CSU Channel Islands

Self-Study for Program Review

Program Name: **MS in Biotechnology and Bioinformatics**

Date: **July 5, 2016**

Chair or Faculty: **Dr. Nitika Parmar (Program Director)**

Programs are invited to use this Program Self-Study Template to assist them in organizing their review materials and data for the self-study portion of their Program Review. In completing this Template, program faculty should be familiar with the ***CSU Channel Islands Guidelines for Program Review***, which outlines the full program review process and explains the elements that should be contained in the self study. Faculty will find important statistical information about their program in the interactive Data Packs located on the Institutional Research office's website.

The Program Self- Study Template is organized into *Four Elements of Review* that describe the main dimensions of the self-study: the program's goals and objectives, the assessment of learning, resources and program capacity, and program planning. Within each of these elements of review are more specific *Criteria for Review.* These criteria each ask for responses and data which indicated the degree to which the program has satisfied that criterion. Each *Criterion of Review* also asks the program to provide comments, which can include reference to information about program practices and statements about program strengths, weaknesses, and areas of improvement. These comments can also include recommendations for improvement, whether that improvement should be initiated at the program, division, or university level

Finally, at the end of the Program Self-Study Template, program faculty will find space to make summary comments and recommendations, expressing their general observations and key suggestions for program improvement. These summary recommendations should be grouped as two-and five-year actions. These recommendations will be particularly important as they will receive direct attention by external reviewers, administrators, and members of the Program Assessment and Review Committee (PARC) in the next stages of the program review process.

Program Review as Self- Assessment. The Self-Study is an opportunity for program faculty to engage in a self-assessment of the program's strengths and areas of improvement. As a collective effort by the faculty, it provides the occasion for reflection on program priorities, current strengths, expected opportunities, and needed improvements. To facilitate this self-assessment, the Program Self-Study

Template includes a rubric and scoring key, allowing the program to evaluate how fully the program satisfies each of the *Criteria of Review.*

Self-Study Rubric Scoring Scale		
SCORE	**STAGE**	**DESCRIPTION**
1	**Initial**	The program is at a preliminary stage in this practice. The program shows the need for additional policies, resources, or practices in order for it to provide the education program to which it is committed or aspires. Insufficient data is available to make determinations.
2	**Emerging**	The program partially satisfies the criterion. The program has many, but not all, of the policies, practices, and resources it needs to provide the educational program to which it is committed or aspires. Some data is available documenting this dimension.
3	**Developed**	The program satisfies this criterion, with developed policies and practices. The program has the availability of sufficient resources to accomplish its program goals on this dimension. Data demonstrates accomplishment of this criterion.
4	**Highly Developed**	The program fully satisfies this criterion. The program may serve as a model and reference for others on campus. The program's practices, policies, and/or its resources contribute to program excellence on this dimension.

Programs are asked to provide a self assessment score for each criterion, using the University as a basis of comparison. This score should reflect a consensus among program faculty and is designed to highlight areas of strength and needed improvement as seen by the discipline.

Program Self-Study Template

Element One: Program Purpose and University Goals		
CRITERION FOR REVIEW	**INQUIRY**	**Self-Assessment SCORE**
A. Program Mission and Operating Practices	Does the program have a mission statement or statement of program goals that is appropriate? Does the program have an organizational structure and procedures for its key activities such as advising, scheduling, chair selection and review?	**4**

Evidence and Comments:

The Master of Science in Biotechnology and Bioinformatics at CSU, Channel Islands (CI) is a professional science master (PSM) degree program designed to meet the needs of biotechnology industry and related public and private agencies and organizations. The program falls within the categories of STEM (Scientific, Technology, Engineering, and Mathematics) fields. STEM occupations are the sixth-largest cluster and will also provide the sixth-largest share of job openings in the U.S. economy over the next decade. In 2008, STEM occupations accounted for about 7.3 million jobs, or about 5 percent of the 147 million in the U.S. economy. By 2018, they are projected to increase to 8.6 million jobs, or 5.3 percent of the nation's 162 million total positions. The STEM occupations are broadly represented in all industries, but are most concentrated in the Professional and Business Services (21 percent) and Information Services (14 percent) industries, to which the graduates of our program will belong. This cluster of occupations is forecast to provide 2.8 million job openings through 2018, including 1.2 million net new jobs and an additional 1.6 million replacement openings. It is important to note that the STEM occupations generate the technological changes that shape all other occupations.

The MS Biotechnology program is offered by the Extended University (EU) at CI. The program combines rigorous scientific training in interdisciplinary areas in biotechnology, bioinformatics, biomedical engineering and stem cell technology with course work and experience in business management and regulatory affairs. The program offers three distinct emphases: biotechnology, biomedical engineering, and stem cell technology and laboratory management (SCTLM). The program currently runs on a four-term/year basis, each term consisting of 12 weeks. This format will change in January 2017 to a conventional semester term basis with the fall and spring semesters consisting of 16 weeks each and the summer semester consisting of 12 weeks. The MS Biotechnology program is also associated with the MS Biotechnology and MBA dual degree

program which started in fall 2007.

The program has admitted a diverse population of students, with at least 25% of the graduates served by the program being underrepresented minorities (URM), according to the standards of the National Science Foundation and the National Institutes of Health. Considering the graduate level of the program, this provides strong evidence of accessibility of the program. Typically all of the graduates from the program have either been employed by the biotechnology industry or have gained entry into professional or graduate programs.

Instructors for the program include science faculty members from the biology and chemistry programs at CI as well as experts from the biotechnology industry. All classes are scheduled during the evenings and weekends to accommodate the needs of working adults allowing them to enroll and complete the programs. Classes are offered both at the main CI campus as well as the Extended University Campus in Thousand Oaks, which is close to the hub of the biotechnology industry, allowing easy access of working adults to the program.

Mission Statement: The MS Biotechnology degree provides students with analytical, business, and managerial skills along with sophisticated expertise in biotechnology and computational sciences for a diverse set of vocations. Qualified graduates will be able to engage in research, development, and management in biotechnology, work in the pharmaceutical industry, conduct scientific research, or enter into the teaching or consulting profession.

