The University of Georgia

University Council
Athens, Georgia 30602

August 19, 2016

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Dear Colleagues:

The attached proposal for a new dual degree in Engineering (B.S.) and Master of Business Administration (M.B.A.) will be an agenda item for the August 26, 2016, Full University Curriculum Committee meeting.

Sincerely,

William K. Vencill

William K. Vencill, Chair
University Curriculum Committee

cc: Provost Pamela S. Whitten
Dr. Rahul Shrivastav

The University of Georgia

Santanu Chatterjee
Director &
Associate Professor of Economics

Terry College of Business
Full-Time MBA Program

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March 30, 2016

Dr. Suzanne Barbour
Dean, The Graduate School
The University of Georgia
Athens, GA 30602

Dean Barbour:

The Terry College of Business and the College of Engineering at The University of Georgia is proposing a dual Bachelor of Science-MBA degree program. This five-year program will include all the current requirements of a Bachelor of Science degree in engineering and the core requirements, plus two electives, of the MBA degree. The program will be structured in a way that highly motivated undergraduate engineering students will be able to complete the requirements for both their undergraduate and their MBA degree in as little as one year beyond the time it now takes them to complete just their undergraduate degree.

The proposed dual degree program will provide The University of Georgia's graduating engineers with the engineering expertise required to meet the technological, scientific, and research needs of important sectors of the economy, as well as the business skills necessary for professional advancement and career success. This program will advance Strategic Direction II, "Enhancing the Graduate and Professional Programs," of The University of Georgia 2020 Strategic Plan by furthering the goal of increasing "interdisciplinary, dual, and joint degree experiences for graduate and professional students." *(Building on Excellence,* 2020, p.12), and will also be the first BS/MBA dual degree offered by the University System of Georgia.

Thank you for your consideration of this proposal, and we look forward to hearing from you in due course.

Sincerely,

The University of Georgia
Dual Degree Proposal for Bachelor of Science in Engineering
and Master of Business Administration

1. Institution: The University of Georgia
2. Schools/Colleges: College of Engineering and Terry College of Business
3. Degrees: Bachelor of Science (BS) in Engineering and Master of Business Administration (MBA)
4. Starting Date: Fall 2017
5. Program abstract

The Terry College of Business and the College of Engineering propose a dual degree program that will combine into one program of study the MBA degree with a choice of eight BS engineering degrees, as follows:

a. Agricultural Engineering
b. Biochemical Engineering
c. Biological Engineering
d. Civil Engineering
e. Computer Systems Engineering
f. Electrical Engineering
g. Environmental Engineering
h. Mechanical Engineering

This five-year course of study will include all the current requirements of an engineering degree and the core requirements, plus two electives, of the MBA degree. The program will be structured in a way that highly motivated undergraduate engineering students will be able to complete the requirements for both their undergraduate and their MBA degree in as little as one year beyond the time it now takes them to complete just their undergraduate degree. The program will provide the University of Georgia's graduating engineers with the engineering expertise required to meet the technological, scientific, and research needs of important sectors of the economy, as well as the business skills necessary for professional advancement and career success.

The first BS/MBA dual degree program offered by the University System of Georgia, this program will advance Strategic Direction II, "Enhancing the Graduate and Professional Programs," of The University of Georgia 2020 Strategic Plan by furthering the goal of increasing "interdisciplinary, dual, and joint degree experiences for graduate and professional students." *(Building on Excellence,* 2020, p.12)

6. Objectives of the program

A major objective of the UGA College of Engineering is to effectively prepare engineering students to meet the challenges of competing in the global environment. We therefore strive to provide our students with both in-class and experiential learning opportunities that enable them to work effectively and collaboratively with professionals from other fields, including business and industry. Moreover, collaborations between the College of Engineering and the Terry College of Business at UGA are already underway, such as the Archway program, where engineering and business students work together to provide solutions to problems in the community. Thus, the dual degree program will be a natural extension of the collaborative efforts of both schools.

A major objective of the proposed dual program is to enhance the professional education of engineering students with an understanding of the functional foundations of the business enterprise and with an introduction to the leadership, communication, and teamwork skills essential in today's workplace. Its aim is to supplement the technical and practical aspects of the scientific field of engineering with the analytical tools and knowledge of the different business functions so that engineering students develop the competencies needed to succeed in a business environment. This combination of engineering and business education is expected to improve both the short and long-term career opportunities of engineering graduates.

7. Justification and need for the program

a. **Benefits:**

i. **Benefits to Students:** For the years 2014-2024, the U.S. Bureau of Labor Statistics projects average to above average demand for engineers in three areas: biomedical, civil, and environmental. New graduates in other majors will face increased competition for U.S. employment. For these graduates, the acquisition of business and soft skills and the experiential learning opportunities to practice them in a real-world setting, as provided in this proposed dual degree program, will help to distinguish them in the job market.

ii. **Benefits to the College of Engineering:** In today's competitive global environment, engineering firms and many U.S. businesses and industries need engineers who are not only proficient in the technical aspects of engineering, but also good team players and communicators who understand the business challenges of global competition. Engineering students typically have expertise in new product development and refinement, while business students are highly skilled at optimizing organizational resources to achieve the tactical and strategic goals of a company or organization. By offering a dual BS/MBA program, UGA and the College of Engineering would gain greater recognition locally and nationally for responding to this need and producing graduates who are in high demand in academia as well as in business and industrial settings.

Career surveys of the graduating engineering class of 2014 showed that the majority are being absorbed into local businesses and industries such as

Caterpillar, Georgia Power, AT&T, and GE, companies which are also hiring MBA graduates. We anticipate that there will be even more opportunities for engineering graduates to find jobs in leading companies if they have the BS/MBA degree and can demonstrate both their technical and business skills. This dual degree program will not only attract more students to pursue engineering degrees, but also enhance both colleges' interdisciplinary teaching and research efforts and thereby increase recognition for the College of Engineering and the Terry College of Business at the local, national and international levels.

In its 2014 survey, *Forbes* found that engineering and business degrees were among the top five most sought after bachelor's degrees by employers. It is therefore very important that UGA and the College of Engineering continue to support students and train them effectively for today's competitive work environment. The expected benefits of this dual degree program to the College of Engineering are as follows: (1) graduates who are more competitive in the job market; (2) a potential increase not only in the overall number of engineering students in the college, but also in the number of female students enrolled due to enhanced diversity initiatives in the Terry College of Business; (3) added support for the development of new corporate relationships in Georgia and the U.S.; and (4) augmenting the college's reputation and standing and improvement of its capability to recruit top students from Georgia and from around the country.

iii. **Benefits to the Terry College of Business:** The proposed dual degree program will benefit the Terry College by supporting its strategic goal of increasing enrollment in business graduate programs, specifically the Full-Time MBA program. Benchmarking of peer, aspirant, and competitor (PAC) schools reveals that their full-time MBA programs have a diverse set of relationships with units outside their respective colleges of business (Table 1 below). Dual degree programs with Engineering are quite common among PAC and SEC schools: Alabama, Florida, and Vanderbilt offer dual degree BS Engineering/MBA programs. Georgia Tech has recently announced MS (Eng.)/MBA and PhD (Eng.)/MBA degrees, starting fall 2016. Similar programs are available at Michigan, Texas, Purdue, Penn State, Rochester, and Stanford, among others.

Table 1 below provides a sampling of peer and aspirant schools with examples of their dual programs between MBA and other units on campus. In addition to increasing enrollment and revenues, such programs have enabled schools to offer a richer and more diverse set of course offerings in their full-time MBA programs. Moreover, greater diversity in the student body through the inclusion of students with an engineering background promises to enrich the learning experience of all MBA students and encourage interdisciplinary thinking among the Terry College faculty and students.

Table 1. Benchmarking of FTMBA Joint/Dual Degree Programs and Specialized Master's

School	FTMBA Enroll-ment	# Joint Programs	# Specialized Master's	Dual Degree Programs
Michigan	450	20	6	Area Studies, **Engineering**, Education, Architecture, Law, Information, Nursing, MD, Natural Resources, Health Services, Public Policy, Social Work, Urban Planning
Texas	504	11	4	Asian Studies, Communications, Energy, **Engineering**, Global, Latin American, law, Mid-East, Nursing, Public Affairs, EU
UNC	573	8	1	City & regional planning, Environment, Information & Library Science, Law, MD, Pharmacy, Public Health, Public policy
Emory	352	6	1	JD, LLM, Physical Therapy, MPH, Theology & Business, MD
Vanderbilt	341	10	4	JD, MD, MDIV, Theology, Medicine, **Engineering**, Arts & Sciences (Joint MBA/BS or MBA/BA), Music Business

School	FTMBA Enroll-ment	# Joint Programs	# Specialized Master's	Dual Degree Programs
Georgia Tech	136	2	0	MBA pathway, **Engineering**
Ohio State	212	6	5	Ag, Env & Dev Econ (MS/MBA), MPA, JD, MD, Health Admin, Pharmacy
Rice	223	3	0	**Engineering,** MBA/MS (Science), MBA/MD
Michigan State	159	3	7	JD/MBA,MBA/CFA,MBA/MGM
Purdue	230	7	7	**BS/MBA (STEM)**, MBA/MSHRM, MBA/MA, MBA/MS (Econ, Marketing)
Penn State	155	3	2	JD, MD**, BS/MBA (STEM)**
UGA	**98**	**5**	**3**	JD, LLM, MPH, MD

b. **Student Demand:** Faced with an increasingly competitive job market, many students are interested in educational opportunities that will differentiate them from their peers and that will give them an edge in securing employment in their field. Based on the feedback received during the Engineering and Career Internship Nights of last year, several companies approached faculty and staff in the College of Engineering to ask about the dual degree BS/MBA. In addition, informal feedback from three graduating classes and also current engineering undergraduate students indicates that there is growing interest in pursuing the dual BS/MBA program in order to advance their careers in leadership roles in Georgia companies and beyond. Moreover, starting in fall 2016, students entering the College of Engineering will have to go through the high-demand major process. The College of Engineering, with a total enrollment of 1,500 undergraduates, projects that 20-30% of each rising junior class will apply to the proposed dual degree program.

8. Program Development.

Discussions regarding this dual degree program began in the fall of 2015. During this time, the Associate Dean of the College of Engineering and the Director of the Full-Time MBA program of the Terry College of Business met to hold some initial, formative discussions. Since that time, the Associate Dean of the College of Engineering and the Full-Time MBA Program Director have met periodically to delineate the

curriculum of this dual degree program. The faculty of the Terry College of Business and the College of Engineering have discussed this program in detail and refined the curriculum to ensure that students will receive the best possible instructional experience and outcomes. It has been approved by the faculty of the College of Engineering and by the MBA Committee and Graduate Programs Committee of the Terry College of Business.

9. Curriculum

The proposed program involves five years of study. During years one, two, and three, students will complete their undergraduate liberal arts studies and STEM requirements. Year four will involve a program of study primarily in the College of Engineering, with one business course each in the fall and spring semesters. In year five, students will be enrolled in the Terry College of Business to complete their MBA program of study, including two electives that will be cross-credited towards the Bachelor of Science degree.

The tables below summarize the credit hour requirements for the separate degree programs and those of the proposed dual degree program.

Table 2. Bachelor of Science in Engineering Credit Hour Requirements

	Undergraduate Credit Hours				
BS Degree Program	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Total**
Agricultural Engineering	33	33	35	29	130
Biochemical Engineering	31	32	33	34	130
Biological Engineering	32	33	34	31	130
Civil Engineering	32	33	33	32	130
Computer Systems Engineering	33	33	32	32	130
Electrical Engineering	33	31	32	34	130
Environmental Engineering	32	32	32	34	130
Mechanical Engineering	32	31	33	34	130

Table 3. MBA Degree Credit Hour Requirements

	Graduate Credit Hours		
	Year 1	**Year 2**	**Total**
MBA Degree Program	32	29	61

Table 4. Dual Degree Program – Engineering Credit Hour Requirements

	Undergraduate Credit Hours						
Dual Degree Program - BS	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**	**Total with MBA Cross-Credits**
Agricultural Engineering	33	33	35	29	0	124	130
Biochemical Engineering	32	34	33	31	0	124	130
Biological Engineering	32	33	34	31	0	124	130

Civil Engineering	32	33	33	26	0	124	130

Undergraduate Credit Hours

Dual Degree Program - BS	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Total with MBA Cross-Credits
Computer Systems Engineering	33	33	32	26	0	124	130
Electrical Engineering	33	34	35	28	0	124	130
Environmental Engineering	32	32	32	28	0	124	130
Mechanical Engineering	32	31	33	28	0	124	130

Table 5. Dual Degree Program – MBA Credit Hour Requirements

Graduate Credit Hours

Dual Degree Program - MBA	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Core Courses				6	24	30
Electives for Cross-Credit					6	6

For detailed programs of study, please see the following:

a. Programs of study for the proposed dual degree program: Addenda 1.1-1.8.

b. Programs of study for the current degree programs in Engineering: Addenda 2.1-2.8.

c. Program of study for the Full-Time MBA program: Addendum 3.

