

FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER: BSC 2419C

COURSE TITLE: Protein Biotechnology and Cell Culture

PREREQUISITE(S): BSC 1404C

COREQUISITE(S): None

CREDIT HOURS: 4

CONTACT HOURS/WEEK: 5

CONTACT HOUR BREAKDOWN:

Lecture/Discussion:	3
Laboratory:	2
Other:	

FACULTY WORKLOAD POINTS: 4.4

STANDARDIZED CLASS SIZE ALLOCATION: 24

COURSE DESCRIPTION:

This course introduces students to protein biotechnology and methods of protein purification and analyses.

SUGGESTED TEXT(S): None

IMPLEMENTATION DATE: Fall Term, 2003 (20041)

REVIEW OR MODIFICATION DATE: Fall Term, 2006 (20071)
Fall Term, 2008 (20091) - Outline Review 2007

COURSE TOPICS	<u>CONTACT HOURS PER TOPIC</u>
I. Cell biology	10
A. Molecular biology of prokaryotes	(5)
B. Molecular biology of eukaryotes	(5)
II. Biochemistry of proteins	15
A. Protein structure and functions	(5)
B. Physical and chemical properties of proteins	(5)
C. Regulation of protein expression	(5)
III. Protein biotechnology	38
A. Protein extraction, dialysis, and concentration	(5)
B. Size exclusion and ion-exchange chromatography	(5)
C. Protein quantitation	(5)
D. Enzyme activity assays	(5)
E. Polyacrylamide gel electrophoresis	(3)
F. Immunoblotting	(3)
G. Sterile cell culture media prep	(4)
H. Cell culture maintenance	(2)
I. Enzyme-linked immunoassays	(3)
J. Bioinformatics	(3)
IV. Cell culture	12
A. Prokaryote and single-cell eukaryote culture	(4)
B. Animal cell culture	(4)
C. Plant cell culture	(4)

PROGRAM TITLE: Biotechnology Laboratory Technology
 COURSE TITLE: Protein Biotechnology and Cell Culture
 CIP NUMBER: 1626.061600

LIST PERFORMANCE STANDARD ADDRESSED:

- | NUMBER(S): | TITLES(S): |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| 1.1 | Communicate in a professional manner. |
| 1.1.1 | Ability to interact with vendors, colleagues, scientists |
| 1.1.2 | Notify appropriate persons about problems and observations |
| 1.1.3 | Coordinate tasks with coworkers |
| 1.1.4 | Make oral and written presentations |
| 1.2.1 | Comprehend and use technical vocabulary |
| 1.2.2 | Document results at the time of performance |
| 1.3.1 | Take notes on procedures |
| 1.3.2 | Prepare, identify, and apply changes to control procedures |
| 1.3.3 | Employ scientific writing techniques |
| 1.4.1 | Perform computerized research and web searches |
| 1.4.2 | Read technical literature |
| 1.4.3 | Identify basic reference sources in biotechnology |
| 1.5.1 | Perform basic applications in work processing, spreadsheets, databases, presentations, and project management |
| 1.5.2 | Navigate the Internet |
| 2.1.1 | Identify first aid supplies, co-worker contact, medical information, emergency protection, and evacuation plan |
| 2.1.2 | Follow correct safety procedures, guidelines, and chemical hygiene plans |
| 2.1.3 | Maintain required safety training; observe rules of electric and equipment safety; recognize common lab hazards |
| 2.1.4 | Maintain and utilize safety equipment and personal protection equipment (PPES) |
| 2.2 | Handle, store and dispose of hazardous materials per MSDS, other safety guidelines, and Worker Protection Standards (WPS) |
| 2.2.1 | Check expiration dates, lot numbers, and labels for hazards |
| 2.2.2 | Monitor usage and exposure of radioisotopes and biohazards |
| 2.2.3 | Follow universal precautions for biological pathogens; store chemicals and biologicals according to storage guidelines. |
| 3.1 | Obtain and read protocol, test procedure, standard operating procedure and proper forms. |
| 3.1.1 | Apply scientific methods |
| 3.1.2 | Recognize and follow documentation requirements |
| 3.1.3 | Design and troubleshoot procedures and/or tests |
| 3.1.4 | Prioritize and perform multiple tasks in a timely manner |
| 3.2 | Maintain laboratory testing |

LIST PERFORMANCE STANDARD ADDRESSED: (CONTINUED)

