CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

000098

Course Abbreviation & Number:
X **New Undergraduate Course:** BIOE- 2000
.. **New Honors Course:** --
.. **New Graduate Course:** -

Effective Term: 01/2015
Catalog Title: Bioengineering Professional Development
Transcript Title: BioE Professional Development
Fixed Credit Course: 0 ~~(1.5,0)~~ (1,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	X Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	.. Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	Natural Science No
.. G-Studio	maximum credits:	.. Lab
.. H-Field course		.. Natural Science w/Lab
.. I-Study Abroad		.. Math or Science
.. L-Lab (no/fee)		.. A&H (Literature)
.. N/B-Lecture/Lab(w/fee)		.. A&H (Non-Literature)
.. N/L-Lecture/Lab(no fee)		.. Social Science
		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: This course will provide an introduction to the professional opportunities available for bioengineering students and insight into best practices and preparation for a bioengineering career.

Prerequisite(s): Sophomore standing in bioengineering

Projected Enrollment:
Year 1 - 90 Year 2 - 110 Year 3 - 120 Year 4 - 130

Required course for students in: Bioengineering

Statement of need and justification based on assessment results of student learning outcomes: In our current curriculum, BioE4000 is the course that covers topics such as ethics, regulatory issues, and "life-long learning" which aligns well with our ABET learning outcomes. Unfortunately, because BioE4000 is taken in the students' last semester, these topics are therefore only really touched upon in the curriculum at the students' very end of their tenure in Clemson BioEngineering. Results from the last 3 years of our student exit interviews, alum surveys, and advisory board reviews indicates that there is a clear need to include more of these topics earlier in the curriculum to better prepare students for the jobs and graduate/professional schools they would like to attend. In addition, by putting some of the content in the sophomore and junior years, the ethics and regulatory issues covered can be better aligned to the curriculum's core 200 and 300-level courses.

Textbook(s): none

Learning Objectives: COURSE LEARNING OBJECTIVES
Students will be able to:
1. Identify potential career opportunities within the biomedical engineering profession.
2. Apply to biomedical engineering positions using effective communication skills.
3. Prepare for pre-professional and postgraduate study entrance exams.

Topical Outline: Week Date Topic
1 Career Opportunities for the Biomedical Engineer
2 Tips and Trick for Successful Resume and Cover Letter Writing
3 Career Panel Discussion - A Day In The Life Of...
4 Searching for Job Opportunities in the MedTech Industry
5 Introduction to Interviewing and Professional Etiquette
6 MedTech Corporate Structure at a Glance - Operational Perspectives
7 MedTech from an Operational Perspective - Part I
8 MedTech from an Operational Perspective - Part II
9 The roles of a Biomedical Engineer in the MedTech Industry
10 Effective Communication Part I - Best Practices for Technical Writing
11 Effective Communication Part II- Best Practices for Oral Presentations
12 Preparing for the GRE / MCAT / FE / DAT / LSAT / Professoriate - Best Practices Panel
13 Clinician - Bioengineer Interaction
14 Introduction to the Michelin Career Center
15 Mock Interviews

Evaluation: It is expected that students will be in attendance at all lectures and will actively participate in class discussion. This course is a pass / fail course. A passing grade will be earned with a final grade of 70% (equivalent to a letter grade of C) or above. The final course grades will be determined as described below.

In-Class Participation 10%

Attendance 10%
Written Assignments (4 – 10% each) 40%
Resume & Cover Letter Review 20%
Final Mock Interview 20%

Pass (>=70%) Fail (<70%)

Form Originator: KWEBB,Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7828

Approval

Kim Webb	11/11/14	Patricia W. Marshall	12/5/2014
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/11/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert M. Jones	2/11/2015
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/21/14		
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form** 000100

Course Abbreviation & Number:
X **New Undergraduate Course:** BIOE- 3000
.. **New Honors Course:** --
.. **New Graduate Course:** -

Effective Term: 01/2015
Catalog Title: Bioengineering Ethics and Entrepreneurship
Transcript Title: BioE Ethics Entrepreneurship
Fixed Credit Course: 0 ~~(1,0)~~ (1,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	X Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	.. Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	Natural Science No
.. G-Studio	maximum credits:	.. Lab
.. H-Field course		.. Natural Science w/Lab
.. I-Study Abroad		.. Math or Science
.. L-Lab (no/fee)		.. A&H (Literature)
.. N/B-Lecture/Lab(w/fee)		.. A&H (Non-Literature)
.. N/L-Lecture/Lab(no fee)		.. Social Science
		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: This course will provide an introduction to the ethical considerations of performing human and animal research in support of medical technology development. Students will also be exposed to fundamental business concepts related to translating technology to the marketplace.

