Section I: BASIC COURSE INFORMATION

Outline Status: **Approved Course**

1. **COLLEGE:** **L.A. VALLEY COLLEGE**

2. **SUBJECT:** **BIOTECHNOLOGY**

3. **COURSE NUMBER:** **003**

4. **COURSE TITLE:** **BIOTECHNOLOGY II**

5. **UNITS:** **4**

6. **CATALOG COURSE DESCRIPTION:**

This class expands concepts from Biomanufacturing I focusing on proteins & bioseparation methods. Protein purification and separation techniques including column chromatography, enzyme activity bioassays, gel electrophoresis(SDS- PAGE) and HPLC will be introduced. The use of immunochemistry and the applications of using antibodies in molecular biology will be explored and concepts and principles of fermentation will be introduced. Students can apply this knowledge in the manufacturing of commercial pharmaceutical products.

7. **CLASS SCHEDULE COURSE DESCRIPTION:**

This class expands the concepts from Biomanufacturing I and focuses on proteins and bioseparation methods. Techniques in protein separation and purification will be introduced as well as fermentation and the use of antibodies in molecular biology as it applies to the manufacturing of commercial pharmaceutical products.

8. **INITIAL COLLEGE APPROVAL DATE:** **10/11/2013**

9. **LAST UPDATE DATE:** **10/11/13**

10. CLASS HOURS:

	Standard Hrs Per Week (based On 18 weeks)	Total Hs per Term (hrs per week x 18)	Units
Lecture:	**2**	**36**	**2**
Lab/Activity (w / homework):	**0**	**0**	**0**
Lab/Activity (w /o homework):	**6**	**108**	**2**
Totals:	Lecture: **2**	Lecture: **36**	Lecture: **2**
	Lab: **6**	Lab: **108**	Lab: **2**
	Total: **8**	Total: **144**	Total: **4**
Totals In Protocol:	Lecture: **2**	Lecture: **36**	
	Lab: **6**	Lab: **108**	
	Total: **8**	Total: **144**	Total: **4**

11. PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT

Note: The LACCD's *Policy on Prerequisites, Corequisites and Advisories* requires that the curriculum committee take a separate action verifying that a course's prerequisite, corequisite or advisory is an "appropriate and rational measure of a student's readiness to enter the course or program" and that the prerequisite, corequisite or advisory meets the level of scrutiny delineated in the policy.

Prerequisites: **Yes**

Subject	Course #	Title	Units	Approval Date
BIOLOGY	**Biot 002**	**Biomanufacturing I**	**3**	**10/11/13**

Corequisites: **No**

Subject	Course #	Title	Units	Approval Date

Advisories: **No**

Subject	Course #	Title	Units	Approval Date

OTHER LIMITATIONS ON ENROLLMENT (see Title 5, Section 58106 and Board Rule 6803 for policy on

12. allowable

limitations. Other appropriate statutory or regulatory requirements may also apply):

Section II: COURSE CONTENT AND OBJECTIVES

1. COURSE CONTENT AND OBJECTIVES:

COURSE CONTENT AND SCOPE - **Lecture:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES - **Lecture:** Upon successful completion of this course, the student will be able to...*(Use action verbs - see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
1.Biotechnology- Proteins Basic principles and methods of protein separation Protein Synthesis in prokaryotes and eukaryotes Cloning (gene vs. organism) Biotechnology products	6	1 apply core concepts which includes knowledge of proteins- structure, synthesis and function as well as protein separation, immunochemistry and fermentation.
2.Protein Purification & Separation Techniques Basic Chromatography techniques Isoelectric focusing, column separation	9	2. apply concepts related to bioseparation and recovery and communicate these concepts using approprate terminology.
3.Fermentation Concepts and principles	6	3. develop specific purification strategies using appropriate technology/ techniques
4.Immunochemistry Antibody production Monoclonal/polyclonal antibodies –map columns Application of antibodies in molecular biology Protein/antibody engineering ELISA	9	4.identify and explain the function of process equipment.
5. Good documentation practices- cGMP Laboratory notebooks	3	5. apply concepts to the production of a therapuetic protein.
6.How to prepare effective and professional presentations	3	
Total:	36	
Total Lecture Hours In Section I Class Hours:	36	

*Total lecture and laboratory hours (which include the final examination) must equal totals on page 1.
**In general "activity" courses or portions of courses are classified "laboratory."

