support course and a distribution elective), the credits are counted in only one place. Using a course to satisfy more than one requirement does **not** reduce the credit total required for graduation.

Total credits for graduation: 127

Effective: 9/04



COURSE DESCRIPTIONS

BIOLOGY

BIO 105 Biological Systems 4 credits DII

This course deals with fundamental biological systems, from the cellular to the organismal level. With appropriate reference to man the course will emphasize the unity and diversity of operational systems in all organisms. Topics are intended to provide a foundation of basic principles and vocabulary to be utilized in Anatomy and Physiology, Microbiology, and Nursing courses. Laboratory exercises introduce dissection, microscopy, experimentation and observation. Three lecture hours and one two-hour laboratory per week. Not open to students who have completed BIO 101 or BIO 103 or BIO 122, or BIO 132.

Co-requisite: CHE 124 or CHE 130.

BIO 115H Honors Biology-Organisms 4 credits DII

This course is intended as one half of a two-semester sequence with BIO 116H. Topics include ecology, evolution, and a survey of living organisms. Three lecture hours and one two-hour laboratory per week. Open only to students in the Honors Program. Not open to Biology or Nursing majors. Not open to students who have completed BIO 102 or BIO 103, or BIO 105, or BIO 108H or BIO 121 or BIO 131.

BIO 116H Honors Biology-Cells 4 credits DII

This course is intended as one half of a two-semester sequence with BIO 115H. Topics include cell structure and function, biochemical principles, genetics, and organ systems. Three lecture hours and one two-hour laboratory per week. Open only to students in the Honors Program. Not open to Biology or Nursing majors. Not open to students who have completed BIO 101 or BIO 103, or BIO 105 or BIO 107H or BIO 122 or BIO 132.

BIO 121 Diversity of Life 4 credits DII

This course is intended as one half of a two-semester sequence with BIO 122. Features of diversity among organisms are emphasized. Topics include taxonomy, a survey of the biological kingdoms, anatomy and physiology of representative organisms, and the interaction of the organism and its living and nonliving environment. Three lecture hours and one two-hour laboratory per week. Not open to students who have completed BIO 102 or BIO 103, or BIO 108H, or BIO 115H, or BIO 131.

BIO 122 World of Cells 4 credits DII

This course is intended as one half of a two-semester sequence with BIO 121, or 123, or 124. Basic biological principles common to all living things are emphasized. Topics include basic chemistry, cell form and function, respiration, photosynthesis, principles of Mendelian and molecular genetics, the origin of life, and principles of evolution. Three lecture hours and one two-hour laboratory per week. Not open to students who have completed BIO 101 or BIO 103, or BIO 105, or BIO 107H, or BIO 116H, or BIO 132.

BIO 123 Plants and People 4 credits DII

This course may be used to fulfill the laboratory science sequence with BIO 122. Basic concepts of biology including morphology, physiology, diversity, evolution, and ecology will be addressed, using plants as a model. These topics will be integrated with a discussion of the interactions between plants and people in the areas of economics, politics, religion, agriculture, medicine, genetic engineering, and the environment. Laboratory experiences may include field trips off campus. Three lecture hours and one two-hour laboratory per week. Not open to students who have completed BIO 102A.

BIO 124 Human and Social Biology 4 credits DII

This course may be used to fulfill a lab science sequence with BIO 122. This course is given in two units. I: The phylogeny of *Homo sapiens* and the milestones in human social and cultural development. II: Human genetics and the structural and functional organization of the human body. Three lecture hours and one two-hour laboratory per week. Not open to students who have completed BIO 102B.

BIO 131 Introduction to Organisms 4 credits DII

This course is intended as one-half of a two-semester sequence with BIO 132. This course examines the diversity of life within evolutionary and ecological frameworks. Lecture topics include the kingdoms of life, evolutionary theory, basic anatomy and physiology of organisms, behavior, ecosystems and ecology. Emphasis will be placed on the different physiological and ecological adaptations of organisms for a vast array of ecosystems within the natural world. Laboratory exercises introduce basic dissection techniques, computer simulations, experimental design and analysis and experiments on the interactions between organisms and their environments. Student projects involve group experiments developing lab and fieldwork, library and presentation skills. Three lecture hours and one three-hour laboratory per week. Intended for students majoring in Biology. Not open to students who have completed BIO 102 or BIO 108H, or BIO 115H or BIO 121.