Prerequisite(s): BioE 2000

Projected Enrollment:
Year 1 - 90 Year 2 - 100 Year 3 - 110 Year 4 - 120

Required course for students in: Bioengineering

Statement of need and justification based on assessment results of student learning outcomes: In our current curriculum, BioE4000 is the course that covers topics such as ethics, regulatory issues, and "life-long learning" which aligns well with our ABET learning outcomes. Unfortunately, because BioE4000 is taken in the students' last semester, these topics are therefore only really touched upon in the curriculum at the students' very end of their tenure in Clemson BioEngineering. Results from the last 3 years of our student exit interviews, alum surveys, and advisory board reviews indicates that there is a clear need to include more of these topics earlier in the curriculum to better prepare students for the jobs and graduate/professional schools they would like to attend. In addition, by putting some of the content in the sophomore and junior years, the ethics and regulatory issues covered can be better aligned to the curriculum's core 200 and 300-level courses.

Textbook(s): Required: N/A

Suggested:
1) "Guide for the Care and Use of Laboratory Animals" – National Research Council

Learning Objectives: COURSE LEARNING OBJECTIVES
Students will be able to:
1. Evaluate ethical issues relevant to the use of animal and human subjects in biomedical engineering practice.
2. Identify opportunities for the translation of biomedical research to the commercial marketplace.
3. Recognize, understand and apply basic business concepts utilized by medical technology companies and entrepreneurs.

Topical Outline: Week Date Topic
1 Introduction to biomedical research ethics - a historical perspective
2 Introduction to the U.S. Food & Drug Administration
3 Animal Subjects in Biomedical Research and Product Development
4 Human Subjects in Biomedical Research and Product Development
5 Ethics - Case Study Assignment
6 No Class - Dedicated Time For Online Compliance Training
7 Introduction to intellectual property basics
8 Translating University Research to the Market Place - CURF and MedTech Interaction
9 Introduction to Entrepreneurship
10 The Business Dictionary for Biomedical Engineers
11 Business Model Basics
12 The Fundamentals of Starting Your Own Company - Stages of Venture Development
13 Evaluating the Idea and the Value Proposition
14 Essentials of a Commercialization/Business Plan
15 Understanding Equity and Financing Your Start-Up

Evaluation: It is expected that students will be in attendance at all lectures and will actively participate in class discussion. This

course is a pass / fail course. A passing grade will be earned with a final grade of 70% (equivalent to a letter grade of C) or above. The final course grades will be determined as described below.

000101

In-Class Participation 10%
Attendance 10%
Compliance Training 40%
Ethic Case Study Assignment 20%
Business Case Study Assignment 20%

Pass (>=70%) Fail (<70%)

Form Originator: KWEBB,Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7829

Approval

Ken Webb	11/11/14	Alice W. Mathews	12/5/14
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/11/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert W. Jones	2/17/15
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/24/14		
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Change/Delete Course Form** 000102

X **Change a Course - Abbrev & Number: BIOE- 3020**
Corresponding Lab Course: BIOE--3021
Corresponding Honors course: --
.. **Add Honors course:** --
Corresponding Graduate course: --
.. **Add Graduate course:** --
Course Title: Biomaterials

Brief Statement of Change:
Change of pre-requisite to allow CH 2230/2270 (taken by pre-med students) to replace CH 2010.

Last Term taught: 201408	.. **Change Abbrev to:**	
Effective Term: 01/2015	.. **Change Number to:**	
.. **Change Catalog Title:**	.. **Change Transcript Title:**	
from:	from: Biomaterials	
to:	to:	
.. **Change of Credit**	From: Fixed Credit: 3 (2,3) Variable Credit: - (-), (-)	To: Fixed Credit: (,) Variable Credit: - (-),(-)

.. **Add cross-listing with the following child course(s):**
.. **Delete cross-listing with the following child course(s):**
.. **Reverse Parent/Child relationship with:**

.. **Change Method of Instruction**		.. **Change Course Modifier**		.. **Change General Education Designation**	
from:	to:	from:	to:	from:	to:
.. A-Lecture Only	..	.. Pass/Fail Only	..	.. Creative Inquiry	..
.. B-Lab (w/fee)	..	X Graded	..	.. English Composition	..
.. D-Seminar	..	.. Variable Title	..	.. Oral Communication	..
.. E-Independent Study	..	.. Creative Inquiry	..	.. Mathematics	..
.. F-Tutorial (w/fee)	..	.. Repeatable	..	.. Natural Science w/Lab	..
.. G-Studio	..	maximum credits		.. Natural Science w/Lab	..
.. H-Field course	..	from:		.. Math or Science	..
.. I-Study Abroad	..	to:		.. A&H (Literature)	..
.. L-Lab (no/fee)	..			.. A&H (Non-Literature)	..
X N/B-Lecture/Lab(w/fee)	..			.. Social Science	..
.. N/L-Lecture/Lab(no fee)	..			.. CCA	..
				.. STS	..