10. Program Administration

Students will be advised within the College of Engineering on their STEM and engineering degree-related coursework and on satisfying the Fundamentals of Engineering exam graduation requirement. Interested engineering students will apply to the dual degree program and admission to the Full-Time MBA program during their third year. Admitted students will register for one MBA course each in the fall and spring of their fourth year; at the end of their fourth year, they will be required to have a summer internship in business or engineering and will participate in additional summer MBA activities. Fifth-year students will also be required to participate in the two-week MBA orientation prior to the beginning of the fall semester. The Director of MBA Student Services will advise BS/MBA students in their final year. At the end of the program, students will complete graduation checks with the College of Engineering and the Full-Time MBA program.

11. Assessment

The College of Engineering and the Terry College of Business have established goals and criteria for assessing the quality of their individual degree programs. Suggested criteria for determining the effectiveness of the dual degree program and measuring the success of students earning the dual degree are as follows:

a. Longitudinal review of dual degree program graduates, their employment status,

salaries, and employers as compared to four-year engineering graduates.

b. Longitudinal enrollment numbers in the dual degree program, including statistics on the demographic makeup and academic qualifications of those students who enroll.

c. Participation in formal exit surveys to assess students' experiences and perceptions of the program.

d. Periodic survey of engineering employers assessing the quality of dual degree program graduate hires.

12. Fiscal and Enrollment Impact and Estimated Budget

No additional fiscal investment as a result of creating this dual degree program is anticipated in its early years; thus, no additional faculty or staff resources will be necessary for the administration at the outset. All academic courses identified in the program of study for the proposed dual degree program are currently being offered. We anticipate a gradual increase in student enrollment, which should be supported by students' tuition/fees.

Addendum 1.1
BSAE AGRICULTURAL ENGINEERING/MBA PROGRAM OF STUDY

Year One – 33 Credit Hour

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
ENGR 1920	Intro to Engineering	1	ENGR 1140	Computational Engineering Methods	2
ENGR 1120	**Engineering Graphics**	**2**	**PHYS 1251**	**Physics for Engineers I**	**3**
ENGR 2100	Principles of Systems Engineering	3	**ENGR 2110**	**Engineering Decision Making**	**3**
CHEM 1211&L	**Chemistry I**	**4**	ENGL 1102	English Composition II	3
ENGL 1101	English Composition I	3	FYOS	First-Year Odyssey	1
Total Credit Hours		**17**	**Total Credit Hours**		**16**

Year Two – 33 Credit Hours

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
ENGR 2120	**Statics**	**3**	**ENGR 2170**	**Electrical Circuits**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	ENGR 2920	Design Methodology	2
	Life Science Elective*	**4**	**MCHE 3140**	**Thermodynamics I**	**3**
	Major Related Elective**	3		Social Sciences Elective	3
				Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**17**

Year Three – 35 Credit Hours

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 3150	**Heat Transfer**	**3**	ENGR 2180	Intro Modeling of Dynamic Systems	3
ENGR 3160	**Fluid Mechanics**	**3**		Area of Emphasis Required Course	3
ENVE 3510	Modeling, Stat. Analysis, Uncertainty	3		Area of Emphasis Required Course	3
	Area of Emphasis Required Course	3		Area of Emphasis Required Course	3
	Social Sciences Elective	3		World Languages & Culture Elective	3
COMM 1100	Intro to Public Speaking	3	CVLE 2710	Numerical Methods for Engineers	2
Total Credit Hours		**18**	**Total Credit Hours**		**17**

Year Four – 29 Credit Hours

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 4140	**Systems Modeling**	**3**	ENGR 4920	Engineering Design Project II	2
ENGR 4910	Engineering Design Project I	2		Area of Emphasis Required Course	3
	Area of Emphasis Required Course	3		Area of Emphasis Required Course	3
MSIT 7100	**Statistics**	**3**	**MIST 7600**	**Data Analytics**	**3**
	Area of Emphasis Elective	1		World Languages & Culture Elective	3
	World Languages & Culture Elective	3			
Total Credit Hours		**15**	**Total Credit Hours**		**14**

*LIFE SCIENCE ELECTIVE: Select from BIOL 1107&L, CRSS 2010&L or PBIO 1210&L.
**MAJOR RELATED ELECTIVE: Select from ANTH 1102, FANR 2200 or GEOG 1125.

Courses in BOLD require a grade of "C" or better

Year 4: Mandatory Summer Internship (Engineering/Business)

Year Five – 30 Credit Hours

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ACCT 6000	Accounting	3	MGMT 7400	Strategy	3
ECON 7910/7920	Economics	3	MGMT 7050	Organizational Behavior	3
FINA 7010	Finance	3	MGMT 7120	Operations	3
MARK 7510	Marketing	3	LEGL 7050	Legal Env of Business	3
MBA ELECTIVE*		3	MBA ELECTIVE*		3
Total Credit Hours		**15**	**Total Credit Hours**		**15**

***Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA Electives approved for cross-credit towards BSAE degree: Choose two classes from the list below.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

BSAE Areas of Emphasis

Students must declare an Area of Emphasis and complete 7 Required Courses (21 credit hours) as well as 1 Elective Course (minimum of 1 credit hour). Graduate level (6000/8000 engineering courses with permission of the agricultural engineering program coordinator may be substituted for six hours of 3000/4000 engineering courses)

Electrical & Electronic Systems

Required Courses		**Elective Courses**	
ENGR 3270	Electronics I	ENGR 3520	Mass Transport and Rate Phenomena
ENGR 4210	Linear Systems	ENGR 3540	Physical Unit Operations
ENGR 4220	Feedback Control Systems	ENGR 4260	Intro to Nanoelectronics
ENGR 4230	Sensors & Transducers	ENGR 4310	Embedded Robotics
ENGR 4240	Intro to Microcontrollers	ENGR 4540	Applied Machine Vision
ENGR 4250	Advanced Microcontrollers	ENGR 4650	Control of Structural Environments I
ENGR 4270	Electronics II	ENGR 4660	Sustainable Building Design
		ENGG 4620	Biomedical Imaging
		ENGR 3101	Applied Vector Analysis (1 credit hour)

Mechanical Systems

Required Courses		**Elective Courses**	
ENGR 2130	Dynamics	ENGR 3520	Mass Transport and Rate Phenomena
ENGR 2140	Strength of Materials	ENGR 3540	Physical Unit Operations
ENGR 3270	Electronics I	ENGR 3610	Structural Design
ENGR 3300	Mechanisms and Machine Kinematics	ENGR 4210	Linear Systems
ENGR 4300	Mechanical Systems	ENGR 4220	Feedback Control Systems
ENGR 4340	Machine Hydraulics	ENGR 4230	Sensors & Transducers
ENGR 4350	Intro to Finite Element Analysis	ENGR 4240	Intro to Microcontrollers
		ENGR 4250	Advanced Microcontrollers
		ENGR 4310	Embedded Robotics
		ENGR 4490	Renewable Energy Engineering

Elective Courses

ENGR 4540	Applied Machine Vision
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design
ENGR 3101	Applied Vector Analysis (1 credit hour)
CVLE 3460	Civil Engineering Hydraulics Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Natural Resource Management

Required Courses

ENGR 2140	Strength of Materials
ENGR 3120	Spatial Data Analysis
ENGR 3410	Intro to Natural Resource Engineering
ENGR 3440	Hydraulics of Closed Conduit Flow
ENGR 4440	Environmental Engr. Unit Operations
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design

Elective Courses

ENGR 3420	Intro to Soil Mechanics
ENGR 3520	Mass Transport and Rate Phenomena
ENGR 3610	Structural Design
ENGR 4161&L	Environmental Microclimatology
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers
ENGR 4410	Open Channel Hydraulics
ENGR 4450	Environmental Engineering Remediation Design
ENGR 4700L	Hydrology, Geology, Soils of Georgia
CRSS 3060&L	Soils & Hydrology
or *WASR 4500*	*Quantitative Methods in Hydrology*
CRSS 4600	Soil Physics
CVLE 3450	Civil Engineering Soils Lab (1 credit hour)
CVLE 3460	Civil Engineering Hydraulics Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Structural Systems

Required Courses

ENGR 2140	Strength of Materials
ENGR 3420	Intro to Soil Mechanics
ENGR 3610	Structural Design
ENGR 4610	Design of Light Steel Structures
ENGR 4630	Design of Residential Structures
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design

Elective Courses

ENGR 3120	Spatial Data Analysis
ENGR 3300	Mechanisms and Machine Kinematics
ENGR 3410	Intro to Natural Resource Engineering
ENGR 3440	Hydraulics of Closed Conduit Flow
ENGR 3520	Mass Transport and Rate Phenomena
ENGR 4210	Linear Systems
ENGR 4220	Feedback Control Systems
ENGR 4350	Intro to Finite Element Analysis
ENGR 4440	Environmental Engineering Unit Operations
CVLE 3450	Civil Engineering Soils Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Process Operations

Required Courses

ENGR 2140	Strength of Materials
ENGR 3270	Electronics I
ENGR 3540	Physical Unit Operations
ENGR 4210	Linear System
ENGR 4220	Feedback Controls
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers

Elective Courses

ENGR 4250	Advanced Microcontrollers
ENGR 4350	Intro to Finite Element Analysis
ENGR 4490	Renewable Energy Engineering
ENGR 4540	Applied Machine Vision
FDST 4010&L	Food Processing
FDST 4050&L	Food Engineering Fundamentals I
FDST 4060&L	Food Engineering Fundamentals II
FDST 4090	Food Quality Control
FORS 3500	Wood Properties & Utilization
MGMT 3000	Management Organizations & Individuals
MGMT 4000	Operations Management
MGMT 4240	Quality Management
MGMT 4250	Productivity Management
POUL 4860	Poultry Processing
ENGR 3101	Applied Vector Analysis (1 credit hour)

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1107-BIOL 1107L, CHEM 1211-CHEM 1211L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2170, ENGR 3150, ENGR 3160, ENGR 4140, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, ENGG, ENVE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 1.2
BSBchE BIOCHEMICAL ENGINEERING/MBA PROGRAM OF STUDY

Year One

Fall Semester		Spring Semester	
Course	**Credit Hours**	**Course**	**Credit Hours**
ENGR 1120 Engineering Graphics	2	ENGR 1140 Comp Methods	2
MATH 2250 Calculus I Sci Engr	**4**	**MATH 2260 Calculus II Sci Engr**	**4**
CHEM 1211 & L Chemistry I	**4**	**CHEM 1212 & L Chemistry II**	**4**
BIOL 1107 Principles of Biology	**4**	ENGL 1101 English Comp I	3
First-Year Odyssey	1	**PHYS 1251 Physics for Engineers I**	**3**
ENGR 1920 Intro to Engineering	1		
Total Credit Hours	**16**		**16**

Year Two

Fall Semester		Spring Semester	
Course	**Credit Hours**	**Course**	**Credit Hours**
BCHE 2910 Engineering Design	3	**ENGR 3160 Fluid Mechanics**	3
MATH 2500 Multivariable Calculus	**3**	**MCHE 3140 Engr Thermodynamics I**	**3**
CHEM 2211 & L Organic Chemistry	4	**MATH 2700 Differential Equations**	**3**
PHYS 1252 Physics for Engineers II	**3**	HIST 2111/2112 American History	3
ENGR 2120 Statics	**3**	POLS 1101 American Government	3
		ENGL 1102 English Comp. II	3
Total Credit Hours	**16**		**18**

Year Three

Fall Semester		Spring Semester	
Course	**Credit Hours**	**Course**	**Credit Hours**
BCHE 3145 Equil Thermodynamics	3	BCHE 3180 Engineering Lab	2
		BCHE 3420 Kinetics/Reactor Design	3
ENGR 3520 Mass Rate	**3**	**ENGR 2110 Engr Decision Making**	**3**
BCMB 3100 Intro Biochemistry	4	**ENGR 3150 Heat Transfer**	**3**
MIBO 3500 Intro Microbiology	3	ENGR 4510 Biochemical Engineering	3
World Language and Culture	3	Social Science Elective	3
Total Credit Hours	**16**		**17**

Year Four

Fall Semester		Spring Semester	
Course	**Credit Hours**	**Course**	**Credit Hours**
BCHE 4910 Capstone Design	2	BCHE 4911 Capstone Design	2
ENGINEERING ELECTIVE	3	BCHE 4180 Adv Biochem Engr Lab	3
COMM 1100 Speech Communication	3	BCHE 4360 Biochem Process Ctrl	3
World Language and Culture	3	BCHE 4710 Bio-Electrochemical Engr	3
World Language and Culture	3	**MIST 7600 Data Analytics**	**3**
MSIT 7100 Statistics	**3**		
Total Credit Hours	**17**		**14**

Courses in BOLD require a grade of "C" or better

Year 4: Mandatory Summer Internship (Engineering/Business)

Year Five

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
ACCT 6000 Accounting	3	MGMT 7400 Strategy	3
ECON 7910/7920 Economics	3	MGMT 7050 Organizational Behavior	3
FINA 7010 Finance	3	MGMT 7120 Operations	3
MARK 7510 Marketing	3	LEGL 7050 Legal Env of Business	3
MBA ELECTIVE*	3	MBA ELECTIVE*	3
Total Credit Hours	**15**		**15**

* *Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA Electives approved for cross-credit towards BSBchE degree: Choose two classes from the list below.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

Major Requirements:

All students must earn a grade of "C" (2.0) or better in the following courses: ENGR 1120, ENGR 2110, ENGR 2120, MCHE 3140, ENGR 3150, ENGR 3160, ENGR 3520, MATH 2250, MATH 2260, MATH 2500 or MATH 2300H , MATH 2700, PHYS 1251, PHYS 1252, BIOL 1103, BIOL 1104 , CHEM 1211, CHEM 1211L and CHEM 1212, CHEM 1212L.
Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or BCHE prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING & PRE-FE EXAMS ARE A GRADUATION REQUIREMENT FOR THIS DEGREE PROGRAM.

