PURDUE UNIVERSITY

Neurobiology and Physiology

College of Science

BIOLOGY-BS
Code-NRPH
120 Credits

Departmental/Program Major Courses (34-36 credits) *A 2.0 average is required in these courses

***Required Major Courses (23 credits)**

_____ (2) BIOL 12100 Biology I: Diversity, Ecology and Behavior *(satisfies Science, Technology & Society Selective for core)*
_____ (3) BIOL 13100 Biology II: Development, Structure, and Function of Organisms
_____ (2) BIOL 13500 First Year Biology Lab or BIOL 14501 First Yr Lab Neuro Res Project or IT 22600 Biotechnology Lab I
_____ (3) BIOL 23100 Biology III: Cell Structure & Function
_____ (2) BIOL 23200 Lab in Cell Structure & Function
_____ (3) BIOL 24100 Biology IV: Genetics & Molecular Biology
_____ (2) BIOL 24200 Lab in Genetics & Molecular Biology
_____ (2) BIOL 28600 Intro to Ecology & Evolution
_____ (4) BIOL 32800 Principles of Physiology

***Major Selectives - Select one course for each requirement (11-13 credits)**

_____ (3) Neurobiology & Physiology Selective (Req # 10)
_____ (3) 500 Level Neurobiology & Physiology Selective (Req # 10)
_____ (3) Biology Selective (Req # 13)
_____ (2-4) Base Lab Requirements (Req # 11)

Other Departmental /Program Course Requirements (64-76 credits)

_____ (5) CHM 12901 General Chemistry
_____ (4) Organic CHM 1 Selective
_____ (4) Organic CHM 2 Selective
_____ (3-4) Chemistry Selective
_____ (4) PHYS 1 Selective – Select from PHYS 23300 or 17200 *(satisfies Science Selective for core)*
_____ (4) PHYS 2 Selective – Select from PHYS 23400 or 27200
_____ (3-5) Calculus 1 Selective – Select from MA 16010, 16100, or 16500 (*satisfies Quantitative Reasoning Selective for core*)
_____ (3-5) Calculus 2 Selective– Select from MA 16020, 16200, 16600 or 17300
_____ (3) STAT 50300
_____ (3-4) Computer Science Selective
_____ (3-4) ENGL 10600 or 10800 *(satisfies Written Communication for core); (satisfies Information Literacy Selective for core)*
_____ (3) Language & Culture 1 Selective
_____ (3) Language & Culture 2 Selective
_____ (3) Language & Culture 3 Selective
_____ (3) COM 21700 *(satisfies Oral Communication for core)*
_____ (3) General Education 1 Selective (*satisfies Human Culture Behavioral/Social Science for core*)
_____ (3) General Education 2 Selective *(satisfies Human Cultures Humanities for core)*
_____ (3) General Education 3 Selective
_____ (0-3) Teambuilding & Collaboration Selective
_____ (3) Great Issues Selective
_____ (1-3) Multidisciplinary Selective

Electives (8-22 credits)

_____ ( ) _____ _____ ( ) _____ _____ ( ) _____ _____ ( ) _____
_____ ( ) _____ _____ ( ) _____ _____ ( ) _____ _____ ( ) _____
_____ ( ) _____ _____ ( ) _____ _____ ( ) _____ _____ ( ) _____

University Core Requirements

Human Cultures Humanities	☐	*Science, Technology & Society Selective*	☐
Human Cultures Behavioral/Social Science	☐	*Written Communication*	☐
Information Literacy	☐	*Oral Communication*	☐
Science Selective	☐	*Quantitative Reasoning*	☐
Science Selective	☐		

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The student is ultimately responsible for knowing and completing all degree requirements.

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Revised 5/2016 (effective Fall 2016)

Neurobiology and Physiology

Suggested Arrangement of Courses:

Credits	**Fall 1st Year**	**Prerequisite**	Credits	**Spring 1st Year**	**Prerequisite**
2	BIOL 12100		3	BIOL 13100	
2	BIOL 13500	CHM 12901 coreq	4	Organic Chem 1 Selective	CHM 11600 or 12901
5	CHM 12901	ALEKS score of 85	3-5	Calculus II Selective	Calc I
3-5	Calculus I Selective		3	Language/Culture 2 Selective	Lang 10100
3	Language/Culture 1 Selective		3-4	ENGL 10600 or 10800	
1	Elective: (BIOL 11500 pref)				
16-18			**16-19**		

