CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

NEW COURSE PROPOSAL

PROGRAM: BIOLOGICAL AND PHYSICAL SCIENCES

1. **Catalog Description of the Course.** *[Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]*

   CHEM 318. BIOLOGICAL CHEMISTRY (3)
   Three hours of lecture per week
   Prerequisites: CHEM 311 with a grade of C or better
   An integrated Organic Chemistry II and Biochemistry. The topics covered include the structure and synthesis of sugars, amino acids, DNA, RNA, proteins; enzyme catalysis and inhibition; and the reactions involved in biosynthetic and metabolic pathways.

2. **Mode of Instruction.**

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	50
Seminar			
Laboratory			
Activity			

3. **Justification and Learning Objectives for the Course.** (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

   This course serves as an alternative pathway for biology students who are not in pre-professional programs. Instead of students following CHEM 311 and CHEM 312 with an additional eight units of chemistry courses (CHEM 314, CHEM 315, and CHEM 400), biology students may elect to complete their chemistry requirements with CHEM 318, which is a combination of highlights of CHEM 314 and CHEM 400. Students who are interested in admission to medical, veterinary, dental, or pharmacy schools should take the combination of CHEM 314, CHEM 315, and CHEM 400.

   Students who successfully complete this course will be able to:
   - Outline the development of the fields of organic chemistry and biochemistry from a historical perspective and how organic chemistry and biochemistry have impacted society
   - Describe the scientific method and how it is used to approach the study of organic and biological molecules
   - Explain the behavior of organic and biological reactions using their knowledge of thermodynamics and kinetics and the geometric and electronic structures of organic and biological molecules
   - Identify the reactions, chemical synthesis, and biosynthesis of alcohols, ethers, aldehydes, ketones, esters, carboxylic acids, amides, and amines
   - Compare and contrast chemical synthesis with biosynthesis
   - Describe major biochemical pathways, energy flow, and the reaction processes
   - Describe the structure and properties of carbohydrates, amino acids, proteins, enzymes, nucleic acids, RNA, DNA, prostaglandins, terpenes, steroids, fatty acids, triglycerides, and phospholipids

4. **Is this a General Education Course** **YES** **(NO)**
   If Yes, indicate GE category:

5. **Course Content in Outline Form.** *[Be as brief as possible, but use as much space as necessary]*

Aromaticity and Aromatic Compounds
- Aromatic and heteroaromatic compounds
- Hückel's Rule and molecular orbital description of aromatic compounds
- Heterocycles in proteins and nucleic acids
- Reactions of aromatic compounds
- Biosynthesis of aromatic compounds

Alcohols: Structures and Reactions
- Acid-base reactivity of alcohols and phenols and substituent effects on acidity
- Synthesis and reactions of alcohols
- Biosynthesis and biological reactions of alcohols

Aldehydes and Ketones: Structures and Reactions
- Synthesis and reactions of aldehydes and ketones
- Biosynthesis and biological reactions of aldehydes and ketones

Carbohydrates: Structures and Reactions
- Names and structures of monosaccharides
- Reactions of monosaccharides
- Glycoside formation
- Disaccharides and polysaccharides

Carboxylic Acids: Structures and Reactions
- Acid-base reactions of carboxylic acids
- Synthesis and reactions of carboxylic acids
- Biosynthesis and biological reactions of carboxylic acids
- Fatty acids, triglycerides, and phospholipids

Carboxylic Acid Derivatives and their Preparation
- Structures and reactivity of esters, thioesters, phosphoesters, amides, and nitriles
- Carboxylic acid derivatives in biological systems
- Organization of phospholipids into micelles, bilayers, and vesicles

Nucleic Acids
- DNA and RNA structure
- Replication and transcription of DNA

Amines: Structures and Reactions
- Acid-base reactions of amines
- Chemical synthesis and reactions of amines
- Biosynthesis and biological reactions of amines

Protein Structure
- Amino acid structures and properties
- Peptide bonds and olidopeptide structure
- Translation of mRNA
- Aspects of protein and polypeptide structure
- X-ray crystallography
- Chemical synthesis and biosynthesis of peptides
- Enzyme catalysis and kinetics
- Enzyme inhibition and kinetics
- Cooperativity and allosteric effects
- Sequence homology of proteins

Biochemical Pathways
- Glucose: catabolism, anabolism, energy generation, and glucose storage
- Fat: catabolism, anabolism, energy generation, and fat storage
- Protein: catabolism, anabolism, energy generation

6. References. *[Provide 3 - 5 references on which this course is based and/or support it.]*

McMurray, J. *Organic Chemistry*, 5th Ed., 2000
Weeks, D. P. *Pushing Electrons*, 3rd Ed., 1998
Wade, L. G., Jr. *Organic Chemistry*, 5th Ed., 2002
Bruice, P. *Organic Chemistry*, 3rd Ed., 2000

7. List Faculty Qualified to Teach This Course.

Dr. Philip Hampton

8. Frequency.

a. Projected semesters to be offered: Fall _____ Spring __X___ Summer _____

9. New Resources Required.

None.

10. Consultation.

Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

____Philip Hampton_____1/8/03_____

Proposer of Course Date