The program is headed by the Program Director Dr. Nitika Parmar who was appointed by the Associate Vice President (AVP) of EU Dr. Gary Berg. Dr. Parmar selects and assigns the faculty, who include CI Biology tenure-tenure track faculty, industrial scientists and world-class entrepreneurs. Since the programs are offered via EU, they are not state supported. Therefore, students pay special tuition and the professors are paid separately by EU. Students in the program have full access to the CI library. Students also receive writing support, career counseling, new student orientations, program advising and more, all of which are funded by EU. The program has a well-established organizational structure and procedures for scheduling and advising as delineated below:

a. *Program organization chart and policies (Please see appendix A for the Organizational chart)*

b. *Structure and procedures to support program leadership*: The MS Biotechnology program is supported by the CSU Channel Islands Extended University department which provides an array of support services that include advising, class scheduling, marketing and recruitment, orientation, faculty hiring, budget planning, financial services, course

registration, and grant administration support. Support to the program director includes lab tech services, instructional contract services, budget and finance support, program marketing, IT support, admissions, records and advising support as well as all student services. Please refer to the Extended University organizational chart for more information. For most support needs, the Program director works directly with the necessary staff depending on the nature of the need. On larger projects, The Program director may work with the Extended University Operations Director or other Administrative staff to organize and execute work. For EU student policies and services, please visit- http://ext.csuci.edu/student-services/index.htm

c. Scheduling: As director of the Program, Dr. Parmar schedules MS Biotechnology classes with assistance from Brianne Keighley, Extended University Programs Advisor, and Rosario Cuevas, Operations Support Analyst. A course offering form is completed by the Director every term and submitted to the support analyst after receiving confirmation from all instructors who have been invited to teach a course. The list of courses offered is then made available to the students via the advisor using a variety of means- both electronically via Peoplesoft and in-person.

d. Advising: Students in the program are provided academic advising by the Extended University Records and Advising Specialist, Brianne Keighley. Students may also be referred to contact the Program Director for more in depth questions regarding the program and curriculum. Advising is done via e-mail, phone as well as in-person. Typically an average of 10 students seek advising meetings per month. The first information that students receive regarding advising is included in their "Welcome to CI" email that is sent to them from the Admissions Specialist once they submit their Intent to Enroll and deposit. This information directs them to contact Brianne to create their individual roadmap and determine which classes they should enroll in for their first term. Advising information is also included in its own video presentation in the Extended University "nuts and bolts" online portal for new students. These nuts and bolts videos are aimed to provide students with a comprehensive overview of different student service areas related to their specific degree program. Students are sent information on how to access this online portal after they submit their Intent to enroll from. They are recommended to watch all videos before they attend their in-person program Orientation. The MS Biotechnology advising video presentation includes detailed information on the following topics: advising appointments, program format, selecting an emphasis, prerequisites, grade requirements, academic standing, GWAR (Graduate Writing Assessment Requirement), graduation and commencement, and Records forms.

It also includes links to the Extended University student services webpage which houses the MS Biotechnology academic calendar and current schedule. Students are responsible for contacting Brianne to arrange their first advising appointment. During this appointment, students will discuss the different emphases. Once an emphasis is selected, they will work with Brianne to create a "roadmap" which outlines which classes they will take each term in order to graduate. There are standard roadmaps created for each emphasis, yet students may have individual preferences to adjust this roadmap to accommodate a certain pace or timeline, or work around a possible life event. Some students may request to put together multiple roadmaps that they will then review and decide which one is best for them. Brianne will also remind the students about grade requirements, GWAR, and instructions on how to enroll in their first courses. Roadmaps are saved on the computer and are often printed for the student to take with them. They are also emailed to the student upon request. After the initial first meeting with an advisor, students are encouraged to maintain contact with Brianne throughout the course of the program. Many students will contact Brianne via email with questions regarding course selection before they enroll. Students may also contact Brianne to look into changing their emphasis, discuss reducing their course load, or explore taking some time off from the program. Students who fail a course, or who are placed on academic probation, are also encouraged to contact Brianne for advising to revise their roadmaps and create a plan to retake the failed course or raise their GPA. Students are also encouraged to meet with Brianne prior to applying for graduation. At that time, Brianne will conduct an initial graduation review and update the student to what classes they have left to complete. She will also verify that they are applying for the correct graduation term. Students may "meet" with their advisor in several ways. Brianne is available to meet in person at her office on the main campus, as well as by appointment at the Thousand Oaks campus. These appointments may be arranged in advanced by calling or emailing Brianne. Walk-ins are also accepted by Brianne at her Camarillo office. Brianne is available Monday through Friday 8am-5pm. Some students are unable to meet in person, so alternative methods are used to conduct advising. A student may call or email Brianne to create a roadmap. Brianne will verify which emphasis they are pursuing, as well as the timeframe in which they wish to complete, and then send their roadmap to them via an email. Students are then encouraged to review the information emailed to them and reply to the email or call Brianne if they have any questions. If the student prefers a phone appointment, Brianne will gather information beforehand, email them the roadmap, and then conduct the phone appointment. As the program is in transition to a new schedule, in addition to the new website refresh project, there are

currently no online advising resources for the MS Biotechnology program. Now that the new schedule is close to being finalized, and the new website is set to launch in late summer 2016, advising resources will soon be posted to the Extended University website and will be available for prospective and current students to view. These resources will include projected course offerings as well as sample roadmaps by emphasis.

e. Faculty hiring and evaluation: The program Director selects and assigns faculty, who include MS Biotechnology tenure-tenure track faculty and lecturers with unique experience in the field. Because the program is administered through Extended University, instructors are hired and paid through that unit in accordance with the 125% rule. Although there is no direct written process for hiring, the program director meets with prospective faculty and peruses their CVs and qualifications before making the offer. The faculty are then requested to fill out a processing form which is then processed by Academic Affairs and Human Resources to complete the on-boarding process. Student ratings of teaching (SRT) are performed for every section of every course. Peer evaluations of teaching are performed for all new instructors and additionally as determined by Dr. Parmar.