BIO 132 Introduction to Cells 4 credits DII

This course is intended as one half of a two-semester sequence with BIO 131. An integrated course stressing basic principles of biology. Lecture topics include chemistry, cell structure and function, metabolism, genetics, DNA and protein synthesis, and evolution. Life processes are examined to illustrate these biological concepts. Emphasis is placed on relationships between structure and function at the cellular level. Laboratory exercises introduce microscopy, scientific writing and research, data analysis, and experimental techniques. Three lecture hours and one three-hour laboratory per week. Intended for students majoring in Biology or Geology. Not open to students who have completed BIO 101 or BIO 103, or BIO 105, or BIO 107H, or BIO 116H, or BIO 122.

BIO 200 Anatomy and Physiology I 4 credits DII

This is the first half of a two-course sequence, within which the various systems of the human body will be studied, including tissues, and skeletal, muscular, and nervous systems. Appropriate medical terminology will be introduced. Three lecture hours and one three-hour laboratory per week.

Prerequisites: BIO 105 or an Introductory Biology lab sequence: CHE 124 or CHE 130; or permission of the Department Chairperson.

Co-requisite: CHE 125 or CHE 212. Not open to Biology majors, except those with a concentration in Medical Technology or Nuclear Medicine Technology, or to students who have completed BIO 206.

BIO 201 Anatomy and Physiology II 4 credits DII

A continuation of Anatomy and Physiology I with emphasis on the circulatory, respiratory, digestive, urinary, endocrine, immune, and reproductive systems. Appropriate medical terminology will be introduced. Three lecture hours and one three-hour laboratory per week.

Prerequisite: BIO 200.

Not open to Biology majors, except those with a concentration in Medical Technology or Nuclear Medicine Technology, or to students who have completed BIO 206.

BIO 203 Introduction to Aquaculture 3 credits DII

Students explore the biological, sociological and economical constraints to the culture of finfish and shellfish. Procedures used to culture finfish and shellfish commercially in the United States are emphasized, although globally important species and procedures are covered. Where appropriate, locally important species are used to illustrate important concepts and effective techniques. Instruction is through lectures, discussions, and occasional required weekend field trips. Three lecture hours per week.

Prerequisites: BIO 101-102 or BIO 103, or BIO 105 or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 121-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.


BIO 204 Introduction to Human Genetics (Fall)
3 credits DII

Human heredity and the social issues relevant thereto. Genes and the unity, continuity and the diversity of life. The physical basis of heredity: cells, chromosomes and genes. Hereditary transmission. Elements of the nature v. nurture controversy; biosocial implications of human sexuality; hereditary contributions to human intellectual and emotional development; ethnic, racial, and sexual group-related, inherited disorders and genetic screening; gene technology and its bioethical ramifications. Three lecture hours per week.

Prerequisites: BIO 102 or BIO 102B, or BIO 103, or BIO 105 or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 121-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.

BIO 205 Aquaculture Methods
1 credit

Students learn how to sample and culture fish and to monitor their aquatic environment. Water quality, proper nutrition and prevention and control of parasites/pathogens are examined. Proper use and storage of equipment and supplies are practiced: importance of good record keeping and use of computers in aquaculture are emphasized. One or two weekend field trips may be required. One three-hour laboratory per week.

Prerequisites: One semester of college level chemistry, or permission of Department Chairperson.

Co-requisite: BIO 203.

BIO 206 Structure and Function of the Human Body
4 credits DII

A study of the fundamental anatomy and physiology of the human body including basic concepts of the skeletal, muscular, nervous, digestive, cardiovascular, endocrine, respiratory, and urogenital systems. Three lecture hours and one two-hour laboratory per week.

Prerequisites: BIO 102 or BIO 102B, or BIO 103, or BIO 105, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 121-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson. Not open to Biology majors or students who have completed BIO 200-201.

BIO 208 Environmental Problems: An Ecological Approach (Spring)
3 credits DII

A course, designed for non-Biology majors, which explores the scientific basis for current local, regional and worldwide environmental problems. The principles underlying the support and maintenance of ecosystems are discussed. The course material demonstrates how solutions to environmental problems lie in recognizing ecological principles and managing human ecosystems accordingly. Not open to Biology majors except those with Environmental Biology concentration. Three lecture hours per week.

Prerequisite: One introductory college-level natural science course or permission of Department Chairperson.

