UTD SCHOOL OF MANAGEMENT

THE UNIVERSITY OF TEXAS AT DALLAS

Proposed Academic Certificate Program

Title: Graduate Certificate in Product Lifecycle and Supply Chain Management

School: School of Management

Contact: Dr. Divakar Rajamani, divakar@utdallas.edu

Implementation Date: Fall 2010

Introduction/Description:

The process of delivering goods and services *better, faster & cheaper* sounds simple, but can sometimes be unpredictable and lead to shortages or surpluses. Over the past two decades, the supply chain journey has evolved through a number of distinct phases, along with a shift in power from suppliers to customers. Over the course of this evolution, supply chain professionals have expanded their perspective and philosophy from an inventory-centric view in the 80s to an order-centric view in the 90s to product-centric view today. As product lifecycles shrink, innovation has risen to the top of the CEO agenda. But product innovation cannot meet the business objectives of lifecycle profitability without supply chain process considerations. Future supply chain professionals need to get involved in the product development process to enable both product and process innovation. The product lifecycle perspective becomes more important because it provides a holistic view across disparate enterprise silos in order to provide a coordinated response to the end-customer — who is the ultimate driver of demand.

With shrinking product lifecycles across the board, companies no longer have the luxury of assuming that "things will work out in the long run." When studies show that 80% of the total cost structure over a product's lifecycle is pre-determined during the conceptualization and design phase, a shorter lifecycle dramatically increases the risk of forgoing a significant portion of return on investments. Moreover, today's more environmentally-conscious societies are shifting more of the burden to the manufacturer on proper disposal of their products when the products reach the end of their lifecycle. The new cost of compliance further adds to margin pressures. Thus, product lifecycle isn't just for the enterprise that designs a product — it needs to be embraced by every enterprise that supports it in an end-to-end supply chain. Integration of product lifecycle and supply chain management can provide fresh perspectives and critical insights that are often missed due to the extreme fragmentation of functions within the enterprise and across supply chains. This is the new frontier for value creation, an untapped area of opportunity to create competitive differentiation and growth for businesses and hence the focus of the proposed program.

Academic Focus of the Certificate:

Academically, the graduate certificate program will focus on educating executives and industry sponsored employees in the disciplines of product lifecycle and supply chain management by combining theory and practice. It will emphasize the need to understand "the big picture", the importance of renewed focus on product lifecycle from design to disposal and supply chain from end to end. Students will be trained to be effective problem solvers to continuously improve the

product performance and supply chain efficiency. The program will employ lectures, case studies, site visits in addition to use of quantitative and qualitative methods to meet the learning objectives of the program. Students are required to integrate classroom learning with work projects. The program will leverage the world-class faculty in the operations management and industry leaders/practitioners to deliver the program. The program will be "exciting" to the students and "relevant" to the hiring organizations.

Job Market for the Certificate:

Target Audience – A typical student is an expert in one or more functional areas such as engineering, manufacturing, product development, procurement, distribution, warehousing, logistics, information technology and consulting and aspires to become a product manager, operations manager, general manager, business partner and is interested in gaining a cross functional knowledge and manage projects across multiple functions and extended global enterprises.

The UTD School of Management is located at the convergence of Richardson, Plano and Dallas in the heart of the complex of major multinational technology corporations known as the Telecom Corridor, and serves the greatest community – DFW area. The regional credentials and diverse business base can "leverage" any investment dramatically. Industries include: Telecommunications, High-tech Manufacturing, System Integration, Software / Services, Transportation, Energy and Defense. There are approximately more than 130,000 businesses in the Dallas/Fort Worth area and more than 1,500 regional and corporate headquarters operations. We expect to enroll between 10-15 students in the first year and steadily grow to between 30-40 students.

Admission Policy:

- Acceptable undergraduate degree.
- Significant professional experience.
- GMAT or GRE not required.
- Personal Goal Statement.
- Three favorable recommendations.

Organizational Arrangement:

The Graduate Certificate in Product Lifecycle & Supply Chain Management is offered by the Center for Intelligent Supply Networks in partnership with the Project Management program in Executive Education department at School of Management, UT Dallas.

Credit Hours and Degree Programs:

The Graduate Certificate provides comprehensive training in Product Lifecycle and Supply Chain Management, combining theory and practice. Graduate Certificate is earned after completing 15 credit hours in 9-12 months.

The graduate certificate program classes will start in September each year. Classes are held in a convenient schedule for working professionals – Thursday, Friday and Saturday – all day, once a month.

Course Offerings and Site Locations (note new courses with an asterisk):

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The following are the course numbers, name and credit hours.

Course No.	Course Name	Credit Hours
Graduate Certificate in Product Lifecycle & Supply Chain Management (15 credit hours)		
OPRE 6366	Supply Chain Management	3
OPRE 6370	Logistics and Distribution	3
OPRE 6371	Purchasing and Sourcing Management	3
OPRE 6379	Product Lifecycle Management *	3
OPRE 6364	Lean and Six Sigma	3

* New course

Location: All classes are scheduled to be offered at School of Management, University of Texas at Dallas.