Addendum 1.3
BSBE BIOLOGICAL ENGINEERING/MBA PROGRAM OF STUDY

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
ENGR 1920	Intro to Engineering	1	**CHEM 1212&L**	**Chemistry II**	**4**
ENGR 1120	**Engineering Graphics**	**2**	**PHYS 1251**	**Physics for Engineers I**	**3**
ENGR 1140	Computational Engineering Methods	2	**BIOL 1103&L**	**Basic Concepts in Biology**	**4**
CHEM 1211&L	**Chemistry I**	**4**	FYOS	First-Year Odyssey	1
ENGL 1101	English Composition I	3			
Total Credit Hours		**16**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
ENGR 2120	**Statics**	**3**	**ENGR 2170**	**Electrical Circuits**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	**ENGR 3160**	**Fluid Mechanics**	**3**
BIOL 1104	Organismal Biology	3	**ENGR 2110**	**Engineering Decision Making**	**3**
ENGL 1102	English Composition II	3	ENGR 2920	Design Methodology	2
			CHEM 2211&L	Organic Chemistry I	4
Total Credit Hours		**15**	**Total Credit Hours**		**18**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MCHE 3140	**Thermodynamics I**	**3**	**ENGR 2140**	**Strength of Materials**	**3**
ENGR 3150	**Heat Transfer**	**3**		Area of Emphasis Required Course	3
ENGR 3520	**Mass Transport & Rate Phenomena**	**3**		Area of Emphasis Required Course	3
BCMB 3100	Intro Biochemistry/Molecular Biology	4		Area of Emphasis Required Course	3
MIBO 3500	Intro Microbiology	3		World Languages & Culture Elective	3
				Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**18**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
	Science Elective*	3	ENGR 4920	Engineering Design Project	4
	Area of Emphasis Required Course	3		World Languages & Culture Elective	3
	Social Sciences Elective	3		World Languages & Culture Elective	3
COMM 1100	Intro to Public Speaking	3		Social Sciences Elective	3
MSIT 7100	**Statistics**	**3**	**MIST 7600**	**Data Analytics**	**3**
Total Credit Hours		**15**	**Total Credit Hours**		**16**

*SCIENCE ELECTIVE: Select any Biology or Ecology course at the 3000 level or above. Suggested courses are: BCMB (CHEM) 4110, BCMB (ENTO) 4200, CBIO (BIOL) 3400, CBIO (MIBO) 4100, CRSS 4600&L, ECOL (BIOL) 3500&L, MIBO 4090, VPHY 3100.

Courses in BOLD require a grade of "C" or better

Year 4: Mandatory Summer Internship (Engineering/Business)

Year 5

FALL	SPRING
ACCT 6000: Accounting (3) ECON 7910/7920 (1.5 x 2): Economics FINA 710 Finance (3) MARK 7510 Marketing (3) MBA Elective** (3) **Total Credit Hours: 15**	MGMT 7400: Strategy (3) MGMT 7050: Organizational Behavior (3) MGMT 7120: Operations (3) LEGL 7050: Legal Env of Business (3) MBA Elective** (3) **Total Credit Hours: 15**

***Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA electives approved for cross-credit towards the BS (Engineering) degree: Choose two courses.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analysis
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

BSBE Areas of Emphasis
Students must declare an Area of Emphasis and complete 4 required courses as well as 2 elective courses (18 credit hours).

Biomedical Area of Emphasis

Biomechanics Track

Required Courses

ENGR 3720	Engineering Physiology
ENGR 4230	Sensors & Transducers
ENGR 4740	Biomaterials
ENGR 4760	Biomechanics

Elective Courses

ENGR 3610	Structural Design
ENGR 4350	Intro to Finite Element Analysis
ENGR 4650	Control of Structural Environments I
ENGG 4620	Biomedical Imaging

Instrumentation Track

Required Courses

ENGR 3720	Engineering Physiology
ENGR 4230	Sensors & Transducers
ENGR 4740	Biomaterials
ENGR 4210	Linear Systems

Elective Courses

ENGR 3270	Electronics
ENGR 4240	Intro to Microcontrollers
ENGR 4260	Intro to Nanoelectronics
ENGG 4620	Biomedical Imaging

Biochemical Area of Emphasis

Required Courses

ENGR 4230	Sensors & Transducers
ENGR 4510	Biochemical Engineering
ENGR 4520	Design of Biochemical Separations Processes
ENGR 4650	Control of Structural Environments I

Elective Courses

ENGR 3540 Physical Unit Operations
ENGG 4615 Soft Materials

Environmental Area of Emphasis

Required Courses

ENGR 3410 Intro to Natural Resources Engineering
ENGR 3440 Hydraulics of Closed Conduit Flow
ENGR 4440 Environmental Engineering Unit Operations
ENGR 4450 Environmental Engineering Remediation Design

Elective Courses

ENGR 3420 Intro to Soil Mechanics
ENGR 4410 Open Channel Hydraulics
ENGR 4660 Sustainable Building Design
CRSS 3060&L Soils & Hydrology
WASR 4500 Quantitative Methods in Hydrology

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1103-BIOL 1103L, CHEM 1211-CHEM 1211L, CHEM 1212-CHEM 1212L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2140, ENGR 2170, ENGR 3150, ENGR 3160, ENGR 3520, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or ENGG prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

NOTES:

(1) 12 credit hours of elective coursework in the integrated program have been approved for cross-credit for both degree requirements. **Cross-credit engineering courses must be taken during Year 4.**

(2) All BE requirements (minimum grades, prerequisites, tracks, electives) apply.

Addendum 1.4
BSCE Civil Engineering/MBA Program of Study

Year One
Fall Semester

Course	Credit Hours
ENGR 1920 Intro to Engineering	1
ENGR 1120 Engineering Graphics	**2**
ENGR 1140 Comp Methods	2
Math 2250 Calculus I Sci Engr	**4**
ENGL 1101 English Comp I	3
Social Science Elective	3
FYOS 1001 First-Year Odyssey	1
Total Credit Hours	**16**

Year Two
Fall Semester

Course	Credit Hours
ENGR 2110 Engr. Decision Making	**3**
ENGR 2120 Statics	**3**
MATH 2500 Multivariable Calculus	**3**
CHEM 1211 & L Chemistry I	**4**
PHYS 1252 Physics for Engr II	**3**
Total Credit Hours	**16**

Year Three
Fall Semester

Course	Credit Hours
ENGR 2130 Dynamics	**3**
ENGR 3150 Heat Transfer	**3**
ENGR 3410 Intro to Nat Res Engr	3
ENGR 3610 Structural Design	3
ENVE 3510 Model, Statistical Analysis	3
CVLE 3460 Civil Engr Lab – Hydraulics	1
Total Credit Hours	**16**

Year Four
Fall Semester

Course	Credit Hours
CVLE 3470 Civil Engr Lab – Structural	1
CVLE 4910 Capstone Design Project I	2
MSIT 7100 Statistics	**3**
ENGINEERING ELECTIVE	3
ENGINEERING ELECTIVE	3
World Language and Culture	3
BUSN 7990 Career Management (Optional)	1
Total Credit Hours	**15 (16)**

Year One
Spring Semester

Course	Credit Hours
Math 2260 Calculus II Sci Engr	**4**
PHYS 1251 Physics for Engr I	**3**
COMM 1100 Speech Communication	3
ENGL 1102 English Comp II	3
LIFE SCIENCE ELECTIVE*	3
Total Credit Hours	**16**

Year Two
Spring Semester

Course	Credit Hours
ENGR 2140 Strength of Materials	**3**
MCHE 3140 Engr Thermodynamics I	**3**
ENGR 3160 Fluid Mechanics	**3**
CVLE 2210 Prin Survey & Trans	2
MATH 2700 Differential Equations	**3**
Social Science	3
Total Credit Hours	**17**

Year Three
Spring Semester

Course	Credit Hours
ENGR 3420 Soil Mechanics	3
CVLE 2710 Numerical Meth Engr	2
CVLE 3310 Civil Engr Materials	3
CVLE 3730 Civil Engr Proj Mgmt	2
CVLE 3450 Civil Engr Lab – Soils	1
ENGINEERING ELECTIVE	3
World Language and Culture	3
Total Credit Hours	**17**

Year Four
Spring Semester

Course	Credit Hours
CVLE 4920 Capstone Design Project I	2
MIST 7600 Data Analytics	**3**
ENGINEERING ELECTIVE	3
ENGINEERING ELECTIVE	3
World Language and Culture	3
Social Science Elective	3
Total Credit Hours	**17**

***LIFE SCIENCE ELECTIVE:** Select from BIOL 1104 Organismal Biology, MARS 1100 Natural Resource Conservation, or ECOL 1000 Ecological Basis of Environmental Issues

Year Four: Mandatory Summer Internship in Engineering or Business

Year Five		***Year Five***	
Fall Semester		***Spring Semester***	
Course	**Credit Hours**	**Course**	**Credit Hours**
ACCT 6000 Accounting	3	MGMT 7400 Strategy	3
ECON 7910/7920 Economics	3	MGMT 7050 Organizational Behavior	3
FINA 7010 Finance	3	MGMT 7120 Operations	3
MARK 7510 Marketing	3	LEGL 7050 Legal Env of Business	3
MBA ELECTIVE**	3	MBA ELECTIVE**	3
Total Credit Hours	**15**	**Total Credit Hours**	**15**

****Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in Year Five in order to graduate from the MBA program.*

MBA ELECTIVES APPROVED FOR CROSS-CREDIT TOWARDS BSCE DEGREE: Choose two classes from the list below.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

ENGINEERING ELECTIVES

Choose **5** classes from at least **2** of the following tracks: Geotechnical, Hydraulics, Structures, or Infrastructure Engineering. **At least 3 design courses** (**indicated by italics**) **must be selected.** At least two courses must be graduate level (indicated by a 6xxx listing) for cross-credit towards the MBA degree.