BIO 210 Basic Nutrition (Spring)
3 credits DII

Foods, their sources and groupings. The caloric, carbohydrate, fat, protein, vitamin, and mineral components of foods. The effects of adequate, excessive, and deficient amounts of these components on bodily health. Three lecture hours per week.

Prerequisite: One college-level course in Biology or Chemistry.

BIO 212 Cell Biology
4 credits DII

An analysis of cells, the basic units of life, emphasizing eukaryotic subcellular and molecular structures and how they influence and control cell functions. The course will involve investigating relationships of intracellular structures and interactions of cells with their environment using an integration of cytological, ultrastructural, biochemical, physiological, molecular, and genetic approaches. Laboratories will stress investigative methods of studying cells. Three lecture hours and one three-hour laboratory per week. Intended for students majoring in Biology.

Prerequisites: BIO 102 or BIO 102B, or BIO 103, or BIO 105, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, BIO 131-132, or permission of Department Chairperson.

Co-requisite: CHE 212.

BIO 214 Marine Biology
3 credits DII

Marine Biology is an introduction to the biology of marine organisms. Selected organisms will be used to develop an understanding of the biological principles common to marine organisms. The taxonomy, evolution, ecology, behavior, and physiology of marine life will be discussed. Demonstrations and occasional local field trips will stress the identification of local marine forms and the ecology of different habitats. In the Fall semester, field trips may occur on weekends. Not open to Biology majors or students who have taken BIO 322.

Prerequisites: BIO 121-122 or BIO 102 or permission of the Department Chairperson.

BIO 215 HIV and the Immune System
3 credits DII

This course will focus on the biology of both the human immune system and the Human Immunodeficiency Virus. Lectures will explore the mechanisms of HIV growth in host cells, and HIV damage to the host immune system. Additional topics include the prevention of HIV transmission, treatment of HIV infection, and the possibility of HIV vaccine development.

Prerequisites: An introductory Biology laboratory sequence, or permission of the Department Chairperson.

BIO 216 Introduction to Marine Mammals
3 credits DII

This course explores the biology and natural history of marine mammals in the North Atlantic, including whales, dolphins and seals. Topics include evolution, anatomy, behavior, field identification, and the history of whaling and contemporary whaling issues. Demonstration laboratory work will focus on smaller marine mammals. One Saturday field trip on Massachusetts Bay is required. One three-hour lecture per week.

Prerequisites: BIO 102 or BIO 102B, or BIO 103, or BIO 105, or BIO 108H or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132.

Offered by the Marine Studies Consortium. Application to campus Representative of the Marine Studies Consortium must be made one semester prior to experience. Additional tuition fee required by Marine Studies Consortium.

BIO 220 Evolutionary Morphology
3 credits DII

This course explores the evolutionary morphology of vertebrates and includes some comparison with invertebrates. Topics include development, morphology, evolution and evolutionary history; biomechanics, and biophysics. Three lecture hours per week.

Prerequisites: An introductory Biology lab sequence, or permission of the Department Chairperson.

BIO 300 Botany (Spring)
4 credits DII

A survey of major plant groups with emphasis on plant relationships, means of reproduction, morphology, and physiology. Fieldwork will be programmed when conditions are favorable. Three lecture hours and one three-hour laboratory per week. Scheduled weekend field trips will be required.

Prerequisite: An introductory Biology laboratory sequence, or permission of the Department Chairperson.

BIO 302T Apprenticeship in Teaching Biology (Spring)
3 credits

A pre-practicum field-based course, which is part of the state approved program for Teacher of Biology (9-12). Students learn skills for teaching Biology by performing activities under a master high school teacher. A minimum of 45 field-site hours is required. Seminars and conferences are held periodically, to coordinate the field experience. Required of students seeking certification in Secondary Education Biology. Taken usually in the Junior year preceding the practicum.

Prerequisite: PSY 252 and permission of Department Chairperson.

BIO 304 Microbiology and Its Applications
4 credits

An introduction to the characteristics and biology of microorganisms, with emphasis on the epidemiology of human pathogens, and understanding of the infective process, immunology, and control of these organisms. The laboratory phase of this course will provide the student with practice in aseptic techniques and manipulation of microbial environments. Three lecture hours and one two-hour laboratory per week.

Prerequisites: BIO 105, CHE 125. Not allowed for Biology major credits or open to Biology majors.



