

Engineering Management Academic Program Review 2024

Academic Year 2024 – 2024

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1. Executive Summary

The Engineering Management programs (EM Programs) have enjoyed consistent student learning outcomes despite several significant issues that occurred during the review period. Covid-19 caused the program to quickly pivot to online offerings, and post-Covid-19 enrollments caused the program to quadruple in size over the following two years. The rapid growth also came with a rapid change in program demographics, significantly lowering the average professional work experience levels, and dramatically raising the proportion of international students. The faculty and staff supporting the program reacted in a timely fashion to these issues and turned adversity to advantage, in raising the performance levels of students on the measured learning outcomes.

Programs Offered. The EM Program at UMBC is designed to provide practicing engineers and technology professionals with the fundamentals of management and leadership while providing additional education opportunities in their chosen discipline. Students learn from industry experts how to manage projects, lead teams, and make decisions integrating technical, financial, legal, and ethical considerations. Courses are developed and taught by practicing experts in the fields of management, operations, law, ethics, and finance.

The **Master of Science in Engineering Management** is a non-thesis, 30-credit program. The curriculum consists of five core courses (15 credits) that cover project management, leadership, communication, law, ethics, and finance. The core courses are supplemented with five elective (15 credits) courses of which one is in management (3 credits) and four are in a technical discipline (12 credits). The elective portion of the program is structured so that students can tailor the topics to their specific goals. The **Master of Professional Studies in Technical Management** is also a non-thesis, 30-credit program with course offerings that are highly aligned with the MS in Engineering Management. The primary differentiators in the programs are two-fold:

- 1) applicants in the Technology Management program are not required to hold an undergraduate engineering degree (instead they are required to have been working for a technology-oriented firm) and
- 2) Technology Management students are not required to take four courses in a technical discipline, freeing them up to pursue additional management science courses.

The **UMBC post-baccalaureate certificate (PBC) in Engineering Management** is designed for students who need proficiency in management and leadership. The certificate program requires students to take the four core courses from the M.S. program (12 credits). The post-baccalaureate certificates in Project Management, and Integrated Product Development and Manufacturing allow students to add a particular specialization to their Engineering Management or Technical Management degrees. All the PBCs can serve as an early entry into a master's program since all PBC courses can transfer to either master's program.

Our Students. The student demographic data indicates that the majority of engineering management students at UMBC are transitioning directly to graduate studies from their undergraduate work which has brought the average of the student body down to the early twenties, whereas 7 years ago the average age was in the mid-thirties. Three quarters of the

program's students are full-time students. There are 45% of the students who are also working, with only 14% of them being full-time employees. The student population has 21% women and 93% minority students with 74% of them being Asian.

The Faculty. The program is led by a full time Graduate Program Director and a full time Assistant Graduate Program Director. The leadership of the program teaches at least four courses per year (two fall, two spring semester courses) in addition to fulfilling administrative duties. The program relies primarily on Adjunct Faculty to teach the courses in the program. By using Adjuncts, the program can claim that all its faculty are not only scholars in the subject matter areas of engineering management, but they are also current practitioners. Additionally, the use of Adjunct Faculty allows the program to scale faculty levels according to enrollment levels. As an example of this, during this seven-year period of study, while the student body saw a four-fold increase, the faculty body also saw a four-fold increase, keeping the student to faculty ratio at a nearly constant level.

Self-study Findings and Plans. This self-study found the program to be in good shape regarding curriculum alignment to professional needs and learning outcomes. The EM program offerings are delivering on the “brand promise” as stated in the individual program objectives. Of remark is that this is occurring despite several significant changes that took place during the period under review. It was serendipitous that the EM program began the Quality Matters initiative pre-Covid-19 as it gave the faculty a running start on how to pivot towards delivering online courses at a quality level that maintained good student outcomes and good student satisfaction levels. The culture of continuous improvement established long before this review period was instrumental in allowing the program to respond quickly and scale operations to match a significant rate of growth, again without experiencing any drop in programmatic outcomes. The vision for the future centers around maintaining a culture of continuous improvement by seeking near term incremental improvements and keeping an eye on the environment to see what opportunities are presented longer term. The program is at a healthy level of enrollment and directives from university leadership are calling for a stabilization at current levels rather than asking for continue rapid growth.

One major initiative is under consideration. The EM programs are exploring the idea of embracing the change in demographics of the incoming student population. Rather than just compensating for the fact that applicants/admits have less career experience and are coming from other countries, the program plans to explore “leaning into” this change by creating a Global Engineering Management program. This would not take the place of the existing programs. It would mean the creation of a new pathway through the program that emphasizes engineering management activities on a global scale. The programs already have a large contingent of students from India, and a growing number of students from North Africa, plans are to investigate what it would look like to attract students from Latin American countries, the Middle East and Europe so that the program can offer students from around the world a global perspective on how engineering management can be conducted for multi-national endeavors.

2. Program Review

2a. Program Description

<u>Degrees Offered by the Academic Unit</u>	<u>First Year Offered</u>
Master of Science in Engineering Management	1987
Master of Professional Studies Technical Management	2017
<u>Non-Degree Programs</u>	<u>First Year Offered</u>
Post Baccalaureate Certificate in Engineering Management	2006
Post Baccalaureate Certificate in Integrated Product Development & Manuf.	2018
Post Baccalaureate Certificate in Project Management	2018

2a-1. Vision Alignment

The Engineering Management suite of programs (EM Programs) are designed to meet the needs of working professionals in a technical field seeking to enhance their careers and for engineers seeking a career change. The course and model of the program directly supports the UMBC [mission statement](#) comment on workforce training,

“UMBC emphasizes science, engineering, information technology, human services and public policy at the graduate level. UMBC contributes to the economic development of the State and the region through entrepreneurial initiatives, workforce training, ...”

Furthermore, the program’s high levels of enrollment from typically underrepresented groups in the field of engineering management is a testament to the program’s ability to meet the statement “...inspiring inquisitive minds from all backgrounds” found in the vision statement. The program’s post-baccalaureate certificates provide a gateway for students who are not fully prepared for a Master of Science program who want to supplement their program with an additional level of expertise or are uncertain if a master’s program is going to further their career goals.

2a-2. Overview

The EM Program at UMBC resides within the Engineering and Computing Education Program (ECEP) in of the College of Engineering and Information Technology. The program is designed to provide practicing engineers and technology professionals with the fundamentals in management and leadership while providing additional education opportunities in their chosen discipline. Students learn from industry experts how to manage projects, lead teams, and make decisions integrating technical, financial, legal, and ethical considerations. Courses are developed and taught by practicing experts in the fields of management, operations, law, ethics, and finance.

The Master of Science in Engineering Management is a non-thesis, 30-credit program. The curriculum consists of five core courses (15 credits) that cover project management, leadership, communication, law, ethics, and finance. The core courses are supplemented with five elective

(15 credits) courses of which one is in management (3 credits) and four are in a technical discipline (12 credits). The elective portion of the program is structured so that students can tailor the topics to their specific goals. The Master of Professional Studies in Technical Management is also a non-thesis, 30-credit program with course offerings that are highly aligned with the MS in Engineering Management. The primary differentiators in the programs are two-fold: 1) applicants in the Technology Management program are not required to hold an undergraduate engineering degree (instead they are required to have been working for a technology-oriented firm) and 2) Technology Management students are not required to take four courses in a technical discipline, freeing them up to pursue additional management science courses.

The UMBC post-baccalaureate certificate (PBC) in Engineering Management is designed for students who need proficiency in management and leadership. The certificate program requires students to take the four core courses from the M.S. program. The post-baccalaureate certificates in Project Management, and Integrated Product Development and Manufacturing allow students to add a particular specialization to their Engineering Management or Technical Management degrees. All the PBCs can serve as an early entry into a master's program since all PBC courses can transfer to either master's program.

The EM Program and [Systems Engineering](#) (SE) programs at UMBC share many electives. In fact, EM Program students may decide to specialize in Systems Engineering and receive a certificate in Systems Engineering.

2a-3. Program History

The EM Programs started when the M.S. in Engineering Management program was created in 1987 as a program that allowed students with engineering degrees to add more depth to their area of expertise and broaden their knowledge of management. The curriculum goals states "Prepare graduates for careers in management to lead and manage effectively in technical organizations". Until 2006, the management courses were taught either at University of Maryland University College or Merrick School of Business at University of Maryland Baltimore. The engineering courses were taught at UMBC.

In 2006 the UMBC College of Engineering and Information Technology collaborated with the Division of Professional Studies to redesign the program and offer all the management-focused and engineering-focused courses at UMBC. Enrollment in the program since UMBC has taken full control has grown from five students in 2006 to nearly 180 students in 2024.

2a-4. Organization

The EM Program at UMBC resides within the Engineering and Computing Education Program in the College of Engineering and Information Technology. Dr. Toby R. Gouker, Graduate Program Director (GPD) for UMBC's Professional Engineering Programs, currently administers the EM Program academically. Dr. Gouker has been with UMBC since 2010 and has worked in higher education for over 20 years. He also has over 40 years of experience in a wide range of industries, which has been focused on engineering management principles. Professor Jonathan Jett-Parmer, Lecturer, Systems Engineering, hired in August 2024 to serve as Assistant Graduate Program Director (AGPD) assigned to administrative and teaching duties along with a variety of

projects aimed at improving the program. Jett-Parmer brings significant operations, supply chain and professional training experience to the program with prior service as a Captain in the Navy, managing reserve technical personnel readiness.

