DEGREE/PROGRAM CHANGE
FORM C

Fields marked with * are required

Name of Initiator: Timothy Lee Ward **Email:*** tlward@unm.edu **Date:*** 10-11-07

Phone Number:* 505 277-2067 Initiator's Rank / Title* Professor: Chemical & Nuclear Engineering

Faculty Contact* Timothy L. Ward Administrative Contact* Susan Pinter

Department* Chemical and Nuclear Engineering

Division Main Campus **Program** Chemical Engineering

Branch

Proposed effective term:

Semester Fall Year 2008

Course Information

Select Appropriate Program Undergraduate Degree Program CIP Code

Name of New or Existing Program * Chemical Engineering Concentrations

Catalog Page Number 399 Select Category Concentration Degree Type BS

Select Action Revision

Exact Title and Requirements as they should appear in the catalog.

See current catalog for format within the respective college (enter text below or upload a doc/pdf file)

Attached files show revised concentration requirements and descriptions, and a version with highlighted changes from the previous requirements and text.

ChE 2008 Concentrations.doc

ChE 2008 Concentrations showing changes.doc

☐ **This Change affects other departmental program/branch campuses**

Reason(s) for Request * (enter text below or upload a doc/pdf file)

Planned changes by the Chemistry Dept. in the credit value of Chem 311 and Chem 312 from 4 to 3(see attached memo from Dept. of Chemistry) forced us to revise the Advanced Chemistry elective credits associated with our concentrations. This has been done so that all concentrations are consistent. A couple of other minor revisions/corrections have also been made in the descriptive text. For the Materials Processing concentration, the description was broadened to include polymeric and biomedical materials, and course options were provided for the concentration that would appeal to students interested in these types of materials. This is in response to student interest, and aligns with the research areas of recently hired faculty.

CHNE-memo.doc

Statements to address budgetary and Faculty Load Implications and Long-range planning * (enter text below or upload a doc/pdf file)

There are no budgetary or faculty load implications from these revisions.

CONCENTRATIONS-CHEMICAL ENGINEERING

Future chemical engineers will conceive and solve problems on a range of scales (nano, micro and macro). They will bring new tools and insights from research and practice in other disciplines: molecular biology, chemistry, solid-state physics, materials science, and electrical engineering. They will also make increasing use of computers, artificial intelligence and expert systems in problem solving, in product and process design, and in manufacturing. Chemical engineering can be viewed as the engineering discipline with the strongest tie to the molecular sciences and therefore is an integral part of multidisciplinary research efforts. To allow students an opportunity to gain in-depth knowledge in specialized areas and to prepare them for diverse career opportunities, we provide five concentrations:

1. Chemical Process Engineering
2. Bioengineering
3. Materials Processing
4. Semiconductor Manufacturing
5. Environmental Engineering

Students choose a basic engineering elective, a basic science elective, 3 advanced chemistry courses and two technical electives. In addition to these courses, the projects in the last design course (494L) and the last laboratory course (~~415L~~ 419L) provide opportunities to gain experience in the chosen concentration.

BASIC ENGINEERING ELECTIVE

The recommended course is ChNE 213. Alternatives are CE 202 or ECE 203. Students in the semiconductor processing concentration may wish to take ECE 203.

BASIC SCIENCE ELECTIVE

Students in Bioengineering or Environmental Engineering concentrations will take Biology 201L, all others take Physics 262 during the second semester of the sophomore year.

ADVANCED CHEMISTRY AND SCIENCE ELECTIVES

A minimum of ~~11~~ 9 credit hours of advanced chemistry, selected from among CHEM 302, 304L, 311, 312, 421, 431 or Biochemistry 423, depending upon the student's area of concentration. One year of Physical Chemistry is required for all concentrations. Up to four hours of other natural science courses may be substituted for advanced chemistry. Such advanced natural science courses must build on basic science prerequisites and may include physics, life sciences, and material science. The courses chosen must represent a logical sequence of courses for the concentration and must be approved by the academic advisor.

TECHNICAL ELECTIVES

Students have the opportunity to take 6 credit hours of technical electives. Three hours must be engineering courses within the department or the school. The other three hours may be taken outside of the school but must be a logical part of the concentration.

CHEMICAL PROCESS ENGINEERING CONCENTRATION

The Chemical Process Engineering concentration is designed to provide maximum flexibility for students to pursue career opportunities in a wide range of industries as a process engineer. Historically, many chemical process engineers have found employment in the petroleum or chemical industries, and many still do. However, chemical engineers with a strong process engineering foundation are in increasing demand in many other technology areas, including pharmaceuticals, semiconductors and electronic materials, and environmental or "green" engineering. This concentration builds on the traditional process engineering emphasis, allowing the technical electives to be chosen by the student in consultation with his adviser to fit the interests or professional goals of the student.