.. **Change Catalog Description:**
from:
to:

X **Change Prerequisite(s):**
from: BioE 2010 and CH 2010 and MSE 2100CoReq: BioE 3021
to: BioE 2010 and MSE 2100 and (CH 2010 or (CH 2230 and 2270))CoReq: BioE 3021

Learning Objectives:

Topical Outline:

Evaluation:

Form Originator: KWEBB, Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7827

Approval

Ken Webb	11/11/14	Patricia W. Hendrix	12/05/14
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/14/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert H. Jones	2/11/15
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/24/14		
College Dean	Date	President	Date

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Change/Delete Course Form**

000103

X **Change a Course - Abbrev & Number: BIOE- 4000**
Corresponding Lab Course: --
Corresponding Honors course: --
.. **Add Honors course:** --
Corresponding Graduate course: --
.. **Add Graduate course:** --
Course Title: Senior Seminar

Brief Statement of Change:
Revising name and content as the culmination of new 2000/3000/4000 sequence.

Last Term taught: 201401 Effective Term: 01/2015	.. **Change Abbrev to:** .. **Change Number to:**
X **Change Catalog Title:** from: Senior Seminar to: Bioengineering Leadership and MedTech Commercialization	X **Change Transcript Title:** from: Senior Seminar to: BioE Leadership & MedTech Comm
.. **Change of Credit**	From: Fixed Credit: 1 (~~15~~ 0) (1,0) Variable Credit: - (-), (-)
	To: Fixed Credit: (,) Variable Credit: - (-),(-)

.. **Add cross-listing with the following child course(s):**
.. **Delete cross-listing with the following child course(s):**
.. **Reverse Parent/Child relationship with:**

X **Change Method of Instruction**		.. **Change Course Modifier**		.. **Change General Education Designation**	
from:	to:	from:	to:	from:	to:
.. A-Lecture Only	X	X Pass/Fail Only	..	.. Creative Inquiry	..
.. B-Lab (w/fee)	..	.. Graded	..	.. English Composition	..
X D-Seminar	..	.. Variable Title	..	.. Oral Communication	..
.. E-Independent Study	..	.. Creative Inquiry	..	.. Mathematics	..
.. F-Tutorial (w/fee)	..	.. Repeatable	..	.. Natural Science w/Lab	..
.. G-Studio	..	maximum credits		.. Natural Science w/Lab	..
.. H-Field course	..	from:		.. Math or Science	..
.. I-Study Abroad	..	to:		.. A&H (Literature)	..
.. L-Lab (no/fee)	..			.. A&H (Non-Literature)	..
.. N/B-Lecture/Lab(w/fee)	..			.. Social Science	..
.. N/L-Lecture/Lab(no fee)	..			.. CCA	..
				.. STS	..

X **Change Catalog Description:**
from: Addresses problems to be encountered by bioengineering graduates in professional practice. Invited lecturers and faculty provide lectures and demonstrations. Pertinent information on job interview skills, career placement and guidance, professional registration, professional ethics in bioengineering, entrepreneurship and patents, and business management are provided.
to: This course will provide students with an introduction to common leadership techniques and managerial approaches. Students will also be exposed to various product/technology valuation techniques which contribute to how business decisions are made in the MedTech sector.

X **Change Prerequisite(s):**
from: Senior standing in Bioengineering
to: BioE 3000

Learning Objectives: COURSE LEARNING OBJECTIVES
Students will be able to:
1. Identify the importance of professional registration and societies.
2. Evaluate professional issues relevant to the biomedical engineering practice.
3. Apply leadership techniques, managerial approaches and leadership skills in the professional / contemporary workplace setting.

Topical Outline: 1 Leadership Skills I - Introduction to Time & Project Management
2 No class - Time dedicated for assignment #1 (group)
3 Leadership Skills II - Managerial Approaches, Communications, Conflict Resolution
4 Leadership Skills III - Goal setting
5 No class - Time dedicated for assignment #2 (individual)
6 How MedTech Companies Make Money
7 MedTech New Product Valuation Techniques
8 Leadership Skills III - Strategic Planning
9 No class - Time dedicated for assignment #3 (group)
10 What makes a great MedTech product?
11 How do I validate my idea?
12 Pitching your idea to investors
13 Current Trends in Healthcare Finance and Economics
14 Contemporary Workplace Issues
15 Senior Exit Interview

Evaluation: It is expected that students will be in attendance at all lectures and will actively participate in class discussion. This

course is a pass / fail course. A passing grade will be earned with a final grade of 70% (equivalent to a letter grade of C) or above. The final senior exit interview must be completed before a final grade will be assigned. The final course grades will be determined as described below.