The Division of Continuing and Professional Studies (DPS) provides the business administration of the program. The program reports to Dr. Christopher Steele, Associate Vice Provost, Continuing and Professional Studies. The Organizational Structure of DPS can be found in Appendix B. The Engineering Management program relies on DPS as a shared service with several of their staff members assigned to provide administrative and support services to the EM program. Nancy Clements provides classroom scheduling and faculty contracting, Jeremy Matthews provides data analysis, Kim Edmonds, Joshua Bass, and Pamela Rombach provide student advising, and Renee Eisenhuth’s team provides admission management services. Others in DPS provide marketing, corporate relations, and other services as requested.

An Advisory Panel consisting of managers at local companies and government organizations, and members of the administrative team was established to review the program periodically. However, the advisory panel has not met recently. Meetings were suspended during the Covid-19 pandemic and have not resumed because of the focus on scaling the EM program offerings to handle the dramatic increase in enrollments. The GPD is in the process of recruiting a new suite of Advisory Panel members and current members have not shown an interest in continuing to participate. The panel will be reactivated by the end of the Fall 2024 semester, once the Assistant Graduate Program Director has been in place.

The members of the former Advisory Panel are shown in Table 2-1. Even though the panel has not met recently, the program continued to follow their advice, first with the creation of a capstone experience in the program to showcase student’s comprehensive mastery of engineering management practices, and to grow more granular certificate programs to help students tailor their degrees with areas of specialization.

Table 2-1: Former EM Program Advisory Panel

Member	Institution	Member	Institution
Paul Patton, Sr. VP	CACI	Anita Griner, Chief Performance Officer	Coanosante
Scott Reiner, VP Health Analytics	GD IT		
Dr. Robert Harding, Director Incubator Technology	WR Grace & Co.		

2b. Data Analysis provided by IRADS & Provost’s Office:

All Data used in this report is documented in Appendix A. This data is attributed to UMBC REX, the university’s data warehousing system, provided by the Office of Institutional Research, Analysis & Decision Support and the REX Data Warehouse team, and reference data from relevant student, employee, and finance data tables, as well as other information systems across campus.

2b-1 & 2b-2: Trends in Admissions (1), and Enrollment Trends, and Degrees Awarded (2)

As stated previously, the EM program’s signature offering, MS in Engineering Management has

grown over the past seven years to nearly 180 students. (Figure 2-1) The Engineering Management degree was at a period of steady state with approximately 60 students enrolled from late 2018 to early 2021, where admissions to the program essentially matched graduation rates, even through the beginning of the Covid-19 pandemic. Post Covid-19, however, the program experienced a very significant surge in enrollments which has been attributed to a backlog of international students waiting to enter the program due to a lack of visa availability during the peak of the Covid-19 outbreak. Enrollments in the Technical Management degree program, on the other hand, have not managed to grow significantly since the program's inception in 2017. They remain at a low level of about 10 students indicating that the need for technical managers without an undergraduate degree in engineering may not be as strong as was anticipated when the program was created.

Enrollment in the Engineering Management and Integrated Product Development and Manufacturing Post Baccalaureate Certificates are also at a low level, while the PBC in Project Management has seen very significant growth in the past year, due in large part to a cohort of 50 students from the administrative offices of the Prince George's County Public School system. The school system recognized that many of its non-teaching staff support the system through the completion of projects, (IT upgrades, new classroom space, curriculum upgrades, etc.) and so it wanted to have its staff become better managers of these ongoing projects.

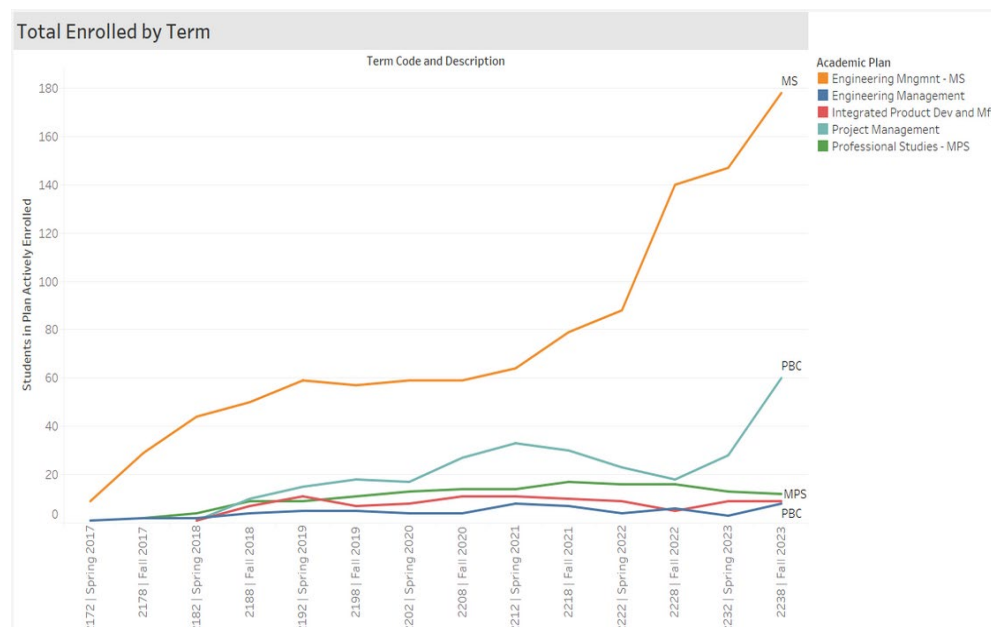


Figure 2-1: EM program enrollments for the past 7 years.

The number of master's degrees awarded for the past seven years (Figure 2-2) is commensurate with the previously mentioned enrollment levels and roughly lags enrollment levels by the 3-year average time to complete a master's degree. Certificate program awards do not track enrollments as well due to the higher rate of variability in time to completion (2.5-5 years) and the fact that many students do not disclose their intention to earn a PBC until they declare their intent to graduate.

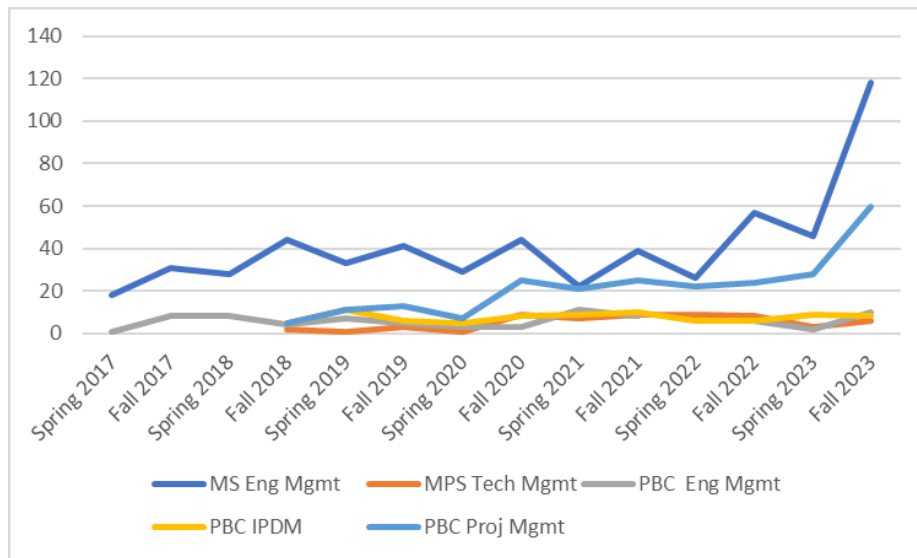


Figure 2-2: EM Program Degree Awards for the past 7 years.

2b-3: Transfer Students Because UMBC’s EM Programs are graduate-level programs, there is no analysis on trends in the ratio of transfer students. Occasionally students do transfer into UMBC’s EM programs, but the numbers are not significant enough to warrant analysis.

2b-4: Curriculum

The M.S. in Engineering Management requires ten (10) courses: five (5) core management courses, one (1) management elective, and the remaining (4) technical courses in the student's discipline. Students choose their elective courses to achieve a focus consistent with their career plans. The proper choice of electives allows the students to obtain post-baccalaureate certificates in a range of subject areas both from within the EM program offerings, (systems engineering, project management, integrated product development and manufacturing) and/or other programs (data science, cybersecurity, biotechnology, entrepreneurship, etc.). Table 2-2 lists some examples of the paths the students may take to compete the program.

Table 2-2: EM Program Degree Sample Pathways through EM Program

Core Courses (15 credits)	Project Management Focus 15 credits	Organizational Leadership Focus 15 credits	Entrepreneurship Focus 15 credits
ENMG 650: Project Management OR ENMG 668: Project and Systems Engineering Management	ENMG 663: Advanced Project Mgmt Applications ENMG 661: Leading Virtual/Global Teams	ENMG 654: Leading Teams and Organizations ENMG 659: Strategic Management	ENMG 690: Innovation and Technology Entrepreneurship ENMG 664: Quality Engineering and Management
ENMG 652: Management, Leadership and Communication ENMG 656: Engineering Law and Ethics	ENMG 680: International Project Management ENMG 681 Technical Contract and Acquisition Management ENMG 665 DEI In Project Management	ENMG 661: Leading Virtual/Global Teams ENMG 692: Principles of Organization Learning ENMG 691 Operations and Supply Chain Mgmt	ENMG 654: Leading Teams and Organizations SYST 672: Decision and Risk Analysis SYST 660 Systems Engineering Principles
ENMG 658: Financial Management ENMG 693 Management Project			

Curriculum Approach

The Engineering Management program's curriculum core covers a diverse set of disciplines. This core focuses on the management topics. The framework of the management curriculum does not change, the content of the courses does evolve though, to capture the state-of-the-art of the discipline, and use current events to motivate an understanding of the key principles.