Basic Science Elective		
Phys 262	General Physics	3
Advanced Chemistry and Science Electives		
Chem 302	Organic II	3
Chem 311	Physical Chemistry I	~~4~~ 3
Chem 312	Physics Chemistry II	~~4~~ 3
Technical Electives		
Technical Elective		3
Technical Elective (Engr)		3

BIOENGINEERING CONCENTRATION

Since biological and medical systems involve complex chemical and physical processes, chemical engineering is a natural professional background for bioengineering applications. Bioengineering is an interdisciplinary field that combines the tools and methods of engineering to address challenges in the health sciences and in basic research. Bioengineers strive to understand biological systems, from molecules to whole organisms, from a quantitative and analytical perspective. Because of this in-depth study, bioengineers are uniquely qualified to work at the interface between living and non-living systems, enhancing our ability to measure, image, repair, or replace physiological substances or processes. Training in bioengineering prepares students for graduate school or industry, and is an excellent preparation for professional programs (medicine, dentistry, nursing, pharmacy). Career opportunities for bioengineers at the B.S. level include the biosensor, pharmaceutical and medical device industries as well as positions in hospitals, federal labs, and environmental agencies.

Basic Science Elective		
Biol 201~~L~~	Cell Biology	4
Advanced Chemistry and Science Electives		
Chem 302	Organic II	3
Chem 312	Physical Chemistry	~~4~~3
Advanced Biology*		~~4~~ 3
Technical Electives		
Technical Elective		3
~~Biochem 423 Intro to Biochem or~~		
~~Chem 421 Biological Chemistry~~		
Technical Elective (Engr)		3

*Typical choices for the advanced biology course would be BIOL 202, 237~~/247L or 351/352L~~, 238, 239L, BIOC 423 or CHEM 421.

MATERIALS PROCESSING CONCENTRATION

The Materials Processing concentration is designed to add additional emphasis in ~~solid state and~~ inorganic, polymeric or biological materials, depending on the student's interest. Students who are interested in working in the realm of high technology materials, biomedical materials, or nanotechnology should choose this concentration. ~~This~~ These rapidly developing fields ~~is~~ are expected to provide many job opportunities in the next decade. New materials are currently being developed whose properties depend strongly on their micro/nanostructure and processing history. Materials included in this category are advanced ceramics, polymers, composites, photonics, superconductors, semiconductors, and recording media. ~~The technologies that will prove to be important include: process integration, reactor design and engineering, ultrapurification, materials synthesis and processing, thin film deposition, modeling, chemical dynamics, and process design and control for safety and environmental protection.~~ This concentration provids flexibility for students interested in inorganic or organic materials technology.

Basic Science Elective

Phys 262	General Physics or	
BIOL 201	Cell Biology	3

Advanced Chemistry and Science Electives

Chem 311	Physical Chemistry I	~~4~~ 3
Chem 312	Physical Chemistry II	~~4~~ 3
Chem 431	Adv Inorganic Chem or	
ChNE 475	Polymer Sci and Eng	3

Technical Electives

Technical Elective	3
Technical Elective (Engr)	3

SEMICONDUCTOR MANUFACTURING CONCENTRATION

There is an increasing demand for chemical engineers in high technology oriented semiconductor manufacturing companies like Intel, Motorola, IBM, etc. This concentration is designed to prepare the student in the fundamental unit operations used in semiconductor manufacturing (oxidation, diffusion, lithography, plasma etch, CVD, ion implant and metalization) and statistical methods used extensively in the industry to optimize the performance of these unit operations. The continuing revolution occurring in computer technology virtually insures there will be a strong future demand for engineers with the background needed for semiconductor manufacturing. The goal of this concentration is to introduce students to the specific chemical engineering tools used in micro-chip fabrication.

Basic Science Elective

Phys 262	General Physics	3

Advanced Chemistry and Science Electives

Chem 311	Physical Chemistry I	~~4~~ 3
Chem 312	Physical Chemistry II	~~4~~ 3
Chem 431	Adv Inorganic Chem	3

Technical Electives

ECE 371L	Materials and Devices	4
Technical Elective		3

ENVIRONMENTAL ENGINEERING CONCENTRATION

The chemical engineer with a concentration in waste management will be prepared to enter a field of growing importance. This field deals with treatment of waste to reduce its volume, to recover recyclable resources and to prepare appropriately for long-term disposal. Interesting applications exist in atmospheric discharge control and clean-up, bio-treatable water decontamination, soil remediation, and nuclear byproduct handling. Increasingly, chemical engineers will be required to develop new processes to minimize byproduct and waste generation, and achieve higher energy efficiencies.

Basic Science Elective		
Bio 201~~L~~	Cell Biology	4
Advanced Chemistry and Science Electives		
Chem 302	Organic II	3
Chem 312	Physical Chemistry	~~4~~3
Biochem 423	Intro to Biochem or advanced biology*	~~4~~3
Technical Electives		
Technical Elective		3
Technical Elective (Engr)		3

*Typical choices for the advanced biology course would be BIOL 202, 237, 238, 239L, or CHEM 421.