BIO 305 Comparative Vertebrate Anatomy 4 credits DII

A study of the ontogeny, phylogeny, structure, and taxonomy of the vertebrates. Laboratory will consist of the comparative, systematic dissection and study of selected vertebrate types. Three lecture hours and two two-hour laboratories per week.

Prerequisite: BIO 101-102 or BIO 103, or BIO 105, or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, BIO 131-132 or permission of Department Chairperson.

BIO 308 Entomology (Fall) 4 credits DII

The morphology, physiology, ecology, taxonomy, and systematics of insects are studied. Methods of identifying, collecting, and preserving insects are introduced; the preparation of a small insect collection is required. Three lecture hours and one three-hour laboratory per week; required field trips to local habitats for observation and collection of insects will be scheduled for two Saturdays in September. Offered in the Fall of even-numbered years.

Prerequisites: BIO 101-102 or BIO 103, or BIO 105, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132 or permission of Department Chairperson.

BIO 310 Invertebrate Zoology (Spring) 4 credits DII

The morphology, physiology, ecology, taxonomy, and systematics of invertebrates are studied. Required field trips, including two full-day trips, perhaps on weekends, to local habitats and scientific institutions for observation of aquatic and terrestrial invertebrates will be conducted. Three lecture hours and two two-hour laboratories per week.

Prerequisites: BIO 101-102 or BIO 103, or BIO 105, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.

BIO 312N Developmental Biology 4 credits DII

The basic principles of development are studied. Though material illustrating developmental stages in a wide variety of organisms, including protists, plants, and animals will be used, the major emphasis will be on development in vertebrates. The biochemical, morphological, and evolutionary aspects of development will be studied. The laboratory will combine descriptive and experimental exercises. Three lectures hours and one three-hour laboratory per week. Not open to students who have received credits for BIO 312. Prerequisites: BIO 212, or permission of the Department Chairperson.

BIO 313 Molecular Biology 4 credits

An introduction to major concepts and experimental techniques in molecular biology. This course examines the synthesis of DNA, RNA, and proteins; and the regulation of these processes. Molecular biology techniques covered in lecture include cloning, gene fusions, DNA sequencing, basics of DNA and protein sequence analysis (bioinformatics), PCR, DNA microarrays and electrophoresis. Laboratories will focus on methods used in cloning DNA. Three lecture hours and one three-hour laboratory per week. One or two field trips off campus may be required. Occasional short periods of lab work outside of the scheduled time may be required. Prerequisites: BIO 212, or permission of the Department Chairperson.

Co-requisite: CHE 213.

BIO 314 Vertebrate Histology (Spring) 4 credits DII

A study of the microscopic structure and related function of tissues and organs of vertebrate organisms with emphasis on mammals. In addition, lecture material will include discussion of the physiology of tissues and introduction of histochemistry and electron microscope descriptions. Three lecture hours and one three-hour laboratory per week.

Prerequisite: BIO 101-102, or BIO 103, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson. BIO 212 strongly advised.

BIO 315 Natural History of the Vertebrates 4 credits DII

A study of the vertebrate animals, with emphasis on their ecology and life histories. Lab and fieldwork will include identification of vertebrates, museum techniques used in specimen preparation and storage, and field methods used in vertebrate studies. Several weekend field trips will be required. Three lecture hours and one three-hour laboratory per week.

Prerequisites: BIO 101-102 or BIO 103, or BIO 105, or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.

BIO 316 Parasitology 4 credits DII

An introduction to the study of the protozoan and helminth parasites. The laboratory will involve identification of prepared slides of parasitic types and also collecting and staining parasites from marine and freshwater hosts. Three lecture hours and one three-hour laboratory per week.

Prerequisite: BIO 310 or BIO 131-132, or BIO 105, or BIO 101-102, or BIO 107H-108H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or permission of Department Chairperson.

BIO 320 General Ecology 4 credits DII

A study of relationships between organisms and their environments. Lectures deal with the structure and function of the ecosystem, with special emphasis upon the concepts of productivity, energy flow, material cycling, population dynamics, and species diversity in terrestrial and aquatic environments. Fieldwork will include measurement and quantitative description of local ecosystems. Three lecture hours and one three-hour laboratory per week. Required of Biology majors seeking Secondary Education Biology certification. Prerequisite: BIO 101-102 or BIO 103, or BIO 105, or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132 or permission of Department Chairperson.

