FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

| | |
|---|---|
| COURSE NUMBER: | BSC 1404C |
| COURSE TITLE: | Introduction to Biotechnology Methods |
| PREREQUISITE(S | None |
| COREQUISITE(S): | None |
| STUDENT ADVISING NOTES: | Satisfactory completion of high school chemistry or CHM 1025C or CHM 1032C |
| CREDIT HOURS: | 3 |
| CONTACT HOURS/WEEK: | 4 |
| CONTACT HOUR BREAKDOWN: | |
| Lecture/Discussion:<br>Laboratory:<br>Other: Lecture/Lab Combination | 4 |
| FACULTY WORKLOAD POINTS: | 3.7 |
| STANDARDIZED CLASS SIZE ALLOCATION: | 24 |

COURSE DESCRIPTION:

This course will build upon the concepts taught in Introduction to Biotechnology and teaches basic concepts and techniques necessary to work effectively in a biotechnology laboratory. The nature of science, lab work, and the role of the biotechnician will be discussed. Basic skills learned will include: following procedures and keeping records; laboratory safety procedures for biological, chemical, and radiological hazards; laboratory mathematics and measuring; preparing solutions; and basic techniques used for the separation of biomolecules. Students will develop confidence in their ability to work safely with proficiency in the use of basic biotech lab instruments.

| | |
|---|---|
| SUGGESTED TEXT(S): | Basic Laboratory Methods for Biotechnology, Seidman, Lisa and Cynthia Moore, Prentice Hall, 1999. |
| IMPLEMENTATION DATE: | Fall Term, 2003 (20041) |
| REVIEW OR MODIFICATION DATE: | Fall Term, 2006 (20071) |

| COURSE TOPICS | | CONTACT HOURS PER TOPIC |
|---|---|---|
| I. Introduction (Safety and the Workplace) | | 12 |
| A. Biotechnology and the Workplace (1) | (2) | |
| B. Introduction to a Safe Workplace (2) | (2) | |
| C. Safely in the Laboratory: General Considerations and Physical Hazards (28) | (2) | |
| D. Working Safely with Chemicals (29) | (2) | |
| E. Working Safely with Biological Materials (30) | (2) | |
| F. Biotechnology and the Regulation of Medical and Food Products (3) | (2) | |
| II. Documentation and Math Review | | 19 |
| A. Documentation: The Foundation of Quality (5) | | |
| B. Basic Math Techniques (8) | (3) | |
| C. Proportional Relationships (9) | (3) | |
| D. Relationships and Graphing (10) | (2) | |
| E. The Measurement of Weight (15) | (3) | |
| F. The Measurement of Volume (16) | (3) | |
| G. The Measurement of Temperature (17) | (2) | |
| H. The Measurement of pH, Selected Ions, and Conductivity (18) | (3) | |
| III. Measurements Involving Light and Laboratory Solutions | | 12 |
| A. Measurements Involving Light A: Basic Principles and Instrumentation (19) | (2) | |
| B. Measurements Involving Light B: Applications and Methods (20) | (2) | |
| C. Preparation of Laboratory Solutions A: Concentration Expressions and Calculations (21) | (2) | |
| D. Preparation of Laboratory Solutions B: Basic Procedures and Practical Information (22) | (2) | |
| E. Lab Solutions to Support the Activity of Biological Macromolecules and Intact Cells (23) | (2) | |
| F. Solutions: Associated Procedures and Information (24) | (2) | |
| IV. Biotechnology Methods | | 17 |
| A. Introduction to Filtration (25) | (2) | |
| B. Introduction to Centrifugation (26) | (2) | |
| C. Introduction to Bioseparations (27) | (2) | |
| D. Extraction of DNA | (2) | |
| E. Electrophoretic Methods | (3) | |
| F. Polymerase Chain Reaction (PCR) | (3) | |
| G. Restriction Enzyme Analysis (REA) | (3) | |

PROGRAM TITLE: Biotechnology Laboratory Technology

COURSE TITLE: Introduction to Biotechnology Methods

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
1.2.1 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

2.1 Maintain a safe work area.
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)
2.2.1 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
3.2.1 Check and maintain equipment, logs, and perform preventive maintenance tasks according to schedule
3.2.2 Clean, organize, and sterilize materials when required
3.3.1 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

LIST PERFORMANCE STANDARD ADDRESSED: (continued)

NUMBER(S): TITLES(S):

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

4.1.1 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
4.2.1 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)

5.1.1 Identify decision to be made and compare alternatives
5.1.2 Make decision based on values and goals and evaluate decision made
5.2.1 Diagnose problem, its urgency, and causes

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.
8.2.2 Check calibration and perform systems diagnostics

**Florida State College At Jacksonville**

***Course Learning Outcomes & Assessment For All College Credit Courses***

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

*Section 1*

COURSE PREFIX AND NUMBER: **BSC 1404C**

SEMESTER CREDIT HOURS: **3**

COURSE TITLE: **Introduction to Biotechnology Methods**

*Section 2*

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

- ☐ **AA Elective**
- ☒ **AS Required Professional Course**
- ☐ **College Prep**
- ☐ **AS Professional Elective**
- ☐ **AAS Required Professional Course**
- ☐ **Technical Certificate**
- ☐ **Other** _____
- ☐ **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:

- ☐ **Communication**
- ☐ **Social & Behavioral Sciences**
- ☐ **Mathematics**
- ☒ **Natural Sciences**
- ☐ **Humanities**

*Section 4*

INTELLECTUAL COMPETENCIES:

- ☒ **Reading**
- ☒ **Speaking**
- ☒ **Critical Analysis**
- ☒ **Quantitative Skills**
- ☒ **Scientific Method of Inquiry**
- ☒ **Writing**
- ☒ **Listening**
- ☒ **Information Literacy**
- ☒ **Ethical Judgment**
- ☒ **Working Collaboratively**

***Section 5***

| | LEARNING OUTCOMES | METHOD OF ASSESSMENT |
|---|---|---|
| • | Explain and apply techniques of basic laboratory preparations, standard operating procedures, laboratory safety guidelines, and equipment operation. | Written tests, reports and/or use of equipment to demonstrate student competency in field. |
| • | Demonstrate knowledge of scientific method. | Formulate problem, make observations, derive and test hypothesis and make conclusions. |
| • | Communicate scientific ideas through oral or written assignments. | Students use analytical reasoning skills to solve problems on written tests and/or laboratory work. |
| • | 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. |
| • | 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. |
| • | 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: 3/4/05

**SECTION 7 <u>MUST</u> BE COMPLETED FOR ALL GENERAL EDUCATION COURSES.**

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