In-Class Participation 10%
Attendance 10%
Class Assignments (3 – 10% each) 30%
Product Valuation Assignment 10%
Required Reading Assessments (2 – 10% each) 20%
Senior Exit Interview 20%

Pass (>=70%) Fail (<70%)

Form Originator: KWEBB, Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7831

Approval

Ken Webb	11/11/14	Jessica W. Thompson	12/5/14
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/12/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert W. Jones	2/11/15
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/24/14		
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Change/Delete Course Form** 000105

X **Change a Course - Abbrev & Number: BIOE- 4230**
Corresponding Lab Course: --
Corresponding Honors course: --
.. **Add Honors course:** --
Corresponding Graduate course: BIOE--6230
.. **Add Graduate course:** --
Course Title: Cardiovascular Engr and Path

Brief Statement of Change:
Change pre-requisite from BioE 3210 (biofluid mehcanics) to BioE 3210 OR BioE 3200 (biomechanics). Students in our bioelectrical concentration do not normally take BioE 3210, thus, they cannot access this course. The instructors believe a general background in biomechanics (3200) is appropriate preparation for this course.

Last Term taught: 201401	.. **Change Abbrev to:**	
Effective Term: 01/2015	.. **Change Number to:**	
.. **Change Catalog Title:**	.. **Change Transcript Title:**	
from:	from: Cardiovascular Engr and Path	
to:	to:	
..	From: Fixed Credit: 3 (3,0)	To: Fixed Credit: (,)
Change of Credit	Variable Credit: - (-), (-)	Variable Credit: - (-),(-)

.. **Add cross-listing with the following child course(s):**
.. **Delete cross-listing with the following child course(s):**
.. **Reverse Parent/Child relationship with:**

.. **Change Method of Instruction**		.. **Change Course Modifier**		.. **Change General Education Designation**	
from:	to:	from:	to:	from:	to:
X A-Lecture Only	..	.. Pass/Fail Only	..	.. Creative Inquiry	..
.. B-Lab (w/fee)	..	X Graded	..	.. English Composition	..
.. D-Seminar	..	.. Variable Title	..	.. Oral Communication	..
.. E-Independent Study	..	.. Creative Inquiry	..	.. Mathematics	..
.. F-Tutorial (w/fee)	..	.. Repeatable	..	.. Natural Science w/Lab	..
.. G-Studio	..	maximum credits		.. Natural Science w/Lab	..
.. H-Field course	..	from:		.. Math or Science	..
.. I-Study Abroad	..	to:		.. A&H (Literature)	..
.. L-Lab (no/fee)	..			.. A&H (Non-Literature)	..
.. N/B-Lecture/Lab(w/fee)	..			.. Social Science	..
.. N/L-Lecture/Lab(no fee)	..			.. CCA	..
				.. STS	..

.. **Change Catalog Description:**
from:
to:

X **Change Prerequisite(s):**
from: BioE 3020 and BioE 3200 and BIOL 3150
to: BioE 3020 and BIOL 3150 and (BioE 3200 or BioE 3210)

Learning Objectives:

Topical Outline:

Evaluation:

Form Originator: KWEBB, Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7825

Approval

Ken Webb 11/11/14		Janice W. Morrison	12/5/2014
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/11/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert H. Jones	2/11/2015
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/24/14		
College Dean	Date	President	Date

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Major Form**

Change Major Name: Bioengineering (~~BE~~ - 201508)
Degree: BS
Effective Catalog Year: 2015
.. **Change Major Name to:**
.. **Change Degree to:** (CHE approval required)
X **Change Curriculum Requirements**
(Submit or upload Curriculum map in catalog format. CHE approval required for > 18 hours of changes)
.. **Change General Education Requirements**
(Must also submit a General Education Checklist)
.. **Add, Change or Delete Concentration(s)**
(Submit or upload Curriculum map in catalog format. CHE approval required)
.. **Add, Change or Delete Emphasis Area(s)**
Explanation: Our curriculum has always included a senior seminar focused on professional development. Results from the last 3 years of our student exit interviews, alum surveys, and advisory board reviews indicates that there is a clear need to provide expanded content in this area and to deliver it earlier in the curriculum. Therefore, we are expanding this existing course to a 3 course sequence, adding BioE 2000 and 3000 to the sophomore and junior years respectively as zero credit pass-fail courses that are pre-reqs for the final BioE 4000 course in the senior year.
Form Originator: KWEBB, Webb,Charles K **Date Form Created:** 11/11/2014
Form Last Updated by: KWEBB, Webb,Charles K **Date Form Last Updated:** 11/11/2014
Form Number: 7833

Approval

Ken Webb	11/11/14	Patricia W. Hendrix	12/05/2014
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
[signature]	11/11/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
[signature]	11/21/14	Robert H. Jones	2/11/15
Chair, College Curriculum Committee	Date	Provost	Date
[signature]	11/21/14		
College Dean	Date	President	Date

00013

College of Engineering and Science

BIOENGINEERING Bachelor of Science

The undergraduate program in Bioengineering is built upon a rigorous engineering science foundation that is, in turn, based upon a broad curriculum of applied and life sciences, mathematics, electives in humanities, social science, and design. Students select a formal focus that concentrates in a subfield of interest in bioengineering: Biomaterials Concentration or Bioelectrical Concentration.