BIO 322 Biological Oceanography (Spring) 4 credits DII

A detailed view of the physical, chemical, geological, and biological factors that determine the nature of life in the sea. Adaptations, patterns of distribution, and production of plankton, nekton, and benthos with special attention to their interrelationships and interactions with the environment will be studied. Occasional field trips including one two-day field trip, perhaps on a weekend. Three lecture hours and one three-hour laboratory per week.

Prerequisite: BIO 101-102, or BIO 103, or BIO 105, or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.

BIO 323 Fish Biology 4 credits

Students will explore the structure, systematics and function of fishes. The biology of locally important species is emphasized, but the global diversity of freshwater and marine fishes is examined. Instruction is through lectures, discussions, and hands-on experiences that include dissection, use of dichotomous keys, and developing/conducting an experiment examining in-depth the physiological function of at least one organ system. Required weekend field trips may be scheduled. Three lecture hours and one three-hour laboratory per week.

Prerequisites BIO 101-102, or BIO 103, or BIO 105, or BIO 108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of the Department Chairperson.

BIO 324 Exercise Physiology 3 credits DII

This course is designed to introduce the student to the immediate and long-term effects of exercise on the human body. The emphasis will be on the respiratory, cardiovascular and metabolic effects of human movement under normal and stressful conditions. Three lecture hours per week. Required for SFL majors.

Prerequisite: BIO 200-201 or BIO 206 or permission of Department Chairperson.

Not allowed for Biology major credits.

**BIO 326 Marine Botany (Fall)****4 credits DII**

A survey of plants living in seawater environments with particular emphasis on taxonomy, morphology, and ecology. Selected studies on algal physiology are also included. In addition to the regularly scheduled lab/field program, students will be required to plan and participate in two one-day field trips on the weekend. Three lecture hours and one three-hour laboratory per week.

Prerequisite: BIO 101-102 or BIO 103, or BIO 105, or BIO 107H-108H, or BIO 115H-116H, or BIO 121-122, or BIO 122-123, or BIO 122-124, or BIO 131-132, or permission of Department Chairperson.

BIO 328 Aviation Physiology (Spring)**3 credits DII**

A study of the effects of flight on the human body, emphasizing the neuromuscular, digestive, circulatory and respiratory systems as well as the body's mechanisms for homeostasis. Special attention will be given to problems of altitude and pressure compensation, motion sickness, time zone disorientation and the effects of alcohol and drugs. Three lecture hours per week. Offered in the Spring of odd-numbered years.

Prerequisite: BIO 102 or BIO 121, or permission of Department Chairperson. Not open to Biology majors for major credits.

BIO 330 Molecular Forensics**4 credits**

This course will focus on biological principles from molecular biology and physiology that are used in forensic science. Topics will include the biological basis of individuality, the application of genetics in the design and interpretation of a variety of forensic tests, and the effects of drugs, other chemicals and biological agents on human physiology. Occasional required field trips. Three lecture hours and three laboratory hours per week.

Prerequisites: An Introductory Biology Lab sequence, CHE 213.

BIO 340 General Pathology (Fall)**3 credits**

An introduction to the basic concepts of human disease, manifestations of disease, and diseases of major organ systems integrated with normal anatomy and physiology. Required of students in the Nuclear Medicine Technology concentration. Three lecture hours per week. Prerequisites: BIO 201, CHE 213.

BIO 341 Biology of Marine Mammals**3 credits DII**

A course that explores the biological diversity of marine mammals. Special attention is given to comparison of structural, physiological, and behavioral adaptations found in the different groups, including whales, seals, manatees, and sea otters. Some discussion of commercial utilization and conservation is included. Occasional weekend field trips may be required. Three lecture hours per week.

Prerequisites: An introductory Biology lab sequence, or permission of the Department Chairperson.

BIO 342N Biology of Whales**3 credits**

This upper level course examines the biology of whales, dolphins and porpoises. Topics include physiology, population biology and life history analysis, molecular genetics, morphology, distributional ecology and social behavior. Early lectures focus on the biology of whales and how they are adapted to the marine environment. Later lectures examine how biological principles can be applied to the conservation of a wide range of cetacean species. One three-hour lecture per week. Not open to students who have received credits for BIO 342.

Prerequisites: Two upper level biology courses or permission of Department Chairperson.

Offered by the Marine Studies Consortium. Additional tuition fee required by Marine Studies Consortium.