NUMBER(S):	TITLES(S):
3.2.1	Check and maintain equipment, logs, and perform preventive maintenance tasks according to schedule
3.2.2	Clean, organize, and sterilize materials when required
3.2.3	Order inventory of supplies and reagents; date/label reagents
3.3	Prepare solutions and reagents for laboratory use.
3.3.1	Practice aseptic techniques
3.3.2	Use titration/pipetting techniques; measure volume/weights
3.3.3	Perform basic calculations and statistical analysis
3.3.4	Calculate and prepare dilution series
3.3.5	Monitor physical properties of reagents, buffers, media and solutions and determine optimum conditions for use
3.4	Set up general laboratory tests
3.4.1	Obtain and review appropriate procedures and test forms
3.4.2	Collect and set up samples for analysis
3.4.3	Set-up equipment and perform/document tests and results
3.5	Operate laboratory equipment
4.0	Regulatory Compliance
4.1	Accept federal regulations
4.1.1	Follow the guidelines from the following agencies: FDA, OSHA, USDA, NIH, NR, DOT, EPA, CDC, NRC
4.1.2	Follow regulations from Clinical Lab Improvement (CLIA, 88, Amendment of 1988 Protein tech skills) and Drug Enforcement Administration
4.2	Accept state, local, and industry regulations
4.2.1	Follow and observe HAZMAT Guidelines
4.2.2	Follow and observe country and state environmental protection guidelines
4.2.3	Perform manufacturing using current good manufacturing practices (GMP)
5.0	Decision Making and Problem Solving
5.1	Apply decision making techniques in the workplace
5.1.1	Identify decision to be made and compare alternatives
5.1.2	Make decision based on values and goals and evaluate decision made
5.2	Apply problem solving techniques in the workplace
5.2.1	Diagnose problem, its urgency, and causes
5.2.2	Be sensitive to multicultural and nonsexist dimensions of problem solving
5.2.3	Explore possible solutions to a problem and compare/contrast advantages
5.2.4	Determine appropriate action; implement it and evaluate results
6.2.1	Isolate and characterize cell lines
6.2.2	Propagate plant and animal cells
6.2.3	Practice cryogenic techniques
6.2.4	Propagate and harvest viruses
6.2.5	Practice transfection techniques
6.4	Perform genetic engineering and molecular biology techniques
6.4.10	Perform autoradiography

LIST PERFORMANCE STANDARD ADDRESSED: (CONTINUED)

NUMBER(S):	TITLES(S):
6.4.11	Perform non-isotopes techniques
6.5	Separate proteins, isolate or characterize proteins
6.5.1	Disrupt cells
6.5.2	Run protein gels
6.5.3	Perform western blotting
6.5.4	Denature/renature proteins
6.5.5	Precipitate soluble solutions
6.5.6	Chromatograph proteins
6.5.7	Concentrate (filter and dialyze) proteins
6.5.8	Quantitative proteins (IEF)
6.5.9	Perform enzyme activity assays
6.5.10	Monitor protein stability
6.6	Perform chemical assays
6.6.1	Perform quantitative analysis and distillation techniques
6.6.2	Perform titration techniques (manual and automatic)
6.6.3	Employ dyes and indicators
6.6.4	Perform lypholization and organic chemistry techniques
6.6.5	Perform extractions
6.6.6	Measure turbidity, viscosity, and density
7.1	Inspect and verify integrity of product, procedure, and specimen
7.1.1	Perform quality tests and document results
7.1.2	Verify test standards and maintain QA records
7.1.3	Archive samples and documents
7.1.4	Release final product and perform trend analysis
8.1	Monitor and record the environmental conditions of the facility (growth chamber, greenhouse, seed storage room, animal room, or manufacturing site)
8.1.1	Sample environment, clean work area according to SOP's and document room integrity.
8.1.2	Notify appropriate personal if sampling indicates a problem.
8.2	Validate or confirm equipment
8.2.1	Label equipment
8.2.2	Check calibration and perform systems diagnostics
8.2.3	Perform or schedule preventive maintenance
8.2.4	Troubleshoot equipment and maintain equipment logs.



NOTE: Use either the Tab key or mouse click to move from field to field. The box will expand to accommodate your entry.

