PROGRAM POLICY STATEMENT
Biopharmaceutical Sciences – Bioprocess Development Concentration (M.S.)
and
Chemical Engineering/Biopharmaceutical Sciences 4+1 (BChE/M.S.)

PART I. PROGRAM HISTORY

I-A. Statement of purpose and expectation of graduate study in the program

The biopharmaceuticals market sector is enormously important and rapidly changing. Revenues from biopharmaceutical products have grown by >6000% since 1990, and the global biopharmaceutical market is projected to reach ~$500 billion by 2025. Medical breakthroughs using gene and cell therapies have driven dramatic shifts in the composition and diversity of products and pipeline, while established biologic therapies such as monoclonal antibodies and their derivatives have become the mainstay for treating chronic and life-threatening ailments including auto-immune diseases and a range of cancers that cannot be tackled with small-molecule treatments. New classes of vaccines to prevent rather than cure diseases are being introduced, as seen in the extraordinarily rapid development of novel mRNA vaccines to address the Covid-19 pandemic. Next-generation treatments such as gene- and cell-based therapies can cure (rather than simply treat) these devastating diseases. Meanwhile, technological advances in data science, analytics, automation, and manufacturing, as well as unprecedented new needs in global medicine and public health, are fundamentally and continuously altering the discovery and development landscape.

There is a national and international need for scientists and engineers with advanced training in biopharmaceutical sciences, spanning disciplines such as agricultural sciences, biology, biochemistry, bioinformatics, biochemical engineering, biomaterials science and engineering, biomedical engineering, biophysics, chemical engineering, environmental science and engineering, microbiology, and public policy. Following industry-university workshops held with industry thought leaders at UD (Spring 2018; Fall 2019), and with the emergence of the UD Biopharmaceutical Innovation Board, comprised of high-level leaders from major companies in the biopharmaceutical industry (e.g., AstraZeneca, Bristol-Myers Squibb, GlaxoSmithKline, Merck & Co.), UD has been identified as a center of excellence for training students across these fields.

The job market for new employees is highly competitive and lucrative, with starting annual salaries ranging from $50,000 to over $100,000 for M.S. degree holders across a range of industrial research and development positions (from basic sciences to engineering and data sciences). The job market in biopharmaceutical sciences is rapidly expanding. There is national leadership opportunity at UD for research and curriculum development in biopharmaceutical sciences that leverages existing leaders in basic sciences/engineering, past investments in biopharmaceutical manufacturing, and associated technology centers at UD (e.g., NIIMBL, AMBIC, BITC).

The M.S. Program and the 4+1 BChE in Chemical Engineering/M.S. in Biopharmaceutical Sciences Program are envisioned as the first of several related degree programs in Biopharmaceutical Sciences at UD. Given the strong industry need for students, we propose the first concentration of the Biopharmaceutical Sciences M.S. Degree to focus on bioprocess development, a field that is populated largely, but not exclusively, by chemical engineers. However, the vision for this program is a diverse, inclusive series of concentrations under the Biopharmaceutical Sciences M.S. Degree that address industry needs in areas such as analytics, quality, regulatory science, discovery, policy, public health, and allied topics. The inaugural

program in bioprocess development will leverage UD's unique position at the intersection of the Greater Philadelphia, New York/New Jersey, and Capital Region biopharma/biotech hubs, as well as UD's leadership within NIIMBL. The program was built via collaboration with international leaders in biopharma and government to create a future-facing model for training and retraining scientists in the biopharmaceutical industry.

Broader programs for an M.S. degree and other graduate degrees focused on Biopharmaceutical Sciences at UD will bring together a coordinated effort of our leading faculty to collaborate with industrial thought leaders for cutting edge pedagogical and technical advancements. These training programs will revolutionize the industry and fundamentally change how we collaborate and how we educate the next generation of leaders in this field. This effort will include faculty and departments across a number of Colleges, as the needs will span basic sciences, engineering, health sciences, public policy, impact on the environment and sustainability, agricultural sciences, and business and economic drivers. This inaugural M.S. in Biopharmaceutical Sciences represents a key opportunity to create hybrid degrees that are a combination of excellent fundamentals with hands-on biopharmaceutical research, development, and manufacturing experience, and it incorporates a unique model for integrated internships in both the Master's and 4+1 degrees, in concert with key industry partners that have committed to join with UD in developing these programs. This will also leverage efforts from UD to compete for federal funding opportunities around the NSF Advanced Manufacturing and Future Manufacturing programs that can bridge R&D efforts at UD and the longer-term development of biopharmaceutical manufacturing via NIIMBL and related UD and DE state investments.