1. (cont'd) LAB:

COURSE CONTENT AND SCOPE - **Lab:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES – **Lab:** Upon successful completion of this course, the student will be able to...*(Use action verbs – see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
1.Gel electrophoresis (SDS PAGE) to separate and study protein fractions	9	1.apply procedures of bioseparations and recovery using appropriate techniques such as, but are not limited to: electrophoresis, chromatography, centrifugation, ELISA.
2.pH, refractometry	3	
3. TLC and conductivity analyzer techniques	3	2.analyze, evaluate and interpret research data and communicate this understanding using the appropriate terminology.
4.Protein recovery and purification and validation	9	
5.Recovery centrifugation-High speed and density gradient	6	3. document data and procedures utilizing appropriate cGMP.
6.Sterile Filtration	3	
7.Tangential flow filtration	4	4.demonstrate proper use of equipment.

8.Affinity Chromatography 9.Ion-Exchange Chromatography, selection of resins 10. Principles of chromatography 11.Validation/scale down 12. Principles of chromatograh Scale up 13.Large scale column packing and elution 14.HPLC-Electromagnetic detectors 15.Aseptic techniques 16.Microbial Fermentation 17.Microbial Media design and prep 18.Advanced technologies in Biotechnology: ELISA Column chromatography Enzyme activity bioassay-Standardization techniques Calculation of yield and specific activity Protein concentration and Yield	6 6 2 4 6 6 4 3 9 9 16	5. demonstrate the techniques required for successful growth and use of microbes such as asceptic technique, media design and prep.
Total: Total Lab Hours In Section I Class Hours:	108 108	

Essential Academic Skills: Reading and Communication

2. REQUIRED TEXTS AND SUPPLEMENTAL READINGS:

Provide a representative list of textbooks and other required reading; include author, title and date of publication:

Title	Author	Year
Introduction to Biomanufacturing	**Northeast Biomanufacturing Center & Collaborative**	**2012**
Basic Laboratory Methods for Biotechnology	**Seidman & Moore**	**2011**

3. READING ASSIGNMENTS:

If applicable, reading assignments in this course may include but are not limited to the following:

Assigned reading from texts and other sources such as journal articles.

4. WRITING ASSIGNMENTS:

Writing assignments, as required by Title 5, in this course may include, but are not limited to the following:

SOP design/writing, Batch record design/writing, reports of experimental results, log books, summary and analysis of guest lecture or other outside of class presentation.

Essential Academic Skills: Critical Thinking and Other Course Components

5. REPRESENTATIVE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING:

Provide examples of assignments, as required by Title 5, that demonstrate critical thinking.

Students will be required to analyze, evaluate and interpret experimental data and communicate this information using appropriate terminology.

6. SELF REFLECTIVE LEARNING:

If applicable, describe how students will reflect on their development as active learners. Provide representative examples below:

7. COMPUTER COMPETENCY:

If applicable, explain how computer competency is included in the course.

8. INFORMATION COMPETENCY:

If applicable, explain how information competency is included in the course.

Students will be required to evaluate, analyze and interpret experimental data. They will be required to communicate this information. Students will be able to incorporate their data to uses in biomanufacturing processes and their ethical implications.

Evaluation and Instruction

9. REPRESENTATIVE OUTSIDE ASSIGNMENTS (HOMEWORK):

Out of class assignments (Homework) may include, but are not limited to the following:

Assigned readings from the texts and other sources such as industry specific journal articles, assigned writings,

planning for oral presentations, problem sets.

10. METHODS OF EVALUATION:

Title 5, section 55002 requires grades to be "based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays, or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students." Methods of evaluation may include, but are not limited to the following (please note that evaluation should measure the outcomes detailed "Course Objectives" at the beginning of Section II):

Essays on exams, problem solving on exams, Objective exams, classroom discussion, Lab reports, projects,skill demonstration, participation.

11. METHODS OF INSTRUCTION:

Please Check All That Apply

- [x] **Discussion**
- [x] **Activity**
- [ ] **Field Experience**
- [ ] **Independent Study**
- [x] **Purposeful Collaboration**
- [ ] **Other (Please Explain)**

12. SUPPLIES:

List the supplies the student must provide.

Lab coats, eye protection, lab notebooks, gloves

13. DIVERSITY:

If applicable, explain how diversity (e.g., cultural, gender, etc.) is included in the course.