Faculty/Staffing (assign each course to a faculty member):

Name of Core Faculty and Faculty Rank	Highest Degree and Awarding Institution	Courses Assigned in Program	% Time Assigned to Program
Dr. Metin Cakanyildirim Associate Professor	Ph.D. Cornell University, USA	OPRE 6366: Supply Chain Management	10%
Dr. Milind Dawande Professor	Ph.D. Carnegie Mellon University, USA	OPRE 6370: Logistics and Distribution	10%
Dr. Chelliah Sriskandarajah Ashbel Smith Professor	Ph.D. National Polytechnic Institute of Grenoble, France	OPRE 6371: Sourcing and Purchasing Management	10%
Dr. Divakar Rajamani Clinical Professor	Ph.D. University of Windsor, Canada	OPRE 6379: Product Lifecycle Management	50%
Dr. Kannan Ramanathan Senior Lecturer	Ph.D. University of Illinois at Urbana-Champaign, USA	OPRE 6364: Lean & Six Sigma	10%

Additional Information:

The Center for Intelligent Supply Networks is a part of school of management and was established in 2003. The center's mission is to be a leader and premier provider of product lifecycle and supply chain management education, research, consultation and information for individuals and organizations. The center is actively supported by an advisory board. Its responsibilities are to (a) ensure that the Center's "products/services" are aligned with its "customers", (b) help promote the center, and (c) influence the research initiatives and its academic programs. It has broad representation from end-user companies, technology providers, systems integrators, and UTD faculty. The center has been offering continuing education in Product Lifecycle, Supply Chain Management, Sourcing Management and Lean & Six Sigma through professional certificate programs and custom programs which are usually 4 months in duration. The advisory board has been instrumental in guiding the development of content for the various programs and has also supported the programs by sending participants. More than 400 participants from 50+ companies have been awarded certificates so far. A few strategic partners in the past include: Alcatel-Lucent, Blockbuster, Brinks Logistics, Dr. Pepper, Dell, Ericsson, Estech, FedEx Office, Fujitsu Networks, JC Penney, Labinal, Lennox, L3-Communications, Raytheon and SAP.

Email Responses from Industry Advisors:

From: Tim Pickens [mailto:tpickens@esi-estech.com]
Sent: Tuesday, March 02, 2010 1:39 PM
To: Rajamani, Divakar
Subject: RE: Graduate Certificate Program

After having reviewed the Proposed Academic Certificate Program in Product Lifecycle and Supply Chain Management to be offered by UTD, I believe that this program offers many of the vital skills and information critical to the success of industry leaders in today's global economy. At no time in recent history has it been more vital for companies to seize every opportunity to improve margins, decrease cycle times and minimize costs. In many cases it is not simply a matter of improving profitability; it is a matter of survival. The proposed curriculum offers what I believe is a balanced and thorough program that will produce leaders who have the knowledge, insight and skills to successfully and profitability manage products throughout their lifecycle. This program will position the participants and their respective organizations for strong future success.
Tim Pickens
VP Product Operations
Estech Systems Inc. (ESI)

From: Harker, Tracy [mailto:THarker@hitachiconsulting.com]
Sent: Wednesday, March 03, 2010 12:00 PM
To: Rajamani, Divakar
Subject: RE: Graduate Certificate Program

The significant growth of outsourced manufacturing and extended supply chains in the 90's exposed weaknesses in product lifecycle management and the necessity for collaboration with suppliers. Early supplier involvement and concurrent engineering processes improved communications, resulting in benefits in quality, cost, and time to market. As innovation has accelerated and customer expectations increased, highly coordinated collaborative processes, both inside the enterprise and across the supply chain, have evolved to assure development resources are focused on the right priorities, products are meeting the expectations of the market, and the time to market is providing a competitive advantage. Understanding these solutions and the integration of PLM and Supply Chain disciplines is imperative to achieving best in class performance.
Tracy L. Harker
Vice President,
Management Consulting

From: Paul Peck [mailto:ppeck@gscsinc.com]
Sent: Thursday, March 04, 2010 5:56 PM
To: Rajamani, Divakar
Subject: FW: UTD Quote

"Effective supply chain management is crucial to any manufacturer or distributor. It drives cost of sales - that big number that appears just below the 'top line'. In the new world order of "design anywhere, build anywhere, deliver anywhere", there is going to be increasing demands placed on the supply chain management professional. This new program at UT-Dallas teaches the skills and offers the professional development that elevates supply chain professionals to become capable executives who can deal with a wide variety of challenges on a global basis."
Paul Peck
CEO, Global Supply Chain Solutions LLC.

From: Bill Wissing [mailto:Bill.Wissing@blockbuster.com]
Sent: Tuesday, March 09, 2010 3:03 PM
To: Rajamani, Divakar
Subject: RE: Graduate Certificate Program

Divakar,
The proposed certificate program is on track for what is needed now and well into the future.
This program will allow professionals to not only have the academic credential to cross silos but also have practical experience.
For businesses to thrive it is essential that individuals understand product lifecycles and supply chain management. In addition they must have the ability to educate the organization on the need to collaborate across all disciplines to maximize a product potential to the company.
William J. Wissing
SVP Distribution & Logistics Blockbuster Inc.

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Certificate Program Assessment Plan

Program : Graduate Certificate in **Product Lifecycle and Supply Chain Management** *Start Date:* ***Sept 2010***

Program Head: Dr. Divakar Rajamani *Phone:* ***972-883-4843*** *Email: divakar@utdallas.edu*

Mission Statement: The graduate certificate program will focus on educating executives and industry-sponsored employees in the disciplines of product lifecycle and supply chain management, combining theory and practice. They will be trained to effectively problem solve and continuously improve the product performance and supply chain efficiency. The program will employ lectures, case studies, site visits in addition to use of quantitative and qualitative methods to meet the learning objectives of the program. Students are required to integrate classroom learning with work projects. The program will leverage the best faculty in the operations management and industry leaders/practitioners to deliver the program. The program will be "exciting" to the students and "relevant" to the hiring organizations.

