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| **BAY AREA COMMUNITY COLLEGE CONSORTIUM****REQUEST FOR PROGRAM ENDORSEMENT - NEW CREDIT PROGRAM** | **https://lh3.googleusercontent.com/WSDCQK-QPlaMP1_V8BvZUOESTVjgMqb8mzp9cCsqkKOCdyP-eBAc8dPg3JuhtllkorUyqo-m5zjeomLK2cpUq7YemoO74_5PLrRwQeE8yIcdl6Tes9OmY_E16DFwYwq-pA** |

**Complete (maximum 3 pages) and Email this document to:** mail@baccc.net **CC:** Rock Pfotenhauer, Chair, Bay Area Community College Consortium, rock@baccc.net; (831) 479-6482 and Kit O’Doherty, kitodoherty@gmail.com; (650) 560-9798. Write REQUEST FOR PROGRAM ENDORSEMENT in the subject line of your email. Your email constitutes a request for Program Endorsement at the closest BACCC meeting for which the [deadline for submission](https://sites.google.com/a/cabrillo.edu/baccc/Home/program-endorsement-guidelines/deadlines) has been met.

**Stem Cell and Cell-Based Technologies Jim DeKloe**

PROPOSED PROGRAM TITLE CONTACT PERSON

**Solano Community College**  Professor

COLLEGE TITLE

**Solano Community College District**  707-477-8354

DISTRICT PHONE NUMBER

**Spring 2020**  James.dekloe@solano.edu

PROJECTED PROGRAM START DATE E-MAIL ADDRESS

**GOAL(S) OF PROGRAM (CHECK ALL THAT APPLY):**

  CAREER TECHNICAL EDUCATION (CTE)  TRANSFER  OTHER

**TYPE OF PROGRAM (CHECK ALL THAT APPLY):**

 A.A. DEGREE  A.S. DEGREE CERTIFICATE OF ACHIEVEMENT**:**  🞋 18+ semester (or 27+ quarter) units

 ⭘ 12-18 semester (or 18-27 quarter) units

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| **Recommended T.O.P. Code** | **0430.00** |
| **Units for Major-Degree** |  |
| **Total Units for Degree** |  |
| **Required Units – Certificate** | **27-29** |

1. **Insert the description of the program as it will appear in the catalog:**

The Stem Cell and Cell-Based Technologies program uses intensive hands-on laboratory courses to train students to culture and genetically modify eukaryotic cells and tissues. This prepares graduates to work in a biotechnology company that produces stem cells and other cell-based therapeutic products (e.g. CAR-T cell cancer therapies), or to pursue other emerging technologies in regenerative medicine. The program incorporates gene editing tools to manipulate cells, introduction of genes using virus vectors and other techniques, and also explores promising eukaryotic cell production systems.

1. **Provide a brief rationale for the program:**

Solano Community College has built a reputation on Biomanufacturing. For twenty years we have trained students to grow genetically engineered cells that produce protein products like antibodies. But in the new manufacturing sector that is emerging, companies produce whole cells or tissues (or in the future organs) to treat diseases like cancer and to replace damaged or missing tissues. This new program expands students’ knowledge and skills to allow them to work in this emerging field. The courses all also serve as electives for the students enrolled in Solano College’s Bachelors of Science in Biomanufacturing degree.

1. **List all courses required for program completion, including core requirements, restricted electives and prerequisites.**