14. SCANS COMPETENCIES (required for all courses with vocational TOP Codes; recommended for all courses):

SCANS (Secretary's Commission on Necessary Skills) are skills the Department of Labor identified, in consultation with business and industry leaders, which reflect the skills necessary for success in the workplace. Check the appropriate boxes to indicate the areas where students will develop the following skills (please note that all SCANS competencies do not apply to all courses):

RESOURCES

- [x] **Managing Time:** Selecting relevant goal-related activities, ranking them in order of importance, allocating time to activities, and understanding, preparing and following schedules.

☐ **Managing Money:** Using or preparing budgets, including making cost and revenue forecasts; keeping detailed records to track budget performance, and making appropriate adjustments.

☒ **Managing Material and Facility Resources:** Acquiring, storing, allocating, and distributing materials, supplies, parts, equipment, space or final products in order to make the best use of them.

INTERPERSONAL

☒ **Participating as Member of a Team:** Working cooperatively with others and contributing to group's efforts with ideas, suggestions and effort.

☐ **Teaching Others New Skills:** Helping others learn needed knowledge and skills.

☒ **Exercising Leadership:** Communicating thoughts, feelings, and ideas to justify a position, encouraging, persuading, convincing or otherwise motivating an individual or group, including responsibly challenging existing procedures, policies or authority.

☐ **Negotiating:** Working toward agreement that may involve exchanging specific resources or resolving divergent interests.

☒ **Working with Cultural Diversity:** Working well with men and women and with people from a variety of ethnic, social, or educational backgrounds.

INFORMATION

☒ **Acquiring and Evaluating Information:** Identifying a need for data, obtaining the data from existing sources or creating them, and evaluating their relevance and accuracy.

☒ **Organizing and Maintaining Information:** Organizing, processing and maintaining written or computerized records and other forms of information in a systematic fashion.

☒ **Interpreting and Communicating Information:** Selecting and analyzing information and communicating the results of others, using oral, written, graphic, pictorial, or multimedia methods.

☒ **Using Computers to Process Information:** Employing computers to acquire, organize, analyze and communicate information.

SYSTEMS

☒ **Understanding Systems:** Knowing how social, organizational and technological systems work and operating effectively with them.

☒ **Monitoring and Correcting Performance:** Distinguishing trends, predicting impacts of actions on system operations, diagnosing deviations in the functioning of a system/organization, and taking necessary steps to correct performance.

☒ **Improving or Designs Systems:** Making suggestions to modify existing systems in order to improve the quality of products or services and developing new or alternative systems.

TECHNOLOGY

☒ **Selecting Technology:** Judging which sets of procedures, tools or machines, including computers and their programs, will produce the desired results.

☒ **Applying Technology to Tasks:** Understanding overall intent and proper procedures for setting up and operating machines, including computers and their reprogramming systems.

[X] **Maintaining and Troubleshooting Equipment:** Preventing, identifying, or solving problems with equipment, including computers and other technologies.

Section III: RELATIONSHIP TO COLLEGE PROGRAMS

1. THIS COURSE WILL BE AN APPROVED REQUIREMENT FOR AN APPROVED ASSOCIATE DEGREE OR CERTIFICATE PROGRAM: No

a. If yes, the course will be a portion of the "approved program" listed on the State Chancellor's Inventory of Approved Programs (approved programs can be found on the State Chancellor's Office website at https://misweb.cccco.edu/webproginv/prod/invmenu.htm..

NOTE: In order for a course to be approved as a requirement for an associate degree or certificate program, the program must be listed on the State Chancellor's Office *Inventory of Approved Programs* AND the course must be listed in the college catalog as either a requirement or an elective for the program. If course is not part of an approved program at the college adopting the course, it will be considered to be a "stand-alone" course, and is subject to the State Chancellor's approval criteria. The college must complete and submit the Chancellor's Office "APPLICATION FOR APPROVAL OF CREDIT" form. Certain courses are granted "blanket approval" by the State Chancellor's Office and do not require separate approval. See the Chancellor's Office *Program and Course Approval Handbook* for details. LACCD Skills **Certificates are not State approved programs** and are not listed on the Chancellor's Office *Inventory of Approved Programs.*

2. GENERAL EDUCATION REQUIREMENTS FOR THE ASSOCIATE DEGREE STATUS:

a. Area requested: **None**

b. Area requested: **None**

Section IV: ARTICULATION INFORMATION

(Complete in consultation with College Articulation Officer)

1. TRANSFER STATUS:

a. Transferable to the University of California: **No**

c. Transferable to the California State University: **No**

b. UC Approval Date:

d. College Approval Date:

2. GENERAL EDUCATION FOR TRANSFER:

IGETC Certification:

a. Area requested:
b. Date requested:
c. IGETC Approval Date:

If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

CSU Certification:

a. Area requested:
b. Date requested:
c. CSU Approval Date:

If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in CSU Certification Guidelines.