B. Program Relation to University Mission	Is the program supportive of the University's mission and strategic goals? Is its program integrated and supportive of the campus's four mission centers, its general education program, and Academic Affairs and University's strategic priorities?	**4**

Evidence and Comments:

The Program Director Dr. Parmar, was involved in the planning of the program curriculum from 2006-2009 and aligning it with Ci's four mission centers. The program is well integrated into all four pillars. Consistent with the University's mission, the program emphasizes graduating researchers with a global and multicultural perspective. In addition to coursework that fosters experiential learning and integrative approaches, the program offers world-class internship experiences. The program's large number of international students and its cultural and diverse curriculum ensure diversity and an international perspective. The curriculum takes an integrative, interdisciplinary approach in alignment with CI's four pillars. The curriculum has undergone changes since its inception in response to industry and workplace demands, and has proven to be resilient and yet cutting edge, and effective in preparing STEM researchers to serve our local, regional, national and international communities. The program's goals include-

- Conducting an annual program of assessment, including an exit survey (currently Mr. Douglas Lane conducts and manages the assessment process).

- Continuing to conduct a separate admissions process for the SCTLM emphasis that is funded by a grant from CIRM. This feature of our admission process, established in 2009, sets CI's MS Biotech program apart and has resulted in higher caliber and more highly qualified students.

- Converting its current special sessions 12-week terms to the semester calendar, aligning with the main campus, effective spring 2017 in response to a CSU directive from the Chancellor's Office.

C. Dissemination of Program Mission and Goals	Has the program disseminated information about itself to key constituencies, including faculty, professional colleagues, current and prospective students, and the community?	**4**

Evidence and Comments:

The EU Marketing and Recruitment team, headed by Dr. Janet Egiziano, is charged with disseminating information about and recruiting students to the MS Biotechnology program. Marketing and advertising efforts are ongoing, year-round. Data collected through customer relationship management software (CRM) shows that between 2011-2016 advertising and marketing efforts produced 880 inquiries about the program. Marketing and advertising targeted to prospective students include the following:

- Search Engine Marketing (SEM) and Search Engine Optimization (SEO) – Mobile, desktop and tablet advertising on Yahoo, Google, Bing, Noozhawk, VC Star online, Job seekers websites, and relevant professional websites. Ads placed on these sites drive traffic to the MS Biotechnology home page on the EU website. Those who click on the ads are re-targeted for additional ads wherever their location.
- Geo Targeting - Delivery of online advertising to Ventura County, Western LA County, Malibu, portions of San Fernando Valley.
- Geo Fencing - Delivery of online advertising to individuals when they are physically at specific locations such as other universities, relevant major businesses and institutions, and more. Ads are re-targeted to individuals after they leave the physical site.
- The use of customer relationship management software (CRM) assists recruiters in initiating and maintain effective communication with prospective students from the moment of inquiry to application, to enrollment, to graduation, to alumni status.
- Print advertising – VC Star; magazines, other periodicals; event programs
- *CI Connection* – EU monthly e-newsletter
- EU website
- Program Brochure – print and electronic
- Relevant Career Fairs – CI campus and other paid opportunities
- Social Media – Facebook, Instagram, LinkedIn

- GRE Test Prep Course – Low cost, 18-session course funded and administered by EU. Aids in recruitment. Advertising in GEO targeted and GEO fenced areas increases awareness of CI's MS Biotechnology.
- Information sessions – In-person, live online and videotaped.
- Tabled events – Relevant companies host tabled events for their employees that are arranged through the Consortium of Southern California Colleges & Universities.
- Networking meetings and events.

In addition to the above strategies, information is disseminated to current students, alumni, key constituencies, faculty, and professional colleagues through the following:

- Email communications
- Direct mail
- Printed and e-flyers
- Electronic message boards on campus

Summary Recommendations for Element One:

a. Continue advertising the program via a variety of means and market it internationally. Program Director will be undertaking international travel to conduct recruitment drives.

b. Collaborate with the EU Marketing team more frequently in determining the best avenues for program promotion.

c. Expand advising sessions and have mandatory advising session with program director for students in the SCTLM emphasis.

d. Finalize the schedule for the transition from term to semester basis, effective January 2017.

II. Element Two: Achieving Educational Outcomes

CRITERION FOR REVIEW	INQUIRY	SCORE
A. Curriculum Requirements and Expectations for Learning	Do the program's curriculum and degree requirements reflect high expectations of students? Is that curriculum reflective of current standards in the discipline?	4

Evidence and Comments:

Consistent with the CSU Channel Islands mission, the Master's program "facilitates learning within and across disciplines through integrative approaches", "emphasizes experiential and service learning", and "graduates students with multicultural and international perspectives". The purpose of the program is to meet the need for a well-trained workforce in the field of biotechnology to produce a pipeline of talent and human capital that fosters growth and prosperity for the biotechnology industry in the State of California and the nation. The target

populations are the working adults in the related industry and fresh graduates from bachelor's programs, who are ready to take on graduate level curriculum. Distinctive features of the Master's program are that courses are grounded in the latest research and cutting-edge practice and candidates engage in active learning consistent with the principles of adult learning. The program design is geared toward the needs of working professionals who are place-bound. Another distinctive feature is the strong partnership between CSU Channel Islands and local biotechnology industry. The strengths of the program are embedded in the curriculum design and implementation. The philosophy of this program is to implement an academic program at the graduate level that combines the modern scientific theories and current applications in the field of biotechnology. The program is adaptive to the fast changing field of biotechnology and is highly flexible in its implementation. The program blends rigorous scientific training in interdisciplinary areas in biotechnology, bioinformatics, biomedical engineering and stem cell technology with course work and experience in business management and regulatory affairs. The program offers three emphasis: biotechnology, biomedical engineering and stem cell technology and laboratory management. All emphases share a set of four core courses and each also has its own set of required courses in addition to free standing elective courses. Biotechnology is centered in the laboratory and employs sophisticated molecular biology techniques for applications in human and animal health, agriculture, environment, and specialty biochemical manufacturing. This requires well-trained individuals in the fields of biotechnology and bioinformatics. Biomedical engineering is an interdisciplinary field, fusing molecular and cellular life sciences with contents in engineering analysis, design, and synthesis approaches, business management, bioethics, law and regulation, and globalization of biotechnology. It introduces the principles and applications of bioinformatics, biomechanics, biorobotics, biomaterials, nanotechnology, genetics, cellular, tissue and organ engineering, biomedical instrumentation and devices, biosensors, and medical imaging in biological systems. Stem cell technology and laboratory management introduces the current knowledge and highly specialized technical skills in the stem cell field and trains technical and managerial personnel in stem cell research and development. Our approach also includes team projects drawn from biotechnology industries to focus on real-world problems and applications of biological sciences, internships and to inculcate interpersonal as well as problem-solving skills using multiple perspectives. Graduates from this program will develop analytical, managerial and interpersonal skills along with sophisticated expertise in biotechnology, bioinformatics, biomedical engineering or stem cell technology. They will be ready to make immediate contributions to scientific research and development, management in biotechnological, biomedical, biomedical engineering, and pharmaceutical industries, biotechnology law and regulations, governmental or environmental agencies, research institutes, consulting firms, research and clinical laboratories,