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| **Course** | **Name** | **Description** |
| BIOT 001 | Principles of Biotechnology | This lecture course covers topics important in the development, production, recovery, and analysis of products produced by biotechnology. The course traces the path of a drug or biologic from the cell through the production facility, the final processing, and into the human body. It discusses the growth characteristics of the organisms used to produce pharmaceutical proteins, the techniques used in product recovery, and the techniques used in product analysis |
| BIOT 052 | Business, Regulatory, and Quality Practices in Biotechnology | This course examines how basic business principles and sound manufacturing procedures assure the quality and safety of a product as the manufacturing team moves a product down the biotechnology production pipeline. It explores the role of governmental oversight and regulation during the discovery, development, and manufacturing of new products produced by biotechnology. |
| BIOT 057 | Synthetic Biology and Algae Biotechnology | Combines two emerging areas in biotechnology through exploration of advances in synthetic biology and algae biotechnology. Synthetic biology applies advanced gene editing techniques for the creation of new organisms. Topics include synthetic DNA synthesis, minimal cells, manipulation of biobricks, gene circuits, CRISPR/Cas and other gene editing tools, and cell free production. These techniques can be utilized to produce biomaterials, DNA for gene therapy, and algae bio-based production. Students isolate, identify, manipulate, grow, monitor, and harvest algae for biofuels, nutraceuticals, industrial enzymes, and therapeutic proteins in the laboratory. |
| BIOT 060 | Mammalian Cell Culture | Students learn mammalian cell culture techniques that include working under aseptic conditions, sterile techniques in a biosafety cabinet (laminar flow hood), media preparation, quantification and passage of cells, and cryopreservation of cell lines. Laboratory experience prepares students for work in industry. |
| BIOT 061 | Stem Cells | Covers the principles of stem cell biology. Topics include embryonic stem cells in early development, adult stem cells, induced pluripotent stem cells, and the ethical issues involved in stem cell research. Emphasis on laboratory techniques including culture of stem cells and organoids and directed differentiation of mouse embryonic stem cells. The laboratory emphasizes analysis of stem cells by immunofluorescence and flow cytometry |
| BIOT 062  | Cell Culture and Protein Recovery | This laboratory course teaches the skills needed to serve as a technician in biotechnology production. Students grow and monitor bacterial, yeast, and mammalian cells on a laboratory scale that emulates the large-scale production used in industry. Students will become familiar with the cleaning, sterilization, aseptic inoculation, operation, and monitoring of fermenters and bioreactors. Students then recover and purify proteins produced by those cell cultures. They recover and purify proteins using centrifugation, ultrafiltration, and chromatography techniques. The course emphasizes the use of current Good Manufacturing Practices (cGMP), and students gain experience following Standard Operating Procedures (SOPs). |

BIO 014 (Principles of Microbiology) or BIO 002 (Cell/Molecular Biology) serve as prerequisites for this courses. These courses have CHEM 010 (Intermediate Chemistry) or CHEM 001 (General Chemistry 1) or Chem 012 (Chemistry for the Health Sciences) as prerequisites. These prerequisite units are included in the units for the certificate.

1. **Summarize the Labor Market outlook (including citation of the source of data) for students exiting the program.**

The Labor Market Analysis was performed by the Center of Excellence at City College of San Francisco. (The complete analysis is attached.) This analysis shows a gap in the San Francisco Bay Area between the number of technicians generated by our local colleges and the number of job openings projected in the future. We do not focus solely on job projections in the North Bay, since, based on our experience with graduates, student often accept job offers from companies located in other counties through the San Francisco Bay Area. But, national and international analyses suggest that this field will be huge: a $100 billion industry in the US and a $250 million industry worldwide in the next five years. (Ark report 2018) And, a recent National Public radio segment suggested that this field will be so big (and so expensive) that it might collapse the healthcare system. While the financing of this field will be a future concern, this analysis indicates that this field will be huge with a large workforce requirement.

1. **List similar programs at other colleges in the service area which may be adversely impacted as follows:**

 The design of this program is being coordinated with several national and regional efforts. City College of San Francisco has been part of a National Science Foundation Advanced Technological Education grant headed by our collaborators in Madison Wisconsin. CCSF also has had a CIRM (California Institute for Regenerative Medicine) grant for years. Solano College has been added to a new NSF ATE grant for the next 4 years. Also, these colleges are working with NIIMBL, the National Institute for Innovation in the Manufacture of Biologics – a $ 250 million effort led by the University of Delaware; this consortium will contribute additional expertise and we have submitted a grant for $600,000 to this organization.

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| College | Program | Who you contacted | Outcome of contact |
| City College of San Francisco | Stem Cell certificate | Bob Del Vecchio and Carin Zimmerman | They gave us excellent advice |
| Shoreline College (Seattle) | Program in development | Guy Hamilton | They are working with industry and us to develop the program |
| Madison Community College (WI) | Stem Cell certificate | Tom Tubon | We are participating with them in a national stem cell grant. |

1. **Include other information you would like to share.**

This program will be taught in Solano College’s new $ 34.5 biotechnology training facility, located across the street from biotechnology pioneer Genentech’s billion-dollar Vacaville Manufacturing facility, the largest facility of its type in the world.

A recent report projected that the field of cancer therapies that use CAR-T cells (Chimeric Antigen Receptor T cells) will be worth $100 billion in the United States and $ 250 billion worldwide within 5 years. We already have had several alumni recruited by Juno/Celgene (in Bothell WA, a suburb of Seattle) and we have been in conversation with them and their colleagues in Summit, NJ. We have also been in conversation with Dark Horse Consulting, a consulting firm that specializes in advising companies on the production of CAR-T, stem cell therapies, and gene therapies. Stem cell treatments will continue to improve, and this field likely will be as big in the future, but it will mature more slowly. Early implementation of this program will prepare students to enter this field as it emerges.

Jim DeKloe has been granted a sabbatical for Fall 2019 to work on the curriculum for this program.