IGETC Certification:

a. Area requested:
b. Date requested:
c. IGETC Approval Date:

If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

CSU Certification:

a. Area requested:
b. Date requested:
c. CSU Approval Date:

If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in CSU Certification Guidelines.

3. MAJOR REQUIREMENT FOR TRANSFER:

Will this course be articulated to meet lower division major requirements?

List college/university and the majors:

CAN NUMBER:

CAN Approval --

Date requested:

CAN SEQUENCE #:

Date approved:

Section V: SUPPLEMENTAL COURSE INFORMATION

1. **DEPT/DIVISION NAME:** **Biological Science**

2. **DEPT/DIVISION CODE:** **15**

3. **SUBJECT CODE** : **923**

4. **SUBJECT ABBREVIATION** : **BIOTECH**

5. **RECOMMENDED MINIMUM QUALIFICATION AREA**:

6. **ABBREVIATION FOR TRANSCRIPTS** : **BIOTECH II**

7. **DEGREE CREDIT:**

   Indicate whether the course meet the "standards for approval" for degree credit course set forth in Title 5, section 55002(a)(2), which requires the course to have a degree of intensity, difficulty, and vocabulary that the curriculum committee has determined to be at the college level: **Degree Applicable**

8. **GRADING METHOD** : **LETTER GRADE**

9. **REPETITIONS:** # of times repeated for credit : **0**

10. **PRIOR TO TRANSFERABLE LEVEL**

    This course attribute applies to ***English, Writing, ESL, reading and mathematics*** courses ONLY. If applicable, indicate how many levels below the transferable level this course should be placed: **Not applicable**

11. **CREDIT BASIC SKILLS**

    Title 5, section 55000(j) defines basic skills as "courses in reading, writing, computation, and English as a Second Language, which are designated as non-degree credit courses pursuant to Title 5, section 55002(b)." **No**

12. **CROSS REFERENCE**

    Is this course listed as equivalent in content to existing College/District courses in another discipline? **No**

If Yes, list courses (documentation of cross-discipline agreement must be provided):

13. COURSE SPECIFICALLY DESIGNED FOR STUDENTS W/ DISABILITIES

Title 5, section 56029 allows a course to be repeatable when continuing success of the students with disabilities is dependent on additional repetitions of a specific class. Is this course designated as an "approved special class" for students with disabilities? **No**

If yes, provide an explanation of how this course meets the requirements of Title 5, section 56029.

14. COOPERATIVE EDUCATION STATUS -

Title 5, section 55252 allows for two types of Cooperative Education: 1) General Work Experience Education -- i.e., supervised employment, which is intended to assist students in acquiring desirable work habits, attitudes and career awareness, which need not be related to the students' educational goals; or 2) Occupational Work Experience Education -- i.e., supervised employment, extending classroom based occupational learning at an on-the-job learning station, which is related to the students' educational or occupational goal. Is this course part of the college's approved cooperative work experience education program? **No**

15. COURSE CLASSIFICATION: Credit Course

Note: A course's Classification, TOP Code and SAM code must be aligned – e.g., Courses with an "Occupational" Course Classification must have an "Occupational" TOP Code and a SAM Code of A, B, C, or D; courses that do not have an "Occupational" Course Classification cannot have an Occupational TOP Code and must have an "E" SAM Code. Courses coded as "basic skills" in #11 should be coded "Adult and Secondary Basic Skills."