A. Geotechnical

CVLE 4420	Adv. Soil Mechanics
CVLE 4430	Groundwater Engineering
CVLE 4440	*Design with Geo-synthetics*
CVLE 4450	*Geotechnical Structures – Foundation & Retaining Walls*

B. Hydraulics

WASR 4500/6500	Quan. Methods in Hydrology
ENGR 3440	*Hydraulics of Closed Conduit Flow*
ENGR 4410	*Open Channel Hydraulics*
CVLE 4130/6130	Mechanics of Jets and Plumes
CVLE 4140/6140	Transport and Mixing in Natural Flows

C. Infrastructure Engineering

ENGR 4650/6650	HVAC Systems for Buildings and Industry
ENGR 46606660	Sustainable Building Design
ENVE 4550/6550	Environmental Life Cycle Analysis
ENVE 4710	GIS for Urban Engineering, Planning, and Development
ENVE 4720	*Urban Infrastructure Planning and Development*

CVLE 4730	Project Estimating and Planning
CVLE 4750	Building Information Modeling (BIM)
CVLE 4760	*Commercial Building Systems*

D. Structural Engineering

ENGR 4350/6350	Finite Element Analysis
ENGR 4610	*Design of Steel Structures*
ENGR 4630	*Design of Residential Structures*
CVLE 4640/6640	Adv. Strength of Materials
CVLE 4330/6330	Adv. Structural Analysis
CVLE 4530	*Design of Reinforced Concrete Structures*
CVLE 4540	*Adv. Des. Of Reinforced Conc. Structures*
CVLE 4620	*Adv. Design of Steel Structures*
CVLE 4810	*Design of Wood Structures*
CVLE 4340	*Design of Bridges*

Major Requirements:

All students must earn a grade of "C" (2.0) or better in the following engineering courses: MATH 2250, MATH 2260, MATH 2500, MATH 2700, CHEM 1211-1211L, PHYS 1251, PHYS 1252, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2130, ENGR 2140, MCHE 3140, ENGR 3150, ENGR 3160. Except for those ENGR courses requiring a grade of C (2.0) or better, a maximum of two ENGR or CVLE prefix courses with grades of D (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:

Overall GPA 2.7 for Transfer Students.

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREE PROGRAM.

Addendum 1.5
BSCSE COMPUTER SYSTEMS ENGINEERING/MBA PROGRAM OF STUDY

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
CSEE 2200	**Intro to Computer Systems Engr. I**	**2**	**PHYS 1251**	**Physics for Engineers I**	**3**
CSCI 1301	**Intro to Computing & Programming**	**4**	**CSCI 1302**	**Software Development**	**4**
ENGL 1101	English Composition I	3	**CSEE 2210**	**Intro to Computer Systems Engr. II**	**2**
	Social Sciences Elective	3	CSCI 2611	Discrete Math for Engineers	3
FYOS	First-Year Odyssey	1			
Total Credit Hours		**17**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	**ENGR 2170**	**Electrical Circuits**	**3**
CSEE 2220	**Fundamentals of Logic Design**	**3**	CSEE 2920	CSEE Design Methodology	4
CSCI 1730	Systems Programming	4	CSCI 2720	Data Structures	4
ENGL 1102	English Composition II	3		Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**17**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 2110	**Engineering Decision Making**	**3**	**MATH 3300**	**Applied Linear Algebra**	**3**
ENGR 6230	Sensors & Transducers	3	CSEE 4280	Advanced Digital Design	4
CSEE 4230	Embedded Systems Design	4	ENGR 3270	Electronics I	3
CSEE 4270	Design of Digital Systems	3		CSEE Track Elective	3
ENGG 2090	Probability & Statistics for Engineers	3		Humanities & The Arts Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**16**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 6210	Linear Systems	3	CSEE 4920	CSEE Capstone Design Project	4
MIST 7100	**Statistics**	**3**	**MIST 7600**	**Data Analytics**	**3**
	World Languages & Culture Elective	3		CSEE Track Elective	3
	World Languages & Culture Elective	3		Life Science Elective*	4
	Social Sciences Elective	3		World Languages & Culture Elective	3
Total Credit Hours		**15**	**Total Credit Hours**		**17**

*****LIFE SCIENCE ELECTIVE**:** Select from BIOL 1103&L or BIOL 1104&L or BIOL 1107&L or BIOL 1108&L.

Courses in BOLD require a grade of "C" or better

Year Four: Mandatory Summer Internship in Engineering or Business

Year Five

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ACCT 6000	Accounting	3	MGMT 7400	Strategy	3
ECON 7910/7920	Economics	3	MGMT 7050	Organizational Behavior	3
FINA 7010	Finance	3	MGMT 7120	Operations	3
MARK 7510	Marketing	3	LEGL 7050	Legal Env of Business	3
MBA ELECTIVE*		3	MBA ELECTIVE*		3
Total Credit Hours		**15**	**Total Credit Hours**		**15**

***Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA Electives approved for cross-credit towards the BSCSE degree: Choose two courses.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: CSEE 2200, CSEE 2210, CSEE 2220, CSCI 1301, CSCI 1302, ENGR 2110, ENGR 2170, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MATH 3300, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, CSEE, ENGG) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

Addendum 1.6
BSEE Electrical Engineering/MBA Program of Study

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**	**PHYS 1252**	**Physics for Engineers II**	**3**
ELEE 1030	**Intro to Electrical Engineering**	3	**CSEE 2220**	**Fundamentals of Logic Design**	**3**
ENGL 1101	English Composition I	3	ENGL 1102	English Composition II	3
BIOL 1104	Organismal Biology	3		World Languages & Culture Elective	3
FYOS	First-Year Odyssey	1			
Total Credit Hours		**17**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2700	**Differential Equations**	**3**	**MATH 2500**	**Multivariable Calculus**	**3**
ENGR 2170	**Electrical Circuits**	**3**	**ENGR 2120**	**Statics**	**3**
ELEE 2040	**Programming for Electrical Engrs.**	**3**	ENGR 2110	Engineering Decision Making	3
COMM 1100	Intro to Public Speaking	3	ENGR 3270	Electronics I	3
CHEM 1211&L	Chemistry I	4		Social Sciences Elective	3
				Non-EE Elective*	3
Total Credit Hours		**16**	**Total Credit Hours**		**18**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 4210	Linear Systems	3	CSEE 4210	Digital Signal Processing	3
ENGR 4270	Electronics II	3	ENGR 4220	Feedback Control Systems	3
ENGG 2090	Probability & Statistics for Engrs.	3	ELEE 3020	Electrical Engr. Design Lab	2
MCHE 3140	Thermodynamics I	3	ENGR 4240	Microcontrollers	3
	Social Sciences Elective	3	ELEE 4020	Electromagnetics	3
	World Languages & Culture Elective	3		World Languages & Culture Elective	3
Total Credit Hours		**18**	**Total Credit Hours**		**17**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ELEE 4910	EE Capstone Design I	2	ELEE 4920	EE Capstone Design II	2
ELEE 4710	Fundamentals of Power	3		EE Track Required Course	3
	EE Track Required Course	3		EE Track Elective	3
	EE Track Required Course	3		EE Track Elective	3
MSIT 7100	**Statistics**	**3**	**MIST 7600**	**Data Analytics**	**3**
Total Credit Hours		**14**	**Total Credit Hours**		**14**

*NON-EE ELECTIVE: Suggested areas include Business, Foreign Language, other Engineering fields or other fields approved by the BSEE Curriculum Coordinator.

Courses in BOLD require a grade of "C" or better

Year Four: Mandatory Summer Internship in Engineering or Business

Year Five

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ACCT 6000	Accounting	3	MGMT 7400	Strategy	3
ECON 7910/7920	Economics	3	MGMT 7050	Organizational Behavior	3
FINA 7010	Finance	3	MGMT 7120	Operations	3
MARK 7510	Marketing	3	LEGL 7050	Legal Env of Business	3
MBA ELECTIVE*		3	MBA ELECTIVE*		3
Total Credit Hours		**15**	**Total Credit Hours**		**15**

***Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA electives approved for cross-credit towards the BS (Engineering) degree: Choose two courses.

- ENTR 7090: Critical Design Thinking
- MARK 7600 Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320 Innovation Projects

BSEE Elective Tracks

Students must select one of the following tracks (18 credit hours):

A. Micro-Electronics

Required Courses

ELEE 4120 Microelectronic Devices & Circuits
ELEE 4170 Analog Integrated Circuits
ELEE 4590 Principles of Communication Systems

Elective Courses

CSEE 4240 Wireless Sensor Networks
CSEE 4270 Design Digital Systems
CSEE 4530 Intro to Optical Engineering
ELEE 4145 Principles of Laser and Photonics
ELEE 4545 Engineering Entrepreneurship
ENGR 4230 Sensors & Transducers
ENGR 4250 Advanced Microcontrollers
ENGR 4260 Intro to Nanoelectronics

B. Industrial Automation and Control

Required Courses

ELEE 4235 Applied Process Control
ENGR 4230 Sensors & Transducers
ENGR 4250 Advanced Microcontrollers

Elective Courses

CSEE 4240 Sensor Networks
CSEE 4270 Design Digital Systems
CSEE 4320 Mechatronics
ELEE 4275 Advanced Control Systems
ELEE 4545 Engineering Entrepreneurship
ELEE 4590 Principles of Communication Systems
ENGR 2100 Principles of Systems Engineering
ENGR 4540 Applied Machine Vision

C. Power Systems

Required Courses
ELEE 4720 Electrical Machines
ELEE 4735 Analytical Methods in Power Systems
ELEE 4745 Power Electronics

Elective Courses
ELEE 4545 Engineering Entrepreneurship
ELEE 4715 Power Distribution
ELEE 4725 Analysis of Power Systems
ELEE 4755 Power Electronics Dynamics and Control
ENGR 2100 Principles of Systems Engineering
ENGR 4230 Sensors & Transducers

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: CSEE 2220, ELEE 1030, ELEE 2040, ENGR 2120, ENGR 2170, MATH 2250, MATH 2260, MATH 2500, MATH 2700, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, CSEE, ELEE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

NOTES:

(1) 12 credit hours of elective coursework in the integrated program have been approved for cross credit for both degree programs. E**ngineering courses approved for cross-credit must be taken during Year 4**.

(2) All EE requirements (Minimum grades, prerequisites, tracks, electives) apply.

Addendum 1.7
BSEnvE ENVIRONMENTAL ENGINEERING/MBA PROGRAM OF STUDY

Year One

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
MATH 2250 Calculus I	4	MATH 2260 Calculus II	4
ENGL 1101 English Comp. I	3	CHEM 1212 & L Chemistry II	4
LAND 2510 History Built Environ. ***or*** *PHIL 2020 Logic & Critical Thinking*	3	ENGL 1102 English Comp. II	3
		PHYS 1251 & L Physics I	3
CHEM 1211 & L Chemistry I	4	ENVE 1020 Synthesis & Design Studio I ***or*** *ENGR 1120 Engr. Graphics & Visualization*	2
ENVE 1010 Synthesis & Design Seminar	1		
FYOS 1001 Freshman Odyssey	1		
Total Credit Hours	**16**	**Total Credit Hours**	**16**

Year Two

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
MATH 2500 Calculus III	3	MATH 2700 Differential Equations	3
ENGR 1140 Comp. Methods	2	BIOL 1104 Organismal Biology	3
PHYS 1212 & L Physics II	3	ENGR 3160 Fluid Mechanics	3
ENGR 2120 Statics	3	ENVE 2610 Intro to Environmental Engineering & Sustainability	3
CHEM 2211 & L Organic Chemistry	4		
		ENVE 2010 Synth & Dsgn Studio II ***or*** *ENVE 2920 Env Engr Dsgn Methodology*	2
		World Language/Culture Elective	3
Total Credit Hours	**15**	**Total Credit Hours**	**17**

Year Three

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
ENVE 3210 Energy Analysis I	3	ENVE 3220 Energy Analysis II	3
ENVE 3320 & L Environ. Engr-Urban Systems	4	ENVE 3510 Modeling, Statistical Analysis & Uncertainty	3
ENGR 2140 Strength of Materials	3	POLS 1101 Political Science	3
ENGR 3410 Intro. Natural Resources	3	ECOL 3500 Ecology	4
EHSC 4490 Environmental Toxicology	3	World Language/Culture Elective	3
Total Credit Hours	**16**	**Total Credit Hours**	**16**

Year Four

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
ENVE 4910 Environ. Engr. Design	2	ENVE 4920 Environ Engr. Design	2
ENVE 3520 Engineering Economics & Management	3	ENVE ELECTIVE III	3
		MIST 7600 Data Analytics	**3**
ENVE ELECTIVE I	3	ENVE ELECTIVE IV	3
MSIT 7100 Statistics	**3**	World Language/Culture Elective	3
ENVE ELECTIVE II	3	HIST2111/2112 American History	3
Social Science Elective	3		
Total Credit Hours	**17**	**Total Credit Hours**	**17**

Year Four: Mandatory Summer Internship in Engineering or Business

Year Five		***Year Five***	
Fall Semester		***Spring Semester***	
Course	**Credit Hours**	**Course**	**Credit Hours**
ACCT 6000 Accounting	3	MGMT 7400 Strategy	3
ECON 7910/7920 Economics	3	MGMT 7050 Organizational Behavior	3
FINA 7010 Finance	3	MGMT 7120 Operations	3
MARK 7510 Marketing	3	LEGL 7050 Legal Env of Business	3
MBA ELECTIVE*	3	MBA ELECTIVE*	3
Total Credit Hours	**15**	**Total Credit Hours**	**15**

*****_Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program._

MBA Electives approved for cross-credit towards the BSEnvE degree: Choose two courses from the list below.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

Select 1
Environmental Engineering
ENVE4530/6530 Energy & Environmental Policy Analysis
ENVE4540 Economics of Energy & Sustainable Development

Select 3 from the two lists below with the following criteria:
At least one course must be taken from Elective List II
At least two must be design courses (in italics)

Elective List I, Energy/Water Resources
ENVE 4230/6230 Energy in Nature, Civilization, and Engineering
ENGR3420 Soil Mechanics
ENGR3440 Hydraulics of Closed Conduit Flow
ENGR 3540 Physical Units of Operation
ENGR 4410 Open Channel Hydraulics
ENGR4440/6440 Environmental Engineering Unit Operations
ENGR4660/6660 Sustainable Building
ENGR4490/6490 Renewable Energy Engineering

Elective List II, Infrastructure/Planning/Economics
ENVE 4250 Energy Systems and the Environment
ENVE4550/6550 Environmental Life Cycle Analysis
ENVE4710 GIS for Urban Engineering, Planning & Development

Major Requirements:

All students must earn a grade of “C” (2.0) or better in each of the following courses: ENGR 1120, ENGR 2120, ENGR 2140, ENGR 3160, ENVE 2610, MATH 2250, MATH 2260, MATH 2500, MATH 2700, PHYS 1211-1211L, PHYS 1212-1212L, BIOL 1104, CHEM 1211-1211L and CHEM 1212-1212L. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or ENVE prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students.