<i>Section 1</i>	
COURSE PREFIX AND NUMBER: BSC 2419C	SEMESTER CREDIT HOURS: 4
COURSE TITLE: Protein Biotechnology and Cell Culture	

Section 2

TYPE OF COURSE: (Click on the box to check all that apply)

<input type="checkbox"/> AA Elective	<input checked="" type="checkbox"/> AS Required Professional Course	<input type="checkbox"/> College Prep
<input type="checkbox"/> AS Professional Elective	<input type="checkbox"/> AAS Required Professional Course	<input type="checkbox"/> Technical Certificate
<input type="checkbox"/> Other _____		
<input type="checkbox"/> General Education: (For General Education courses, you must also complete Section 3 and Section 7)		

Section 3 (If applicable)

INDICATE BELOW THE DISCIPLINE AREA FOR GENERAL EDUCATION COURSES:

<input type="checkbox"/> Communication	<input type="checkbox"/> Social & Behavioral Sciences	<input type="checkbox"/> Mathematics
<input checked="" type="checkbox"/> Natural Sciences	<input type="checkbox"/> Humanities	

Section 4

INTELLECTUAL COMPETENCIES:

<input checked="" type="checkbox"/> Reading	<input checked="" type="checkbox"/> Speaking	<input checked="" type="checkbox"/> Critical Analysis	<input checked="" type="checkbox"/> Quantitative Skills	<input checked="" type="checkbox"/> Scientific Method of Inquiry
<input checked="" type="checkbox"/> Writing	<input checked="" type="checkbox"/> Listening	<input checked="" type="checkbox"/> Information Literacy	<input checked="" type="checkbox"/> Ethical Judgment	<input checked="" type="checkbox"/> Working Collaboratively

<i>Section 5</i>	
LEARNING OUTCOMES	METHOD OF ASSESSMENT
<ul style="list-style-type: none"> Explain and apply techniques of protein isolation and characterization, and demonstrate ability to perform cell culture for mammalian cell lines. 	Written tests, reports and/or use of equipment to demonstrate student competency in field.
<ul style="list-style-type: none"> Demonstrate knowledge of scientific method. 	Formulate problem, make observations, derive and test hypothesis and make conclusions.
<ul style="list-style-type: none"> Communicate scientific ideas through oral or written assignments. 	Students use analytical reasoning skills to solve problems on written tests and/or laboratory work.
<ul style="list-style-type: none"> Interpret scientific models such as formulas, graphs, tables and schematics, draw inferences from them and recognize their limitations. 	Written reports of lab experiments and/or written tests demonstrate student competency in the application of scientific knowledge.
<ul style="list-style-type: none"> Demonstrate problem solving methods in situations that are encountered outside of the classroom. 	Students use demonstrations, group discussions, written tests, laboratory reports, research projects and/or field experiences to illustrate competence in recognizing and evaluating various scientific processes.
<ul style="list-style-type: none"> Demonstrate proper laboratory technique including safety in the use and care of laboratory equipment and materials. 	Results from laboratory work and experiments demonstrate student awareness of science and society.

Section 6

Name of Person Completing This Form: Kevin Pegg Date: 12/21/2007

SECTION 7 MUST BE COMPLETED FOR ALL GENERAL EDUCATION COURSES.

<i>Section 7</i>	<i>Primary</i>	<i>Secondary</i>	<i>N/A</i>	VALUE	<i>Primary</i>	<i>Secondary</i>	<i>N/A</i>
A. Global and Historical Knowledge & Understanding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Intellectual honesty	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends a general knowledge of the nature, origins and contributions of major civilizations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Curiosity and openness to new ideas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends the workings and interrelations of personal, business and government economies	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Recognition of one's own creative potential	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends political, social and economic systems and their effects upon society	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Acceptance of and respect for differences among people and cultures	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Cultural and Aesthetic Knowledge and Understanding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the contributions of the arts and humanities to the human experience on a personal, national or global level	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Civic Engagement	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
• Comprehends the historical development of the arts and sciences	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lifelong Learning	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Comprehends religious and cultural systems and their effects upon society	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
C. Human Awareness and Understanding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the dynamics of human behavior and the process of increasing self-awareness, growth and development	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the stages of human development and the dynamics of human relationships in diverse cultures	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the factors that promote physical, mental and social well-being	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
D. Mathematics, Science and Technology	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the basic concepts and investigative processes of the natural sciences	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the breadth, significance and development of the mathematical sciences	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
• Comprehends the ways science and technology have shaped and continue to reshape human cultures and the environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				