Credits	**Fall 2nd Year**	**Prerequisite**	Credits	**Spring 2nd Year**	**Prerequisite**
3	BIOL 23100	CHM 12901 prereq; BIOL 13100	3	BIOL 24100	BIOL 23100
2	BIOL 23200		2	BIOL 24200	
4	Organic Chem 2 Selective	Organic I lecture	3-4	Chemistry Selective	
3	Language/Culture 3 Selective	varies	2	BIOL 28600	BIOL 12100
3	COM 21700		1	Elective: (BIOL 29300 pref)	
			3	General Education 1 Selective	
15			**14-15**		

Credits	**Fall 3rd Year**	**Prerequisite**	Credits	**Spring 3rd Year**	**Prerequisite**
3	Neurobiology & Physiology Selective (Req # 10)	varies	4	BIOL 32800	
4	PHYS 1 Selective		4	PHYS 2 Selective	
3	General Education 2 Selective		3	STAT 50300	
3	Elective		1	Elective: (BIOL 39300 pref)	
3	Elective		3	General Education 3 Selective	
16			**14-15**		

Credits	**Fall 4th Year**	**Prerequisite**	Credits	**Spring 4th Year**	**Prerequisite**
3	Biology Selective (Req # 13)		3	500 Level Neurobiology & Physiology Selective (Req # 10)	
2-4	Base Lab Requirement (Req # 11)		3-4	Computer Science Selective	
1-3	Multidisciplinary Selective		3	Great Issues Selective	
3	Elective		3	Elective	
4	Elective		3	Elective	
13-15			**15-16**		

120 semester credits required for Bachelor of Science degree.
2.0 Graduation GPA required for Bachelor of Science degree.

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The student is ultimately responsible for knowing and completing all degree requirements.

Revised 5/2016 (effective Fall 2016)

NEUROBIOLOGY AND PHYSIOLOGY

Fall 2016

Graduation Requirements:
- *A minimum 2.0 average in all biology courses required for this major*
- *A minimum of 32 credits at or above the 300-level completed at a Purdue campus*
- *At least one 500-level Biology course other than BIOL 54200*
- *120 Total Credits*

BIOLOGY:

1. BIOL 12100 Biology I: Diversity, Ecology and Behavior (2 cr.; fall) **or**
   BIOL 19500 Biodiversity, Ecology & Evolution (3 cr.; fall)
2. BIOL 13100 Biology II: Development, Structure, and Function of Organisms (3 cr.; spring) **or**
   BIOL 19500 Organismal Development & Physiology (3 cr.; spring)
3. BIOL 13500 1st Year Biology Lab (2 cr.; both) **or**
   BIOL 14501 1st Year Biology Lab w/Neuro Research Project (2 cr.; fall) **or**
   IT 22600 Biotechnology Lab (2 cr.; fall)
4. BIOL 23100 Biology III: Cell Structure and Function (3 cr.; fall)
5. BIOL 23200 Laboratory in Biology III: Cell Structure and Function (2 cr.; fall)
6. BIOL 24100 Biology IV: Genetics and Molecular Biology (3 cr.; spring)
7. BIOL 24200 Laboratory in Genetics and Molecular Biology (2 cr.; spring)
8. BIOL 28600 Introduction to Ecology and Evolution (2 cr.; spring)
9. **Intermediate Biology Selective**: Choose one of these eight options:
   (Neurobiology and Physiology majors must choose BIOL 32800, Principles of Physiology)
   - **A. BIOL 32800[1] Principles of Physiology (4 cr.; spring)**
   - B. BIOL 36700 Principles of Development (2 cr.; spring) plus BIOL 36701 Principles of Development Laboratory (1 cr.; spring)
   - C. BIOL 39500 Macromolecules (3 cr.; fall)
   - D. BIOL 41500 Intro. to Molecular Biology (3 cr.; spring)
   - E. BIOL 41600 Viruses & Viral Diseases (3 cr.; spring)
   - F. BIOL 42000 Eukaryotic Cell Biology (3 cr.; fall)
   - G. BIOL 43600 Neurobiology (3 cr.; fall)
   - H. BIOL 43800 General Microbiology (3 cr.; fall)
10. **Neurobiology & Physiology Selective**: Two of these seven courses[2]:
    - A. BIOL 43200[3] Reproductive Physiology (3 cr.; alt fall)
    - B. BIOL 43600[3] Neurobiology (3 cr.; fall))
    - C. BIOL 53800[3] Molecular, Cellular & Developmental Neurobiology (3 cr.; spring)
    - D. BIOL 55900[3] Endocrinology (3 cr.; fall)
    - E. BIOL 56200[3, 5] Neural Systems (3 cr.; spring)
    - F. BIOL 59500[3] Neural Mechanisms in Health & Disease (3 cr.; fall)
    - G. BIOL 59500[3] Neurobiology of Learning & Memory (3 cr.; fall)
11. **Chemistry Selective:** One of these five courses:
    - A. BCHM 56100 General Biochem (3 cr.; fall)
    - B. CHM 37200 Physical Chemistry (4 cr.; spring)
    - C. CHM 37300 Physical Chemistry (3 cr.; fall)
    - D. CHM 33900[6] Biochemistry : A Molecular Approach (3 cr.; spring)
    - E. CHM 53300 Introductory Biochemistry (3 cr.; fall)
12. **Base Lab Requirement:** Must meet Base Lab requirement as described on the back of this page.
13. **Biology Selective**: Three credits of the following in addition to the above requirements[2]:

BIOL 30100[7] Human Anatomy & Physiology (3 cr.; fall)
BIOL 30200[7] Human Anatomy & Physiology (3 cr.; spring)
BIOL 36700 Principles of Development (2 cr.; spring)
BIOL 36701 Lab in Principles of Development (1 cr.; spring)
BIOL 41500 Intro. to Molecular Biology (3 cr.; spring)
BIOL 41600 Viruses and Viral Diseases (3 cr.; spring)
BIOL 42000 Eukaryotic Cell Biology (3 cr.; fall)
BIOL 43200[3] Reproductive Physiology (3 cr.; alternate fall)
BIOL 43600[3] Intro. to Neurobiology (3 cr.; fall)
BIOL 43800 General Microbiology (3 cr.; fall)
BIOL 43900 Microbiology Lab (2 cr.; fall)
BIOL 44400 Human Genetics (3 cr.; fall)
BIOL 44600 Molecular Biology of Pathogens (3 cr.; spring)
BIOL 47800[8] Intro to Bioinformatics (3 cr.; fall)
BIOL 48100 Eukaryotic Genetics (3 cr.; spring)
BIOL 48300[9] Environmental & Conservation Biology (3 cr.; alternate spring)
BIOL 49500 Biological & Structural Aspects of Drug Design & Action (3 cr; spring)
BIOL 51100 Intro. to X-Ray Crystallography (3 cr.; spring)
BIOL 51600 Molecular Biology of Cancer (3 cr.; spring)
BIOL 51700 Molecular Biology: Proteins (2 cr.; spring)
BIOL 52900 Bacterial Physiology (3 cr.; spring)
BIOL 53300 Medical Microbiology (3 cr.; fall)
BIOL 53700 Immunology (3 cr.; spring)
BIOL 53800[3] Molecular, Cellular & Developmental Neurobiology (3 cr.; spring)
BIOL 54100 Molecular Genetics of Bacteria (3 cr.; fall)
BIOL 54900 Microbial Ecology (2 cr.; alternate spring)
BIOL 55001 Eukaryotic Molecular Biology (3 cr.; fall)
BIOL 55900[3] Endocrinology (3 cr.; fall)
BIOL 56200[3,5,8] Neural Systems (3 cr.; spring)
BIOL 56310 Protein Bioinformatics (2 cr.; spring)
BIOL 58000 Evolution (3 cr.; spring)
BIOL 58210 Ecological Statistics (3 cr.; fall)
BIOL 58500 Ecology (3 cr.; fall)
BIOL 58705 Animal Communication (3 cr.; alternate fall)
BIOL 59100 Field Ecology (4 cr.; alternate fall)
BIOL 59200 Evolution of Behavior (3 cr.; alternate spring)
BIOL 59500 Cellular Biology of Plants (3 cr.; alternate fall)
BIOL 59500 Epigenetics in Human Disease (3 cr.; fall)
BIOL 59500 Genetics and –Omics of Host-Microbe Interactions (3 cr.; fall)
BIOL 59500 Methods & Measurement in Physical Biochemistry (3 cr.; fall)
BIOL 59500[3] Neural Mechanisms in Health & Disease
BIOL 59500[3] Neurobiology of Learning & Memory (3 cr.; fall)
BIOL 59500 Sensory Ecology (3 cr.; alternate spring)
BIOL 59500 Theory of Molecular Methods (3 cr.; fall)