private and public health organizations, or education.

The MS Biotechnology degree is an intensive program that requires students to remain committed and focused. Currently students attend four 12-week terms. Approximately 65% of students are full-time working professionals and many are balancing work, family and school life. To be accepted into the program, applicants must have completed an undergraduate degree in Biology, Biochemistry, Pharmacy, Chemistry or Bioinformatics. The program requires a minimum of 12 core units (4 common courses) for all students in the three emphases as well as required courses within each emphasis (12-16 units; 4-5 courses) in addition to free electives (7-10 units; 3-4 courses). In total students are required to take 34-35 units for the degree program. GWAR requirement is fulfilled by one course. The degree satisfies the CSU requirement for a culminating experience in the following manner- for the Biotechnology and Biomedical Engineering emphases, all students complete BIOL 600 Team Project; for the Stem Cell Technology and Laboratory Management emphasis, students complete BIOL 602 Stem Cell Technology Internship.

In BIOL 600, students work individually and in teams to analyze, research, discuss, and report on subjects relevant to the biotechnology industry. In BIOL 602, which is a required four-term project, students conduct original research in an active stem cell research laboratory at various research universities and institutions, outside of CI. The Program has formed formal agreements with research institutions and biotechnology companies, including UC San Diego, UC Riverside, UC Berkeley, UC Santa Barbara, UC Davis, University of Southern California, Stanford University, Cedars Sinai Institute, the Scripps Research Institute, City of Hope Beckman Research Institute and Children's Hospital of LA, to host our graduate student interns. All courses culminate in an individual final written report and an oral presentation at the Biotechnology Program Colloquium. Currently efforts are being made to establish internships for the Biotechnology and Biomedical Engineering emphases.

(Please see Appendix B for a list of all courses for the three emphases and Appendix C for a representative list of course syllabi)

B. Course and Program Learning Outcomes	Has the program developed assessable learning outcomes for its courses and for the program? Are course learning outcomes aligned with program outcomes?	**4**

Evidence and Comments:

The Master of Science in Biotechnology and Bioinformatics is designed to foster the ability to apply knowledge and skills in the research and development efforts in the general field of

biotechnology. The Program is meeting that need by producing graduates educated with cutting-edge knowledge and skills in the field of biotechnology and providing opportunities for experiential learning and application of the knowledge and skills in real-world projects through the program. The program learning outcomes are well established-

- Graduates from this program should develop a comprehensive understanding of scientific principles which underlie biotechnology and bioinformatics.
- Graduates from this program should develop expertise in contemporary techniques used in biotechnology and bioinformatics.
- Graduates from this program should develop analytical and interpersonal skills and become familiar with regulatory and management issues as they relate to the biotechnology industry.
- Graduates from this program should develop skills that make them attractive for employment and/or advancement in the biotechnology sector and related fields

Students who successfully complete the MS Biotechnology degree will be able to:

- Work in cross-disciplinary teams to address questions of relevance to the biotechnology industry through the design and implementation of databases that integrate computational biology and empirical analyses.
- Explain techniques used to make biological inferences from protein and nucleic acid sequences.
- Identify biologically relevant problems in biotechnology, biomedical, and agricultural research.
- Outline the state and Federal regulatory processes that govern the biotechnology industry.
- Explain fundamental principles that underlie modern techniques in biotechnology.
- Demonstrate proficiency in performing fundamental molecular biology techniques.
- Each course has its own learning objectives.

The course and program learning outcomes are assessable and align with each other.

Please see Appendix D for the entire list of course learning outcomes for each course. A PLO matrix is included. Since this assessment just started in spring, 2016 each of the Spring classes assessed is shown an "I". Previously no PLO matrix was synthesized.

C. Learning Outcome Data and Analysis	Does the program regularly collect course and program learning data? Is that data analyzed, available, and used for program improvement?	**3**

Evidence and Comments:

The MS Biotechnology program created an assessment plan in 2011 and an assessment was undertaken in 2012 for two courses-BIOL504 and BINF500 to assess program objectives 1 and 2

(objectives 3 and 4 still need to be assessed). A preliminary Curriculum Analysis was also done for courses taught from 2006-2008 but this covered only courses required for the Biotechnology emphasis. Assessment has not been done regularly since 2013. To address this shortcoming, in January, 2016 an Assessment Coordinator, Mr. Douglas Lane was hired and was charged with synthesizing a new assessment plan and assessing two program learning goals for 10 courses offered in spring, 2016. Faculty were provided with a scoring rubric for each student learning outcome (SLO). Although an assessment report was submitted by the coordinator in June 2016, the program faculty did not meet in the summer inter-session to discuss an action plan for improving student learning. A program faculty meeting addressing the assessment results will be convened where all faculty teaching for the program will be invited to provide input into outcomes achievement.

Starting summer, 2016, we plan on assessing one or more SLO each term depending on the courses offered with a goal of assessing all within a one-year period. We also plan on conducting an annual exit survey of students in their last term of the program. Our goal is to assess all courses annually, analyze the data, discuss the outcomes at a faculty meeting, collectively determine a single, unique change to make for each learning outcome and assess the effectiveness of that change in the next assessment cycle, thereby closing the loop.

Please see Appendix E for the preliminary assessment, current assessment plan and SLO data analysis.