This Biopharmaceutical Sciences M.S. Degree will establish a collaborative and adaptive educational model that engages leading academic, industrial, and government scientists. This informed training will use industry practice and expertise to create a strengthened pipeline that provides students with a holistic understanding of the biopharmaceutical industry, its regulatory frameworks, and the evolution of the industry as it moves into the future. More broadly, the program will create sustained partnerships and seed innovative thinking and new collaborations between industry and academic scientists.

I-B. Date of Permanent Status (or current status)

New program proposal

I-C. Degrees offered (include brief description of concentrations, fields, etc.)

1-Year M.S. in Biopharmaceutical Sciences (Concentration in Bioprocess Development)
4+1 BChE in Chemical Engineering/M.S. in Biopharmaceutical Sciences (Concentration in Bioprocess Development)

I-D. Term when first students may enroll

Summer 2021

I-E. Factors that identify the student demand for the program

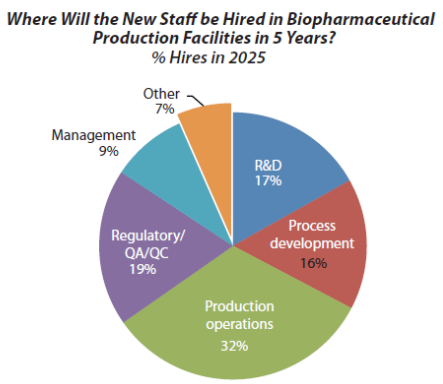
Market research results. Recent market research indicates that there will be a large demand for skilled employees with backgrounds in biopharmaceutical science and related fundamental sciences, engineering, and regulatory science that includes hands-on training. In a recently published report [1], >280 individuals and organizations from biopharmaceutical manufacturers

and direct suppliers were surveyed to understand current needs in hiring, employment growth, and training. Data were compared over similar surveys conducted over the past several years to understand recent trends (see excerpted Figure). Respondents made several key observations:

- While hundreds of global universities offer bachelor and master's degrees in biotechnology, dozens of community colleges train for basic good manufacturing practice (GMP) operations, and many vendors offer specialized training for operations on their proprietary technologies, **only a few, if any, industry-recognized certification programs exist. Furthermore, no coordinated or standardized curricula or certification programs exist where trainees can be assured of having obtained the knowledge/hands-on experience needed to be effective in a bioprocess environment.**
- Classroom and lab training is often insufficient to support a student's transition to an industrial environment. Specifically, to meet industry needs, **more effort will need to be placed on training academic- and research-oriented graduates to meet the needs of companies producing biologics.** More M.S. and Ph.D. programs in GMP bioprocessing appear to be needed. Training in cell and gene therapy is an acute need because industry needs individuals with graduate degrees to perform nearly all of their operations, and currently it takes 6 or more months for most of the facilities to train new hires before they can work unsupervised.
- There is no substitute for on-the-job training. Respondents indicated that once graduates are hired, they tend to spend 6-12 months in training by supervisors or others who provided the needed hands-on knowledge and expertise. It is clear that effective bioprocessing requires hiring, training, retaining, and more retraining of high-quality, highly educated, talented people.
- The data from the most recent survey continues to reflect the same trends observed over the past decade. Specifically, the growth and importance of commercial product manufacturing, with more products entering the market, means that **more process development and bioprocessing is being done relative to basic research.** Process development and other bioprocess fields will be competing for trained, skilled workers with manufacturing and regulatory expertise.

In total, these data clearly indicate a current and longer term demand for highly skilled and educated candidates in areas including: biopharmaceutical manufacturing process development; recombinant cell culture; gene therapies; cell therapies; analytical sciences; regulatory science; product purification, formulation and manufacturing. There is a clear desire from the industry to increase the amount of hands-on experience in industry-relevant environments (e.g., via internships) to reduce the burden on employers and new employees for training or re-training in cutting edge biopharmaceutical industry environments spanning R&D to manufacturing [1]. There are also opportunities for higher level investments that could synergize and promote complementary efforts across Delaware educational institutions (e.g., DSU, Del Tech, UD). Focusing on a combination of education in key fundamentals and more practical, industry-focused education and hands-on training and experience is a growing strategy amongst universities that are able to take advantage of their local biotechnology industry partners [1]. The emergence of these efforts highlights the need for UD to take advantage of the interest and engagement from local industry leaders in building new programs.