(Footnotes and other requirements are on the back of this page)

Base Laboratory Requirement for all Biology Majors (recommended choices are **bolded**)

1. Each student will satisfy each of the following three learning objectives:
   Objective 1 – Research planning, literature review, and writing
   Objective 2 – Observation, experimentation
   Objective 3 – Analysis, simulation, and presentation

2. Objectives may be met by taking courses according the following chart:

Courses	Title	Objective 1	Objective 2	Objective 3
BIOL 43900	Microbiology Lab	X	X	X
BIOL 44201	Protein Expression		X	X
BIOL 44202	**Animal Physiology**		**X**	**X**
BIOL 44205	LabView		X	X
BIOL 44207	Protein Structure		X	
BIOL 44211	Anatomy & Physiology		X	
BIOL 44212	Microscopy & Cell Bio		X	X
BIOL 44215	**Physiology Measurements**	**X**		**X**
BIOL 54200	**Neurophysiology**		**X**	**X**
BIOL 58210	Ecological Statistics	X		X
BIOL 59100	Field Ecology	X	X	X
BIOL 59500	CryoEM 3D Reconstruction		X	X
BIOL 59500	Data Analysis in Neurosci			X
BIOL 59500	Theory of Molecular Methods	X		X
BIOL 59500	Neural Mech in Hlth Disease	X		X

3. Students who successfully complete a Biology Honors Research Thesis have successfully met all three objectives.
4. Undergraduate Research may be used to meet these objectives. Student must get Research Mentor approval for each objective after that objective is completed. Student must also earn at least four credits of BIOL 49400 or 49900 research. Consult with your academic advisor for the forms used to obtain Research Mentor for each objective.
5. A combination of courses and research may be used to meet this requirement.

CHEMISTRY

1. **General Chemistry:**
   A. CHM 12901[6] General Chemistry with a Biological Focus (5 cr.; fall)
2. **Organic Chemistry Selectives**: One of these two options:
   A. CHM 25500 Organic Chemistry (3 cr.; both) and CHM 25501 Organic Chemistry Lab (1 cr.; both) and
      CHM 25600 Organic Chemistry (3 cr.; both) and CHM 25601 Organic Chemistry Lab (1 cr.; both)
   B. CHM 26505 Organic Chemistry (3 cr.; fall) and CHM 26300 Organic Chemistry Lab (1 cr.; fall) and
      CHM 26605 Organic Chemistry (3 cr.; spring) and CHM 26400 Organic Chemistry Lab (1 cr.; spring)

PHYSICS Selectives: One of these two options:

1. PHYS 23300 Physics for Life Sciences I (4 cr.; both) and PHYS 23400 Physics for Life Sciences II (4 cr.; both)
2. PHYS 17200 Modern Mechanics (4 cr.; both) and one of the following two choices:
   A. PHYS 27200 Electric and Magnetic Interactions (4 cr.; both) or
   B. PHYS 24100 Electricity and Optics (3 cr.; both) and PHYS 25200 Electricity and Optics Laboratory (1 cr.; spring)

UNIVERSITY CORE and COLLEGE OF SCIENCE CORE REQUIREMENTS

Composition and Presentation; Teambuilding and Collaboration; Language and Culture; Great Issues; General Education; Multidisciplinary Experience; Mathematics; Statistics; Computing (see handout).

FREE ELECTIVES Approximately 14-26 credits

[1] This course may count as the Intermediate Biology Selective and as the College of Science Teambuilding and Collaboration requirement.
[2] A 500-level BIOL course must be taken as part of requirement #10 or #13.
[3] A course chosen for requirement #10 may NOT be used for requirement #13.
[4] (omitted)
[5] This course may count for one of [a Neurobiology & Physiology Selective or as a Biology Selective] and as the College of Science Multidisciplinary requirement.
[6] Students who select 12901 for General Chemistry must take CHM 33900 **and** 33901. Students who end up with Special Case approval for some other Gen Chem courses may choose the other Chem Selective options. Credit is not allowed for both BIOL 44201 and CHM 33901.
[7] If both BIOL 30100 & 30200 are completed, three of the six credits will satisfy the biology elective requirement. The other three credits will count as free electives. If only BIOL 30100 or 30200 is completed, the credits will count only as free elective credit.
[8] This course may count for a Biology Selective and as the College of Science Multidisciplinary requirement.
[9] This course may count for the Biology Selective and as the College of Science Great Issues requirement.

NRPH 2/16