Project Management. The project management courses utilize the Project Management Institute's (PMI) Body of Knowledge (PMBOK) to inform the content. The textbook directly links content to the PMBOK. The close linking of course content to state-of-the-practice prepares the students to manage projects in a wide variety of industries and prepares the students to take the PMI certification exam. Recent course additions include the development of content to cover agile project development techniques.

Management and Leadership. The content of the leadership courses is delivered using lectures and case studies. The case studies are from Harvard Businesses Publishing and capture both historical and current orthodoxy on leadership. The case studies are regularly updated to capture topical issues. Some of the topics from recent case studies used include: leadership challenges as a result of the pandemic, ethical issues in ride sharing application firms, and business implications of crypto currency. Work is underway to experiment with original case development, utilizing generative AI. The intent of this initiative is to provide better targeted context within a case to support learning objectives, and to thwart the potential for students to grab solutions from other student analyses in previous time periods and locations.

Finance. The content of the finance course is based on the fundamentals of finance and supplemented with current topics as part of the student's projects. The goal of the course is to

provide students with the language they need to convince financial officers in their organization of the return on investment of their ideas.

Law. The law content of the curriculum is centered on conveying the fundamentals of legal system, tort law, and intellectual property. Case studies are used to illustrate the legal concepts and bring in current engineering law issues into the classroom discussion.

Ethics. Ethical issues are discussed throughout the curriculum typically through case study discussions. The case studies cover both classic situations, and current topics. Ethics principles are discussed in a law and ethics course as well as the management and leadership course.

The UMBC post-baccalaureate certificates in Engineering Management, Project Management and Integrated Product Development and Manufacturing are designed for students who need timely proficiency in core areas to successfully manage technical teams. The certificate programs require students to take four (4) courses, see Table 2-3.

Table 2-3: The core courses of the Post Baccalaureate Certificate programs

Required Courses (12 credits)
ENMG 650: Project Management OR ENMG 668: Project and Systems Engineering Management
ENMG 652: Management, Leadership and Communication
ENMG 656: Engineering Law and Ethics
ENMG 658: Financial Management

Required Courses (12 credits)
ENMG 650: Project Management OR ENMG 668: Project and Systems Engineering Management
ENMG 652: Management, Leadership and Communication
ENMG 663: Advanced Project Management
ENMG XXX: Selective Option

Required Courses (12 credits)
ENMG 615: Product Development
ENMG 616: Manufacturing Operations
ENMG 617: Advance Manufacturing Operations
ENMG 618: Org. Mgmt. for Product Design and Manuf.

Course Trends

The core courses (except for the capstone) of both master's programs have continuously been offered three times per year Fall, Spring, and Summer at a course per semester level that keeps up with interest. The core courses are offered in both in person and online formats to best meet student's modality preference. Electives with heavy interest are traditionally offered in both the Fall and Spring, with multiple sections per semester if interest is high enough. The ability to dial

up and down on course levels based upon interest is one of the benefits of having a large staff of adjunct faculty available for instruction. The volume of course offerings over the past seven years is shown in Figure 2-3.

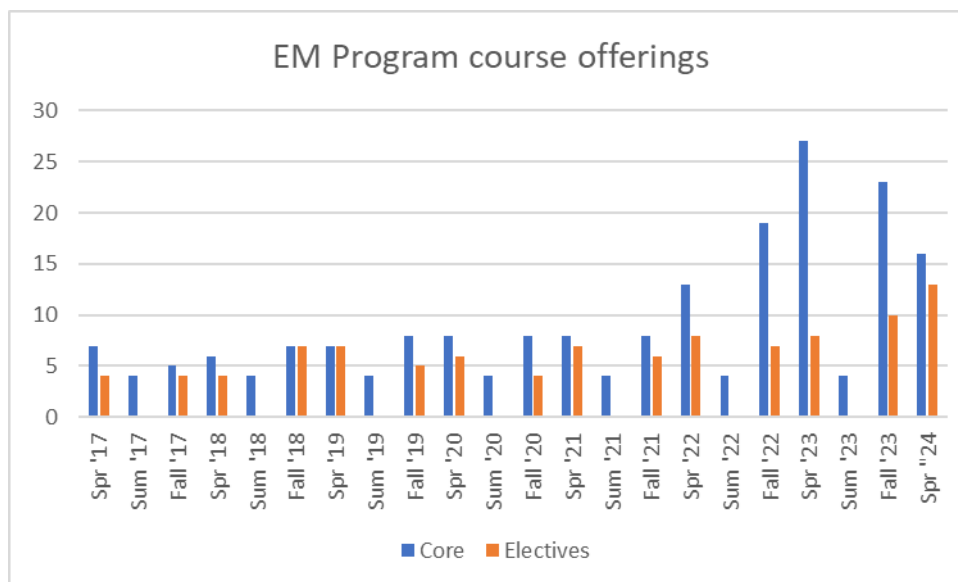


Figure 2-3: EM Program Seven Year Trend in Course Offerings

The offerings and ratios (core vs. elective) are relatively constant pre- and during Covid-19, then rose rapidly in the years post-Covid-19. The large increase in student body was successfully met by a significant increase in adjunct faculty recruiting and training. Elective course offerings did not rise as aggressively as core offerings in the post-Covid-19 era due to the increased level of elective sharing between the EM program and other programs on campus (data science, cybersecurity, biotechnology, etc.).

2b-5 & 6: Student Progression (5) and Time to Degree (6)

Figure 2-4 shows degree and certificate program outcomes over the past seven years. With an average time to graduation of 3 years, it is appropriate to look back to data before 2021 to acquire an indication of an attrition rate for the master's programs. For terms before 2021, the Engineering Management program averages less than 10% attrition, even if you take the conservative step of including the remaining active students pre-2021 as non-graduating. Given that many of the students are working professionals, and may have switched job locations or career objectives, this level of attrition has been judged to be acceptable.

Technical Management program, on the other hand, is closer to 40%. On the surface this rate of attrition appears to be alarming, however, the enrollment levels in the program are low (10-15 students) and a transfer rate of 3-4 students per year has been observed from Technical Management to other programs (Data Science, Information Systems, etc.), resulting in a loss of actual student headcount from UMBC of about 10-15%, so no further action is planned for this program either.

Post Baccalaureate Certificate completion rates are very difficult to use for drawing program performance implications. With the longer and more variable times to completion, the high rate of variability in timing of a declaration to complete a certificate, and the abandonment of certificates in favor of a full master's degree, analysis or concern about certificate completion has been deemed unwarranted. The general assumption is that certificates are utilized by students with a more casual approach to higher education, a casualness driven by a variety of forces: uncertainty about ability, uncertainty about time commitment, desire for quick results, or even life's forces as shown in this request for readmission to a certificate by a student:

"Hello Dr. Gouker

Hope you are doing well. It's been a long time since we connected. I am Hxx Yxxxx, UMBC campusID # - XXXXXXX. I have started my certificate program for Project Management back in Fall of 2018 and completed three courses of the program before the pandemic hit. I couldn't get back to finishing the last course and obtaining my degree due to the shut down for the pandemic followed by having a new baby and a full-time job. I would like to pursue completing that course and obtain my degree this fall. Can you please let me know the possibilities of how to achieve that and if I could keep the credits for the courses I already completed?

Appreciate any help in the matter. I have already submitted the returning student form as suggested by admissions."

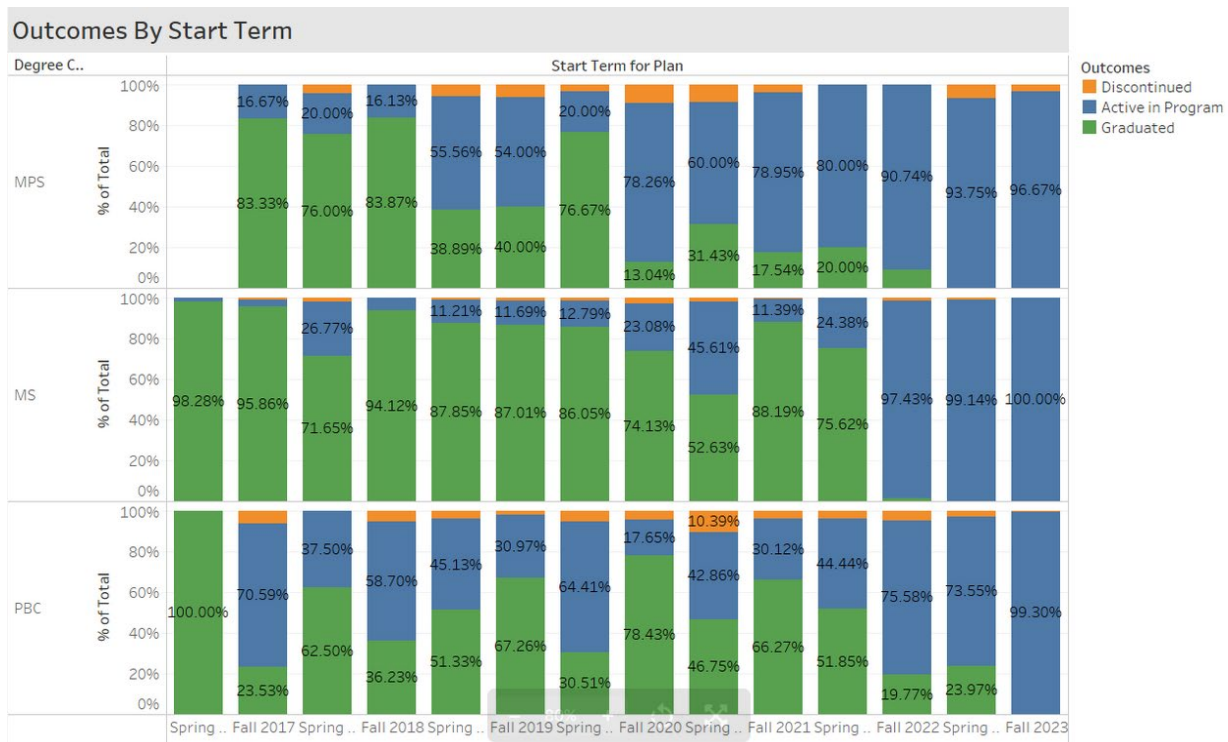


Figure 2-4: EM Program Graduation, Active and Discontinued Rates for the past 7 years.