Student ratings of teaching (SRT) are performed for every course each term enabling us to gauge student learning and make necessary changes if required.

D. Timeliness of Degree Attainment	Do students in the program attain the degree in a timely fashion?	**4**

Evidence and Comments:

The average time to degree completion between fall 2012 and fall 2015 was 22 months for the entire program. Students enrolled in the SCTLM emphasis take longer to graduate (24 months) versus students enrolled in the BME and Biotech emphases (20 months). 36% of students completed the degree in 12-18 months while 64% completed the degree in 18-27 months. One student took 33 months to complete the degree. As the MS Biotech program is a PSM degree, students take variable amounts of time for degree completion since flexibility with regard to the number of units taken per term is allowed. Students typically take 6-12 units per 12-week term year-round and depending on their specific emphasis requirements and pre-requisites, time to degree completion is influenced by the number of units required upon entering the program and also on whether students adhere to their curriculum roadmaps and attend full-time or part-

time. Retention data has not been tracked.

E. Involvement of Students in Curricular Activities	Are students active participants in the learning process? Does the program provide opportunities for students to participate in curricular-related activities, such as clubs, fieldtrips, competitions, research and creative opportunities, service learning experiences, performances, and internships?	**3**

Evidence and Comments:

The program provides opportunity for research and creative activities to students via research embedded within the didactic course (BIOL502, BME 501, BME502), a Special Topics course (BIOL590), a Directed study course (BIOL597) and a Team Project (BIOL600). A unique feature of the SCTLM emphasis is the requirement of the 1-year internship at an off-site research institute. Students I this emphasis enroll in BIOL602 and complete a rigorous hands-on internship in the field of stem cell technology. This internship is facilitated by the CIRM award to CI. The program hosts one mixer each year for current students and alumni. Students and alumni have an opportunity to network with scientists from the local biotech companies (such as Amgen and Baxalta), faculty from other academic institutions (such as UCSB and UCLA), as well as CI faculty and administrators.

F. Advising and Academic Support	Does the program provide adequate student advising? Are its students supported in other venues such as EOP, career services, and disability accommodation?	**4**

Evidence and Comments:

MS Biotechnology students receive advising and are offered writing support, career counseling, new student orientations, and more, all of which are funded by and administered through EU. In addition, EU provides professional workshops, such as Dale Carnegie courses, free of charge to students.

- New Student Orientations: Extended University and MS Biotechnology program leaders conduct new student orientation each fall and spring to inform students of services including advising, disability services, career services, financial aid, the Graduate Studies Center, student financial services, and more. To reinforce and further disseminate this information, EU developed an online student handbook and a series of videos and PowerPoint presentations, called “Nuts & Bolts”, which are accessible on Blackboard.

- Advising: Brianne Keighley, Student Services Professional, employed through EU, provides program advising for MS Biotechnology students. Working from student transcripts, Brianne develops individual curriculum “roadmaps” and assists students

with revisions when circumstances require divergence from that roadmap. She also assists them with their graduation applications and a variety of other services. Dr. Parmar and MS Biotechnology tenure-tenure track faculty also advise students.

- Career Services are provided to MS Biotechnology students and alumni, funded by Extended University. http://ext.csuci.edu/career-services/index.htm. Services include one-on-one counselling, workshops on a variety of topics, and resources to assist students and alumni in conducting a career search and making career decisions. EU's career counselor also networks with businesses on behalf of students, ensuring that they are aware of our MS Biotechnology program and the quality of our graduates.

- Disability Resource Programs: Provides assistance with disability accommodations, alternative media resources, disability counseling and educational outreach for students with particular needs. Our graduate student handbook and Blackboard-based "Nuts & Bolts" student orientation informs students of these services and how to access them.

- Financial Aid: Extended University employs a financial counselor, Kristin Carpenter, to serve students enrolled in its degree programs.

G. Articulation, Transfer and Retention	Does the program have policies and procedures that facilitate articulation with community colleges? Are transfer students accommodated and integrated into the program? Are native and transfer students in the program being retained in the major and by the University?	**4**

Evidence and Comments:

Students admitted into the MS Biotech program without adequate course-work in molecular and cellular biology are required to complete a "foundational" pre-requisite course (BIOL501-Cellular and Molecular Biology) before they can enroll in other core/required courses. The program accepts equivalent MS and other relevant graduate level courses from other institutions on a case-by-case basis to bypass this requirement.

Summary Recommendations for Element Two:

a. Revisit the Bioinformatics component of the degree program and add classes focusing on Bioinformatics (currently there are only 2 classes focusing on Bioinformatics). Program Director is currently in conversation with the Chair of the Computer Science program at CI to determine possibility of developing new courses in computational biology.

b. Minimize conversion of courses from an in-person to an online format to facilitate better

learning experiences and be in compliance with the SEVIS (Student and Exchange Visitor Program), specifically for our international student pool. Minimize offering of new courses that rely solely on online mode of instruction.

c. Track retention rates and data. This will be done in collaboration with the Institutional Effectiveness Office at CI.

d. Review course learning outcomes of the core and required courses to ensure that they are assessable.

e. Conduct assessment every semester and assess program and course learning outcomes with an established rubric. Assessment has not been consistent and the program director will be committed to establishing annual assessment practices. Exit surveys will be developed for students to gather feedback about the program.

f. Explore internship opportunities for students in the Biotechnology and BME emphases. Program Director is currently in conversation with local biotech industries and academic institutions within the UC system in establishing an internship agreement. It is anticipated that these internships will be finalized and implemented in January 2017.

g. Increase opportunities for research activities by offering research oriented courses more often, such as BIOL597.

h. Increase opportunities for service learning by offering relevant courses more often, such as BIOL603.

i. Continue excellent advising and student services.