Class Hours: Thursday, Friday and Saturday – all day, once a month

Approximate Credit Hours:

Certificate Program Learning Goals	Assessment Procedures/Methods (Courses incorporating procedures/methods)	Criterion of Success	Data Collection Schedule
1. Learn supply chain management techniques and tools for effectively designing, planning and executing the end-to-end supply chain processes	1. Quizzes and/or Exams 2. Assignments 3. Case Discussion and Presentations 4. Projects and Presentations	Student success will be determined by their combined performance in the assessment methods chosen	At the end of each semester or course completed

2. Learn the product lifecycle management techniques and tools for effectively introducing new products, improving product performance and lifecycle margins.	1. Quizzes and/or Exams 2. Assignments 3. Case Discussion and Presentations 4. Projects and Presentations	Student success will be determined by their combined performance in the assessment methods chosen	At the end of each semester or course completed
3. Learn lean and six sigma techniques and tools for effective problem solving and continuous improvement	1. Quizzes and/or Exams 2. Assignments 3. Case Discussion and Presentations 4. Projects and Presentations	Student success will be determined by their combined performance in the assessment methods chosen	At the end of each semester or course completed

New Program Request Form for Bachelor's and Master's Degrees

Directions: An institution shall use this form to propose a new bachelor's or master's degree program. In completing the form, the institution should refer to the document *Standards for Bachelor's and Master's Programs,* which prescribes specific requirements for new degree programs. Note: This form requires signatures of (1) the Chief Executive Officer, certifying adequacy of funding for the new program; (2) a member of the Board of Regents (or designee), certifying Board approval, and (3) if applicable, a member of the Board of Regents or (designee), certifying that criteria have been met for staff-level approval. NOTE: Preliminary authority is required for all engineering programs. An institution that does not have preliminary authority for a proposed engineering program shall submit a separate request for preliminary authority prior to submitting the degree program request form. That request shall address criteria set in Coordinating Board rules Section 5.24 (a).

Information: Contact the Division of Academic Affairs and Research at 512/427-6200 for more information.

Administrative Information

1. Institution: The University of Texas at Dallas

2. Program Name – Show how the program would appear on the Coordinating Board's program inventory (*e.g., Bachelor of Business Administration degree with a major in Accounting*):

Bachelor of Science in Biomedical Engineering (B.S.B.M.E.)

3. Proposed CIP Code:

14.0501.00, Biomedical/Medical Engineering

4. Brief Program Description – Describe the program and the educational objectives:

The objective of the Bachelor's degree program in Biomedical Engineering is to produce engineering graduates who will be capable of undertaking challenging projects that will require Bachelor's-level knowledge of the design of mechanical, electrical and thermal systems, focused on life science applications.

The primary educational objectives of the proposed Bachelor of Science program are to educate Biomedical Engineers to meet the design and development needs of local and state industry, and to prepare graduates for study in medical school and MS or PhD programs. The proposed B.S.B.M.E. program will undergird and strengthen the recently approved doctoral and Master's programs in Biomedical Engineering at U.T. Dallas.

Biomedical engineering principles are essential for the development of new technologies in the life sciences and micro-scale technologies associated with medical applications. Biomedical engineers must have the intellectual agility to contribute not only their specialized expertise in interdisciplinary collaborations for technology development, but to understand

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and appreciate the contributions of specialists in medical and health-related fields.

The proposed B.S.B.M.E. degree program will provide the necessary foundational education to allow graduates to contribute to challenging projects that will require knowledge of the fundamentals of the design of engineering and biological systems.

5. Administrative Unit – Identify where the program would fit within the organizational structure of the university (*e.g., The Department of Electrical Engineering within the College of Engineering*):

The Department of Bioengineering within the School of Engineering and Computer Science. The creation of this department was approved by THECB in January 2010.

6. Proposed Implementation Date – Report the first semester and year that students would enter the program:

Spring 2011

7. Contact Person – Provide contact information for the person who can answer specific questions about the program:

Name: Dr. Mark Spong

Title: Dean of Engineering and Computer Science and Lars Magnus Ericsson Professor of Electrical Engineering

E-mail: "Spong, Mark W" <mws081000@utdallas.edu>

Phone: 972 883-2974

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Program Information

I. Need

Note: Complete I.A and I.B only if preliminary authority for the program was granted more than four years ago. This includes programs for which the institution was granted broad preliminary authority for the discipline.

A. Job Market Need – Provide short- and long-term evidence of the need for graduates in the job market.

The principal areas of focus of the Career Center of the Biomedical Engineering Society are the following:[1]

- Instrumentation – application of electronics to sensing, diagnosis, and treatment
- Biomaterials – tissue and artificial materials used for replacement or implantation
- Biomechanics – application of mechanics (motion, heat transfer, etc.) to medicine
- Cellular, tissue, and genetic engineering – microscopic-level work addressing medical application
- Clinical engineering – application of systems engineering principles to hospital health care systems, integrating computer and information systems with patient care
- Imaging – development of improved medical imaging devices and data analysis methods
- Orthopedic engineering – application of engineering to solution of orthopedic problems such as bones, joints, and muscles
- Rehabilitation engineering – addresses quality of life issues such as prosthetics, hearing loss, and home/work enhancements
- Systems physiology – engineering applied to function of living organisms.

It is clear from this list that biomedical engineering is a broad field that includes virtually every application of engineering to medicine, biology, and health care. To enable Bachelor's graduates to enter this field, the U.T. Dallas B.S.B.M.E. program will provide a strong foundation in mechanical and electrical engineering, as well as projects and courses focusing on biological and biomedical applications of engineering.