2b-7: Faculty profile

The faculty supporting the program has always been primarily part-time. The only full-time

faculty have been those who served as the Graduate Program Directors, or Assistant Graduate Program Directors. The Engineering Management program offerings are predicated on having experienced instructors who are part of the local Engineering and Technical Management workforce. This has led the program to be heavily focused on Adjunct Faculty that bring a practical nature to the scholarly teachings of the curriculum.

Table 2-4 provides a list of current faculty members teaching in the program and shows education, experience demographical information and courses taught. (Full CVs/resumes are attached to Appendix D.)

Table 2-4. UMBC Engineering Management Program faculty demographics

Faculty	Position	Degrees	Expertise	Gender	Ethnicity	Courses Taught
Sabrina Aflalo	Adjunct	MBA BS Bus/Mktg PM Certificate	Aerospace Program Management	Female	White-Non Hispanic	ENMG 650
David Blair	Adjunct	MBA MSE Biomed Eng BS Biomed Eng	Biomedical Engineering Product Development	Male	White-Non Hispanic	ENMG 618
Theresa Cassino	Adjunct	PhD Chem Eng MS Chem Eng BS Chem Eng	Pharmaceutical Project Management	Female	White-Non Hispanic	ENMG 650
Alireza Chamani	Adjunct	PhD Mech Eng (candidate) MS Robotics MS Mech Eng BS Mech Eng	Mechanical Engineering PE, PMP	Male	Middle Eastern/ North African	ENMG 663
Matthew Esworthy	Adjunct	J.D. BA Poly Sci	Commercial Law Litigation	Male	White-Non Hispanic	ENMG 656
Steven Falk	Adjunct	MSE Biomed Eng BSE Biomed Eng PE, Registered Patent Agent	Electromechanical Systems	Male	White-Non Hispanic	ENMG 615
Karen Falkler	Adjunct	BS Sports Psychology	Work Culture Wellness	Female	White-Non Hispanic	ENMG 652
Suzanne Frock	Adjunct	MBA BSBA	Operations and Supply Chain Management	Female	White-Non Hispanic	ENMG 691, MGMT 410
Toby Gouker	Senior Lecturer	PhD Mgmt & Decision Sciences MBA BS Chem Eng GSIC, CISM, CPEM	Engineering Mgmt Higher Ed Admin	Male	White-Non Hispanic	ENMG 652, ENMG659, ENMG 693
Christopher Haug	Adjunct	MBA BS Env Eng	Entrepreneurship	Male	White-Non Hispanic	ENMG 652
Jonathan Jett-Parmer	Lecturer	MS Systems Eng MBA MS Env Sci BS Mech Eng	Manufacturing & Supply Chain	Male	White-Non Hispanic	PROJ 663
John Johnson	Adjunct	PhD Sys Eng MS Sys Eng BS Elec Eng MBA	Systems Engineering	Male	Black or African American	SYST 672
Mark Junda	Adjunct	MBA BS Bus Admin	Federal Acquisitions FAC-C Professional	Male	White-Non Hispanic	ENMG 681

Table 2-4. UMBC Engineering Management Program faculty demographics (cont.)

Faculty	Position	Degrees	Expertise	Gender	Ethnicity	Courses Taught
Keith Kirkwood	Adjunct	MS Eng Mgmt BS Infor Sys	Large Scale Project Management TS/SCI Clearance	Male	White-Non Hispanic	ENMG 650
Michael Maloney	Adjunct	MS Finance BA Bus Admin	Financial Management	Male	White-Non Hispanic	ENMG 658
Robert Mather	Adjunct	MBA BA Comm	MFG & Supply Chain Logistics	Male	White-Non Hispanic	ENMG 617
Albert Mubako	Adjunct	D. Mgmt MBA BS Management	Digital Business Transformation	Male	Black or African American	ENMG 691
Sam Negahban	Adjunct	PhD Civil Eng MS Civil Eng BS Civ Eng	Construction Project Mgmt	Male	Middle Eastern/ North African	ENMG 663
George Ray	Adjunct	D. Mgmt MS Software Eng MS Mktg BS Acctg BS Comp Sci	Knowledge Management Marine Corps Vet	Male	White-Non Hispanic	ENMG 661
Jeffery Ray	Adjunct	D. Mgmt JD MS Info&Soft Eng MS Civil Eng BS Civil Eng	Large Scale Project Management TS/SCI Clearance PE, PMP, CSEP	Male	White-Non Hispanic	ENMG 650, ENMG 668,
Denean Robinson	Adjunct	Ed.D Education MS Exec Mgmt BS Family Studies	Human Res Workforce Dev	Female	Black or African American	ENMG 652, ENMG 659
Charles Spearman	Adjunct	PhD Org Dev& Chg MA Org Dev&Chg MS Qual Assurance	Bus Process Dev Quality Management	Male	White-Non Hispanic	ENMG 664
Jason Stremmel	Adjunct	MBA BS Mech Eng Six Sigma BB	Manufacturing Operations	Male	White-Non Hispanic	ENMG 616
Maura Swart	Adjunct	MS Info Tech BS Mech Eng PMP	Engineering software mgmt & support	Female	White-Non Hispanic	ENMG 650, ENMG 652
Charles Swassing	Adjunct	MS Eng Mgmt BA Health Admin	Infor Sys Mgmt	Male	White-Non Hispanic	ENMG 654
Brian Wayman	Adjunct	PhD Mech Eng BS Mech Eng	Medical Device Program Management	Male	Black or African American	ENMG 650
Orlando Williams	Adjunct	MS Sys Eng BA Bus Admin	Systems Engineering	Male	Black or African American	ENMG 650
Quincy Wright	Adjunct	MBA BS Const Mgmt PMP, CCM,MPM	Large Scale Project Mgmt	Male	Black or African American	ENMG 667
James Ziegler	Adjunct	MBA BS Acctg CPA	Finance	Male	White-Non Hispanic	ENMG 658

The pool of faculty teaching in the program are well educated, holding undergraduate engineering and technology degrees with advanced degrees from a variety of fields. The strength of the faculty though, is their lengthy industrial experiences and their ability to transfer that experience to the students.

Figure 2-5 shows the gender make up of professionals working as Engineering Managers in the US. The UMBC EM Program faculty makeup is 79% male and 21% female, which exceeds our goal to have a female representation in the faculty that at least matches the 7.4% female population in the professional field. Exceeding the goal by this much has been an asset as it has allowed the department to have an ample supply of mentors for the 22-38% female student body we have been successful in attracting over the past seven years.

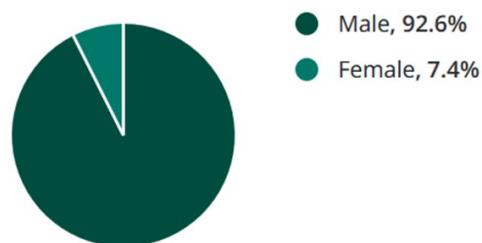


Figure 2-5. US Engineering Management Profession Gender Demographics.
 zippia.com (<https://www.zippia.com/engineering-manager-jobs/demographics/>)

Figure 2-6 shows the ethnic make-up of professionals working as Engineering Managers in the US. The EM Program faculty at UMBC is composed of 73% white, 21% Black or African American, and 7% Middle Eastern or North African. As with gender, our goal is to present a faculty pool to the students that at least matches the ethnic make-up of the underrepresented groups within the professional community. With a faculty makeup that is 21% Black or African American, we more than exceed the industry level of 3.1%, however our representation in other areas falls below our goal.

At the beginning of this seven-year review period, the EM program student body was 45% white, 17% Asian, 15% Black/African American, and 6% Hispanic/Latino with the remaining as not specified. This level of diversity of the student body was deemed acceptable regarding the goal of attracting underrepresented individuals. With the post Covid-19 influx of students, the current diversity mix is quite different at 7% White, 74% Asian, 15% Black/African American, 0% Hispanic/Latino, and 4% not specified. The program is interested in exploring ways to increase diversity, balancing the large influx of Asian students by attracting Hispanic/Latino students to the program.