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREE PROGRAM

Addendum 1.8
BSME MECHANICAL ENGINEERING/MBA PROGRAM OF STUDY

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
ENGR 1120 Engr. Graphics & Design	**2**	**ENGR 1140 Comp. Eng. Methods**	**2**
ENGR 1920 Introduction to Engineering	1	**MCHE 1940 Design Studio & Prof. Practice**	**3**
MATH 2250 Calculus I Science & Eng.	**4**	**MATH 2260 Calculus II Science & Eng.**	**4**
FYOS 1001 First-Year Odyssey Seminar	**1**	**PHYS 1251 Physics for Engineers I**	**3**
ENGL 1101 English Comp. I	**3**	**ENGL 1102 English Comp. II**	**3**
COMM 1100 Intro Public Speaking	**3**		
Social Science Elective	**3**		
Total Credit Hours	**17**	**Total Credit Hours**	**15**

Year Two

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
ENGR 2120 Statics	**3**	**ENGR 2170 Electrical Circuits**	**3**
MCHE 2990 Engineering Systems in Society	3	**ENGR 2140 Strength of Materials**	**3**
MATH 2500 Multivariable Calculus	**3**	**ENGR 2130 Dynamics**	**3**
PHYS 1252 Physics for Engineers II	**3**	**MCHE 3140 Eng. Thermodynamics I**	**3**
CHEM 1211&L Chemistry I	**4**	**MATH 2700 Differential Equations**	**3**
Total Credit Hours	**16**	**Total Credit Hours**	**15**

Year Three

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
MCHE 3310 Engineering Materials	**3**	CVLE 2710 Numerical Methods for Engineers	2
MCHE 3920 Mfg. & Design Studio	**3**	**ENGR 3150 Heat Transfer**	**3**
ENGR 3300 Mechanisms & Kinematics	3	ME TRACK ELECTIVE	3
ENGR 3160 Fluid Mechanics	**3**	***** Biological Science requirement**	**3**
ENGR 4210 Linear Systems	3	ENGR 4220 Feedback Control Systems	3
MCHE 4000 ME Professional Practice	2	MCHE 3450 Mechanical Engineering Lab	2
Total Credit Hours	**17**	**Total Credit Hours**	**16**

Year Four

Fall Semester		**Spring Semester**	
Course	**Credit Hours**	**Course**	**Credit Hours**
Social Science Elective	3	World Language & Culture	3
MCHE 4910 or ENGR 4910 Capstone Design I	2	MCHE 4920 or ENGR 4920 Capstone Design II	2
MSIT 7100 Statistics	**3**	**MIST 7600 Data Analytics**	**3**
ELECTIVE (Engineering list)	3	ELECTIVE (Engineering list)	3
** *MCHE 4390 Mechanical Vibration* ***OR***		** *ENGR 4300 Mechanical Systems* ***OR***	
World Language & Culture	3	*World Language & Culture*	3
World Language & Culture	3	Social Science Elective	3
Total Credit Hours	**17**	**Total Credit Hours**	**17**

Year Four: Mandatory Summer Internship in Engineering or Business

Year Five

Fall Semester			**Spring Semester**		
Course		**Credit Hours**	**Course**		**Credit Hours**
ACCT 6000	Accounting	3	MGMT 7400	Strategy	3
ECON 7910/7920	Economics (1.5 X 2)	3	MGMT 7050	Organizational Behavior	3
FINA 7010	Finance	3	MGMT 7120	Operations	3
MARK 7510	Marketing	3	LEGL 7050	Legal Env of Business	3
MBA ELECTIVE□		3	MBA ELECTIVE□		3
Total Credit Hours		**15**	**Total Credit Hours**		**15**

□*Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*

MBA electives approved for cross-credit towards the BS (Engineering) degree: Choose two courses.

- ENTR 7090: Critical Design Thinking
- MARK 7600: Predictive Analytics
- MGMT 7220: Project Management
- MIST 6550: Energy Informatics
- MIST 7600: Data Management
- MGMT 7160: Lean Six Sigma
- ENTR 7320: Innovation Projects

NOTE: 12 credit hours of elective coursework in the integrated program have been approved for cross-credit for both degree programs. Engineering courses approved for cross-credit must be taken during Year 4.

***MAJOR-RELATED ELECTIVE:** Suggested courses include ECOL 3070, EDES 4610, EDES 4660, EHSC 3060, ETES 5060, FDST 4050, HPRB 4450. Co-op, Research, Engineering or courses from Other Fields approved by BSME Curriculum Coordinator.

*****ALTERNATIVE CLASS CHOICE** (Choose **ONE**): Either MCHE 4390 in Fall Term or ENGR 4300 in Spring Term*
**** **BIOLOGICAL SCIENCE REQUIREMENT ELECTIVE:** Choose one. Either BIOL 1103 or BIOL 1104 or BIOL 1107 or BIOL 1108*

Courses in BOLD require a grade of "C" or better

BSME Elective Tracks

*Students must select **four** elective courses from the following Tracks (12 credit hours).*

Advanced Energy Systems Track

ENGR 4490 Renewable Energy Engineering
ENGR 4650 HVAC Systems for Buildings & Industry
ENVE 4250 Energy Systems & the Environment
ENVE 4530 Energy & Env Policy Analysis
MCHE 3150 Engineering Thermodynamics II
MIST 4550 Energy Informatics

Advanced Mechanics Track

ENGR 4300 Mechanical Systems
ENGR 4310 Embedded Robotics *
ENGR 4350 Intro Finite Element Analysis
ENGR 4760 Biomechanics
CSEE 4320 Mechatronics Systems Engineering *
MCHE 4360 Robotic Manipulators
MCHE 4380 Solid Mechanics
MCHE 4810 Intro to Micro and Nano Systems
MCHE 4500 Advanced Thermal Fluid Systems

Architectural Engineering Track

CVLE 4740 Life Cycle Analysis
CVLE 4750 Building Information Modeling *
CVLE 4760 Commercial Building Systems *
ENGR 4630 Engr Dsgn of Residential Structures
ENGR 4650 HVAC Systems for Buildings & Industry
ENGR 4660 Sustainable Building Design
MIST 4550 Energy Informatics

Industrial Design and Processes Track

CVLE 4740 Life Cycle Analysis
ENGR 3540 Physical Unit Operations
ENGR 4230 Sensors and Transducers
ENGR 4310 Embedded Robotics *
ENGR 4340 Machine Hydraulics
ENGR 4540 Applied Machine Vision
ENGR 4650 HVAC Systems for Buildings & Industry
MCHE 3150 Engineering Thermodynamics II
MCHE 4360 Robotic Manipulators
MCHE 4410 Industrial Process Design
MCHE 4420 Industrial Controls
MCHE 4500 Advanced Thermal Fluid Systems

Modeling and Controls Track

CVLE 4750 Building Information Modeling *
ENGR 4230 Sensors and Transducers
ENGR 4240 Intro to Microcontrollers
ENGR 4250 Advanced Microcontrollers
ENGR 4350 Intro Finite Element Analysis
ENGR 4650 HVAC Systems for Buildings & Industry
MCHE 4410 Industrial Process Design
MCHE 4420 Industrial Controls
MCHE 4360 Robotic Manipulators
MIST 4550 Energy Informatics
CSEE 4320 Mechatronics Systems Engineering *
ELEE 4235 Applied Process Control
** Prerequisite modifications needed, in pro*

Major Requirements:

All students must earn a grade of "C" (2.0) or better in the following courses: BIOL 1103 or 1104 or 1107, CHEM 1211, CHEM 1211L, ENGR 1120, ENGR 1140, ENGR 2120, ENGR 2130, ENGR 2140, ENGR 2170, ENGR 3150, ENGR 3160, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 or PHYS 1211-1211L, PHYS 1252 or PHYS 1212-1212L. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR or MCHE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements.

Transfer Entrance Requirements into Major:

Overall GPA 2.7 for Transfer Students.

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM & THE PRE-FE EXAM ARE GRADUATION REQUIREMENTS FOR THIS DEGREE PROGRAM.

Addendum 2.1
BSAE AGRICULTURAL ENGINEERING

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
ENGR 1920	Intro to Engineering	1	ENGR 1140	Computational Engineering Methods	2
ENGR 1120	**Engineering Graphics**	**2**	**PHYS 1251**	**Physics for Engineers I**	**3**
ENGR 2100	Principles of Systems Engineering	3	**ENGR 2110**	**Engineering Decision Making**	**3**
CHEM 1211&L	**Chemistry I**	**4**	ENGL 1102	English Composition II	3
ENGL 1101	English Composition I	3	FYOS	First-Year Odyssey	1
Total Credit Hours		**17**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
ENGR 2120	**Statics**	**3**	**ENGR 2170**	**Electrical Circuits**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	ENGR 2920	Design Methodology	2
	Life Science Elective*	**4**	**MCHE 3140**	**Thermodynamics I**	**3**
	Major Related Elective**	3		Social Sciences Elective	3
				Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**17**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 3150	**Heat Transfer**	**3**	ENGR 2180	Intro Modeling of Dynamic Systems	3
ENGR 3160	**Fluid Mechanics**	**3**		Area of Emphasis Required Course	3
ENVE 3510	Modeling, Stat. Analysis, Uncertainty	3		Area of Emphasis Required Course	3
	Area of Emphasis Required Course	3		Area of Emphasis Required Course	3
	Social Sciences Elective	3		World Languages & Culture Elective	3
COMM 1100	Intro to Public Speaking	3	CVLE 2710	Numerical Methods for Engineers	2
Total Credit Hours		**18**	**Total Credit Hours**		**17**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 4140	**Systems Modeling**	**3**	ENGR 4920	Engineering Design Project II	2
ENGR 4910	Engineering Design Project I	2		Area of Emphasis Required Course	3
	Area of Emphasis Elective	3		Area of Emphasis Required Course	3
	Area of Emphasis Elective	3		Area of Emphasis Required Course	3
	Area of Emphasis Elective	1		World Languages & Culture Elective	3
	World Languages & Culture Elective	3			
Total Credit Hours		**15**	**Total Credit Hours**		**14**

*LIFE SCIENCE ELECTIVE: Select from BIOL 1107&L, CRSS 2010&L or PBIO 1210&L.
**MAJOR RELATED ELECTIVE: Select from ANTH 1102, FANR 2200 or GEOG 1125.
Courses in BOLD require a grade of "C" or better

BSAE Areas of Emphasis

Students must declare an Area of Emphasis and complete 7 Required Courses (21 credit hours) as well as 3 Elective Courses (minimum of 7 credit hours).