Long-term need

According to the Texas Workforce Commission's website,[2] the demand for biomedical engineers will increase by 30% from 2006 to 2016. In 2008, the Bureau of Labor Statistics of the U.S. Department of Labor projected a growth of 21% in job openings for biomedical engineers through 2016. In 2010, the BLS radically revised their projection,

[1] *BMES Bulletin*, Vol. 32, No. 2, p. 9 (2008).

[2] http://socrates.cdr.state.tx.us/iSocrates/occprofiles/occprofile.asp?soc=17-2031&reptype=&lwda=00

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predicting a remarkable 72% employment growth for biomedical engineers from 2008 to 2018.[3]

In 2003, the Texas Legislature passed, and Governor Perry signed, legislation to develop strategies to strengthen the competitiveness of key industry clusters, one of which is biotechnology and life sciences. The goal of the legislation is to support education "that will provide a skilled workforce pipeline to meet the short- or long-term needs of the target industries."[4] In a 2006 report, the Perryman group estimated that, a decade after a 25% increase in engineering enrollments, the annual gross product of Texas "would be enhanced by $2.1 billion, and 22,349 permanent jobs would be added."[5] This proposal for a B.S.B.M.E. degree program at U.T. Dallas supports the Texas Industry Cluster Initiative, and is responsive to the Perryman Group's call for an increase in Texas' engineering enrollments.

Short-term need

The Texas biomedical industry continues to grow. New academic programs in biomedical engineering will help to meet the need for engineers created by the growth of the biomedical industry. The Dallas/Fort Worth Metroplex has over 455 life science firms, ranging from established pharmaceutical and medical device companies to companies in the early development stages. The Metroplex hosts 38 basic chemical manufacturing facilities, 32 pharmaceutical and medical facilities, 215 medical equipment and supply facilities, and 170 scientific R&D firms. Current industry in the biotechnology and biomedical engineering sector residing in North Texas includes the following local manufacturers of medical devices account for approximately 4000 local employees: Advanced Neuromodulation Systems (devices for therapeutic neurostimulation) (recently acquired by St. Jude Medical), Avail Medical Products (disposable medical products), Avcor (medical supplies), B. Braun Medical (IV Pumps), Bledsoe Brace Systems (surgical appliances), Chase Medical (surgical and medical instruments), Galt Medical Corp. (surgical and medical instruments), Hydro-Med Products (disposable medical surgical specialty products), Innovative Spinal Technologies (surgical and medical instruments), MicroFab (tissue engineering), National Heritage (safety needle devices), Osteo Med L. P. (medical devices and surgical implants), Plexon (brain-machine interface technology), Quest Medical (surgical and medical instruments, electromedical equipment), Retractable Technologies (safety needle devices), Thermotek Inc. (surgical appliances, surgical and medical instruments), and Tyco Healthcare Group (medical supplies). The following local manufacturers of pharmaceutical and biochemical manufacturers account for approximately 5000 local employees: Abbott Laboratories (diagnostic instrumentation), Access Pharmaceuticals (pharmaceuticals), Adams Laboratories (pharmaceuticals), Alcon (ophthalmic medical products), American Embryo (vaccines for veterinary use), Bio-Synthesis (custom DNA peptide antibodies), Boehringer Ingelheim Corp. (pharmaceutical preparations), Carrington Laboratories (pharmaceutical preparations), Cumbre (discovery and development of

[3] *Occupational Outlook Handbook*, 2010-11 Edition, Engineers (U. S. Bureau of Labor Statistics, http://www.bls.gov/oco/ocos027.htm, 2010).

[4] http://www.twc.state.tx.us/news/ti_workforce_future.pdf

[5] http://www.twc.state.tx.us/news/ti_perryman.pdf

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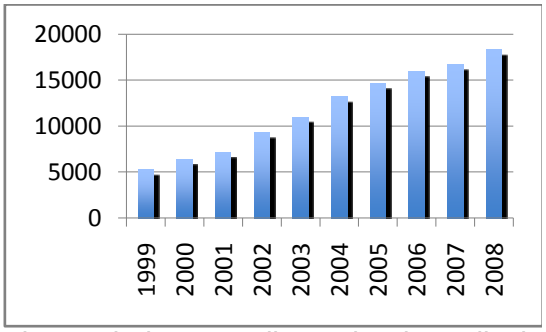
pharmaceuticals), Macrocyclics (pharmaceutical research), and MPM Medical Inc. (medical devices for wound care and oncology care). The local presence of a vibrant life sciences industry and a world-renowned medical school will afford many opportunities for co-op positions and internships for the U.T. Dallas Bachelor's students in Biomedical Engineering.

B. Student Demand – Provide short- and long-term evidence of demand for the program.

Long-term demand

The past two decades have witnessed a rapid expansion of new biomedical engineering degree programs. Nationwide, there are currently about 18,000 undergraduate students[6] studying biomedical engineering. Common destinations of Bachelor's graduates in biomedical engineering include the workforce, medical school and graduate study.

Biomedical engineering is by far the most rapidly growing engineering discipline in terms of student enrollment and degrees granted. For example, from 1999 to 2008 the number of Bachelor's degrees granted in biomedical engineering grew by a factor of 3.19,[7] for a ten-year compound annual growth rate of 12.3%. This rate of growth contrasts with much lower annual growth rates of the number of bachelor's degrees in long-established engineering fields such as Mechanical Engineering (3%), and a slight decline in Electrical Engineering (-0.2%). The very rapid growth in the number of biomedical engineering degrees granted nationwide attests to the recognition of substantial career opportunities in biomedical engineering by prospective students.