The curriculum provides undergraduates with a solid background formation in engineering and life sciences in preparation for advanced studies. Through the Bioengineering program, graduates acquire an understanding of biology, biochemistry, and physiology and the capability to apply advanced mathematics including differential equations and statistics, science, and engineering to solve the problems at the interface of engineering and biology. Graduates also have an ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and nonliving materials and system.

BIOELECTRICAL CONCENTRATION

Freshman Year

First Semester

2 - CES 102 Engineering Disciplines and Skills
4 - CH 101 General Chemistry
3 - ENGL 103 Accelerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

Second Semester

4 - CH 102 General Chemistry
3 -ENGR 141 Programming & Problem solving in ECE & ME
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I[2]
1 - Biology Requirement[3]
3 - Arts and Humanities Requirement[1] *or*
3- Social Science Requirement[1]
18

Sophomore Year

First Semester

3 - BIO E 201 Intro. to Biomedical Engineering
2 - E C E 201 Logic and Computing Devices
3 - E C E 202 Electric Circuits I
1- E C E 209 Logic and Computing Devices Lab
1 - E C E 211 Electrical Engineering Lab. I
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II[2]
17

Second Semester

3 - M S E 210 Introduction to Materials Science
1 - E C E 212 Electrical Engineering Lab.
3 - E C E 262 Electric Circuits II
3 - C E 201 Engineering Mechanics: Statics
4 - MTHSC 208 Intro to Ord. Diff. Equations
2- E G 208 EgrGraph/Comp Apps
0 – BioE 2000 Bioengineering Professional Development
16

Junior Year

First Semester

4 - CH 201 Survey of Organic Chemistry[2]
1 - E C E 311 Electrical Engineering Lab. III
3 - E C E 320 Electronics I
3 - E C E 330 Signals, Systems, and Transforms
4 - BIOSC 315 Functional Human Anatomy
15

Second Semester
3 - E C E 380 Electromagnetics
3 - BIO E 302 Biomaterials
3 - BIO E 370 Bioinstrumentation and Bioimaging
3 - BIOCH 305 Essential Elements of Biochem.
3 - E C E/BioE Technical Requirement[3]
0 – BioE 3000 Bioengineering Ethics and Entrepreneurship
15

Senior Year

First Semester
3 – BIO E 401 Bioengineering Design Theory
3 - BIO E 320 Biomechanics
3 - BIOSC 461 Cell Biology
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
3 – E C E/BIO E Technical Requirement[3]
15

Second Semester
1 - BIO E 400 ~~Senior Seminar~~ Bioengineering Leadership and MedTech Commercializaiton
3 - BIO E 403 Applied Biomedical Design
3 - BIO E 448 Tissue Engineering
6 – E C E/BIO E Technical Requirement[3]
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

128 Total Semester Hours

[1]See Policy on Social Sciences and Humanities for Engineering Curricula. Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.

[2]Students planning to enter medical school should take CH 223/227 instead of CH 201 and take CH 224/228 as an additional course sequence. Students planning to enter medical school should also take PHYS laboratories as additional courses-PHYS 122 course with PHYS 124 lab and PHYS 221 course with PHYS 223 lab.

[3]Select from department-approved list.

Notes:
1. To transfer from General Engineering into the Bioengineering degree program, students must have a minimum cumulative grade-point ratio of 3.0 in courses taken at Clemson and must have earned a *C* or better in each course in the General Engineering freshman curriculum including the Arts and Humanities/Social Science Requirements.
2. A student is allowed to enroll in E C E courses (excluding E C E 307, 308, 309) only when all prerequisites have been passed with a grade of *C* or better.
3. All Bioelectrical Concentration students must have a cumulative engineering grade-point ratio of 2.0 to enroll in any 300- or 400-level E C E courses
4. No student may exceed a maximum of two attempts, excluding a *W*, to complete successfully any E C E course.

College of Engineering and Science

BIOENGINEERING Bachelor of Science

The undergraduate program in Bioengineering is built upon a rigorous engineering science foundation that is, in turn, based upon a broad curriculum of applied and life sciences, mathematics, electives in humanities, social science, and design. Students select a formal focus that concentrates in a subfield of interest in bioengineering: Biomaterials Concentration or Bioelectrical Concentration.

The curriculum provides undergraduates with a solid background formation in engineering and life sciences in preparation for advanced studies. Through the Bioengineering program, graduates acquire an understanding of biology, biochemistry, and physiology and the capability to apply advanced mathematics including differential equations and statistics, science, and engineering to solve the problems at the interface of engineering and biology. Graduates also have an ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and nonliving materials and system.