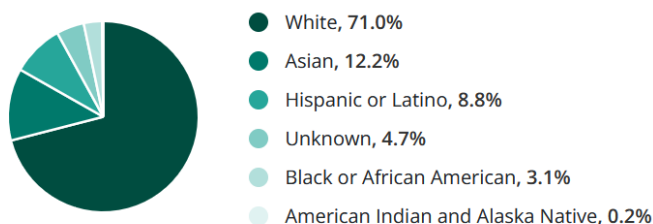


Figure 2-6. US Engineering Management Profession Race Demographics. zippia.com

2b-8 & 2b-9: Faculty-Student Ratio (8) and Faculty Productivity (9)

Table 2-5 shows the number of faculty and students in EM program over the past seven years. Pre-and during Covid-19 as the student body grew, faculty was added and the ratio of students to faculty remained relatively consistent near 6. Post-Covid-19 however, the ratio has increased somewhat. While new faculty have been added quickly, they have also been added conservatively, given the prediction that our rapid rise in students is really a post Covid-19 backlog phenomenon. Expectations were such that the level of enrollment of new students would

decline somewhat after the backlog cleared, so that new faculty should be added, but the program need not add additional faculty to anticipate a continued rapid growth spurt.

Table 2-5: Annual Student to Faculty Ratio (2017-2023)

	2017	2018	2019	2020	2021	2022	2023
Faculty	6	9	10	11	17	20	24
Students	37	55	66	70	98	158	188
S/F Ratio	6.2	6.1	6.6	6.4	5.8	7.9	7.8

New admit data from the 2024 admission cycle is suggesting that the expected decline is materializing (Figure 2.7). The signature program (MS in Engineering Management) has remained healthy but is at a level which is significantly less than the high seen in 2023. (As a side note, the admits into the Project Management PBC can be ignored for the purposes of this analysis, given that they represent the cohort of 50 students admitted from the Prince Georges County Public School system.)

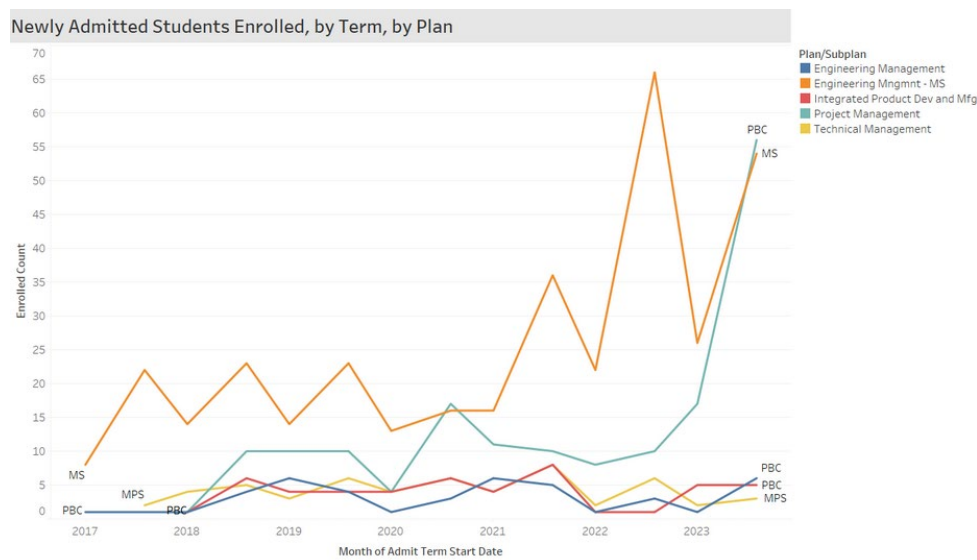


Figure 2-7: New student admits by semester (2017-2024)

Faculty productivity in other typical areas of analysis do not apply to the faculty supporting the EM programs. As adjunct faculty under contract on a semester-by-semester basis, no expectations are in place for research endeavors or service.

2b-10: Budget

The EM programs do not have a direct budget line. The College of Engineering and Information Technology (COEIT) and the Division of Professional Studies (DPS) offer the EM programs jointly under a Memorandum of Understanding (MOU). The MOU outlines the distribution of the revenues from the EM program courses to different university budgets. The university administration takes 10% of tuition revenue to cover overhead costs; DPS retains the remaining

90% of tuition. DPS covers instructor salaries and expenses, the GPD and AGPD salaries, administrative program support, and marketing expenses. DPS gives 25% of the net annual revenue to COEIT and 75% to the provost office for support of other programs. Given that all faculty are adjunct instructors and not research faculty, their financial support is easily met through this arrangement. To date, any requests made by the Graduate Program Director for resources have been met by administrative support in ECEP.

2c. Analysis of Data Provided by the Program

2c-1. Educational Goals, Learning Outcomes, and Program Assessment Plans

Educational Goals

The educational goals for the Engineering Management program were modified by the Advisory Board when the program was revised in 2006, further updated in 2008 and ratified in 2015. The goals as of the program are:

- I. Lead and manage effectively in technical organizations,
- II. Make sound decisions using technical, business, and ethical factors,
- III. Effectively communicate technical concepts to non-technical audiences.

The program seeks to accomplish these goals through focused graduate courses in management supplemented with elective courses in engineering and management. The core management courses cover best practices in project management, leadership, ethics, and financial analysis.

Intended Student Learning Outcomes

Program Learning Outcomes (PLOs) were refined in 2016 to improve the ability to perform assessment. Each of the core courses and electives contributes to the student achievement of the learning outcomes. Table 2-6 provides a mapping of Educational Goals to Program Learning Outcomes for evaluation of both the certificate and MS programs.

Table 2-6: EM Program Learning Outcomes

Educational Goal	Program Learning Outcome
I	PLO-IA: Demonstrate the ability to effectively manage a project's cost, schedule, technical performance, and risk.
I	PLO-IB: Apply management, leadership, communication, and interpersonal skills to deal with others effectively.
II	PLO-IIA: Apply sound professional and ethical standards to decision making.
II	PLO-IIB: Analyze and apply company financial information to make effective decisions.
III	PLO-III: Demonstrate the ability to effectively communicate technical concepts to technical staff and management.

Program Assessment Plan

The UMBC EM program has an established process for assessing student's performance relative to the student learning outcomes set for the program. The process begins with establishing the educational goals and ends with feedback on the curriculum and teaching methods. The assessment process, shown in Figure 2-8, is managed by the Graduate Program Director.

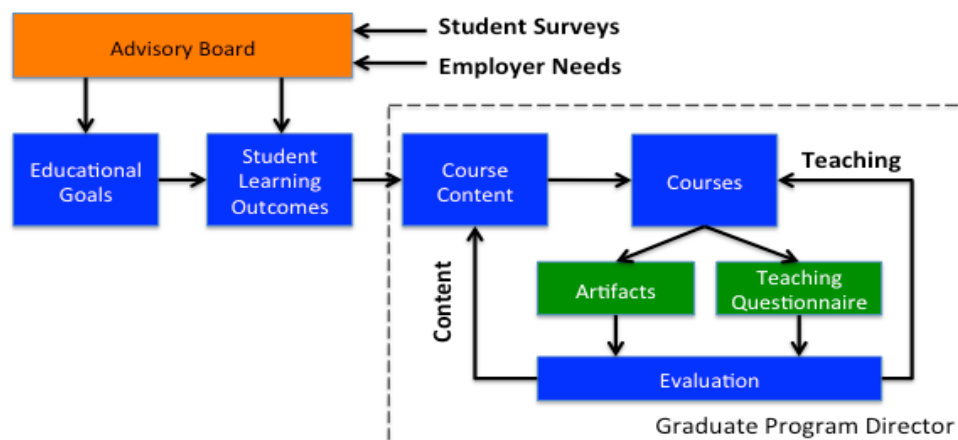


Figure 2-8: Learning outcome feedback process ensures educational goals are met.

In addition to measuring performance against the Program's Learning Outcomes, the faculty chose to evaluate the EM program via several methods: teaching effectiveness, student satisfaction, and impact on students' careers. The assessment tools in use in the program are described below.

A. Teaching Effectiveness

The Graduate Program Director (GPD) utilizes several approaches to evaluate teaching effectiveness in the program. Student Evaluation of Educational Quality (SEEQ) provides a warning flag for identifying the instructors who are struggling with teaching the material. SEEQ scores are derived from student surveys at the end of a course and are rated on a Likert scale of: Very Poor (1), Poor (2), Average (3), Good (4) and Very Good (5) to capture student opinions and perceptions of a course offering relative to other UMBC course offerings across the campus. If the SEEQ scores are below average for teaching effectiveness or show a market decline, a further investigation into the root cause is warranted. The GPD also randomly attends classes to evaluate the teaching styles and student performance during presentations.

Table 2-6 shows the average SEEQ scores for post-Covid-19 classes that were identified for further investigation. (Evaluations were suspended during the Covid-19 period.) Of the over 150 courses offered in this period, only one course (highlighted scored in red) fell below average (<3.0) for teaching effectiveness, a section of ENMG 650 Project Management Fundamentals in the Fall of 2023. An investigative conversation between the GPD and the instructor revealed that the instructor was struggling with adaptation to increased responsibility at the "day-job" and admitted that while student performance did not suffer, attention to students did suffer in that term. The GPD and instructor agreed that it was best for the instructor to take some time off from teaching and revisit the possibility of teaching in the future once day-job responsibilities had settled to a manageable level.

Table 2-7 also highlights several other courses/sections where teaching effectiveness was above average, but not at a level of proficiency that the faculty desired (>4.0). Peer-to-peer teaching effectiveness communications have been established to bring the learning experience of this 15% of courses to a higher level. As a result, different lecture emphasis, in-class exercises, and assignments are now being shared amongst faculty on what “works best” in terms of student receptiveness.