The Bachelor's enrollment in Biomedical Engineering has shown the highest growth of Bachelor's enrollments in all engineering disciplines over the past decade. (*Profiles of Engineering Colleges*, ASEE, 2009)

Short-term demand

The accompanying chart of U.S. Bachelor's enrollment in biomedical engineering shows the level of interest in this degree from students nationwide, and indicates a strong potential for healthy enrollments at the undergraduate level at U.T. Dallas. Specific examples reinforce this projection. For example, UCLA had over 2000 applications for its first degree class in biomedical engineering, a class they capped at 35 places.[8] In 2004, approximately half of the 2000 Duke engineering freshmen wanted to major in biomedical engineering.[9]

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[6] *Profiles of Engineering and Engineering Technology Colleges*, American Society for Engineering Education, 2009.

[7] *Profiles of Engineering and Engineering Technology Colleges*, American Society for Engineering Education, 2009.

[8] Dr. Janie Foulke, National Trends in Bioengineering, invited lecture at The University of Texas at Dallas, November 19, 2004.

[9] Ibid.

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Heightened competition for admission to similar degree programs elsewhere in Texas is a strong indicator of short-term demand. The U.T. Austin undergraduate program in biomedical engineering accepts only 100 students per year,[10] with the result that the students who are offered admission generally come from the top 3% of their high school classes. Texas A&M University and the University of Houston are the only other two undergraduate programs in the state. Thus, the creation of a B.S.B.M.E. program at U.T. Dallas will help to meet student demand in Texas for additional high-quality undergraduate programs in biomedical engineering.

Because of the location of the proposed U.T. Dallas Bachelor's biomedical engineering program in the Dallas/Fort Worth Metroplex, the Bachelor's student enrollment should realistically surpass the Bachelor's enrollment in many other biomedical engineering programs in Texas. U. T. Dallas receives 40 to 50 inquiries per year regarding an undergraduate biomedical engineering degree.

Over the next five years the U.T. Dallas B.S.B.M.E. program will grow to 5–6 full time equivalent faculty members. The hiring profile will be sufficient to support an undergraduate population of 100 to 150.

C. Enrollment Projections – Use this table to show the estimated cumulative headcount and full-time student equivalent (FTSE) enrollment for the first five years of the program. (*Include majors only and consider attrition and graduation*.)

YEAR	1	2	3	4	5
Headcount	50	66	89	117	156
FTSE	40	53	71	94	125

[10] http://www.bme.utexas.edu/academics/undergraduate_prospective.cfm

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II. Quality

A. Degree Requirements – Use this table to show the degree requirements of the program. *(Modify the table as needed; if necessary, replicate the table for more than one option.)*

One of the goals of the proposed B.S.B.M.E. program is to make it possible for students to satisfy the curricular requirements for admission to medical schools in Texas and elsewhere while simultaneously obtaining an engineering degree. BMEN 3330 and BMEN 4330 are intended to satisfy the Texas advanced biology requirement for medical school admission, as well as help meet the ABET requirement that an engineering program must provide at least one and one-half years (48 SCH) of engineering topics, exclusive of mathematics and science. If students take an additional 8 SCH of organic chemistry as in the following table, they will meet both the premedical curricular requirements and the ABET requirements for graduation with a B.S.B.M.E. degree as described in Section G.

The proposed B.S.B.M.E. program provides a solid foundation for both graduate study and medical school while requiring fewer hours than combinations of other engineering degree programs with the pre-medical requirements.

Category	Semester Credit Hours	Clock Hours
General Education Core Curriculum *(bachelor's degree only)*	42	
Major Preparatory Courses	26	
Major Required Courses	52	
Prescribed Electives	6	
Other *(Specify, e.g., internships, clinical work)*	(if not included above)	
TOTAL	126	

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B. Curriculum – Use these tables to identify the required courses and prescribed electives of the program. Note with an asterisk (*) courses that would be added if the program is approved. *(Add and delete rows as needed. If applicable, replicate the tables for different tracks/options.)*

Prefix and Number	General Education Core Curriculum	SCH
RHET 1302	Rhetoric	3
ECS 3390	Professional and Technical Communication	3
GOVT 2301	Constitutional Foundations and Political Behavior in the U.S. and Texas	3
GOVT 2302	Political Institutions in the U.S. and Texas	3
HIST (various)	American History	6
ECS 3361	Social Issues and Ethics in Computer Science and Engineering	3
ARTS 1301	Exploration of the Arts	3
HUMA 1301	Exploration of the Humanities	3
MATH 2417	Calculus 1 (1 SCH is counted in Major Preparatory Courses; see table below)	3
MATH 2419	Calculus 2 (1 SCH is counted in Major Preparatory Courses; see table below)	3
PHYS 2325	Mechanics and Heat	3
PHYS 2125	Physics Laboratory 1	1
PHYS 2326	Electromagnetism and Waves	3
PHYS 2126	Physics Laboratory 2	1
CHEM 1111	General Chemistry I Laboratory	1
	Total General Education Core Curriculum	**42**