Fig 11.3: New Hires in Biopharmaceutical Manufacturing (2025)



1. Chapter 11. Hiring, Employment, Growth, and Training in Biopharmaceutical Manufacturing. Report and Survey of Biopharmaceutical Manufacturing Capacity and Production, Bioplan Associates Inc. (2020).

Enrollment projections. We estimate that the program will start with 5-10 students in its first year and expand in the following 2-3 years to reach a steady state of 30+ full-time students. Our projections are justified by enrollments in related programming at the University of Delaware, engagement with interested students at regional HBCUs (detailed below), and discussions with industry. For example, the Biochemical Engineering Minor, offered by the Department of Chemical & Biomolecular Engineering, enrolls ~20-30 students annually. The proposed first Biopharmaceutical Sciences Master's Program expands directly upon the topical themes that are the focus of this minor. Furthermore, our committee has robust support from faculty leaders in related engineering and science departments at UD (Biomedical Engineering, Materials Science & Engineering, Biological Sciences) (see letters). These faculty support the relevance of the Biopharmaceutical Sciences Master's to the interests/career prospects of their students, and they also support the longer-term establishment of other concentrations under the Biopharmaceutical Sciences M.S. degree spanning a range of fields.

A critical goal of our program is to educate a diverse cohort of future leaders in biopharmaceutical sciences. This goal is shared by our industry partners. To this end, we have already initiated recruiting efforts to gauge interest from students at regional HBCUs. For example, we have partnered with the NIIMBL eXperience program (https://niimbl.force.com/s/niimbl-experience), a mentoring program which engages an outstanding group of underrepresented minority students interested in careers in biopharmaceutical sciences. Students from the eXperience program, in addition to current UD students, have already contributed to our recruiting efforts, for example by participating in a NIIMBL video showcasing their interest in biopharmaceutical sciences careers.

Furthermore, our committee has directly interacted with UD and President Assanis' Biopharmaceutical Innovation Board members and other industry leaders to survey their interest in the Biopharmaceutical Sciences Master's Program as a training/retraining opportunity of interest to their companies. These interactions also have been used to obtain their input and suggestions on the program's curriculum. Specific examples of companies we have interacted with are AstraZeneca, Merck, Bristol-Myers Squibb, GlaxoSmithKline, Pfizer, Prelude, Nektar Therapeutics, and Charles River Laboratories. These conversations have revealed robust interest in the Biopharmaceutical Master's Program for both training and retraining industry scientists. Full time funding for the first cohort of students (tuition scholarships plus 15-month paid internships) has been secured via a gift from AstraZeneca.

I-F. Identify the College and Department/School in which the program will reside

The program is designed to be the first of a series of interrelated interdisciplinary degrees in the Biopharmaceutical Sciences with students earning degrees from the relevant academic unit on campus. It emerged through collaborative discussions with industry partners, NIIMBL leadership (e.g., our committee includes three NIIMBL leaders: Prof. Kelvin Lee, Institute Director; Prof. Christopher Roberts, Associate Institute Director; and Dr. John Erickson, Senior Fellow and Chief Technology Officer), the UD Office of the President, and faculty in Chemical & Biomolecular Engineering. To facilitate the unique model for this program, in which collaborations between industry, government, and academic scientists (across multiple units) will form the basis for training design/leadership, the Biopharmaceutical Sciences Master's will be administratively housed within NIIMBL and partnered with relevant departments and Colleges to issues degrees (akin to the interdisciplinary Bioinformatics program that partners across Colleges).

NIIMBL has already committed staffing and other resources (see letter) to ensure the successful initiation of the inaugural degree programs [the 1-Year M.S. in Biopharmaceutical Sciences and the 4+1 BChE in Chemical Engineering/M.S. in Biopharmaceutical Sciences (with Concentration in Bioprocess Development)]. These degrees will be granted by the Department of Chemical & Biomolecular Engineering within the College of Engineering (see letters of support).