Table 2-7. Average Student Evaluation of Educational Quality (SEEQ) since 2022

			Compared with other courses	Compared with other instructors	Overall rating
Term	Section	Enrolled	Course	Course	Course
Spring 2022		387	4.26	4.44	4.48
	ENMG 652 02	17	3.40	3.40	3.40
	ENMG 652 04	8	3.71	4.29	4.29
	ENMG 652 05	23	3.69	3.77	3.85
	ENMG 661 01	24	3.50	3.67	3.83
Fall 2022		582	4.36	4.50	4.49
	ENMG 650 03	25	3.73	3.55	3.73
	ENMG 656 02	25	3.71	4.00	4.00
	ENMG 691 01	25	3.56	4.11	4.11
Spring 2023		715	4.28	4.41	4.41
	ENMG 652 12	25	3.43	3.14	3.43
	ENMG 652 02	17	4.00	3.67	3.67
	ENMG 652 04	25	3.80	3.89	4.00
	ENMG 656 01	25	3.88	3.88	4.13
	ENMG 656 02	20	3.80	3.80	4.00
	ENMG 659 01	20	3.67	3.67	4.00
Fall 2023		786	4.26	4.36	4.36
	ENMG 650 05	25	3.80	4.20	4.20
	ENMG 650 06	25	3.25	2.50	2.75
	ENMG 652 02	24	3.00	4.00	4.00
	ENMG 654 01	15	3.85	3.69	3.85
	ENMG 656 02	24	4.00	3.50	3.75
	ENMG 658 01	26	4.17	3.17	3.33
	ENMG 658 02	24	3.75	4.00	3.75
	ENMG 659 01	25	3.83	3.83	3.83
	ENMG 661 02	25	3.67	4.00	4.00
	ENMG 681 01	24	4.00	3.67	4.00
	ENMG 691 01	25	3.50	3.75	3.50

Student Achievement

Student achievement relative to the Program Learning Outcomes (PLOs) is evaluated using three processes: review of artifacts identified in Table 2-8, student performance averages, and a survey of students.

Review of artifacts

Each core course has a set of course learning outcomes described in their syllabus (Appendix C). From the set of course learning outcomes, several have been identified as indicators of success in measuring program learning outcomes (PLO). Table 2-8 shows how the course learning outcomes (CLOs), listed in the course syllabi, are mapped to the PLOs.

Table 2-8. Course Learning Outcomes Mapped to Program Learning Outcomes

Program Learning Outcome	Course Learning Outcome	Course Learning Outcome points of measurement
PLO IA: Students will demonstrate the ability to effectively manage a project's cost, schedule, technical performance, and risk	ENMG 650 / 668 CLO-3	IMP Project
PLO IB Ability to use basic management, leadership, communication and interpersonal skills to deal with others effectively	ENMG 652 CLO-1	Case study analysis paper
PLO IIA Ability to apply sound professional and ethical standards to decision making	ENMG 658 CLO-2	Exam & Paper
PLO IIB Ability to analyze and use company financial information to make effective decisions.	ENMG 658 CLO-6	Project & Paper
PLO III Students will demonstrate the ability to effectively communicate technical concepts to technical staff and management.	ENMG 650 / 668 CLO-1 ENMG 652 CLO-4	ENMG 650 668 Final Exam ENMG 652: Group Presentations

The lead instructors of the core courses containing measurement points for PLO's collect course learning outcome data. The data is derived from rubric-based assessment of projects, papers, presentations, and selected exams. The program learning outcomes management process has been working effectively for many years but was suspended during the Covid-19 pandemic period. With the significant changes in teaching modality and tremendous growth in the student body since Covid-19, student learning outcome concerns surfaced. A post-Covid-19 analysis of the data collected is shown in Table 2-9. The table shows both current learning outcomes for each of the PLOs, plus a delta in parentheses from the pre-Covid-19 measurement of the outcome at each proficiency level. Most students are still successfully demonstrating excellence or proficiency across all the Program Learning Outcomes despite the recent rapid changes. Closer examination of the data suggests that in two of the PLOs, IIA & III, adjustments made during the Covid-19 period have led to a significant improvement in the level of student proficiency excellence for these two outcomes. The Graduate Program Director feels that this significant improvement, as well as the more minor ones, may be a result of the more explicit tying of learning activities to outcomes that occurred during the transition to an online modality. They appear to have had a lasting impact on the delivery of material in the post-Covid-19 period.

Table 2-9. Post-Covid-19 Course Learning Outcomes

Program Learning Outcome	Excellent	Proficient	Not Proficient
PLO-IA Students will demonstrate the ability to effectively manage a project's cost, schedule, technical performance, and risk	73.0% (+0.5)	23.0%(+3.0)	4.0%(-3.5)
PLO-IB Ability to use basic management, leadership, communication and interpersonal skills to deal with others effectively	80.4%(+2.6)	15.6%(-5.4)	4.0%(+2.8)
PLO-IIA Ability to apply sound professional and ethical standards to decision making	69.1%(+33.5)	26.4%(-20.3)	4.6%(-13.2)
PLO-IIB Ability to analyze and use company financial information to make effective decisions.	80.4%(+7.2)	17.4%(-9.4)	2.2%(+2.2)
PLO-III Students will demonstrate the ability to effectively communicate technical concepts to technical staff and management.	81.1%(+45.4)	13.2%(-46.9)	5.1%(-0.9)

Review of student body performance averages

While the analysis of key artifacts is the primary indicator of program success, the faculty wanted to also evaluate program success by looking at overall course grade trends along with drop/fail/withdraw/incomplete (DFWI rate) rates as another measure. Figure 2-9 gives longitudinal grade averages of all EM program courses at the top (legend on the right-hand side) that have moved up and down slightly over the past seven years between, 3.87 and 3.55. The trend for DFWI numbers over the same period is shown in the bars on the graph (legend on the left-hand side) with the percentage of the enrolled population experiencing a DFWI event as a number above the bar. Over the years, the number of DFWIs has increased, but this is because of an increase in the size of the student body as the percentage of DFWI remains in the 2-4% range. The DFWI percentages are consistent with the “not proficient” levels seen in the PLO examination above.

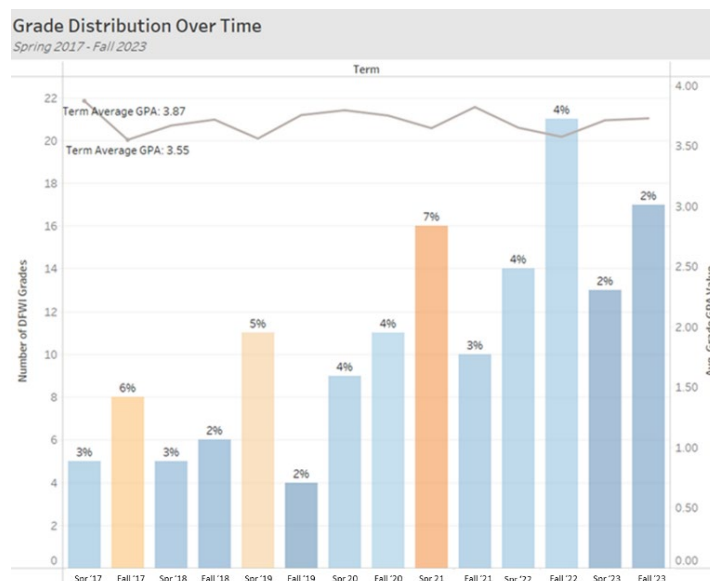


Figure 2-9. Grade DFWI Trends (2017-2023)

Student Survey Results

The survey (Appendix E) was delivered in multiple sections with the first section focused on the perceived value of the program. The survey was delivered in the spring of 2024 with 29 of 180 students responding for a response rate of 16%. The survey results showed that 86% of the students are satisfied with their overall learning experience, but only 76% indicated that they thought it was a cost-effective program. As a state school, UMBC is generally considered to have value-based programs, however with the large contingent of international students now in the program, it looks like the value proposition is eroding somewhat in the eyes of the current demographics, given that international students are paying an out of state rate for their tuition. When it comes to student support/advising, 79% of the students feel the Student Success Team is helpful in navigating them through their program of study. Some level of frustration was recorded however regarding the availability of elective courses, with only 69 % feeling that there were enough electives offered.

The second section of the survey measured the student's perception of their preparedness to become engineering managers. Close to 95% of the students felt that the skill development in project management, ethical behaviors, financial management, leadership, and team development were sufficient to prepare them for their future as a manager. 100% of the students surveyed felt that the level of additional technical depth they gained from the program was sufficient for their future as an engineering manager.

The next section of the survey looked at student's work experience before, and during their program of study. While the programs were designed to help mid-career, professionals advance in their careers, more that 50% of the current student body entered the program with less than 3 years of experience. (Figure 2-10)

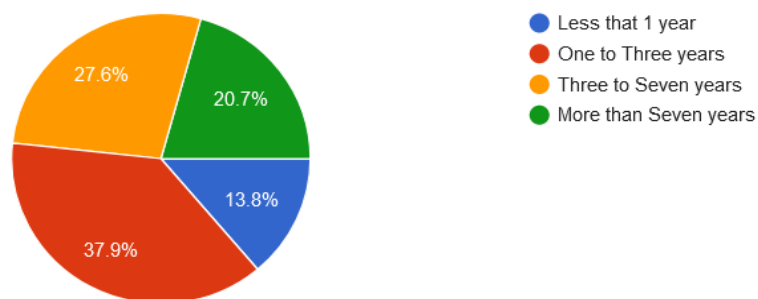


Figure 2-10. Student Work Experience Pre-admission

While studying in the program, only 17% of students remain in the professional workforce (Figure 2-11). Most of the student body is either looking for work, working in a non-professional job on campus, or has made the decision to be a full-time student. This has proven to be a challenge for the faculty. Since the program was originally designed for working professionals, many assignments were designed to help take managerial concepts immediately back into the workplace. The assignments used the context of previous work experience to anchor managerial concepts in the student's increase of knowledge base. The faculty had to pivot to more in-class activities that simulate work experience so that course knowledge can be acquired effectively.