BIO 400 Neuroanatomy**4 credits**

This course will provide students with a solid background in the anatomic and functional divisions of the human nervous system. Major areas of focus will be on the general organization of the nervous system, development and histogenesis, architecture of the central nervous system (CNS), applied Neuroanatomy, and clinical manifestations. Intended for students majoring in Occupational Therapy. Occasional field trips, perhaps on a weekend, may be scheduled. Three lecture hours and one three-hour laboratory per week.

Prerequisites: BIO 201 or permission of Department Chairperson.

BIO 401 Vertebrate Evolution (Spring)**3 credits**

The biology of vertebrates is used to demonstrate the enormous adaptability of this varied group of animals. Studying specific structural and physiological adaptations within the major classes of vertebrates, the evolutionary history and adaptation of vertebrates to a wide variety of habitats is demonstrated. Three lecture hours per week. Offered in alternate years, spring semester only.

Prerequisite: BIO 305 or permission of Department Chairperson.

BIO 402 Genetics (Fall)**4 credits**

The study of the hereditary material—how it changes, how it is transmitted, and how it provides information to the cell. Topics to be discussed include classical genetic theory, and introduction to the biochemistry of nucleic acids, genome organization, gene regulation and expression, population genetics, and the role of genetic change in evolutionary processes. Four lecture hours per week.

Prerequisites: BIO 212, CHE 213, or permission of Department Chairperson.

BIO 403 Advanced Aquaculture**3 credits**

Lecture course that examines specific requisites to developing and operating a commercial aquaculture facility in Massachusetts or elsewhere in New England. Finfish and shellfish culture techniques, permit requirements and marketing considerations are detailed. New developments and networking opportunities with academic, industry and agency resources are described. Guest lectures by practicing aquaculturists and representatives from support industries and regulatory agencies may be anticipated. One or two field trips may be required. Three lecture hours per week.

Prerequisites: BIO 205 and BIO 323 and BUS 170, or permission of Department Chairperson.

BIO 405 General Physiology (Fall)**4 credits**

An analysis of fundamental biological processes as they occur on the cellular level, with emphasis on organ and organ system physiology, stressing functional relationships affecting the total organism. Three lecture hours and one three-hour laboratory per week. (Not open to students who have completed BIO 200-201.)

Prerequisites: BIO 212, CHE 231, or permission of Department Chairperson.

BIO 406 Microbiology (Fall)**4 credits**

Fundamental aspects of microbes with respect to identification and cultivation are studied. Lecture topics include a survey of the groups of microbes, and focus on the metabolic and genetic capabilities of the bacteria and viruses. Laboratory procedures acquaint the student with the preparation of culture media, aseptic technique, manipulation, identification and control of microbes, and will include specialized areas of microbiology such as food and environmental microbiology. Three lecture hours and two two-hour laboratories per week.

Prerequisites: BIO 212, CHE 213, or permission of Department Chairperson.

BIO 407 Directed Study in Biology**1-3 credits**

This course will consist of readings in particular areas of Biology, under the direction of a staff member. Students wishing to register for this course must make prior arrangements with the Department Chairperson and the faculty member involved. Minimum of three hours per week for each credits awarded. Open only to Junior and Senior Biology majors.

BIO 408N Research in Biology**1-3 credits**

Research direction and participation in any area of Biology of interest to the student and for which a faculty specialist is available. Requires prior arrangements with and the approval of the Department Chairperson and supervising faculty member. Time, space and equipment availability necessarily limits openings to this course. A final paper detailing work performed and conclusions reached is required. Open only to Junior and Senior Biology majors.

BIO 409 Biological Chemistry**4 credits**

A molecular view of the living cell, including a survey of energy transformations, catalysis, synthesis, and intermediary metabolism. Three lecture hours and one three-hour laboratory per week.

Prerequisites: BIO 212, CHE 231, or permission of Department Chairperson.



BIO 411 Immunology (Spring) 4 credits

The structural and functional organization of the immune system and the cellular, molecular, and genetic bases of antibody-mediated and cell-mediated immunity. Transplantation immunology, tumor immunology, and immunopathology. Four lecture hours per week. Prerequisites: BIO 200-01, or BIO 305-405, and CHE 212-213, or permission of Department Chairperson.

BIO 412 Endocrinology (Spring) 4 credits

Studies of hormone-producing tissues and their role in coordinating homeostatic mechanisms. An overview of endocrine systems with emphasis on the mechanisms of hormone action. Four lecture hours per week.