Electrical & Electronic Systems

Required Courses

ENGR 3270	Electronics I
ENGR 4210	Linear Systems
ENGR 4220	Feedback Control Systems
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers
ENGR 4250	Advanced Microcontrollers
ENGR 4270	Electronics II

Elective Courses

ENGR 3520	Mass Transport and Rate Phenomena
ENGR 3540	Physical Unit Operations
ENGR 4260	Intro to Nanoelectronics
ENGR 4310	Embedded Robotics
ENGR 4540	Applied Machine Vision
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design
ENGG 4620	Biomedical Imaging
ENGR 3101	Applied Vector Analysis (1 credit hour)

Mechanical Systems

Required Courses

ENGR 2130	Dynamics
ENGR 2140	Strength of Materials
ENGR 3270	Electronics I
ENGR 3300	Mechanisms and Machine Kinematics
ENGR 4300	Mechanical Systems
ENGR 4340	Machine Hydraulics
ENGR 4350	Intro to Finite Element Analysis

Elective Courses

ENGR 3520	Mass Transport and Rate Phenomena
ENGR 3540	Physical Unit Operations
ENGR 3610	Structural Design
ENGR 4210	Linear Systems
ENGR 4220	Feedback Control Systems
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers
ENGR 4250	Advanced Microcontrollers
ENGR 4310	Embedded Robotics
ENGR 4490	Renewable Energy Engineering
ENGR 4540	Applied Machine Vision
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design
ENGR 3101	Applied Vector Analysis (1 credit hour)
CVLE 3460	Civil Engineering Hydraulics Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Natural Resource Management

Required Courses

ENGR 2140	Strength of Materials
ENGR 3120	Spatial Data Analysis
ENGR 3410	Intro to Natural Resource Engineering
ENGR 3440	Hydraulics of Closed Conduit Flow
ENGR 4440	Environmental Engr. Unit Operations
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design

Elective Courses

ENGR 3420	Intro to Soil Mechanics
ENGR 3520	Mass Transport and Rate Phenomena
ENGR 3610	Structural Design
ENGR 4161&L	Environmental Microclimatology
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers
ENGR 4410	Open Channel Hydraulics
ENGR 4450	Environmental Engineering Remediation Design
ENGR 4700L	Hydrology, Geology, Soils of Georgia
CRSS 3060&L	Soils & Hydrology or *WASR 4500 Quantitative Methods in Hydrology*
CRSS 4600	Soil Physics
CVLE 3450	Civil Engineering Soils Lab (1 credit hour)
CVLE 3460	Civil Engineering Hydraulics Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Structural Systems

Required Courses

ENGR 2140	Strength of Materials
ENGR 3420	Intro to Soil Mechanics
ENGR 3610	Structural Design
ENGR 4610	Design of Light Steel Structures

Elective Courses

ENGR 3120	Spatial Data Analysis
ENGR 3300	Mechanisms and Machine Kinematics
ENGR 3410	Intro to Natural Resource Engineering
ENGR 3440	Hydraulics of Closed Conduit Flow

Structural Systems (cont'd)

Required Courses

ENGR 4630	Design of Residential Structures
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design

Elective Courses

ENGR 3520	Mass Transport and Rate Phenomena
ENGR 4210	Linear Systems
ENGR 4220	Feedback Control Systems
ENGR 4350	Intro to Finite Element Analysis
ENGR 4440	Environmental Engineering Unit Operations
CVLE 3450	Civil Engineering Soils Lab (1 credit hour)
CVLE 3470	Civil Engineering Structural Lab (1 credit hour)

Process Operations

Required Courses

ENGR 2140	Strength of Materials
ENGR 3270	Electronics I
ENGR 3540	Physical Unit Operations
ENGR 4210	Linear System
ENGR 4220	Feedback Controls
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers

Elective Courses

ENGR 4250	Advanced Microcontrollers
ENGR 4350	Intro to Finite Element Analysis
ENGR 4490	Renewable Energy Engineering
ENGR 4540	Applied Machine Vision
FDST 4010&L	Food Processing
FDST 4050&L	Food Engineering Fundamentals I
FDST 4060&L	Food Engineering Fundamentals II
FDST 4090	Food Quality Control
FORS 3500	Wood Properties & Utilization
MGMT 3000	Management Organizations & Individuals
MGMT 4000	Operations Management
MGMT 4240	Quality Management
MGMT 4250	Productivity Management
POUL 4860	Poultry Processing
ENGR 3101	Applied Vector Analysis (1 credit hour)

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1107-BIOL 1107L, CHEM 1211-CHEM 1211L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2170, ENGR 3150, ENGR 3160, ENGR 4140, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, ENGG, ENVE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:

Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.2

BSBCHE BIOCHEMICAL ENGINEERING

Year One

Fall Semester		
Course		**Hours**
MATH 2250	**Calculus I**	**4**
ENGR 1920	Intro to Engineering	1
ENGR 1120	**Engineering Graphics**	**2**
CHEM 1211&L	**Chemistry I**	**4**
ENGL 1101	English Composition I	3
FYOS	First-Year Odyssey	1
Total Credit Hours		**15**

Spring Semester		
Course		**Hours**
MATH 2260	**Calculus II**	**4**
CHEM 1212&L	**Chemistry II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**
ENGR 1140	Computational Engineering Methods	2
ENGL 1102	English Composition II	3
Total Credit Hours		**16**

Year Two

Fall Semester		
Course		**Hours**
MATH 2500	**Multivariable Calculus**	**3**
PHYS 1252	**Physics for Engineers II**	**3**
CHEM 2211&L	Organic Chemistry I	4
ENGR 2120	**Statics**	**3**
BCHE 2910	Intro Biochemical Engineering Design	3
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
MATH 2700	**Differential Equations**	**3**
ENGR 3160	**Fluid Mechanics**	**3**
MCHE 3140	**Thermodynamics I**	**3**
BIOL 1107&L	**Principles of Biology I**	**4**
	Social Sciences Elective	3
Total Credit Hours		**16**

Year Three

Fall Semester		
Course		**Hours**
ENGR 3520	**Mass Transport & Rate Phenomena**	**3**
BCHE 3145	Equilibrium Thermodynamics	3
BCMB 3100	Intro Biochemistry/Molecular Biology	4
MIBO 3500	Intro Microbiology	3
	World Languages & Culture Elective	3
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
BCHE 3180	Biochemical Engineering Lab	2
BCHE 3420	Kinetics & Reactor Design	3
ENGR 2110	**Engineering Decision Making**	**3**
ENGR 3150	**Heat Transfer**	**3**
ENGR 4510	Biochemical Engineering	3
	Social Sciences Elective	3
Total Credit Hours		**17**

Year Four

Fall Semester		
Course		**Hours**
BCHE 4910	Biochemical Engineering Design I	2
	Biochemical Engineering Elective	3
	Biochemical Engineering Elective	3
COMM 1100	Intro to Public Speaking	3
	World Languages & Culture Elective	3
	World Languages & Culture Elective	3
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
BCHE 4911	Engineering Design Project II	2
BCHE 4180	Advanced Biochemical Engr. Lab	3
BCHE 4360	Biochemical Process Control	3
BCHE 4710	Bio-Electrochemical Engineering	3
	Biochemical Engineering Elective	3
	Social Sciences Elective	3
Total Credit Hours		**17**

Courses in BOLD require a grade of "C" or better

BSBCHE Electives
Students must select 3 of the following courses (9 credit hours):

BCHE 4350	Bioprocess Quality Control
BCHE 4460	Bio-Refinery Engineering
BCHE 4625	Tissue Engineering
BCHE 4655	Metabolic Engineering & Synthetic Biology
ENGR 4450	Environmental Engineering Remediation Design
ENGR 4490	Renewable Energy Engineering
ENGR 4520	Design of Biochemical Separation Processes
*ENGR 4740	Biomaterials
*ENGG 4615	Soft Materials

*Students may choose either one of these courses, but not both.

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1107-BIOL 1107L, CHEM 1211-CHEM 1211L, CHEM 1212-CHEM 1212L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 3150, ENGR 3160, ENGR 3520, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, BCHE, ENGG) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.3

BSBE BIOLOGICAL ENGINEERING

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
ENGR 1920	Intro to Engineering	1	**CHEM 1212&L**	**Chemistry II**	**4**
ENGR 1120	**Engineering Graphics**	**2**	**PHYS 1251**	**Physics for Engineers I**	**3**
ENGR 1140	Computational Engineering Methods	2	**BIOL 1103&L**	**Basic Concepts in Biology**	**4**
CHEM 1211&L	**Chemistry I**	**4**	FYOS	First-Year Odyssey	1
ENGL 1101	English Composition I	3			
Total Credit Hours		**16**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
ENGR 2120	**Statics**	**3**	**ENGR 2170**	**Electrical Circuits**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	**ENGR 3160**	**Fluid Mechanics**	**3**
BIOL 1104	Organismal Biology	3	**ENGR 2110**	**Engineering Decision Making**	**3**
ENGL 1102	English Composition II	3	ENGR 2920	Design Methodology	2
			CHEM 2211&L	Organic Chemistry I	4
Total Credit Hours		**15**	**Total Credit Hours**		**18**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MCHE 3140	**Thermodynamics I**	**3**	**ENGR 3150**	**Heat Transfer**	**3**
ENGR 2140	**Strength of Materials**	**3**		Area of Emphasis Required Course	3
ENGR 3520	**Mass Transport & Rate Phenomena**	**3**		Area of Emphasis Required Course	3
BCMB 3100	Intro Biochemistry/Molecular Biology	4		Area of Emphasis Required Course	3
MIBO 3500	Intro Microbiology	3		World Languages & Culture Elective	3
				Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**18**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
	Science Elective*	3	ENGR 4920	Engineering Design Project	4
	Area of Emphasis Required Course	3		Area of Emphasis Elective	3
	Area of Emphasis Elective	3		World Languages & Culture Elective	3
	Social Sciences Elective	3		World Languages & Culture Elective	3
COMM 1100	Intro to Public Speaking	3		Social Sciences Elective	3
Total Credit Hours		**15**	**Total Credit Hours**		**16**

*SCIENCE ELECTIVE: Select any Biology or Ecology course at the 3000 level or above. Suggested courses are: BCMB (CHEM) 4110, BCMB (ENTO) 4200, CBIO (BIOL) 3400, CBIO (MIBO) 4100, CRSS 4600&L, ECOL (BIOL) 3500&L, MIBO 4090, VPHY 3100.

Courses in BOLD require a grade of "C" or better

BSBE Areas of Emphasis

Students must declare an Area of Emphasis and complete 4 Required Courses as well as 2 Elective Courses (18 credit hours).

Biomedical Area of Emphasis

Biomechanics Track

Required Courses

ENGR 3720	Engineering Physiology
ENGR 4230	Sensors & Transducers
ENGR 4740	Biomaterials
ENGR 4760	Biomechanics

Elective Courses

ENGR 3610	Structural Design
ENGR 4350	Intro to Finite Element Analysis
ENGR 4650	Control of Structural Environments I
ENGG 4620	Biomedical Imaging
BCHE 4625	Tissue Engineering

Instrumentation Track

Required Courses

ENGR 3720	Engineering Physiology
ENGR 4230	Sensors & Transducers
ENGR 4740	Biomaterials
ENGR 4210	Linear Systems

Elective Courses

ENGR 3270	Electronics
ENGR 4240	Intro to Microcontrollers
ENGR 4260	Intro to Nanoelectronics
ENGG 4620	Biomedical Imaging

Biochemical Area of Emphasis

Required Courses

ENGR 4230	Sensors & Transducers
ENGR 4510	Biochemical Engineering
ENGR 4520	Design of Biochemical Separations Processes
ENGR 4650	Control of Structural Environments I

Elective Courses

ENGR 3540	Physical Unit Operations
ENGG 4615	Soft Materials

Environmental Area of Emphasis

Required Courses

ENGR 3410	Intro to Natural Resources Engineering
ENGR 3440	Hydraulics of Closed Conduit Flow
ENGR 4440	Environmental Engineering Unit Operations
ENGR 4450	Environmental Engineering Remediation Design

Elective Courses

ENGR 3420	Intro to Soil Mechanics
ENGR 4410	Open Channel Hydraulics
ENGR 4660	Sustainable Building Design
CRSS 3060&L	Soils & Hydrology
WASR 4500	Quantitative Methods in Hydrology

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1103-BIOL 1103L, CHEM 1211-CHEM 1211L, CHEM 1212-CHEM 1212L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2140, ENGR 2170, ENGR 3150, ENGR 3160, ENGR 3520, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or ENGG prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:

Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.4

BSCE CIVIL ENGINEERING

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
ENGR 1920	Intro to Engineering	1	**PHYS 1251**	**Physics for Engineers I**	**3**
ENGR 1120	**Engineering Graphics**	**2**	ENGL 1102	English Composition II	3
ENGR 1140	Computational Engineering Methods	2	COMM 1100	Intro to Public Speaking	3
ENGL 1101	English Composition I	3		Life Science Elective*	3
	Social Sciences Elective	3			
FYOS	First-Year Odyssey	1			
Total Credit Hours		**16**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2500	**Multivariable Calculus**	**3**	**MATH 2700**	**Differential Equations**	**3**
ENGR 2120	**Statics**	**3**	**ENGR 2140**	**Strength of Materials**	**3**
ENGR 2110	**Engineering Decision Making**	**3**	**MCHE 3140**	**Thermodynamics I**	**3**
CHEM 1211&L	**Chemistry I**	**4**	**ENGR 3160**	**Fluid Mechanics**	**3**
PHYS 1252	**Physics for Engineers II**	**3**	CVLE 2210	Principles Surveying & Transportation	2
				Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**17**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 2130	**Dynamics**	**3**	ENGR 3420	Soil Mechanics	3
ENGR 3150	**Heat Transfer**	**3**	CVLE 2710	Numerical Methods for Engineers	2
ENGR 3410	Intro Natural Resource Engineering	3	CVLE 3310	Civil Engineering Materials	3
ENGR 3610	Structural Design	3	CVLE 3730	Civil Engineering Project Mgmt	2
ENVE 3510	Modeling, Stat. Analysis, Uncertainty	3	CVLE 3450	Civil Engineering Lab – Soils	1
CVLE 3460	Civil Engineering Lab – Hydraulics	1		Civil Engineering Track Elective	3
				World Languages & Culture Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**17**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
CVLE 4910	Capstone Design Project I	2	CVLE 4920	Capstone Design Project II	2
CVLE 3470	Civil Engineering Lab – Structural	1		Civil Engineering Track Elective	3
	Civil Engineering Track Elective	3		Civil Engineering Track Elective	3
	Civil Engineering Track Elective	3		Civil Engineering Track Elective	3
	Civil Engineering Track Elective	3		World Languages & Culture Elective	3
	World Languages & Culture Elective	3		Social Sciences Elective	3
Total Credit Hours		**15**	**Total Credit Hours**		**17**

*LIFE SCIENCE ELECTIVE: Select from BIOL 1104, MARS 1100 or ECOL 1000.

Courses in BOLD require a grade of "C" or better

BSCE Electives

Students must select 7 courses from at least 2 of the following tracks (21 credit hours). At least 3 courses must be design courses (listed in *italics*).

A. Geotechnical

CVLE 4420 Advanced Soil Mechanics
CVLE 4430 Groundwater Engineering
CVLE 4440 Design with Geosynthetics
CVLE 4450 Geotechnical Structures – Foundations and Retaining Walls

B. Hydraulics

WASR 4500 Quantitative Methods in Hydrology
ENGR 3440 Hydraulics of Closed Conduit Flow
ENGR 4410 Open Channel Hydraulics
CVLE 4130 Mechanics of Jets and Plumes
CVLE 4140 Transport and Mixing in Natural Flows

C. Infrastructure Engineering

ENGR 4650 Control of Structural Environments I
ENGR 4660 Sustainable Building Design
ENVE 4550 Environmental Life Cycle Analysis
ENVE 4710 GIS for Urban Engineering, Planning, Development
ENVE 4720 Urban Infrastructure Planning and Development
CVLE 4730 Project Estimating and Planning
CVLE 4750 Building Information Modeling (BIM)
CVLE 4760 Commercial Building Systems

D. Structural Engineering

ENGR 4350 Intro to Finite Element Analysis
ENGR 4610 Design of Light Steel Structures
ENGR 4630 Engineering Design of Residential Structures
ENGR 4640 Advanced Strength of Materials
CVLE 4330 Advanced Structural Analysis
CVLE 4340 Design of Bridges
CVLE 4530 Design of Reinforced Concrete Structures
CVLE 4540 Advanced Design of Reinforced Concrete Structures
CVLE 4620 Advanced Design of Steel Structures
CVLE 4810 Design of Wood Structures

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: CHEM 1211-CHEM1211L, ENGR 1120, ENGR 2110, ENGR 2120, ENGR 2130, ENGR 2140, ENGR 3150, ENGR 3160, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or CVLE or ENVE prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:

Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.5
BSCSE COMPUTER SYSTEMS ENGINEERING

Year One

Fall Semester		
Course		**Hours**
MATH 2250	**Calculus I**	**4**
CSEE 2200	**Intro to Computer Systems Engr. I**	**2**
CSCI 1301	**Intro to Computing & Programming**	**4**
ENGL 1101	English Composition I	3
	Social Sciences Elective	3
FYOS	First-Year Odyssey	1
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
MATH 2260	**Calculus II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**
CSCI 1302	**Software Development**	**4**
CSEE 2210	**Intro to Computer Systems Engr. II**	**2**
CSCI 2611	Discrete Math for Engineers	3
Total Credit Hours		**16**

Year Two

Fall Semester		
Course		**Hours**
MATH 2500	**Multivariable Calculus**	**3**
PHYS 1252	**Physics for Engineers II**	**3**
CSEE 2220	**Fundamentals of Logic Design**	**3**
CSCI 1730	Systems Programming	4
ENGL 1102	English Composition II	3
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
MATH 2700	**Differential Equations**	**3**
ENGR 2170	**Electrical Circuits**	**3**
CSEE 2920	CSEE Design Methodology	4
CSCI 2720	Data Structures	4
	Social Sciences Elective	3
Total Credit Hours		**17**

Year Three

Fall Semester		
Course		**Hours**
ENGR 2110	**Engineering Decision Making**	**3**
ENGR 4230	Sensors & Transducers	3
CSEE 4230	Embedded Systems Design	4
CSEE 4270	Design of Digital Systems	3
ENGG 2090	Probability & Statistics for Engineers	3
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
MATH 3300	**Applied Linear Algebra**	**3**
CSEE 4280	Advanced Digital Design	4
ENGR 3270	Electronics I	3
	CSEE Track Elective	3
	Humanities & The Arts Elective	3
Total Credit Hours		**16**

Year Four

Fall Semester		
Course		**Hours**
ENGR 4210	Linear Systems	3
	CSEE Track Elective	3
	World Languages & Culture Elective	3
	World Languages & Culture Elective	3
	Social Sciences Elective	3
Total Credit Hours		**15**

Spring Semester		
Course		**Hours**
CSEE 4920	CSEE Capstone Design Project	4
	CSEE Track Elective	3
	CSEE Track Elective	3
	Life Science Elective*	4
	World Languages & Culture Elective	3
Total Credit Hours		**17**

***LIFE SCIENCE ELECTIVE: Select from BIOL 1103&L or BIOL 1104&L or BIOL 1107&L or BIOL 1108&L.

Courses in BOLD require a grade of "C" or better

BSCSE Electives

Students are encouraged to select 4 courses from no more than 2 tracks (12 credit hours). 3 courses must be CSEE or ENGR or ENGG courses. Students are allowed to substitute one Elective with two semesters of CURO working on the same research project.

A. Computer Hardware Systems

CSCI 4150	Numerical Simulations in Science & Engineering
CSCI 4370	Database Management
CSCI 4730	Operating Systems
CSCI 4740	Real-Time Scheduling
CSCI 4760	Computer Networks
CSEE 4210	Digital Signal Processing
CSEE 4240	Sensor Networks
ENGR 4260	Intro to Nano-electronics

B. Mechatronics

CSEE 4320	Mechatronics
CSCI 4150	Numerical Simulations in Science & Engineering
CSCI 4530	Intro to Robotics
CSCI 4830	Virtual Reality
CSEE 4310	Embedded Robotics
CSEE 4530	Intro to Optical Engineering
ENGR 4220	Feedback Control Systems
ENGR 4270	Electronics II
ENGR 4540	Applied Machine Vision

C. Biological Systems

CSCI 4150	Numerical Simulations in Science & Engineering
CSCI 4490	Algorithms for Computational Biology
CSEE 4630	Instrumentation for Monitoring Biological Systems
ENGG 4620	Biomedical Imaging
ENGR 4220	Feedback Control Systems
MATH 4780	Mathematical Biology

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: CSEE 2200, CSEE 2210, CSEE 2220, CSCI 1301, CSCI 1302, ENGR 2110, ENGR 2170, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MATH 3300, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, CSEE, ENGG) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

Addendum 2.6

BSEE Electrical Engineering

Year One

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2250	**Calculus I**	**4**	**MATH 2260**	**Calculus II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**	**PHYS 1252**	**Physics for Engineers II**	**3**
ELEE 1030	**Intro to Electrical Engineering**	3	**CSEE 2220**	**Fundamentals of Logic Design**	**3**
ENGL 1101	English Composition I	3	ENGL 1102	English Composition II	3
BIOL 1104	Organismal Biology	3		World Languages & Culture Elective	3
FYOS	First-Year Odyssey	1			
Total Credit Hours		**17**	**Total Credit Hours**		**16**

Year Two

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
MATH 2700	**Differential Equations**	**3**	**MATH 2500**	**Multivariable Calculus**	**3**
ENGR 2170	**Electrical Circuits**	**3**	**ENGR 2120**	**Statics**	**3**
ELEE 2040	**Programming for Electrical Engrs.**	**3**	ENGR 2110	Engineering Decision Making	3
COMM 1100	Intro to Public Speaking	3	ENGR 3270	Electronics I	3
CHEM 1211&L	Chemistry I	4		Social Sciences Elective	3
Total Credit Hours		**16**	**Total Credit Hours**		**15**

Year Three

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ENGR 4210	Linear Systems	3	CSEE 4210	Digital Signal Processing	3
ENGR 4270	Electronics II	3	ENGR 4220	Feedback Control Systems	3
ENGG 2090	Probability & Statistics for Engrs.	3	ELEE 3020	Electrical Engr. Design Lab	2
MCHE 3140	Thermodynamics I	3	ENGR 4240	Microcontrollers	3
	Social Sciences Elective	3	ELEE 4020	Electromagnetics	3
				World Languages & Culture Elective	3
Total Credit Hours		**15**	**Total Credit Hours**		**17**

Year Four

Fall Semester			**Spring Semester**		
Course		**Hours**	**Course**		**Hours**
ELEE 4910	EE Capstone Design I	2	ELEE 4920	EE Capstone Design II	2
ELEE 4710	Fundamentals of Power	3		EE Track Required Course	3
	EE Track Required Course	3		EE Track Elective	3
	EE Track Required Course	3		EE Track Elective	3
	EE Track Elective	3		Social Sciences Elective	3
	Non-EE Elective*	3		World Languages & Culture Elective	3
Total Credit Hours		**17**	**Total Credit Hours**		**17**

*NON-EE ELECTIVE: Suggested areas include Business, Foreign Language, other Engineering fields or other fields approved by the BSEE Curriculum Coordinator.

Courses in BOLD require a grade of "C" or better

BSEE Elective Tracks
Students must select one of the following tracks (18 credit hours):

A. Micro-Electronics

Required Courses

ELEE 4120	Microelectronic Devices & Circuits
ELEE 4170	Analog Integrated Circuits
ELEE 4590	Principles of Communication Systems

Elective Courses

CSEE 4240	Wireless Sensor Networks
CSEE 4270	Design Digital Systems
CSEE 4530	Intro to Optical Engineering
ELEE 4145	Principles of Laser and Photonics
ELEE 4545	Engineering Entrepreneurship
ENGR 4230	Sensors & Transducers
ENGR 4250	Advanced Microcontrollers
ENGR 4260	Intro to Nanoelectronics

B. Industrial Automation and Control

Required Courses

ELEE 4235	Applied Process Control
ENGR 4230	Sensors & Transducers
ENGR 4250	Advanced Microcontrollers

Elective Courses

CSEE 4240	Sensor Networks
CSEE 4270	Design Digital Systems
CSEE 4320	Mechatronics
ELEE 4275	Advanced Control Systems
ELEE 4545	Engineering Entrepreneurship
ELEE 4590	Principles of Communication Systems
ENGR 2100	Principles of Systems Engineering
ENGR 4540	Applied Machine Vision

C. Power Systems

Required Courses

ELEE 4720	Electrical Machines
ELEE 4735	Analytical Methods in Power Systems
ELEE 4745	Power Electronics

Elective Courses

ELEE 4545	Engineering Entrepreneurship
ELEE 4715	Power Distribution
ELEE 4725	Analysis of Power Systems
ELEE 4755	Power Electronics Dynamics and Control
ENGR 2100	Principles of Systems Engineering
ENGR 4230	Sensors & Transducers

Major Requirements:
All students must earn a grade of "C" (2.0) or better in each of the following courses: CSEE 2220, ELEE 1030, ELEE 2040, ENGR 2120, ENGR 2170, MATH 2250, MATH 2260, MATH 2500, MATH 2700, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, CSEE, ELEE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements.