16. TOP CODE - (6 digits XXXX.XX) **0430.00**

Course content should match discipline description in Taxonomy of Programs found here: Taxonomy Of Programs website

17. SAM CODE (**S**tudent **A**ccountability **M**odel): **C**

18. FUNDING AGENCY CODE:

19. STATE COURSE ID:

Section VI: APPROVAL STATUS

1. APPROVAL STATUS:

			Approval Date Of	Board Date	Approved Effective Semester
a.	[X]	New Course	College: **10/11/13**	Board: **1/15/14**	Effective Semester:
b.	[ ]	Addition of Existing District Course	College:	Board:	Effective Semester:
c.	[ ]	Course Change*	College:		Effective Semester:
d.	[ ]	Outline Update	College:		Effective Semester:
e.	[ ]	Archive Course	College:		Effective Semester:
f.	[ ]	Reinstate Course	College:	Board:	Effective Semester:

Section VII: APPROVAL INFORMATION FOR NEW OR ADDED COURSES

(complete in consultation with Department Chair and the appropriate Academic Administrator)

1. ORIGINATOR: **Byrd-Williams, Pamela**

2. DEPARTMENT: **Biological Science**

3. IF THIS IS A NEW COURSE, INDICATE HOW THE COLLEGE PLANS TO MEET THE EXPENSE OF THIS COURSE:

[X] By additional funds. Describe:

This course will be supported by a Federal Department of Labor Grant awarded to Job Training until Fall 2015, after which time it will require FTEF and funding from the college.

[ ] By deleting courses from the college catalog and course database. List specific courses to be deleted:

[ ] By deleting sections of existing course. List courses and number of sections to be deleted:

First Year: Second Year: Third Year:

[ ] By rotating sections of existing courses. List courses and number of sections to be rotated, as well as the semesters in which they will be offered:

4. IMPACT

IMPACT -- Will this course directly impact other course offerings and/or associate degree or certificate programs on campus?

(If yes, briefly explain how)

This course will be part of a stackable certificate program and may be part of an Associate Degree program in Biotechnology.

5. METHOD OF SUPPORT

-- Indicate how the college plans to support the proposed course:

A. Additional staff -- List additional staff needed:

This class will require additional faculty and an additional Laboratory Technician. Initial support will be provided by the grant, after Fall 2015 support from the college will be required to fund both positions.

B. Classroom -- List classroom type needed:

Lecture and dedicated laboratory space. Enrollment is limited to 20-24 students due to safety concerns of equipment and biohazardous chemical use within the lab. Enrollment is limited to 20-24 students due to safety concerns of equipment and biohazardous chemical use within the lab. Therefore 2 laboratory sections per lecture class is required.

C. Equipment -- List new equipment needed and indicate funding source for any new equipment:

1-2HPLC Systems,2-4 Bioreactors, 1-2 LC Chromatography systems, 1 Analyzer unit, 1 spectrophotometer, 1 top loading autoclave, 1 refrigerated centrifuge. All equipment will be purchased by the grant. After Fall 2015 service agreements and maintenance contracts will require funding from the college.

D. Supplies- List supplies and indicate dollar value:

Plastic disposables, chemical reagent replacements. The total cost of supplies per class will be approximately $1052 per semester.

E. Library/Learning Resources- The course initiator shall consult with the College Librarian and review the college library, book, periodical, and electronic resource collections relevant to this course. List additional titles and resources to be considered for purchase as funding permits:

Journalof Biotechnology (Elsevier) Journal of Manufacturing Science and Production Journal of Manufacturing Process Biotechnology and Bioprocess Engineering (Springer) Nature Biotechnology Journal of Biotechnology (Elsevier Applied Microbiology and Biotechnology (Springer) Biotechnology Journal (Wiley)

CERTIFICATION AND RECOMMENDATION

[X] This course meets Title 5 requirements for Associate Degree applicable college credit towards an Associate Degree.

[ ] This course meets Title 5 requirements but does not satisfy the requirements for an Associate Degree applicable course.

We certify that the information and answers above properly represent this course.

Originator	
Department/Cluster Chairperson	
Articulation Officer	
Librarian	
Dean (If applicable)	
Curriculum Committee Chairperson	
Academic Senate President	
Vice President, Academic Affairs	
College President	

Section VIII: ADDENDA

(Uploaded Documents)

Type	Addendum Description	File	Delete	To View
Prerequisite Document	*Prerequisite validation form Biomanufacturing II 003*	*88363_900_PrerequisiteValidationForm 003.doc*	*Delete*	*View It*
General	*New Course Addendum Biomanufacturing II, Biot 003*	*New Course Addendum Bioman II 003.doc*	*Delete*	*View It*
SLO Addendum	*Bioman II Course SLO Addendum Biot 003*	*Bioman II Course SLO Bio T 003.doc*	*Delete*	*View It*