PART II. ADMISSION

II-A. Admission requirements, prior degree requirements, and documents required

Admission to graduate programs at the University of Delaware is selective and based on the number of well-qualified applicants and the limits of available faculty, infrastructure, and facilities. Those who meet stated minimum academic requirements are not guaranteed admission, nor are those who fail to meet some of those requirements necessarily precluded from admission if they offer other appropriate strengths. We encourage applicants to highlight their accomplishments that make them suitable for this training as well as the reasons for their interest in careers in the biopharmaceutical industry. Finalists may also be asked to interview with industry partners sponsoring internships in order to support internship placements.

Minimum admission requirements (in brief):

- A baccalaureate degree in chemical engineering, biomedical engineering, materials science and engineering, biochemistry, biological sciences, or a closely related field.
- A minimum undergraduate grade-point average in engineering, science, and mathematics courses of 3.0 on a 4.0 scale.
- A minimum of three letters of strong support from a former teacher or supervisor.
- Non-native speakers of English (international students) are required to achieve a minimum score of 600 on the paper-based TOEFL (PBT) and 100 for iBT.
- Essays focused on motivation/preparation to enroll in graduate studies, and career interests as they relate to biopharmaceutical sciences.
- A resume outlining work and academic experience.

II-B. Application deadlines and admission categories

Master's Program. Applicants for the Master's Program must apply during the fall semester prior to the summer semester of intended matriculation. The priority deadline for admission is Dec. 31, and the late decision deadline is May 1.

4+1 Program. Well-qualified Chemical Engineering majors may apply to the 4+1 program which would culminate in the student earning a Bachelor's degree in Chemical Engineering (BChE) and a Master of Science in Biopharmaceutical Sciences (MS) degree within five years.

The program is limited to University of Delaware undergraduates pursuing the BChE in Chemical Engineering with a minimum Grade Point Average of 3.00 and at least 75 hours earned at the time of application in the final semester of their junior year. Students must complete at least 90 credits toward the undergraduate degree before they can be enrolled in the program. All requirements of both degree programs must be satisfied.

Students must be full-time at the time of application. Up to six credits of graduate coursework in the department of the undergraduate major may be applied toward satisfying the requirements of both degrees. Applications are due by May 31 of junior year, and GRE scores are not required.

PART III. ACADEMIC

III-A. Degree requirements

Students entering the Biopharmaceutical Sciences Master's with a background in chemical engineering are expected to start the program with basic competency in the life sciences, such as through taking an undergraduate introductory course in cell biology, molecular biology, or biochemistry. Eight core courses (17 credits), electives (6-8 credits), and internship credits (5-7) are required as specified. Students who enter the program without an undergraduate degree in engineering, the course CHEG 500—Introduction to Chemical Engineering for Non-Engineers (3 credits) may be required as a prerequisite course.

A. Core (17 credits)

- CHEG 607/807: Modeling, Analysis, and Acquisition of Data (2 credits)
- CHEG 609: Communication and Leadership (1 credit)
- CHEG 620: Advanced Biochemical Engineering (3 credits)
- CHEG 661: Introduction to the Bioprocess Industry (3 credits)
- CHEG 662: Bioprocess Systems Analysis (1 credit)
- CHEG 663: Downstream Bioprocessing (3 credits)
- CHEG 664: Bioprocess Engineering in Practice (2 credits)
- CHEG 803: Scientific Communication (2 credits)

B. Electives (6-8 credits)

A minimum of two elective courses (6 credits) is required. Students in the M.S. track would typically take the two electives during the fall and spring semesters. Students in the 4+1 BChE/M.S. track would typically take the two electives during their undergraduate study period. The courses listed in **Appendix A** are suitable as electives with approval of the program director. Students will also be able to select other courses in consultation with the program director.

C. Internship (5-7 credits)

In parallel with their coursework, students will complete a comprehensive industry internship to be performed on site with an industrial sponsor or sponsors. The internship (CHEG 665) is a critical element of the biopharmaceutical sciences education. Its purpose is to give students a substantive work experience in which they will carry out the responsibilities of an industry team member, working on real industrial projects. The internship is a 15-month extended experience in which students work part time while simultaneously taking coursework for the degree. This enables students to seamlessly apply concepts learned in their coursework to problems encountered in the workplace, which in turn reinforces fundamental learnings from classroom instruction. With approval of the program director and industrial sponsors, students may undertake more than one internship to obtain experience in multiple companies or multiple divisions of the same company, as long as the credit requirements for the internship (below) are met. For example, a student may choose to complete two 7-8 month internships in series.