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Prefix and Number	Major Preparatory Courses	SCH
MATH 2417	Calculus 1 (3 SCH are counted in the General Education Core Curriculum; see table above)	1
MATH 2419	Calculus 2 (3 SCH are counted in the General Education Core Curriculum)	1
MATH 2420	Differential Equations with Applications	4
CHEM 1311	General Chemistry I	3
CHEM 1111	General Chemistry I Laboratory (1 SCH is counted in the Core; see table above)	0
CHEM 1312	General Chemistry II	3
CHEM 1112	General Chemistry II Laboratory	1
CS 1337	Computer Science I	3
BIOL 2311	Introduction to Modern Biology I	3
BIOL 2111	Introduction to Modern Biology Workshop I	1
BIOL 2312	Introduction to Modern Biology II	3
BIOL 2112	Introduction to Modern Biology Workshop II	1
BIOL 2281	Introductory Biology Laboratory	2
	Total Major Preparatory Course Hours	**26**

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Prefix and Number	Major Required Courses	SCH
BMEN 1102	*Introduction to Biomedical Engineering	1
ENGR 1202	Introduction to Engineering[11]	2
ENGR 2300	Applied Linear Algebra for Engineers	3
MECH 2310	Static Equilibrium and Rigid-Body Dynamics	3
ENGR 3300	Advanced Engineering Mathematics	3
BMEN 3301	*Introduction to Biomechanics	3
BMEN 3101	*Biomechanics Laboratory	1
EE 3302	Signals and Systems	3
EE 3102	Signals and Systems Laboratory	1
BMEN 3310	*Fluid Mechanics and Transport Processes in Biomedical Engineering	3
BMEN 3110	*Biomedical Transport Processes Laboratory	1
BMEN 3315	*Thermodynamics and Physical Chemistry in Biomedical Engineering	3
BMEN 3320	*Electrical and Electronic Circuits in Biomedical Engineering	3
BMEN 3120	*Biomedical Circuits and Instrumentation Laboratory	1
BMEN 3330	*Engineering Physiology of the Human Body	3
BMEN 3130	*Engineering Physiology Laboratory	1
ENGR 3341	Probability Theory and Statistics	3
BMEN 3350	*Biomedical Component and System Design	3
BMEN 3150	*Biomedical Engineering Laboratory	1

[11] Starting in the fall of 2010, the Erik Jonsson School will use the ENGR prefix to identify courses that are taken by students in multiple engineering disciplines.

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EITHER BMEN 4310	*Feedback Systems in Biomedical Engineering	3
OR EE 4310	Systems and Controls	(3)
BMEN 4110	*Biomedical Feedback Systems Laboratory	1
ENGR 4388[12]	Senior Design Project 1	3
ENGR 4389	Senior Design Project 2	3
	Total Major Required Course Hours	**52**

Prefix and Number	**Major Prescribed Electives (6 SCH)**	**SCH**
	Students must take two of the following three courses:	6
BMEN 4320	*Intermediate Electrical systems	3
BMEN 4330	*Advanced Engineering Physiology of the Human Body	3
BMEN 4350	*Applied Sensor technology	3
	Total Major Prescribed Elective Hours	**6**

[12] To facilitate compliance with an ABET recommendation that senior design teams include students from multiple disciplines, the Erik Jonsson School will use common course numbers for senior design in most of its engineering degree programs starting in fall 2010. Senior design courses will comprise multiple sections focused on different engineering disciplines. B.S.B.M.E. students will enroll in sections with substantial biomedical design content.

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Prefix and Number	Optional Organic Chemistry Courses (8 SCH)	SCH
CHEM 2323	Introductory Organic Chemistry I	3
CHEM 2123	Introductory Organic Chemistry Laboratory I	1
CHEM 2023	Introductory Organic Chemistry Laboratory I Recitation	0
CHEM 2325	Introductory Organic Chemistry II	3
CHEM 2125	Introductory Organic Chemistry Laboratory I	1
CHEM 2025	Introductory Organic Chemistry Laboratory II Recitation	0
	Total Optional Organic Chemistry Hours	**8**

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C. Faculty – Use these tables to provide information about Core and Support faculty. Add an asterisk (*) before the name of the individual who will have direct administrative responsibilities for the program. *(Add and delete rows as needed.)*

Core faculty in Biomedical Engineering are assigned 100% to the suite of Biomedical Engineering degree programs, with 33.3% assignments to each of the component degrees (B.S.B.M.E., M.S.B.M.E. and Ph.D.B.M.E.). This assignment updates the faculty time assignments presented in other proposals.

Name of Core Faculty and Faculty Rank	**Highest Degree and Awarding Institution**	**Courses Assigned in Program**	**% Time Assigned To Program**
e.g.: Robertson, David Asst. Professor	PhD. in Molecular Genetics Univ. of Texas at Dallas	MG200, MG285 MG824 (Lab Only)	50%
Vidyasagar, Mathukumalli, Prof.[13]	Ph.D. in Electrical Engineering, Univ. of Wisconsin (Madison), 1969	BMEN 4310, BMEN 4110	33.3%
Bhatia, Dinesh, Assoc. Professor	Ph.D. in Computer Science, U.T. Dallas	BMEN 3320, BMEN 3120, BMEN 4350	33.3%
Nam, Hyunjoo, Asst. Professor	Ph.D. in Cellular and Developmental Biology, Harvard University	BMEN 1308, BMEN 4340	33.3%
*New Faculty in Year 2010	Ph.D. in Biomedical Engineering	BMEN 3310, BMEN 3110	33.3%
New Faculty in Year 2010	Ph.D. in Biomedical Engineering	BMEN 1102, BMEN 3302	33.3%
New Faculty in Year 2011	Ph.D. in Biomedical Engineering	BMEN 3350, BMEN 3150, BMEN 4110	33.3%
New Faculty in Year 2011	Ph.D. in Biomedical Engineering	ENGR 4388, ENGR 4389	33.3%
New Faculty in Year 2011	Ph.D. in Mechanical Engineering	MECH 3305, MECH 3105	33.3%

[13] Core faculty assignment will be changed from Mechanical Engineering to Biomedical Engineering.

