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 400. BIOCHEMISTRY (4)
   Three hours lecture and three hours lab per week.
   Prerequisite: CHEM 314 with a grade of C or better
   Introduction to the physical and chemical properties of proteins and enzymes, enzymatic catalysis and inhibition, the biosynthesis of proteins and nucleic acids, and biosynthetic and metabolic pathways. Lab fee required.

2. **Mode of Instruction.**

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	50
Seminar			
Laboratory	1	3	18
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 is typically taken by students in the Biology and Environmental Science and Resource Management majors who are interested in obtaining the Chemistry minor and by students who are interested in admission to medical, veterinary, dental, or pharmacy schools. Instead of students following CHEM 311 and CHEM 312 with CHEM 318, biology students may elect to complete their chemistry requirements with CHEM 400. With an additional three units of Chemistry courses (including CHEM 346/ MGT 346/ BIOL 346 which is required by the Biology major), these students will be eligible to receive the Chemistry minor.

   Students who successfully complete this course will be able to:
   - Outline the development of the field of biochemistry from a historical perspective and how biochemistry has impacted society
   - Describe the scientific method and how it is used to approach the study of biological molecules and biochemistry pathways
   - Explain the behavior of biochemical reactions using their knowledge of thermodynamics and kinetics and the geometric and electronic structures of organic and biological molecules
   - Identify the biochemical pathways responsible for the synthesis and degradation of species and the regulation of the pathways.
   - Describe major biochemical pathways, energy flow, and the reaction processes
   - Describe the structure and properties of amino acids, proteins, enzymes, carbohydrates, 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]*

   Introduction to Biochemistry
   Chemical evolution

Evolution of cells
Architecture of cells
Thermodynamics
Kinetics
Structure and properties of water

Nucleotides and Nucleic Acids
Nucleic acid structure and function
Sequencing of nucleic acids

Amino Acids and Proteins
Amino acid structure and properties
Protein purification
Protein sequencing
Protein evolution
Structure of proteins
Protein folding and stability

Protein Function
Hemoglobin and myoglobin
Myosin and actin
Antibodies

Carbohydrates
Monosaccharides and polysaccharides
Glycoproteins

Lipids
Classification of lipids
Organization of lipids

Biological Membranes
Membrane structure and assembly
Membrane proteins and their function
Transport across membranes

Enzymatic Catalysis
Properties and classification of enzymes
Mechanisms of enzymatic catalysis
Enzymes kinetics
Inhibition of enzymes
Regulation of enzymes

Introduction to Metabolism
Energy content of molecules and thermodynamics
Oxidation-reduction reactions and electrochemistry

Glucose Catabolism
Glycolysis
Pentose phosphate pathway

Glycogen Metabolism and Gluconeogenesis
Glycogen degradation and synthesis
Regulation of glycogen synthesis and regulation
Gluconeogenesis

Citric Acid Cycle
Enzymes in the Citric Acid Cycle
Regulation in the Citric Acid Cycle

Electron-Transport and Oxidative Phosphorylation
Electron-transport
Oxidative phosphorylation and regulation

Photosynthesis

Lipid Metabolism
Fatty acid synthesis and degradation
Regulation of fatty acid synthesis and degradation
Membrane lipid synthesis

Amino Acid Metabolism
Protein degradation
Synthesis and degradation of amino acids

Nucleic Acid Structure and Function

DNA and RNA structure
DNA replication and repair
Transcription
Translation

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

Abeles, R. H.; Frey, P. A.; Jencks, W. P. *Biochemistry*, 1992.
Gilbert, H. F. *Basic Concepts in Biochemistry- A Student's Survival Guide*, 2nd Ed., 2000
Nelson, D. L.; Cox, M. M. Lehninger, Principles of Biochemistry, 3rd Ed., 2000
Stryer, L. *Biochemistry*, 4th Ed., 1995
Voet, D.; Voet, J. G.; Pratt, C. W. *Fundamentals of Biochemistry*, 1st Ed., 2002

7. List Faculty Qualified to Teach This Course.

Dr. Philip Hampton
Dr. Louise Lutze-Mann

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

_____
Proposer of Course Date