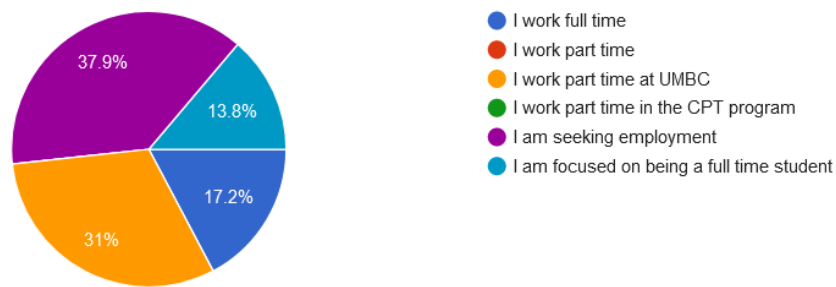


Figure 2-11. Student Employment While in the Program

The survey also provided the opportunity for students to deliver open-ended responses where comments and suggestions could be made about the program's future. Students appreciated the flexible nature of the program, the ease by which content could be acquired, the range of topics covered, the delivery modalities offered, and the "hands-on" nature of many of the courses. Suggestions also included a request for more in-person classes (a by-product of many of these students having to take online classes during Covid-19), more exposure to industry and/or internship opportunities, and requests to hold classes both later in the evenings and earlier in the day.

Students were also asked about whether an alignment with the American Society for Engineering Managers would have been an attraction in their decision making to come to UMBC (Figure 2-12). The response was overwhelming with 98.6 % of the students responding with a yes.

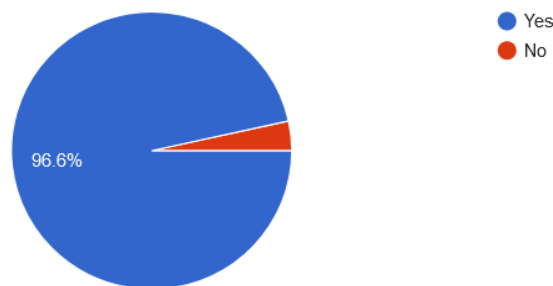


Figure 2-12. Interest in ASEM Certification

B. Long Term Impact on Student's Careers

Nothing can be written for this section at this time because the Alumni office has not provided email addresses so that we can reach out to alumni.

2c-2. Student advising

The recently formed Student Success Team within DPS advises all students in the EM programs. The Student Success Team provides centralized support services to all professional graduate program students. The Student Success Team helps students manage their program from the time

they are enrolled through graduation and serve as a centralized resource for students to achieve their academic goals. The team creates webinars, initiatives, and communications to assist students in maximizing their experience at UMBC while guiding them to the resources available to further their academic and career goals. The team also guides students throughout the registration process and hosts an orientation for students within the Office of Professional Programs. The Student Success Team is staffed by three team members: the Assistant Director, Kim Edmonds and two Graduate Program Coordinators, Pam Rombach and Josh Bass.

Students typically contact the Student Success Team twice a year either in-person or via email. Almost all new students meet with the Graduate Program Director as well to establish a tentative course plan for their entire program of study. Little additional advising is needed by the student body. With nearly 80% of the students responding to the survey expressing satisfaction with advising services, no changes are recommended regarding the current way in which the Student Success Team is operating.

2c-3. Student research

The Engineering and Technical Management programs are non-thesis programs and do not have students actively working on research.

2c-4. Financial support for graduate students

The Engineering Management program is designed for working professionals; therefore, the program does not provide financial support for graduate students. A significant number of students (31%, See Figure 2-11) do however receive financial support in the form of on-campus part-time employment as they pursue their degrees. Students typically work in dining facilities, as campus tour guides, or teaching assistants in other programs.

2c-4. Facilities

The only facilities that the EM program uses are classrooms, no research is being conducted and therefore no lab space is required. As the program has grown the campus has struggled to provide classroom space. Delays in classroom assignment over the past few semesters has delayed students from signing up for some courses and has led to unnecessary levels of anxiety. Eventually classroom have been found for all offerings, but not without a significant level of creativity. The program utilization of adjunct faculty alleviates the need for office space.

2d. Contextual Program Data Analysis

The UMBC EM Programs have advanced significantly since the last review both in infrastructure support, student body growth, and curriculum offerings.

Infrastructure support – Responding to the recommendation from the 2017 APR for the EM Programs to have a home department, the EM program now resides in the Engineering and Computing Education Program within the College of Engineering and Information Technology. This provides a formal home for the program and provides the associated resources for program oversight and development. The college Dean now holds regular meetings with the Graduate Program Director to facilitate dialog for problem solving, resource needs, and continuous

improvement.

In response to increased applications and enrollments, the Division of Professional Studies increased its enrollment management support services significantly since the last APR. A team of three individuals now support the application and admission decision process, and another team of three individuals work with onboarding and advising students on course selections to help tailor their program's electives to best align with their career goals.

The DPS support staff has also increased its marketing efforts for the program, supporting a focus that has turned to increasing awareness of and enrollment in our Accelerated program to attract more domestic students. The large increase in enrollments over the past few years has come from international students which has changed the diversity of the program's student body. We actively seek means and mechanisms to more personally connect with viable domestic undergraduate populations. For example, the GPD was an invited panelist for the CWIT Industry Mentoring Panels and currently participates in the ENME 204: Introduction to Engineering Design and ENME 444: Mechanical Engineering Systems Design courses in the Mechanical Engineering department to promote the transition of students from undergraduate studies into the 5-year BS/MS program. Marketing is also focused on increasing industry's awareness of the EM portfolio of programs. DPS marketing created and circulated content to highlight key attributes of our programs. The recent [UMBC Mic'd Up Podcast with John J. Johnson, IV, Adjunct Faculty](#), and [Mic'd Up Podcast with EM program graduate Alex O'Shaughnessy](#) illustrate this initiative.

Another infrastructure enhancement has come in the form of better career counseling. Most of our international students are looking to transition from students to be a part of the professional workforce in the United States after graduation. To support this goal, a closer working relationship has been established for EM program students with the Career Center. Students can now obtain assistance with resume writing, and interview techniques as they pursue internships during their final semesters and full-time positions post-graduation. Students have reported favorable experiences in their interactions with Career Services with over 60 students landing either summer internships or permanent positions in the spring of 2024 alone.

Student Body Growth – Post-Covid-19, the EM programs experienced a period of very rapid growth, tripling in size within a two-year period. A rapid change in size was not the only change experienced in the student body. The growth came from a large influx of international students, primarily from India, shifting the demographics from a largely domestic student body to a highly international one. There was also a significant shift in career maturity/age of the student body, dropping from an average in the mid-thirties with 10+ years of experience to an average in the low 20's with many students having little to no work experience in their engineering field.

Several issues quickly surfaced with this rapid change in student body and rapid adjustments were made to accommodate. First, to serve a greater number of students, faculty recruiting had to be stepped up quickly. Through networking in the community and existing faculty connections, the program was able to nearly double the number of faculty from 2020 to 2022. The GPD took the lead role in training the new faculty, often co-teaching with them in their first semester. Additionally, a number of course lead

faculty were established to help facilitate training and communication among faculty where many sections of a class were being taught.

An issue regarding academic integrity also surfaced as the student body grew rapidly. Conversations with the faculty led to the hypothesis that students from many countries had a different understanding of what academic integrity meant, and despite taking a course from UMBC on academic integrity as students began their studies, many students ignored the UMBC standards and significant levels of cheating, plagiarism and assignment answer sharing ensued. To address this, the GDP created a specialized academic integrity course embedded in the first week of ENMG 652: Management, Leadership and Communications (See Appendix C) for all students taking their first EM program course and made the course mandatory, with a 100% hurdle rate on the quiz in the course before instructors would grade any student's submission in their courses. Instructors were asked to then grade initial submissions with great rigor with regards to academic integrity issues. Since these changes were implemented, there have been very few residual academic integrity issues.

A third issue also surfaced with the rapid increase in student body attributed to the change in professional work experience level of the student body. After a faculty discussion, it was hypothesized that students were not performing as well on their assignment because they had no significant work experience to use to anchor the managerial theories that were being presented. To address this, the Management, Leadership and Communications course, ENMG 652, was converted to a flip classroom delivery (See Appendix C for syllabus). Lectures on theory were pre-recorded for viewing ahead of the in person class time so that the faculty could devote time in the classroom to activities that simulated work experiences to help anchor the concepts from the lectures.

Curriculum Offerings – While the growth of the student body presented several challenges, it also gave rise to opportunities when it comes to curriculum growth. Core courses were easy to scale when new faculty were onboarded as their training emphasized the freedom to teach however their expertise guided them, once they knew that the learning outcomes from the course had to be met for each of the courses. This first lesson for new faculty was meant to ensure that the integrity of the curriculum was maintained, and degree outcomes were assured. This training is accomplished by having the GPD co-registered as an instructor with new faculty in their first semester so that “on-the-job training” can be delivered in the classroom and online.