BIOMATERIALS CONCENTRATION

Freshman Year

First Semester

2 - CES 102 Engineering Disciplines and Skills
4 - CH 101 General Chemistry
3 - ENGL 103 Accelerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement[1] *or*
3 - Social Science Requirement[1]
16

Second Semester

4 - CH 102 General Chemistry
3-ENGR 141 Programming & Problem solving in ECE & ME
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I[2]
1 - Biology Requirement[3]
3 - Arts and Humanities Requirement1 *or*
3 - Social Science Requirement[1]
18

Sophomore Year

First Semester

3 - BIO E 201 Intro. to Biomedical Engineering
3 - C M E 210 Intro. to Materials Science
4 - CH 201 Survey of Organic Chemistry[2]
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II[2]
17

Second Semester

3 – BIO E 302 Biomaterials
2 - E C E 307 Basic Electrical Engineering
1 - E C E 309 Electrical Engineering Lab. I
3 - E M 201 Engineering Mechanics: Statics
4 - MTHSC 208 Intro to Ord. Diff. Equations
2 – EG 208 Engineering Graphics with Computer Applications
0 – BioE 2000 Bioengineering Professional Development
15

Junior Year

First Semester

3 – BIO E 320 Biomechanics
4 - BIOSC 315 Functional Human Anatomy
3 - C M E 319 Materials Processing I
3 - C M E 326 Thermodynamics of Materials
3 - C M E 327 Transport Phenomena
16

Second Semester

3 - BIOCH 305 Essential Elements of Biochem.
3 - BioE 321 Biofluid Mechanics
3 - MTHSC 302 Statistics for Science and Engr.
3 - BIO E Technical Requirement[3]
3 - BIO E 370 Bioinstrumentation and Bioimaging
0 – BioE 3000 Bioengineering Ethics and Entrepreneurship
15

Senior Year
First Semester
3 – BIO E 401 Bioengineering Design Theory
3 – BIO E Technical Requirement[3]
3 - BIOSC 461 Cell Biology
3 - MSE 415 Intro. to Polymer Science and Engr.
3 - Arts and Humanities Requirement1 *or*
3 - Social Science Requirement[1]
15

Second Semester
1 - BIO E 4000 ~~Senior Seminar~~Bioengineering Leadership and MedTech Commercializaiton
3 – BIO E 403 Applied Biomedical Design
3 - BIO E 448 Tissue Engineering
6 - BIO E Technical Requirement[3]
3 - Arts and Humanities Requirement[1] *or*
6- Social Science Requirement[1]
16

128 Total Semester Hours

[1]See Policy on Social Sciences and Humanities for Engineering Curricula. Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.

[2]Students planning to enter medical school should take CH 223/227 instead of CH 201 and take CH 224/228 as an additional course sequence. Students planning to enter medical school should also take PHYS laboratories as additional courses-PHYS 122 course with PHYS 124 lab and PHYS 221 course with PHYS 223 lab.

[3]Select from department-approved list.

Note: To transfer from General Engineering into the Bioengineering degree program, students must have a minimum cumulative grade-point ratio of 3.0 in courses taken at Clemson and must have earned a *C* or better in each course in the General Engineering freshman curriculum including the Arts and Humanities/Social Science Requirements.

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

000106

Course Abbreviation & Number:
X **New Undergraduate Course:** ECE- 4370
.. **New Honors Course:** --
X **New Graduate Course:** ECE- 637

Effective Term: 08/2015
Catalog Title: Microelectromechanical Systems
Transcript Title: Microelectromechanical Systems
Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	Natural Science No
.. G-Studio	maximum credits:	.. Lab
.. H-Field course		.. Natural Science w/Lab
.. I-Study Abroad		.. Math or Science
.. L-Lab (no/fee)		.. A&H (Literature)
.. N/B-Lecture/Lab(w/fee)		.. A&H (Non-Literature)
.. N/L-Lecture/Lab(no fee)		.. Social Science
		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: This course will introduce the basic materials in current microelectromechanical systems (MEMS) as well as the fundamental sensing and actuation mechanisms therein. It will also explain the basic fabrication techniques for bulk and surface micromachining, discuss the primary forces in MEMS devices, study the basic micro mechanical structures and microfluidics.

Prerequisite(s): ECE 4730 - CH 1020 and PHYS 1220. ECE 6730 - Students are expected to have completed courses comparable to CH 1010 and PHYS 1220 before enrolling in this course.

Projected Enrollment:
Year 1 - 5 Year 2 - 8 Year 3 - 10 Year 4 - 10

Required course for students in:

Statement of need and justification based on assessment results of student learning outcomes: MEMS devices, often in the form of sensors and actuators, are ubiquitous in many high-performance electronics products. The basic knowledge of MEMS, including materials and fabrications, is essential for advanced design, study and research in electronics as well as many other areas. Current hardware engineers and system engineers need to understand the principle that underlie in MEMS, in order to build high-performance systems. Currently, there is no formal MEMS course on Clemson campus.

Textbook(s): S. D. Senturia, Microsystem Design, Kluwer Academics, 2000.

Learning Objectives: Students will be able to understand the basic properties of MEMS materials as well as the fundamental forces and operation mechanisms of a few common MEMS devices and systems. Students will also be able to design basic MEMS fabrication processes, including bulk and surface micromachining processes.