Prerequisites: BIO 131-132 or BIO 103 and CHE 212-213, or permission of Department Chairperson.

BIO 414N Evolutionary Theory 4 credits

Review of Darwin's theory of evolution by means of natural selection, the evidence used to evaluate it, and modern insights gained from classical, molecular and population genetics. Topics include variation in natural populations, speciation, extinction, adaptation and a brief overview of the history of life on Earth. Four lecture hours per week.

Prerequisites: BIO 305, BIO 310, BIO 402, or permission of Department Chairperson.

BIO 415N Biology Seminar 2 credits

Student oral presentations and written reports on topics in Biology based on recent publications or projects in which the student has had significant personal involvement. Open only to Seniors. Required of Senior Biology majors, except those in the Environmental Biology or Nuclear Medicine Technology concentrations. Three hours per week. Not open to students who have completed BIO 417N.

BIO 416 Biology Internship 3-12 credits

An opportunity for students to gain practical or technical training in biology by working at such facilities as laboratories, museums, government agencies or biologically oriented businesses. The student makes necessary arrangements with the chosen facility, in consultation with an appropriate faculty member. Open only to Junior or Senior Biology majors.

Prerequisite: Permission of Department Chairperson.

BIO 417N Environmental Biology Seminar 2 credits

Student oral presentations and written reports on topics in Environmental Biology based on recent publications or projects in which the student has had significant personal involvement. Occasional required field trips, possibly on a weekend. Open only to Seniors. Required of Senior Biology majors in the Environmental Biology concentration. Allowed to replace BIO 415N in Marine Biology concentration. Three lecture hours per week. Not open to students who have completed BIO 415N.

Prerequisites: BIO 208, or BIO 320, or BIO 326, or permission of Department Chairperson.

BIO 418 Marine Biology Internship 3-12 credits

An opportunity for students to gain practical or technical training in marine biology by working at such facilities as aquaria, museums, laboratories, marine stations, government agencies, or marine oriented businesses. The student makes necessary arrangements with the chosen facility, in consultation with an appropriate faculty member. Open only to Junior or Senior Biology majors.

Prerequisite: Permission of Department Chairperson.

BIO 420 Environmental Biology Internship 3-12 credits

An opportunity for students to gain practical or technical training in environmental biology by working at such facilities as national parks, museums, laboratories, ecological stations, government agencies, or environment oriented businesses. The student makes necessary arrangements with the chosen facility, in consultation with an appropriate faculty member. Open only to Junior or Senior Biology majors.

Prerequisite: Permission of Department Chairperson.

BIO 421 Comparative Animal Physiology 4 credits

A comparative approach to the functional adaptations of animals to diverse environments, with emphasis on underlying physiological and biochemical mechanisms. This course examines the ways that diverse animals perform similar physiological functions. Topics covered include energy metabolism, feeding, digestion, thermal biology, osmotic relations, respiratory exchange, circulation, excretion, and neural biology. Three lecture hours and one three-hour laboratory per week. Prerequisites: BIO 212 and CHE 231, or permission of Department Chairperson.

BIO 423 Experimental Methods in Molecular Biology 4 credits

This course will give the student experience in research methods in molecular biology. An experimental research project developed in consultation with the instructor is the primary activity. Lab work will focus on this project, and may also include occasional demonstrations. Lecture topics will include discussion of methods used in lab (both theoretical aspects of these techniques as well as trouble shooting problems), background material relevant to the research projects, data presentation and interpretation, and student presentations of their own research project. A field trip outside of regularly scheduled course hours may be required. Individual projects may require short periods of lab work outside normally scheduled lab time. Two lecture hours and two three-hour laboratories per week. Prerequisites: BIO 313, BIO 406, BIO 409, or permission of the Department Chairperson.

BIO 422 Aquaculture Biology Internship 3-12 credits

An opportunity for students to gain practical or technical training in the husbandry of aquatic animals and plants. Students will work at facilities such as commercial operations, state/provincial/federal hatcheries, zoos or aquariums, and research stations. The student works with an appropriate faculty member to make arrangements with a prospective facility. Open only to Junior or Senior Biology majors.

Prerequisite: Permission of Department Chairperson.