III. Element Three: Developing Resources to Ensure Sustainability

CRITERION FOR REVIEW	INQUIRY	SCORE
A. Faculty Resources	Does the program have faculty in sufficient number, and with appropriate rank, qualification, and diversity, to support its academic program in a manner consistent with its objectives?	**4**

Evidence and Comments:

As of spring 2016, the MS Biotech program has a total of 18 instructors of which 5 are tenure-track faculty from CI, 4 are lecturers in the Biology program and 9 are industrial scientists. Diversity is well represented in the faculty (9 females and 9 males; 13 Caucasians, 2 Hispanics, 3 Asians). 95% of the faculty have a doctorate degree and have ample experience in teaching both undergraduate and graduate level courses. Dr. Parmar is charged with staffing all courses in the

three emphases. Dr. Parmar requires a doctoral degree for instructors in the MS program. To supplement CI tenure/tenure-track faculty, Dr. Parmar secures (through EU) industrial scientists, faculty from other colleges, and successful entrepreneurs. This mix of academics and instructors with current and practical experience adds to the relevance and richness of the program and exposes students to the rigors of both academia and the industry. There are no "full time" faculty who are hired specifically to teach in any of the Masters programs, all are considered part-time. The Extended University has been providing all the administrative support to the program since inception.

(Please see Appendix F for a complete list of instructors in the MS Biotechnology degree program)

B. Professional Staff	Does the program employ professional staff --support coordinator, technicians, lab assistants --sufficient to support the academic program?	**4**

Evidence and Comments:

The MS Biotechnology program is one of 5 graduate and 2 undergraduate programs offered through Extended University. The staff members listed below serve all degree and certificate programs. Program growth will require additional recruiters and marketing support staff. Administrators and staff supporting the program include - Dr. Gary Berg, Dr. Janet Egiziano, Brianne Keighley, Nick Fuentes (Planning); Dr. Janet Egiziano (Directs/develops strategy for marketing, advertising, recruitment, website), Andrew Conley (Recruiter and Marketing Team member), Melissa Whitacre (Marketing specialist), Clara Valdovinos-Magana – (Marketing assistance, social media), Bill Ochs (IT – Marketing analytics and website), Jeff Ziskin (Graphic design, event planning, new student orientations) and two Student Assistants (social media, graphic design and website); Brianne Keighley and Rosario Cuevas (class scheduling); Brianne Keighley (Program Advising); Emma Battles (Application Processing); Clara Valdovinos-Magana (Evening & Weekend coordinator); Rosario Cuevas (Faculty Hiring); Judi Le (Budget Analyst); Scott Trevino (International Admissions); Melissa McCoy (Instructional Support Technician) and Judi Le (CIRM Grant Coordinator). In addition, graduate student assistants are hired on a regular basis to assist with lab preparations.

C. Faculty Workload and Evaluation	Is faculty workload aligned with the program's goals for effective teaching, scholarship, and University and community service? Are part and full time faculty evaluated regularly and according to University policies and practices?	**4**

Evidence and Comments:

Because the MS Biotech program is administered through Extended University, instructors are hired and paid through that unit in accordance with the 125% rule. Student ratings of teaching

(SRT) are performed for every section of every course. Peer evaluations of teaching are performed for all new instructors and additionally as determined by Dr. Parmar.

(Please see Appendix G for SRTs)

D. Faculty Development	Do faculty have and use professional development plans (PDPs)? Does the program support faculty development opportunities sufficient to improve teaching, learning and scholarship?	**4**

Evidence and Comments:

As part of the retention and tenure process, all tenure-track faculty serving as instructors for the MS Biotech program develop Professional Development Plans (PDP) that guide their activities toward tenure and promotion at CI. The PDP is submitted during a faculty member's first year at CI and is approved by the Program Personnel Committee. The PDP details the faculty member's interests, goals and resources required to achieve the standards necessary for tenure and promotion. The Office of Faculty Development works with faculty seeking to improve their pedagogical techniques to improve learning outcomes and assessment. Faculty Development also sponsors an annual competitive mini-grant program that provides re-assigned time, equipment or travel for faculty seeking to advance their scholarly agenda or improve their pedagogy. The Teaching and Learning with Technology Initiative also sponsors a Blended Learning Program to assist faculty seeking to integrate meaningful technology into their teaching. In addition, Teaching and Learning Innovations at CI provides guidance, support and inspiration to faculty and lecturers to step outside of traditional boundaries of teaching to improve student learning and put students at the center of the educational experience.

E. Fiscal and Physical Resources	Does the program have the budgetary resources needed to support its educational program? Are its facilities, including offices, labs, practice and performance spaces, adequate to support the program?	**4**

Evidence and Comments:

The MS Biotech program is funded through Extended University with proceeds from student fees. Extended University is mandated to operate self-supported programs maintained through student fees and other non-State funds. The tuition and fees charged to the students are comparable to those charged by sister campuses and are well under those charged by private institutions in the nation, ensuring financial accessibility of the program. Per EO1000 and a formalized University MOU, Extended University fully reimburses the State for all expenses incurred in the operations of special session degree programs such as the library and additional use of academic technologies. As such, this program is estimated to have sufficient funds available through student fees to maintain and grow the program in the future These fees cover all costs related to the program including but not limited to marketing/advertising, recruitment,

instruction, staff, special consultants (e.g. career services), technology (hardware, software), rent of classroom and office space at the Thousand Oaks campus facility, associated events (e.g., Mixers) and other miscellaneous expenses.

Students could apply for financial aid. A grant of $1,755,906 was awarded to CI from the California Institute for Regenerative Medicine (CIRM) to support stem cell technology training program in 2009. This 3-year grant was renewed in 2012 for four more years until 2016 with an additional funding of $2,481,335. The CIRM grant offers internship stipends in the range of $30,000- $35,750 to 10 students enrolled in the Stem Cell program. With the availability of the CIRM grant, these 10 students have been supported in the past seven years (2009-2015) with the generous internship stipends during the funding period. A total of 70 students have been supported by this grant from 2009-2016. The Extended University offers a $4,500-$5,400 scholarship each to up to 5 additional students enrolled in the stem cell research training program. These scholarships, stipends as well as financial aid packages enhance program accessibility. The program recently received a new grant from CIRM – the Bridges to Stem Cell Research and Therapy Award for 5 years (2016-2021) in the amount of $3,045,000.

Among the students enrolled in the program, a significant number of them are entry level scientists who have completed undergraduate education and are working at local biotechnology companies. Many of them receive tuition reimbursement from the companies to support their professional development and continuing education, which has further facilitated the accessibility to our program.