Topical Outline: 1 - Introduction
4 - Bulk material properties in MEMS
10 - Overview of microfabrication in MEMS
4 - Thin-film characteristics and special processes
3 - Process and design integration in MEMS
2 - Transducers by lumped models
2 - Deformable solids by elasticity theory
3 - Beam and plate deformation mechanics
4 - Microfluidics: theory and principles
4 - Microfluidics: electrokinetics
1 - Pressure sensor design
1 - Accelerometer design
2 - Optical and RF MEMS components
2 - Final project presentations
2 - tests
Total: 45 hours

Evaluation: For 6370 students
Homework problems 30%
Design projects 30%
Project presentation 10%
Midterm 10%
Final exam 20%
---------- ----------
Course Grade 100%

000107

Grading Scale: 85 - 100 A
70 - 84 B
60 – 69 C
0 - 59 F

For 4370 students
Homework problems 40%
Design projects 30%
Midterm 10%
Final exam 20%
---------- ----------
Course Grade 100%

Grading Scale: 90 - 100 A
80 - 89 B
70 - 79 C
60 - 69 D
0 - 59 F

Form Originator: EBRAD,Gibisch,Elizabeth Bradley **Date Form Created:** 10/29/2014
Form Last Updated by: EBRAD, Gibisch,Elizabeth Bradley **Date Form Last Updated:** 11/12/2014
Form Number: 7711

Approval

Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
Chair, College Curriculum Committee	Date	Provost	Date
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Major Form**

Change Major Name: Biosystems Engineering (BS - 201501)
Degree: BS
Effective Catalog Year: 2015
.. **Change Major Name to:**
.. **Change Degree to:** (CHE approval required)
X **Change Curriculum Requirements**
(Submit or upload Curriculum map in catalog format. CHE approval required for > 18 hours of changes)
.. **Change General Education Requirements**
(Must also submit a General Education Checklist)
.. **Add, Change or Delete Concentration(s)**
(Submit or upload Curriculum map in catalog format. CHE approval required)
.. **Add, Change or Delete Emphasis Area(s)**

Explanation: A revised curriculum is submitted that strengthens program requirements through addition of instrumentation course (BE 4150), rearrangement of course requirements to distribute laboratory courses throughout the curriculum, deletion of the fifth general education course, and alteration of a required elective to encourage participation in the Sustainability minor.

Form Originator: CDRAPCH, Drapcho,Caye Marie **Date Form Created:** 10/21/2014
Form Last Updated by: CDRAPCH, Drapcho,Caye Marie **Date Form Last Updated:** 11/21/2014
Form Number: 7693

Approval

	12/3/14		12/5/14
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
David L Freedman	12/2/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
	12/4/14		2/11/15
Chair, College Curriculum Committee	Date	Provost	Date
	12/4/14		
College Dean	Date	President	Date

000110

CLEMSON UNIVERSITY

Clemson Home Page

Curriculum and Course Change System
Major Approval Form

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Form IS complete

Add Major

Major Name: Degree: Effective Catalog Year: 2014

(Submit or upload Curriculum map in catalog format. CHE approval required)

Change Major

Major Name: Biosystems Engineering (BS - 201501) Degree: BS Effective Catalog Year: 2015

- ☐ Change Major Name to:
- ☐ Change Degree to (CHE approval required)
- ☑ Change Curriculum Requirements
  (Submit or upload Curriculum map in catalog format. CHE approval required for > 18 hours of changes)
- ☐ Change General Education Requirements
  (Must also submit a General Education Checklist)
- ☐ Add, Change or Delete Concentration(s)
  (Submit or upload Curriculum map in catalog format. CHE approval required)
- ☐ Add, Change or Delete Emphasis Area(s)

Delete Major

Major Name: Degree: Effective Catalog Year: 2014

Explanation:

A revised curriculum is submitted that strengthens program requirements through addition of instrumentation course (BE 4150), rearrangement of course requirements to distribute laboratory courses throughout the curriculum, deletion of the fifth general education course, and alteration of a required elective to encourage participation in the Sustainability minor.

Upload a curriculum map from my computer:

Choose File No file chosen

Enter a short description of the file to be uploaded: (required)

BE curriculum 2015

Syllabus uploaded successfully

Upload File

CC Chair, EEES

Form Originator:	CDRAPCH	Drapcho,Caye Marie
Date Form Created:	10/21/2014	
Form Number:	7693	

David J. Freedman
Interim Chair, EEES

COES CurrComm

Need help with the application? Click here to send an email to the application support personnel.

Having technical problems with the application? Click here to report a system problem. This will send email to the EA Applications Services Support Team.

Interim Assoc. Dean
11/4/14

12/5/14

Caye and Jackie,

I am happy to allow a blanket override for Biosystems Engineering students to take Biol 4410 Ecology without the usual freshman biology requirement. They are among the best students in the class, and it has been a pleasure to have so many of them in recent years. They even make it more interesting even for our own Biosci students.

