LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		11-126a	AP-4/3/12	App-9/11/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Sharon Sowa	ssowa@iup.edu
Proposing Department/Unit: Biochemistry Program	Phone: 724-357-4481

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

- ☐ New Course
- ☐ Course Prefix Change
- ☐ Course Deletion
- ☐ Course Revision
- ☑ Course Number and/or Title Change
- ☑ Catalog Description Change

Current Course prefix, number and full title	*Proposed* course prefix, number and full title, if changing
BIOC 301 Biochemistry I	BIOC 301 Foundations of Biochemistry

2. Additional Course Designations: check if appropriate

- ☐ This course is also proposed as a Liberal Studies Course.
- ☐ This course is also proposed as an Honors College Course.
- ☐ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

- ☐ Catalog Description Change
- ☐ New Degree Program
- ☐ Program Title Change
- ☐ Program Revision
- ☐ New Minor Program
- ☐ New Track
- ☐ Other

Current program name	*Proposed* program name, if changing

4. Approvals		Date
Department Curriculum Committee Chair(s)	[signature]	2/29/12
Department Chair(s)	[signature]	2/29/12
College Curriculum Committee Chair	[signature]	3/9/12
College Dean	[signature]	3/18/12
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate: (include title)		
UWUCC Co-Chairs	Gail Sedmist	4/3/12

Received
APR 5 2012
Liberal Studies

Received
MAR 12 2012
Liberal Studies

Part II Description of Curriculum Change

1. New Catalog Description

BIOC 301 Foundations of Biochemistry (3c-0l-3cr)
Prerequisites: BIOL 111 and a grade of C or better in CHEM 232

A foundation in biochemical principles emphasizing the structure/function relationships of proteins, carbohydrates, nucleic acids and lipids. Catalysis by enzymes, including reaction mechanisms, kinetics, and regulation of activity considered in detail. The structure of biological membranes and transport of both solutes and signals across membranes are explored. Assumes an understanding of eukaryotic cell structure and organic chemistry of major functional groups. Intended for chemistry and biochemistry students.

2. Proposed changes and Old Catalog Description:

a) Change in course title from Biochemistry I to Foundations of Biochemistry
b) Change in prerequisite to require grade of C or better in current prerequisite course
c) Change course description to more accurately reflect course content
d) Old Catalog Description

BIOC 301 Biochemistry I (3c-0l-3cr)
Prerequisite: BIOL 111 and CHEM 232

An introduction to biochemistry emphasizing the structure and function relationships of proteins, enzymes, and vitamins; bioenergetics; and the metabolism of carbohydrates and lipids.

3. Justification/rationale for changes:

Revised American Chemical Society guidelines categorize courses as 'foundation' or 'in-depth' courses, which build on the foundation courses. For the ACS-certified B.S. in Chemistry, students must complete a foundation course in biochemistry. Students seeking an ACS-certified degree could complete BIOC 301 as one of four required foundation courses.
The course prerequisite is changed to ensure that students have a sufficient grasp of the required concepts to succeed in the course.
The new course description does not reflect a change in course content, rather it more accurately reflects the current content.

BIOC 301 - Syllabus of Record

I. Catalog Description

BIOC 301 Foundations of Biochemistry — 3 class hours, 3 credits (3c-0l-3cr)

Prerequisites: BIOL 111 and a grade of C or better in CHEM 232

A foundation in biochemical principles emphasizing the structure/function relationships of proteins, carbohydrates, nucleic acids and lipids. Catalysis by enzymes, including reaction mechanisms, kinetics, and regulation of activity considered in detail. The structure of biological membranes and transport of both solutes and signals across membranes are explored. Assumes an understanding of eukaryotic cell structure and organic chemistry of major functional groups. Intended for chemistry and biochemistry students.

II. Course Outcomes

Upon successful completion of this course, the student will be able to:

1. Identify organic functional groups characteristic of the main classes of biomolecules: carbohydrates, lipids, proteins, and nucleic acids.
2. Apply knowledge of functional group chemistry to analyze structure and reactivity of biomolecules.
3. Recognize the primary and secondary (covalent and noncovalent) interactions responsible for the three-dimensional dynamic structures of biomolecules.
4. Analyze the interactions between biomolecules and interactions between biomolecules and water.
5. Explain the main functions of carbohydrates, lipids, proteins and nucleic acids.
6. Classify enzymatic reaction mechanisms and modes of biochemical catalysis.
7. Describe the model of a biological membrane and modes of solute and signal transport.
8. Analyze recurring themes among the structure/function relationships of biomolecules.