Internships will generally be supported directly by the industrial sponsor, and each will nominally last 15 months, with a credit load of 1-2 credits per semester (5-7 credits total) and a part- to fulltime workload (20-40 hours per week). The actual credit load and workload will be

determined by consultation with the industry mentor and the program director/steering committee. To meet the 30 total credit requirement for the Biopharmaceutical Sciences Master's degree, some students may need to take additional elective credits. For example, a student taking the minimum 5 credits of internship would complete 8 credits of electives to fulfill the 30 total credit requirement.

Students who are not already employed in the biopharmaceutical industry will generally be matched with industrial sponsors by the program director and steering committee, in consultation with industrial sponsors. Students will be supervised by a mentor at the host company. Non-biopharmaceutical industry professionals interested in supplementing their knowledge through the Master's Program may also undertake internships to gain experience in the biopharmaceutical industry. These internships might, for example, consist of: (i) an industry rotational opportunity undertaken for the purpose of learning new skills; (ii) a 'training period' in a new division of a company into which an employee is transitioning (for example, an employee switching from traditional small-molecule pharmaceutical process development to biologics / biopharmaceutical process development might use the Master's Program to support retraining); (iii) another mentored experience in the biopharmaceutical industry, upon approval of the program director. Biopharmaceutical industry professionals also are encouraged to consider training in the Master's Program for the purpose of learning new skills related to any aspect of biopharmaceutical process development. To earn internship credits, professionals already in the biopharma industry would be expected to complete project reports and presentations detailing the application of bioprocess fundamentals to their work to illustrate the new skills and knowledge they have gained through the program (see 'Grading').

Project scope. Interns will complete a project determined by the program director and steering committee to be of sufficient technical scope and complexity to be suitable for the degree. Example internship projects could include (as a non-exhaustive list): the analysis of existing process equipment; the design of new processes for production of biopharmaceuticals; characterization of existing processes for production of biopharmaceuticals; development or assessment of new analytical technologies for characterization of biopharmaceuticals in an industrial laboratory. The general scope and goals of the internship project and the mentor responsible for overseeing the project at the industry site will be established by the program director, steering committee, and industry representatives prior to placement.

Grading. Over the course of the internship, students will be expected to make substantive technical contributions based on the skills developed in their coursework. To earn credit for work in the internship, the student will be required to complete a report and a technical presentation during each semester. The reports and technical presentations will be graded on a letter grade scale by the program faculty with input from the industrial mentor, with the result subject to final approval by the program director. Grades each semester will be assigned based on the application of biopharmaceutical sciences principles from the coursework and the standards of written and oral professional communication, as well as the technical merit of the finished project with respect to the initial project scope and goals.

Networking and professional development opportunities. Many of our partner companies have established internship programs with comprehensive resources that enable students to find housing and deal with other logistics. Because of the scale of these internship programs, there are often planned networking and professional development events accessible to the student that will enhance their professional and career development that will be provided by the given company, without needing additional investment from UD.

Total number of required credits: 30 credits

III-C. Timetable and definition of satisfactory progress towards the degree

Maintenance of steady, reasonable progress towards the degree is the responsibility of the student. A normal course load for a full-time student is 7 credits in the first summer semester, 8 credits in the fall semester, 6 credits in the winter semester, 6 credits in the spring semester, and 3 credits in the second summer semester. The expectation is that the student completes the degree in 15 months. A student may request an extension of this time limit by submitting a written request to the program director. Students are expected to achieve a minimum grade of C in each of the required courses for the degree. In addition, in accordance with the Graduate Student Probation Policy, a cumulative GPA of 3.00 must be maintained in coursework for each semester.

PART IV. ASSESSMENT PLAN

The program will be evaluated and assessed based upon both direct and indirect assessments of student learnings. Direct assessments will evaluate student performance on relevant quizzes, exams, and reports/presentations required for their internship. Indirect assessments will be performed using student exit surveys designed in collaboration with the Center for Teaching & Assessment of Learning (CTAL) at UD. In addition, the program will be evaluated annually by external evaluators, for each of the first four years, to ensure that the program is on track to deliver both the intended educational impacts on students, and the intended broader societal impacts.

