Master of Engineering in Biopharmaceutical Processing Outcomes

KGI's two-year MEng program is designed for high potential individuals seeking a career in biopharmaceutical processing and biomanufacturing. Students enrolled in this program will:

- Develop a powerful network through hands-on coaching and mentoring by senior academic and industry experts, housed within KGI's Amgen Bioprocessing Center.
- Obtain state-of-the-art scientific and technical skills required to take potential drug molecules from discovery to commercial application through participation in conference style lectures, seminars, individual and teamwork assignments and a capstone Team Design Project.
- Become skilled in key biomanufacturing areas including product and process development, process validation, CMC regulatory compliance and quality.
- Enhance their professional skills and obtain knowledge of management issues within the biopharmaceutical industry.
- Have opportunities to study abroad, participate in a paid industry internship, take part in a team project sponsored by industry, or participate in research activities within the Amgen Bioprocessing Center.

- Learn essential skills required for a rewarding career in the
  biopharmaceutical processing

Class	Year	Academic Year	Admitted	Attrition	Attrition Rate	Retention Year 1 to Year 2	On Time Graduation Rate
MENG Class of 2018	1	2016/2017	18	1	5.56%	17	94.44%
MENG Class of 2018	2	2017/2018	Transferred from other programs			9	100.00%
MENG Class of 2019		2017	24	1	4.1%	23	91.38%
MENG Class of 2020		2018	46	6	13.0%	40	
MENG Class of 2021		2019	25				
Overall Totals							95.27%

The MEng Program: Graduation and Retention Rates

The MEng program aims to prepare and graduate students for careers in the bioscience industries. While our goal is to graduate every student that enters the program, the program had a 95% retention rate during its first three years.

Analysis of Learning on the MEng Capstone Team Design Project

The MEng program features a second-year capstone engineering Team Design Project (TDP), which is modeled after the success of the MBS Team Masters Project. This project spans the entire second year, and includes training in engineering project management. In the TDP, students are provided with the opportunity to bring together all the technical, economic, quality and regulatory CMC elements in the course program and develop a commercial process for the manufacture of a biopharmaceutical product. Students work in small teams to design a complete biomanufacturing process capable of producing commercial quantities of an API (Active Pharmaceutical Ingredient) or DP (Drug Product). Each team works on a separate and specific design project, based on industry best practices, methods and techniques. To enhance industry relevance, all design projects will be team based and sponsored by an industry client.

The MEng Program launched in 2016, and 9 students from other programs (MBS and PPC) switched into the second year of program. Although the students met all requirements of the curriculum and TDP, it was not the standard sequencing of the fully implemented program. A more complete

evaluation will be possible in the 2017-18 academic year as the MEng students' progress in the fully implemented program. For now, results of the TDP for the initial group of 9 students is presented.

Results

Twenty students participated in the TDP during the 2018-2019 academic year. The TDP Final Project Presentations took place on Friday, April 26, 2019. The TDP Rubric was used for scoring presentations based on quality of presentation, slides, and technical coverage [see Table 2]. A panel of judges composed of KGI faculty and industry leaders, including several members of the Amgen Bioprocessing Center Advisory Board (ABCAB), provided feedback on the students' work.

A major strength was working in interdisciplinary teams and communication skills (100% demonstrated exceptional levels of proficiency). Other areas, such as using bioprocessing principles revealed 50% exceptional and 50% proficient, demonstrating an area for improvement in fundamentals.

Table 2: Summative Assessment of Learning Outcomes: Masters of Engineering in Biopharmaceutical Processing, Class of 2019

Program Learning Outcome	Assessment Method	Number of Student Assessed	Exceptional		Proficient		Emerging		Unacceptable	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
1. Students use bioprocessing principles to design processes necessary to translate basic life science discoveries into commercial products, which benefit society.	Rubric (Contains Coverage of Technical Content & Knowledge)	20	10	50.0%	10	50.0%	0	0.0%	0	0.0%
	Rubric (Strength of Argument)	20	10	50.0%	10	50.0%	0	0.0%	0	0.0%
2. Students contribute effectively in an interdisciplinary team to work complex process engineering challenges associated with biomanufacturing of biologics.	Rubric (Team Member Contribution)	20	20	100.0%	0	0.0%	0	0.0%	0	0.0%
3. Students understand the IP, regulatory, business, and marketing functions of the biopharmaceutical industry.	Rubric (Coverage of Process from Design to Implementation)	20	20	100.0%	0	0.0%	0	0.0%	0	0.0%
4. Students communicate effectively in an external environment composed of scientists, engineers and business professionals.	Rubric (Presentation Delivery, Verbal Support of Slides, Energy and Connection with Audience)	20	15	75.0%	5	25.0%	0	0.0%	0	0.0%
	Rubric (Average Score: Problem Statement, Slide Quality, Organization)	20	20	100.0%	0	0.0%	0	0.0%	0	0.0%
5. Students adhere to ethical principles in research, development, regulatory and quality issues inherent in the biopharmaceutical and related industries.	Not assessed on capstone project									

Source: MEng Faculty Panel Reviews of Team Design Project Teams, May 2018