III. Detailed Course Outline

Note: 1 hour = 1 academic hour or 50 minutes

1. Chemical foundations: review of major organic functional groups, chirality, and reactivity (1 hour)
2. Aqueous systems (5 hours)
   Solvent behavior of water, interactions of biomolecules with water, ionization of water, acids/bases/pH/buffers.
3. Protein Structure (6 hours)
   Amino acids, peptides, three-dimensional structure of proteins.
4. Exam 1 (1 hour)
5. Protein structural dynamics and protein function. (3 hours)
   Proteins as structural molecules, transporters, hormones, storage molecules, motility, and other specialized functions.
6. Enzymes (6 hours)
   Principles of catalysis, enzyme kinetics, enzyme reaction mechanisms, cofactors/vitamins/coenzymes, regulation of enzyme activity.
7. Carbohydrates (3 hours)

Monosaccharides, polysaccharides, three-dimensional structure and biochemical functions including energy storage, structural components, and information carriers.

8. Exam 2 (1 hour)
9. Nucleic Acids. (6 hours)
   Nucleotides, nucleic acids, three-dimensional structure and biochemical functions including information transfer and transfer of energy and chemical intermediates.
10. Lipids (4 hours)
    Fatty acids, steroids, waxes, triacylglycerols, phospholipids and sphingolipids, three-dimensional structures and biochemical functions including energy storage, structural components of membranes, and signal molecules (steroid hormones and eicosanoids).
11. Biological membranes (2 hours)
    Fluid mosaic model, transport of solutes across a semi-permeable membrane.
12. Exam 3 (1 hour)
13. Biosignaling (3 hours)
    Transduction of signals across a biological membrane.

Final Exam scheduled during the final exam period (2 hours)

Students will also complete a literature project, which is a personal journal summary of 'current events' in biochemistry. For five weeks throughout the semester, the student will find and read a recently published scientific paper on a topic of their choice, and document it with a complete citation in accepted style format. The paper can be the basis of a news report, but must be from the scientific literature.

IV. Evaluation Methods

3 Hour Exams @100 points	300 points
1 Final Exam	150 points
Classroom Activities/Homework	100 points
Literature project	50 points
Total	600 points

V. Example Grading Scale:

$x \geq 90\%$	A
$90\% > x \geq 80\%$	B
$80\% > x \geq 70\%$	C
$70\% > x \geq 60\%$	D
$60\% > x$	F

VI. Undergraduate Course Attendance Policy: Attendance is expected for all classes. Individual faculty will include in their syllabus an attendance policy consistent with the Undergraduate Course Attendance Policy in the IUP Undergraduate Catalog.

VII. Special Resource Requirements: None

VIII. Required Textbooks, Supplemental Books and Readings:
Voet D, Voet JG, Pratt CW Fundamentals of Biochemistry, 3rd Ed., Wiley, New York, 2008.

IX. Bibliography

1. Berg JM, Tymoczko JL, Stryer L Biochemistry, 6th Ed. Freeman, New York, 2007
2. Fersht, A Structure and Mechanism in Protein Science, WH Freeman, New York, 1999
3. Garrett RH, Grisham CM Biochemistry, 4th Ed. Brooks-Cole, Belmont, CA, 2008
4. Murray, RK, Granner, DK, Mayes, PA, Rodwell, VW Harper's Illustrated Biochemistry 28th Ed, McGraw-Hill, 2009
5. Nelson DL, Cox MM Lehninger Principles of Biochemistry, 5th Ed., Freeman, New York, 2008
6. Voet D, Voet JG Biochemistry, 4rd Ed., Wiley, New York, 2011
7. Online Protein Structural Databases:
   www.rcsb.org/pdb/home
   ca.expasy.org/sprot
   www.ncbi.nlm.nih.gov/protein