EDU 337S Secondary School Curriculum Materials & Methodology in Science (Pre-practicum) (Fall) 3 credits

This course culminates pre-practicum courses required for certification in teaching science at the high school level. It prepares the student to teach effectively a modern science curriculum by emphasizing the philosophy and psychological foundations of science education, the current texts and materials, lab approaches, practical strategies, use of media including computer assisted instruction, and the relationship of science to societal issues. Students are required to test out their own theories of science instruction by fieldwork in local high schools. Three lecture hours per week plus two hours of fieldwork per week. Prerequisite: BIO 302T and permission of supervising Department Chairperson.

Nuclear Medicine Technology

NMT 200 Introduction to Nuclear Medicine Technology (Fall) 1 credit

This course provides an introduction to the career of Nuclear Medicine Technology with an emphasis on the daily activities expected of an NMT professional. Lecture topics are designed to orient the student to the clinical environment, and will include the role of the Nuclear Medicine Technologist in the diagnosis of pathological disease. Two full day field visits are included in this course, which allow the student to observe the activities that take place in the hospital Nuclear Medicine laboratory. Limited to Biology majors with an NMT concentration.

Prerequisites: BIO 201, CHE 213. Concurrent with BIO 340.


NMT 401A Nuclear Medicine Clinical Practicum I (Summer)
3 credits

Assignment to Nuclear Medicine Department of affiliated hospital for 10 weeks (5 days per week). Program includes participation in performing diagnostic nuclear medicine procedures under direction of affiliated physician. Participation in nuclear medicine educational programs and other teaching programs of the respective hospital. Prerequisites: BIO 340, CHE 212-213. Limited to Nuclear Medicine Technology concentration students.

NMT 402 Nuclear Medicine Clinical Practicum II (Fall)
4 credits

Assignment to Nuclear Medicine Department of affiliated hospital for 15 weeks (5 days each week). Program includes participation in performing diagnostic nuclear medicine procedures under direction of affiliated physician. Participation in nuclear medicine educational programs and other teaching programs of the respective hospital. Prerequisite: NMT 401A.

NMT 403 Nuclear Medicine Clinical Practicum III (Spring)
4 credits

Assignment to Nuclear Medicine Department of affiliated hospital for 15 weeks (5 days each week). Program includes participation in performing diagnostic nuclear medicine procedures under direction of affiliated physician. Participation in nuclear medicine educational programs and other teaching programs of the respective hospital. Prerequisites: NMT 402, NMT 410A and NMT 420.

NMT 410A Clinical Nuclear Medicine (Radioimmunoassay) (Fall)
4 credits

Basic theory of immunoassay; discussion and demonstration of assay tools and techniques; theory and practice of data reduction; quality control systems; clinical review of RIA applications. Four lecture hours per week. Prerequisite: NMT 401A.

NMT 411 Clinical Nuclear Medicine (Imaging) (Spring)
3 credits

Review of the anatomy, physiology and pathology of all organ systems with correlation of appropriate diagnostic nuclear medicine procedures and comparison to other modalities of patient investigation for diagnosis. Three lecture hours per week. Prerequisites: NMT 402, NMT 410A and NMT 420.

NMT 415 Nuclear Medicine Seminar (Spring)
1 credit

Seminar assignment of a Nuclear Medicine problem for study; definition of the problem; derivation of information; review of literature; statistical analysis; formal written presentation of results; and discussion. Limited to Nuclear Medicine Technology concentration students in their Senior year. One hour per week.

NMT 420 Nuclear Instrumentation (Fall)
4 credits

The course includes principles and theory of imaging systems as well as survey instruments. Included are: Rectilinear Scanners, Gamma camera systems with and without computerization, C.A.T. Scanners, Liquid Scintillation counters, single/multi-channel analyzers and Gamma Counters. Laboratory experiments will be performed at an affiliate institution. Included in the laboratory is photography and exposure of various films and processing materials. Four lecture hours per week.

Co-requisites: NMT 402 and NMT 410A.

NMT 430 Radiochemistry, Radiopharmaceuticals and Radiation Safety (Spring)
4 credits

State and federal regulations, as well as guidelines will be explained and the students will be familiarized with safe handling techniques and concepts. Radiation units, genetic and somatic effects and carcinogenesis are included. Radiopharmaceutical production, generator systems and quality control techniques are given particular emphasis. Demonstration of equipment included. Four lecture hours per week.

Prerequisites: NMT 402, NMT 410A and NMT 420.