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Support faculty in Biomedical Engineering are assigned 50% to the suite of Biomedical Engineering degree programs, with 16.7% assignments to each of the component degrees (B.S.B.M.E., M.S.B.M.E. and Ph.D.B.M.E.). This assignment updates the faculty time assignments presented in other proposals.

Name of Support Faculty and Faculty Rank	**Highest Degree and Awarding Institution**	**Courses Assigned in Program**	**% Time Assigned To Program**
Bleris, Leonidas, Asst. Professor (EE)	Ph.D. in Electrical Engineering, Lehigh University	BMEN 4310	16.7%
Nosratinia, Aria, Professor (EE)	Ph.D. in Electrical Engineering, University of Illinois-UIUC	BMEN 3341	16.7%
Goeckner, Matthew, Professor (MECH)	Ph.D. in Physics, University of Iowa	MECH 2310	16.7%
Tamil, Lakshman, Professor (EE)	Ph.D. in Electrical Engineering, University of Rhode Island	BMEN 2300	16.7%
Lee, Jyeong-Bong, Assoc. Professor (EE)	Ph.D. in Electrical Engineering, Georgia Tech	MECH 4360, MECH 4370	16.7%
Lee, Hoi, Asst. Professor (EE)	Ph.D. in Electrical and Electronic Engineering, Hong Kong Univ. of Science & Technology	BMEN 4320, BMEN 4330	16.7%

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D. Students – Describe general recruitment efforts and admission requirements. In accordance with the institution's Uniform Recruitment and Retention Strategy, describe plans to recruit, retain, and graduate students from underrepresented groups for the program.

The historically underrepresented groups in engineering include African-Americans, Hispanic-Americans and women. The future of engineering jobs in Texas and the Nation depends on success in recruiting future engineers from these groups to replace expected retirements and enable growth in the number of engineers available to fill jobs in Texas and the U.S. Biomedical engineering, in particular, appeals strongly to women. In 2008, 38.6% of the Bachelor's degrees granted in biomedical engineering in the U.S. went to women, in sharp contrast to the proportions of women graduates in other engineering disciplines such as Electrical Engineering (12.1%) and Mechanical Engineering (11.9%).[14]

U.T. Dallas has historically graduated a higher proportion of women than the national average in both Electrical Engineering and Computer Science. For example, in 2006-2007, 28.9% of the students who earned Master's degrees in Electrical Engineering at U.T. Dallas were women; the national average is 19.9%. We attribute this relatively modest success to a welcoming culture and a strong system of support through student organizations such as the Society of Women Engineers. At the undergraduate level, U. T. Dallas has established a strong reputation in terms of recruitment and retention of minority students through the Academic Bridge Program under the leadership of Dean George Fair. Expanded post-enrollment support programs will be essential in maintaining a reputation that will encourage students from underrepresented groups to apply to U.T. Dallas.

Going forward, it is clear that no engineering school can afford to limit its efforts with respect to students from underrepresented groups to post-enrollment support and retention. U. T. Dallas will broaden and deepen its recruitment efforts for graduate students beyond our current Metroplex constituency to target baccalaureate graduates from Texas colleges and universities, especially historically minority institutions. The expanded recruitment effort will be staffed and operated in the Erik Jonsson School, working closely with the office of the recently hired Vice President for Enrollment Management and the Vice President for Diversity. U.T. Dallas' efforts to involve under-represented populations in biomedical research are in keeping with the initiative set forth in the National Institute of Biomedical Imaging and Bioengineering's Strategic Plan.[15]

[14] *Profiles of Engineering and Engineering Technology Colleges*, American Society for Engineering Education, 2009, p. 12.

[15] See National Institute of Biomedical Imaging and Bioengineering Strategic Plan I, 2006.

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E. Library – Provide the library director's assessment of library resources necessary for the program. Describe plans to build the library holdings to support the program.

Expansion of the collection applicable to Biomedical engineering has already been financed and documented in the MS and PhD program documents.

F. Facilities and Equipment – Describe the availability and adequacy of facilities and equipment to support the program. Describe plans for facility and equipment improvements/additions.

The U.T. Dallas strategic plan for institutional growth estimates that, exclusive of classroom space, the average space requirement for new faculty members is 4,000 sq ft per tenure-system faculty member. Thus, the addition of 5 new FTE faculty members will require about 20,000 gross square feet of new space (nearly all of it research and office space for faculty and research staff, although some space will be needed for administration of the program), exclusive of classroom and other space. This amount of space can be made available. At U.T. Dallas, a minimum of 10,000 sq ft, and perhaps up to 12,000 or more gross sq ft of research space, is available in the new Natural Science and Engineering Research Laboratory. An additional 5,000 to 8,000 sq ft of space can be made available in the existing Engineering Building to facilitate the program's administrative offices, i.e., department head, undergraduate student advisors, etc. Space for undergraduate laboratories can also be made available.

G. Accreditation – If the discipline has a national accrediting body, describe plans to obtain accreditation or provide a rationale for not pursuing accreditation.

The Accreditation Board of Engineering and Technology (ABET) is responsible for accreditation of undergraduate engineering programs in the United States.