The program offers its lecture/discussion courses at an 8,419 square foot state-of-the-art facility in Thousand Oaks. This location supports high-speed wireless access and all of the classrooms include full audio visual equipment for faculty use. The complex is comprised of six 25-40 person classrooms, a 60-person lecture room, a large conference room, student lounge, kitchen break room, and faculty workspace and administrative offices. Ample parking is provided free to students and bathrooms are located in an adjacent hallway. University personnel staff the facility during the daytime for student recruitment and advising and in evening hours when classes are held. In addition to the courses, the program hosts special events, lectures, and social gatherings for the students at the facility.

For our laboratory needs, the program has three labs on the main CI campus which are fully equipped with equipment and supplies needed for experimentation (Sierra Hall 2334 Cell Culture Lab used for BIOL510 and BME 501/502), Aliso Hall 236 (Molecular Biology lab and attached cell culture facility shared with undergraduate Biology program used for BIOL 502, BIOL 505 and BIOL 501) and Aliso Hall 234 (used for Bio 508 and shared with the undergraduate

Biology program). All labs have a preparation lab for storage and lab prep needs. The labs have cutting-edge equipment in the areas of molecular and cellular biology, structural biology, immunology, biomedical sciences, bioinformatics and cell culture, such as gel imaging systems, fluorescent microscopes, cellometer, plate readers, PCR machines, spectrophotometers, laminar flow hoods and flow cytometer. All routine small equipment is abundantly present in the labs such as centrifuges, incubators, water-baths, freezers, pipets, liquid nitrogen tank, etc.

(Please see appendix H for a full list of equipment.)

The MS Biotech students have full access to the Graduate Studies Center (GSC) which is dedicated to providing academic, professional and personal support services for post baccalaureate students at CI. This center facilitates access to post baccalaureate programs, offers guidance in promoting student success and program completion, and fosters professional, personal, and workforce development. Some of the resources that are available through this center include- career services, program counselling, financial aid information, writing studio, information sessions, program mixers, community service partnerships and GRE preparation workshops.

F. Developing External Resources	Does the program seek and receive extramural support, including grants, gifts, contracts, alumni funding?	**4**

Evidence and Comments:

The MS Biotechnology program does not seek additional funding. Dr. Parmar is also the Director of the Stem Cell program at CI and was able to secure a

$3, 04,000 grant from the California Institute for Regenerative Medicine (CIRM) for 5 years (effective 2016-2021). Previously Dr. Parmar was overseeing another CIRM award from 2012-2016. This award funds a large number of activities pertinent to the SCTLM emphasis, particularly student internships. Additionally, in previous years a local Biotech company (Amgen) provided funding to the program to award industry-sponsored scholarships ($1000) to students.

G. Information Technology	Does the program have access to information resources, technology, and expertise sufficient to deliver its academic offerings and advance the scholarship of its faculty?	**4**

Evidence and Comments:

Extended University provides the MS program with information resources, technology and expert staff (Bill Ochs) that typically exceeds the level provided to stateside programs. CI has a vast number of Library research databases that can be accessed anywhere a CI instructor and

student has internet access. This information resource is used during course instruction and can assist with student research outside of the classroom too. http://library.csuci.edu/research/databases-az.htm. CI provides a Single Sign On (SSO) portal for faculty and students to access all technology resources. These resources include the ability for an instructor or student to log into any Channel Island PC or MAC workstation on the campus. This ability allows Instructors and students too quickly and seamless access their course program needs. Additional Single Sign On technology resources include, access to the course management system, email access, wireless access, and printing access. CI IT policy is to treat any user's device such as a laptop, tablet, and smart phone as it were a CI device. Instructors and students can take their devices to the campus, Solution Center, for assistance and receive help in configuring their devices to access the campus resources they are entitled to as an instructor or student. CI provides technology support for all faculty, students, and staff using the campus Solution Center. Any IT issue that might arise can be directed to the campus Solution Center for a timely resolution. All issues are logged and tracked via the campus TrackIT system. IT support staff can immediately be deployed to address issues and even be deployed to a live classroom session if desired. Programs such as the MS Biotech program also have designated IT support staff that are specify focused on supporting a program area. This increases the support quality level by the IT tech, by having the tech become more familiar with the program needs and establish solid communication paths between the tech and program stakeholders. CI provides in depth faculty technology instruction by utilizing the campus FIT Studio (Faculty Innovations in Teaching) http://www.csuci.edu/tli/fitstudio.htm; http://tlinnovations.cikeys.com/. The tools and resource provided to faculty that assist with instruction include, Video Creations, VoiceThreads, Course Design tools, and Blended Learning. The FIT studio tools and staff assist with the creation of engaging classroom material for students.

Use of IT has also been made for lab instruction purposes. The Instructional Support Technician (IST) and graduate student lab assistants have worked together to create a number of lab protocols and work instructions for all of the different lab equipment students utilize in the MS Biotechnology program. Currently there are print outs of all of these in the Sierra Hall classroom but the long term goal is to create a MS Biotechnology Lab Resources website through CI Keys that will house all of these documents along with instructional videos and webinars. The IST and graduate student assistant also recently finished putting together a series of ten instructional videos through the CI Fit studio. Each short video clip goes through one piece of laboratory equipment and also provides student of a virtual tour of the Sierra Hall lab classroom and an overview of lab safety. These videos are currently available here on the YouTube MS Biotechnology Instructional Videos channel but will eventually be added to the MS

Biotechnology Lab Resources website:
https://www.youtube.com/playlist?list=PLacOE0Z_gPF3Rn41w8evuRPdutTgSSFyo

The videos will be made available as part of the new student online orientation so that all students will be exposed to the lab environment before even beginning their lab courses. The IST also works with faculty and students in the program by offering in person training on how to use equipment and advice on how to use the equipment for different experiments and research projects

H. Community Involvement and Liaison	If appropriate, does the program have an advisory board or other links to community members and professionals? Does the program maintain a relationship with its alumni?	**4**

Evidence and Comments:

An Advisory Board was established prior to the development of the degree program. The Board had included representatives from local biotechnology companies, research and educational institutions, community organizations, community colleges, the local military base, and Workforce Investment Board, graduate students and faculty. The Board provided crucial input in program design and the method of implementation for the program. The Board was instrumental in proposing the concept and the development of the MS Biotechnology and MBA dual degree program. Regular meetings were held by the Board to provide input in program development and promotion. The Board members also helped the Program to organize special events to provide networking opportunities and advice on transition from graduate program to careers in industry and professional pursuit for our students. Currently this Board is defunct. A new Advisory board will be convened in fall, 2016 which will bring together program faculty and local biotechnology industry leaders to enable the program to grow and evolve to meet the local employment force needs. External stakeholders are involved in the program as well. The MS Biotech program is supported by Extended University. Additionally the program is partnered with MBA and pursuing a potential partnership with the Computer Science program at CI. MS Biotechnology has a partnership with Amgen who supports employees in the program with tuition reimbursement. Amgen has been a past sponsor of student scholarships as well. The Osher Lifelong Learning Institute at CI (OLLI), is an educational program for adults aged 50 and better. OLLI has a vested interest in the MS Biotech program as they attend colloquiums and thesis presentations. MS Biotech instructors also frequently teach courses for the OLLI program.

Presently the program has not established a mechanism of tracking the alumni except for posts on social media such as Facebook and Linkedin. Our intent is to collaborate with the Alumni Association and Institutional Effectiveness Office at CI to track our MS Biotech students. In the

future will work with Tania Garcia, Director of the Alumni and Friends Association to send out alumni surveys to collect more data.

Summary Recommendations for Element Three:

a. Identify additional instructors for the program as newer courses are proposed, particularly in the Bioinformatics area.

b. Involve the alumni more intimately via mixers and additional social gatherings.

c. Engage with the biotech industry more creatively in establishing opportunities for students. Approach local biotech companies to garner funding for students in the form of student assistantships.

d. Explore external private funding sources that could provide funds for students (such as travel awards, research assistantships, etc.)

e. Reformulate the Biotechnology Advisory Board and reconvene the meetings for program feedback and input to facilitate improvement if needed, in response to industrial needs.

f. Develop more "basic lab practices" online videos as introductory orientations.

g. Liaison more with the local community (via the OLLI program, the Naval Base Ventura County and Library Series talks in Thousand Oaks, Oxnard and Camarillo) to advertise the program.

h. Continue having a stringent admissions process for the SCTLM emphasis.

IV. Element Four: Creating a Learning Centered Organization

CRITERION FOR REVIEW	INQUIRY	SCORE
A. Program Planning	Does the program engage in planning activities which identify its academic priorities and examine the alignment of its core functions with those of the institution?	**4**

Evidence and Comments:

Yes, the program does engage in planning activities which identify its academic priorities and examine the alignment of its core functions with those of the institution. Staff meetings are held every term to initiate planning conversations in the areas of curriculum resources, budget and personnel. In addition, the program director serves on the Extended University Advisory Council,

a campus-wide faculty service committee led by various EU graduate and undergraduate program directors. Alignment of core functions of degree programs is discussed regularly. Input from faculty members outside the MS Biotech program brings new perspective. Due to lack of a robust assessment in the past few years, no faculty meetings have been convened to discuss assessment outcomes.

B. Integration of Planning Resources	Does program planning successfully align its curricular, personnel, and budgetary resources? Are its planning goals informed by student learning outcome data? Is program planning integrated into the Academic Affairs budgeting process?	**4**

Evidence and Comments:

The MS Biotech program is separately developed, planned and supported via the Extended University (EU) unit of Division of Academic Affairs. The program has been successful in aligning its curricular, personnel and budgetary resources for all three emphases. This is due to the efforts of Program Director Nitika Parmar, AVP Gary Berg, and EU staff. Judi Le, EU budget analyst, develops the budget with input from AVP Gary Berg and Dr. Parmar.

C. Professional accreditation	If the program holds or is seeking professional accreditation, are its practices and resources consistent with that objective?	**4**

Evidence and Comments:

The MS Biotech program has received WASC (Western Association of Schools and Colleges) accreditation. The program is also a member of the National Professional Science Master's Association (NPSMA). The practices and resources are consistent with the objectives of NPSMA which include- curriculum designed to dovetail into professional career opportunities; equipping our students with the skills to interact with scientific researchers and business managers alike, offering courses on policy or regulation and combining a rigorous study in STEM areas with coursework in management, policy, or law.

Summary Recommendations for Element Four:

a. Continue to actively participate with all instructors in program planning and assessment.
b. Participate in the annual NPSMA meetings to reflect and act on best practices for PSM programs.

Summary Comments and Recommendations

Instructions: First, summarize key program strengths and areas of improvement identified in the self study elements above. Second, list and explain recommendations identified in the self study, and describe actions that the program our University can undertake to respond to these recommendations. These recommendations should grouped as two-year and five-year actions.

Key program strengths:

a. Unique degree program with three distinct emphases.

b. SCTLM emphasis funded by the CIRM grant that allows the program to offer excellent world-class labs for students to intern in, using cutting-edge technology.

c. Outstanding advising sessions.

d. Robust curriculum that covers diverse fields in the areas of biotechnology.

e. Excellent instructors from the industry who provide the "real-world" picture to the students from the industrial perspective.

f. Excellent support from staff members of EU in all areas- counseling, IT support, orientations, events, advising, career information, etc.

g. Effective recruitment and marketing strategies.

Areas of improvement:

a. Conduct assessment in a consistent manner every year for multiple student learning and program outcomes.

b. Market the program internationally more aggressively.

c. Revisit the Bioinformatics component of the degree and offer more courses in computational biology.

d. Track alumni using effective tools.

e. Track retention rates.

f. Reconvene the Advisory Board for valuable program feedback.

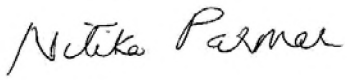
Actions that University can take:

a. Facilitate full and consistent support from the Office of Institutional Effectiveness for tracking alumni and gathering student data.

b. Facilitate involvement of the Foundation to explore funding opportunities for graduate students.

Submitted by: **NITIKA PARMAR (Program Director)**

Signature:



Date: **July 5, 2016**