Transfer Entrance Requirements into Intended Major:
Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.7
BSENVE Environmental Engineering

Year One

Fall Semester		
Course		**Hours**
MATH 2250	**Calculus I**	**4**
ENVE 1010	**Synthesis & Design Seminar**	**1**
CHEM 1211&L	**Chemistry I**	**4**
ENGL 1101	English Composition I	3
LAND 2510	*History of Built Environment I*	
or *PHIL 2020*	*Logic & Critical Thinking*	3
FYOS	First-Year Odyssey	1
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
MATH 2260	**Calculus II**	**4**
CHEM 1212&L	**Chemistry II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**
ENVE 1020	***Synthesis & Design Studio I***	
or ***ENGR 1120***	***Engineering Graphics***	**2**
ENGL 1102	English Composition II	3
Total Credit Hours		**16**

Year Two

Fall Semester		
Course		**Hours**
MATH 2500	**Multivariable Calculus**	**3**
ENGR 1140	Computational Methods	2
ENGR 2120	**Statics**	**3**
PHYS 1252	**Physics for Engineers II**	**3**
CHEM 2211&L	Organic Chemistry I	4
Total Credit Hours		**15**

Spring Semester		
Course		**Hours**
MATH 2700	**Differential Equations**	**3**
BIOL 1104	**Organismal Biology**	**3**
ENGR 3160	**Fluids**	**3**
ENVE 2610	**Intro Env. Engr. & Sustainability**	**3**
ENVE 2010	***Synthesis & Design Studio III***	
or ***ENVE 2920***	***Env. Engr. Design Methods***	**2**
	World Languages & Culture Elective	3
Total Credit Hours		**17**

Year Three

Fall Semester		
Course		**Hours**
ENVE 3210	Energy Analysis I	3
ENVE 3320&L	Env. Engr. – Urban Systems	4
ENVE 3510	Modeling,Stat.Analysis,Uncertainty	3
ENGR 3410	Intro to Natural Resources	3
EHSC 4350	Environmental Chemistry	3
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
ENVE 3220	Energy Analysis II	3
ENGR 2140	**Strength of Materials**	**3**
ECOL 3500&L	Ecology	4
	World Languages & Culture Elective	3
	Social Sciences Elective	3
Total Credit Hours		**16**

Year Four

Fall Semester		
Course		**Hours**
ENVE 4910	Env. Engr. Senior Design I	2
ENVE 3520	Engr. Economics & Management	3
	ENVE Elective	3
	ENVE Elective	3
	ENVE Elective	3
	Social Sciences Elective	3
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
ENVE 4920	Env. Engr. Senior Design II	2
	ENVE Elective	3
	ENVE Elective	3
	ENVE Elective	3
	World Languages & Culture Elective	3
	Social Sciences Elective	3
Total Credit Hours		**17**

Courses in BOLD require a grade of "C" or Better

BSENVE Electives – Fall 2015

Choose 1 course:

ENVE 4530 Energy & Environmental Policy Analysis
ENVE 4540 Economics of Energy & Sustainable Development

Choose 5 courses:
At least 1 course must be taken form Elective Area B. At least 3 design courses (listed in *ITALICS*) must also be selected.

A. Energy/Water Resources

ENVE 4230 Energy in Nature, Civilization and Engineering
ENGR 3420 Introduction to Soil Mechanics
ENGR 3440 Hydraulics of Closed Conduit Flow
ENGR 3540 Physical Unit Operations
ENGR 4410 Open Channel Hydraulics
ENGR 4440 Environmental Engineering Unit Operations
ENGR 4660 Sustainable Building Design
ENGR 4490 Renewable Energy Engineering

B. Infrastructure/Planning/Economics

ENVE 4250 Energy Systems & the Environment
ENVE 4550 Environmental Life Cycle Analysis
ENVE 4710 GIS for Urban Engineering, Planning & Development
ENVE 4720 Urban Infrastructure Planning & Development

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: ENVE 1010, [ENVE 1020 or ENGR 1120], [ENVE 2010 or ENVE 2920], ENVE 2610, ENGR 2120, ENGR 2140, ENGR 3160, MATH 2250, MATH 2260, MATH 2500, MATH 2700, PHYS 1251, PHYS 1252, BIOL 1104, CHEM 1211, CHEM 1211L, CHEM 1212, CHEM 1212L.

Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two ENGR or ENVE prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major:

Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 2.8

BSME MECHANICAL ENGINEERING

Year One

Fall Semester		
Course		**Hours**
MATH 2250	**Calculus I**	**4**
ENGR 1920	Intro to Engineering	1
ENGR 1120	**Engineering Graphics**	**2**
ENGL 1101	English Composition I	3
COMM 1100	Intro to Public Speaking	3
	Social Sciences Elective	3
FYOS	First-Year Odyssey	1
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
MATH 2260	**Calculus II**	**4**
PHYS 1251	**Physics for Engineers I**	**3**
ENGR 1140	**Computational Engineering Methods**	**2**
MCHE 1940	ME Design Studio/ME Prof. Practice I	3
ENGL 1102	English Composition II	3
Total Credit Hours		**15**

Year Two

Fall Semester		
Course		**Hours**
MATH 2500	**Multivariable Calculus**	**3**
PHYS 1252	**Physics for Engineers II**	**3**
ENGR 2120	**Statics**	**3**
MCHE 2990	Engineering Systems in Society	3
CHEM 1211&L	**Chemistry I**	**4**
Total Credit Hours		**16**

Spring Semester		
Course		**Hours**
MATH 2700	**Differential Equations**	**3**
ENGR 2140	**Strength of Materials**	**3**
MCHE 3140	**Thermodynamics I**	**3**
ENGR 2130	**Dynamics**	**3**
ENGR 2170	**Electrical Circuits**	**3**
Total Credit Hours		**15**

Year Three

Fall Semester		
Course		**Hours**
ENGR 3300	Mechanisms & Machine Kinematics	3
MCHE 3310	Engineering Materials	3
MCHE 3920	Manufacturing & Design Studio	3
ENGR 3160	**Fluids**	**3**
ENGR 4210	Linear Systems	3
MCHE 4000	ME Professional Practice II	2
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
ENGR 3150	**Heat Transfer**	**3**
CVLE 2710	Numerical Methods for Engineers	2
MCHE 3450	ME Lab	2
ENGR 4220	Feedback Control Systems	3
	Biological Science Elective*	3
	ME Track Elective	3
Total Credit Hours		**16**

Year Four

Fall Semester		
Course		**Hours**
MCHE 4910	ME Capstone Design Project I	2
	ME Track Elective	3
	Major Related Elective**	3
	Social Sciences Elective	3
	World Languages & Culture Elective	3
MCHE 4390***	Mechanical Vibration	3
Or	*World Languages & Culture Elective*	
Total Credit Hours		**17**

Spring Semester		
Course		**Hours**
MCHE 4920	ME Capstone Design Project II	2
	ME Track Elective	3
	ME Track Elective	3
	Social Sciences Elective	3
	World Languages & Culture Elective	3
ENGR 4300***	Mechanical Systems	3
Or	*World Languages & Culture Elective*	
Total Credit Hours		**17**

*BIOLOGICAL SCIENCE ELECTIVE: Select from BIOL 1103 or BIOL 1104 or BIOL 1107&L.

**MAJOR RELATED ELECTIVE: Suggested courses include ECOL 3070, EDES 4610, EDES 4660, EHSC 3060, ETES 5060, FDST 4050, HPRB 4450, Co-Op, Research, Engineering, or courses from other fields approved by BSME Curriculum Coordinator.

***ALTERNATE CLASS ELECTIVE: Choose either MCHE 4390 in Fall term or ENGR 4300 in Spring term.

Courses in BOLD require a grade of "C" or better

BSME Electives
Choose 4 courses from the following tracks (12 credit hours):

A. Advanced Energy Systems

ENGR 4490	Renewable Energy Engineering
ENGR 4650	Control of Structural Environments I
ENVE 4530	Energy & Environmental Policy Analysis
MCHE 3150	Engineering Thermodynamics II
MIST 4550	Energy Informatics

B. Advanced Mechanics

CSEE 4230	Mechatronics Systems Engineering
ENGR 4300	Mechanical Systems
ENGR 4310	Embedded Robotics
ENGR 4350	Intro to Finite Elements Analysis
ENGR 4760	Biomechanics
MCHE 4360	Robotics I
MCHE 4380	Solid Mechanics
MCHE 4500	Advanced Thermal Fluid Systems
MCHE 4810	Intro to Micro and Nano Systems
MCHE 4820	Mechatronics

C. Architectural Engineering

CVLE 4740	Life Cycle Analysis
CVLE 4750	Building Information Modeling (BIM)
CVLE 4760	Commercial Building Systems
ENGR 4630	Engineering Design of Residential Structures
ENGR 4650	Control of Structural Environments I
ENGR 4660	Sustainable Building Design
MIST 4550	Energy Informatics

D. Industrial Design and Processes

CVLE 4740	Life Cycle Analysis
ENGR 3540	Physical Units Operation
ENGR 4230	Sensors & Transducers
ENGR 4310	Embedded Robotics
ENGR 4340	Machine Hydraulics
ENGR 4540	Applied Machine Vision
ENGR 4650	Control of Structural Environments I
MCHE 3150	Engineering Thermodynamics II
MCHE 4410	Industrial Process Design
MCHE 4420	Industrial Controls
MCHE 4500	Advanced Thermal Fluid Systems

E. Modeling and Controls

CVLE 4750	Building Information Modeling (BIM)
ELEE 4235	Applied Process Control
ENGR 4230	Sensors & Transducers
ENGR 4240	Intro to Microcontrollers
ENGR 4250	Advanced Microcontrollers
ENGR 4350	Intro to Finite Element Analysis
ENGR 4650	Control of Structural Environments I
MCHE 4360	Robotics I
MCHE 4410	Industrial Process Design
MCHE 4420	Industrial Controls
MIST 4550	Energy Informatics

Major Requirements:

All students must earn a grade of "C" (2.0) or better in each of the following courses: BIOL 1103 or BIOL 1104 or BIOL 1107-BIOL 1107L, CHEM 1211-CHEM 1211L, ENGR 1120, ENGR 1140, ENGR 2120, ENGR 2130, ENGR 2140, ENGR 2170, ENGR 3150, ENGR 3160, MATH 2250, MATH 2260, MATH 2500, MATH 2700, MCHE 3140, PHYS 1251 and PHYS 1252. Except for those courses requiring a grade of "C" (2.0) or better, a maximum of two (ENGR, MCHE, CVLE, ENVE, ELEE) prefix courses with grades of "D" (1.0) may be used to satisfy graduation requirements. Competency in a computer programming language is expected and may be satisfied with ENGR 1140.

Transfer Entrance Requirements into Intended Major: Overall GPA 2.7 for Transfer Students

THE FUNDAMENTALS OF ENGINEERING (FE) EXAM IS A GRADUATION REQUIREMENT FOR THIS DEGREEE PROGRAM.

Addendum 3
Terry College of Business, UGA
Full-Time MBA Program of Study
(61 credits)

YEAR ONE, FALL (17 credit hours)

Module 1	**Module 2**
• Accounting– ACCT 6000 (3) • Finance – FINA 7010 (3) • Marketing – MARK 7510 (3) • Microeconomics – ECON 7910 (1.5) • Success in the Job Search – BUSN 7990 (2)	• Accounting-ACCT 6000 (contd.) • Finance -- FINA 7010 (contd.) • Macroeconomics – ECON 7920 (1.5) • Statistics – MSIT 7100 (3)

Winter Break

YEAR ONE, SPRING (15 credit hours)

Module 1	**Module 2**
• Strategy – MGMT 7400 (3) • Operations – MGMT 7120 (3)	• Strategy – MGMT 7400 (cont'd with Business Simulation) • Organizational Behavior – MGMT 7050 (3)
• Data Analytics – MIST 7600 (3) • Elective (3)*	

YEAR TWO, FALL (13 credit hours)

- Elective (3)*
- Elective (3)*
- Elective (3)*
- Elective (3)*
- Managing Your Career – BUSN 7990 (1)

Winter Break

YEAR TWO, Spring (16 credit hours)

Module 1	**Module 2**
	• Legal Environment of Business – LEGL 7010 (3)
• Elective (3)* • Elective (3)* • International Residency/Spring Break or Elective (3) • Volunteer Service – BUSN 7990 (1)	

**Students are required to take either MGMT 7160 Lean Six Sigma or ENTR 7320 Innovation Projects as one of their MBA electives in order to graduate from the MBA program.*