ABET requires that "The [biomedical engineering] program must demonstrate that graduates have: an understanding of biology and physiology, and the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology; the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems."[16]

[16] *Criteria for Accrediting Engineering Programs*, ABET, Inc., 2009

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The U. T. Dallas baccalaureate programs in Computer Engineering, Electrical Engineering, Telecommunications Engineering, Software Engineering and Computer Science are currently accredited by ABET. The next ABET accreditation cycle for U. T. Dallas will occur in 2011–12.

ABET will not accredit an engineering program unless and until students have graduated from the program. Therefore, ABET evaluation will be requested for the baccalaureate program in biomedical engineering when students are ready to graduate.

The B.S.M.E. program at U. T. Dallas, which was new in 2008, is not yet ABET-accredited. We will request that ABET evaluate the undergraduate Mechanical Engineering program at the end of its fourth academic year, or when students are ready to graduate.

H. Evaluation – Describe the evaluation process that will be used to assess the quality and effectiveness of the new degree program.

ABET[17] accreditation guidelines for engineering degree programs require comprehensive assessment of both quality and effectiveness. In the Erik Jonsson School, every course has a set of course learning outcomes (CLOs), which are the same for all instructors. The achievement of the CLOs is assessed for each class section through quantitative measures of student performance on test questions or homework problems that directly address specific CLOs.

ABET requires that each engineering degree program demonstrate that its students attain the following outcomes:
(a) An ability to apply knowledge of mathematics, science, and engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret data
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) An ability to function on multidisciplinary teams
(e) An ability to identify, formulate, and solve engineering problems
(f) An understanding of professional and ethical responsibility
(g) An ability to communicate effectively
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) A recognition of the need for, and an ability to engage in life-long learning
(j) A knowledge of contemporary issues
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

[17] http://www.abet.org/

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In the Erik Jonsson School, each CLO in every course is mapped to one of the program outcomes (a–k). The statistics on CLO attainment gathered from a selected set of core courses are used to assess the attainment of the program outcomes.

In addition to demonstrating attainment of program-level outcomes, every ABET-accredited engineering program must define a set of program educational objectives (PEOs) and demonstrate that the alumni of the program attain the PEOs within 3–5 years after graduation.

ABET also requires that every engineering degree program demonstrate that it is engaged in continuous improvement using feedback from students, faculty, alumni, employers and industrial advisory boards. The assessment process and results must be documented in self-study reports.

In addition, all UT Dallas degree programs are reviewed at least every five years per UT Dallas Policy Memorandum 94-III.24-63 Academic Program Review. The review committee includes both external and internal members.

III. Costs and Funding

Five-Year Costs and Funding Sources - Use this table to show five-year costs and sources of funding for the program.

Five-Year Costs		Five-Year Funding	
Personnel[1]	$2.525M	Reallocated Funds	$1M
Facilities and Equipment	$0	Anticipated New Formula Funding[3]	$.857M
Library, Supplies, and Materials	$0	Special Item Funding	$0
Other[2]	$.35M	Other[4]	2.75M $0
Total Costs	**$2.875M**	**Total Funding**	**$4.6M**

1. 3 new T/T faculty members will be added to support the B.S.B.M.E. programs, at an average annual cost of $125,000 each. A total of 2 FTE-years of senior lecturer/part-time lecturer personnel will be added at an average annual cost of $65,000, beginning with 2 FTEs in year1.
2. Administrative staff costs ($0.14M); travel ($0.06M); accreditation ($0.15M).
3. Indicate formula funding for students new to the institution because of the program; formula funding should be included only for years three through five of the program and should reflect enrollment projections for years three through five.
4. Designated tuition and fees, $8.56M; PUF, $10M.

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Signature Page

1. Adequacy of Funding – The chief executive officer shall sign the following statement:

   I certify that the institution has adequate funds to cover the costs of the new program. Furthermore, the new program will not reduce the effectiveness or quality of existing programs at the institution.

   _____ _____
   Chief Executive Officer Date

2. Board of Regents or Designee Approval – A member of the Board of Regents or designee shall sign the following statement:

   On behalf of the Board of Regents, I approve the program.

   _____ _____
   Board of Regents (Designee) Date of Approval

3. Board of Regents Certification of Criteria for Commissioner of Assistant Commissioner Approval – For a program to be approved by the Commissioner or the Assistant Commissioner for Academic Affairs and Research, the Board of Regents or designee must certify that the new program meets the eight criteria under TAC Section 5.50 (b): The criteria stipulate that the program shall:

   (1) be within the institution's current Table of Programs;
   (2) have a curriculum, faculty, resources, support services, and other components of a degree program that are comparable to those of high quality programs in the same or similar disciplines at other institutions;
   (3) have sufficient clinical or in-service sites, if applicable, to support the program;
   (4) be consistent with the standards of the Commission of Colleges of the Southern Association of Colleges and Schools and, if applicable, with the standards or discipline-specific accrediting agencies and licensing agencies;
   (5) attract students on a long-term basis and produce graduates who would have opportunities for employment; or the program is appropriate for the development of a well-rounded array of basic baccalaureate degree programs at the institution;
   (6) not unnecessarily duplicate existing programs at other institutions;
   (7) not be dependent on future Special Item funding
   (8) have new five-year costs that would not exceed $2 million.

   On behalf of the Board of Regents, I certify that the new program meets the criteria specified under TAC Section 5.50 (b).

   _____
   Board of Regents (Designee) Date

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2010 Undergraduate Catalog

Please use the following link to access the administrative section of the undergraduate catalog. All policy changes have been approved previously by CUE, CEP, and the Senate.

The password is CEP.

https://pluto.utdallas.edu/xythoswfs/webui/_xy-6190_1-s_tUIHmkNi