PART V. FINANCIAL AID

The Biopharmaceutical Sciences Master's Program will offer competitive, industry-sponsored full-tuition scholarships for selected students. Students will be selected for these awards at the time of program application, with decisions based upon the established admissions criteria. In addition to the availability of full-tuition scholarships, all students enrolled in the program will be placed into 15-month internships to be completed on a part- to full-time basis, as detailed above, that will generally be supported by industry. The continuance of funding will be based upon satisfactory progress towards the degree on the timetable and progression detailed above.

PART VI. PROGRAM ADMINISTRATION

The Biopharmaceutical Sciences Master's Program will be administered by NIIMBL, with leadership from a program director and steering committee comprised of UD faculty and/or NIIMBL scientists with expertise that is relevant to the biopharmaceutical sciences industry. The initial program director and steering committee members will be selected from the ad hoc committee that was established to develop the program. That committee, led by Prof. Millicent Sullivan, comprises academic and industry leaders in biopharmaceutical sciences concepts and application. The current membership of the ad hoc committee is:

Millicent Sullivan, Professor and Associate Chair of Chemical & Biomolecular Engineering, Professor of Biomedical Engineering

Kelvin Lee, Gore Professor of Chemical & Biomolecular Engineering, NIIMBL Institute Director

Christopher Roberts, Professor of Chemical & Biomolecular Engineering, NIIMBL Associate Institute Director, Director of the Center for Biomanufacturing Science and Technology

John Erickson, NIIMBL Senior Fellow and Chief Technology Officer

Abraham Lenhoff, Allan P. Colburn Professor of Chemical & Biomolecular Engineering, Past Chair of Chemical & Biomolecular Engineering

Babatunde Ogunnaike, William L. Friend Professor of Chemical & Biomolecular Engineering, Past Dean of Engineering

The responsibilities of the program director and steering committee will be to direct and administer the program. This will include providing core instruction, admissions (in coordination with NIIMBL staff), student advisement, and administration of the internship. Additional supporting instruction will be provided by instructors recruited from local industry, many of whom already teach or co-teach core and elective courses (e.g., David Roush, Merck; Bruce Vickroy, GSK; Gene Schaefer, Janssen; Kristin Valente, Merck; Nick Levy, Janssen). Additionally, faculty in the Department of Chemical & Biomolecular Engineering and related disciplines already offer elective courses of interest to the students of this program. Administrative support will be provided by NIIMBL.

Appendix A: Electives

Elective courses will be focused on science, technology, engineering, mathematics, and/or business topics that are relevant to Biopharmaceutical Sciences. Elective courses must comprise 600-level or 800-level courses that are approved by the program director. In any given semester, a range of courses meet these elective requirements. Typical elective courses might include topically-relevant courses such as the example courses listed below.

Chemical & Biomolecular Engineering
CHEG621 Metabolic Engineering
CHEG648 Biomaterials for Drug & Gene Delivery

Biomedical Engineering
BMEG661 Cell Engineering
BMEG662 Engineering Biomedical Nanostructures
BMEG695 Computational Systems Biology

Materials Science & Engineering
MSEG628 Macromolecular Design & Bioconjugations

Biological Sciences
BISC602 Molecular Biology of Animal Cells
BISC609 Molecular Biology of the Cell
BISC612 Advanced Cell Biology
BISC654 Biochemical Genetics
BISC671 Cellular and Molecular Immunology
BISC682 Bacterial Pathogens: Molecular Mechanisms
BISC690 Fundamentals of Pharmacology

APPENDIX B

Summer Core
CHEG 661 – Introduction to the Bioprocess Industry (3 credits)
CHEG 607/807 – Modeling, Analysis, and Acquisition of Data (2 credits)
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester)

Fall Core
CHEG 620 – Advanced Biochemical Engineering (3 credits)
CHEG 662 – Bioprocess Systems Analysis (1 credit)
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester)
Elective (3 credits)

Winter Core
CHEG 663 – Downstream Bioprocessing (3 credits)
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester)

Spring Core
CHEG 664 – Bioprocess Engineering in Practice (2 credits)
CHEG 603/803 – Scientific Communication (2 credits)
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester)
Elective (3 credits)

Summer Core
CHEG 609 – Communication and Leadership (1 credit)
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester)

15-month Internship
CHEG 665 – Bioprocess Design Internship (1-2 credits per semester, 5-7 credits total)