Post-baccalaureate certificates (and associated courses) were developed in Project Management and Integrated Product Development and Manufacturing to provide students with the ability to pursue knowledge depth within these two areas. Individual electives were also developed to allow students to explore a wide range of other knowledge areas: acquisition and contracting, agile processes, digital transformation, operations and supply chain management, and strategic management. With courses developed for DEI in Project Management, Mindsets and Methods of Emergent Strategy, and DE/I Theory & Practice for Technological Development and Management the EM programs are well on their way to developing an additional post-baccalaureate certificate in Diversity, Equity, and Inclusion in Technological Design and Management.

In addition to new course offerings, the GPD led an initiative to invite course lead instructors to put their courses through the Quality Matters course review program (<https://www.qualitymatters.org/>). The goal of this course review process is to deliver a better course design, which makes navigation easier for students, reduces barriers to student achievement, and results in better outcomes. While there were no issues with the courses as they were currently being offered, the GPD knew in the 2018-2019 timeframe, that UMBC was preparing to make more of its offerings available online. From previous work at another institution, the GPD knew that successful online courses required more exacting practices to retain the same level of educational outcomes. Five course leads accepted this invitation and successfully put their courses through the three-month process (ENMG 650, 652, 656, 658, 668).

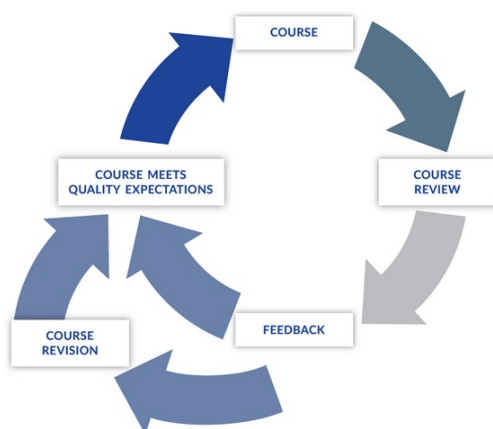


Figure 2-13. Quality Matters Process

The Quality Matters process is shown in Figure 2-13. After submitting their course, the peer course review team reviewed the course using the QM Rubric and provided feedback to the instructor on how to improve the quality of the course. Then through a collaborative team of a reviewer, the instructors, and a course developer, the team worked together to improve the course to meet QM Standards at the 85% quality level or better. Instructors also took advantage of professional development options that assisted them in using QM Standards to improve courses.

3. Program Planning

3a. Areas for Improvement

To look at programmatic improvements, the GPD took the faculty through a **Start-Stop-Continue** retrospective exercise. The facilitators guide that informed the GPD for this exercise is given in Appendix F. With the large contingent of working professionals that serve as adjuncts for the program, it is challenging to pull them all together for a meeting so an open-ended survey was conducted where the faculty were invited to reflect on their teaching experiences and deliver their comments and suggestions on where they felt the program has been, where it is now and where they would like to see it go.

Start – The most important item that faculty suggested to start doing is to have the program

deliver more content that helps students be better prepared for this professional graduate school experience. They felt that more introductory material on succinct managerial writing skills, better research skills for writing, proper referencing for academic work and confidence building when it comes to contributing orally to classroom discussions were in order. While some efforts have been made towards presenting this type of content, the continued influx of less professionally experienced students has made the delivery of this type of prerequisite material more important.

The faculty also suggested they be given access to more opportunities to learn improved teaching techniques. While they appreciated the on-boarding process to get them up to speed quickly for teaching in a graduate school program, many of our now seasoned professionals are interested in continuous learning and improvement in their teaching ability. Most of the faculty are not teaching in the program for financial reasons, as they expressed a love for the teaching experience and the desire to become better instructors and continue to feed their sense of purpose.

Faculty also recognize the importance of working as part of a community, and as adjuncts that only come to campus occasionally they feel a level of disconnectedness that does not foster comradery and creativity among them as much as they would like. No real suggestions were brought forward on how to build a better sense of community, but the benefits of it merit a further investigation on the part of the GPD. The faculty also mentioned the idea of creating faculty-student interactions outside of the classroom as another initiative to consider starting to improve the sense of community.

Stop – With the success of the flip classroom in ENMG 652, Management, Leadership, and Communications, faculty expressed an interest in stopping the traditional lecture only format that occurs in many other classes. As expressed by a former student who is now a member of the faculty: *“involvement and discussion, which was stellar, helped me learn quite a bit more than I did in other classes that were solely lecture oriented.”*

Requests were also made to restrict students from registering for more courses that they end up taking. When enrollments grew rapidly, sometimes new sections took a week or two to establish. The absence of seats in a course of interest introduced anxiety in students and the idea of “camping out” in multiple courses quickly caught on. Camping out lets students lock up a seat in an attractive course so that they could then take their time to decide what they wanted to take. Once this technique caught on, it further exacerbated classroom seat availability, confirming the need for camping out. This practice has been suppressed as of the Spring 2024 semester by restricting students to registering for no more than 10 credit hours without being granted special permission.

A similar stop request was made by the GPD with regards to admission fee waivers. Somehow within the candidate for admissions, word spread that universities were becoming more selective in accepting applicants which caused students to begin to apply to more schools. In general, it was known that the same number of applicants were being accepted by schools, but applications for those positions doubled from 4-5 applications per person to more like 9-10 applications per person. The program was a frequent recipient of requests from international students for an application waiver fee, claiming that applying to 9 schools was a financial burden on them. This issue also began to be addressed in the Spring 2024 semester by declining any requests for an application fee waiver. While the above two issues may appear trivial, they consumed a significant level of student services that would have been otherwise deployed to help students in

a meaningful way.

One last area where faculty felt it important to stop a current practice was to stop allowing students to arrive for class after the semester starts. At times due to visa or personal reasons, a student cannot begin their studies during the first weeks of a semester. Historically, faculty have allowed a “catch up period of up to two weeks. Observations of the performance of these late starters has shown that they often do not actually end up catching up. In the fall 2024 semester guidance will be issued to all faculty to discourage the allowance of late arrivals to the semester start.

Continue – When asked the question of what to continue, the faculty emphasized several of the newer initiatives, like increased emphasis on policing academic integrity, continuing to build a base of electives that partner well with the core courses, and remaining open to continuous improvement activities like the Quality Matters program, and initiatives to create a standardized format for classes where multiple sections are being taught. The faculty are pleased with the supportive nature of the DPS staff who help the program’s students. The faculty feel that the relationship should not only continue but should be enhanced to better support students in non-academic, more whole life ways. The faculty also appreciate the high standards admissions continues to maintain for applicants to the program. They feel that diversity within the student body is a tremendous asset and that continuing to discern for quality students from a variety of undergraduate educational experiences is important.

3b. Vision for the Future

For the most part, the EM program offerings are delivering on the “brand promise” as stated in the individual program objectives. Of remark is that this is occurring despite several significant changes that took place during the period under review. It was serendipitous that the EM program began the Quality Matters initiative pre-Covid-19 as it gave the faculty a running start on how to pivot towards delivering online courses at a quality level that maintained good student outcomes and good student satisfaction levels. The culture of continuous improvement established long before this review period was instrumental in allowing the program to respond quickly and scale operations to match a significant rate of growth, again without experiencing any drop in programmatic outcomes. The vision for the future centers around maintaining a culture of continuous improvement by seeking near term incremental improvements and keeping an eye on the environment to see what opportunities are presented longer term. The program is at a healthy level of enrollments and directives from university leadership are calling for a stabilization at current levels rather than asking for continued rapid growth.

Incremental improvements include the completion of the courses for the Post-baccalaureate Certificate in Diversity, Equity, and Inclusion in Technological Design and Management in partnership with the Community Leadership program. Once complete and course offerings are underway, they will be evaluated for the attractiveness of the sequence and an application will be initiated to then offer the graduate certificate.

Plans are also to continue to offer course lead faculty the chance to take their courses through the Quality Matters program. For some time, most classes offered had been through the Quality Matters program, but with the recent increase in new electives, less than have of the course inventory has been through the program. If a new elective course is successful in its first two offerings, the faculty will be encouraged to pursue the program for the course so that it can

become an offering that matches the quality of the other program offerings.

Faculty will also be encouraged to reconfigure their class experiences into the flip classroom format where appropriate. Student and faculty feedback from the flipped courses was strong, both in outcomes and satisfaction.

Based on student interest shown in the survey, as an incremental improvement the GPD plans to continue investigations into the curriculum alignment changes required to allow the program to receive certification from the American Society of Engineering Managers.

The one initiative under consideration that would be more than an incremental improvement is to explore the idea of embracing the change in demographics of the incoming student population. Rather than just compensating for the fact that applicants/admits are earlier on in their careers and are coming from other countries, we plan to explore “leaning into” this change and creating a Global Engineering Management program. We already have a large contingent of students from India, and a growing number of students from North Africa, plans are to investigate what it would look like to attract students from Latin American countries, the Middle East and Europe so that the program can offer students from around the world a global perspective on how engineering management can be conducted for multi-national endeavors.

The program already benefits from having faculty outside of the US on its roster (Canada and South Africa) and several courses already point towards a perspective beyond US borders (ENMG 661: Leading Virtual Global Teams, ENMG: 667 DEI in Project Management, ENMG 680: International Project Management, ENME489: Special topics in M.E.: Global Engineering). Plans are to investigate what additional offerings would be necessary to qualify a program that can claim a Global Engineering Status and investigate what additional pre-/early admissions requisites would need to be in place to ensure success in the program from any country of undergraduate studies.