David Tonkyn
Associate Professor of Biological Sciences
Clemson University
Clemson, SC 29634
864 656-3588 (voice)
864 656-0437 (fax)
tdavid@clemson.edu

FYI → Biol Sci is willing to change preqs on Biol 4410 to make this blanket override unnecessary, according to David Tonkyn.
Thanks, Mary Beth

Freshman Year First Semester
4 -- CH 1010 General Chemistry
3 -- ENGL 1030 Accelerated Composition
1 -- ENGR 1050 Engineering Disciplines and Skills I
1 -- ENGR 1060 Engineering Disciplines and Skills II
4 -- MATH 1060 Calculus of One Variable I
3 -- Arts and Humanities Requirement[1] *or*
3 -- Social Science Requirement[1]
16

Second Semester
4 -- CH 1020 General Chemistry
1 -- ENGR 1070 Programming and Problem Solving I
1 -- ENGR 1080 Programming and Problem Solving II
1 -- ENGR 1090 Programming and Problem Solving Applications
2 -- ENGR 2100 Computer--Aided Design and Engineering Applications
4 -- MATH 1080 Calculus of One Variable II
3 -- PHYS 1220 Physics with Calculus I
16

Sophomore Year First Semester
2 -- BE 2120 Fundamentals of Biosystems Engineering
3 -- CE 2010 Statics[2]
4 -- MATH 2060 Calculus of Several Variables
3 -- PHYS 2210 Physics with Calculus II
4 -- Biology Requirement[3]
16

Second Semester
2 -- BE 2100 Intro. to Biosystems Engineering
2 -- CE 2080 Dynamics[2]
4 -- MATH 2080 Intro. to Ordinary Diff. Equations
3 -- ME 3100 Thermodynamics and Heat Transfer
4 -- MICR 3050 General Microbiology
15

Junior Year First Semester
3 -- BE 3200 Principles and Practices of Geomatics
3 -- BE 4100 Biol. Kinetics and Reactor Modeling
3 -- BIOL 4410 Ecology
4 -- CE 3410 Introduction to Fluid Mechanics
2 -- ECE 2070 Basic Electrical Engineering
1 -- ECE ~~2090~~ 2080 Electrical Engineering Lab. I
16

Second Semester
3 -- BE 3220 Small Watershed Hydrology and Sedimentology

3 -- BE 4120 Heat and Mass Transport in BE
3 -- BE 4380 Bioprocess Engineering Design
3 -- BE 4150 Instrumentation and Process Control for BE
3 -- CH 2230 Organic Chemistry
1 -- CH 2270 Organic Chemistry Laboratory
16

[1]Students should choose courses to fulfill General Education requirements including Humanities, Social Science, Cross--
Cultural Awareness and Science and Technology in society components.
See *Undergraduate Announcements* and academic advisor for details.
[2]ME 2010 may be substituted for CE 2010 and 2080
[3]BIOL 1030/1050 or 1100

BIOPROCESS ENGINEERING EMPHASIS AREA
Senior Year First Semester
3 -- BCHM 3050 Biochemistry
3 -- BE 4280 Biochemical Engineering
2 -- BE 4740 Biosystems Engr. Design/Project Mgt.
2 -- BE 4750 Biosystems Engr. Capstone Design
2 -- BIOL 4340 Biological Chemical Laboratory Techniques
4 -- CE 2060 Structural Mechanics
16

Second Semester
3 -- Engineering Requirement[4]
3 -- Global Sustainability Requirement[5]
9 -- Arts and Humanities Requirement[1] *or*
9 -- Social Science Requirement[1]
15

126 Total Semester Hours
[1]Students should choose courses to fulfill General Education requirements including Humanities, Social Science, Cross--
Cultural Awareness and Science and Technology in society components. See *Undergraduate Announcements* and academic advisor for details.
[4]Engineering course 3000-level or above or other approved course
[5]Choose from Sustainability Minor course list or other approved course

ECOLOGICAL ENGINEERING EMPHASIS AREA
Senior Year First Semester
2 -- BE 4210 Engineering Systems for Soil Water Management
2 -- BE 4740 Biosystems Engr. Design/Project Mgt.
2 -- BE 4750 Biosystems Engr. Capstone Design
3 -- Arts and Humanities Requirement[1] *or*
3 -- Social Science Requirement[1]

3 -- Ecological Requirement[6]
4 -- CE 2060 Structural Mechanics
16

Second Semester
3 -- BE 4240 Ecological Engineering
3 -- Engineering Requirement[4]
6 -- Arts and Humanities Requirement[1] *or*
6 -- Social Science Requirement[1]
3 -- Global Sustainability Requirement[5]
15

126 Total Semester Hours

[1]Students should choose courses to fulfill General Education requirements including Humanities, Social Science, Cross--
Cultural Awareness and Science and Technology in society components. See *Undergraduate Announcements* and academic advisor for details.
[6]Ecological Requirement: Choose from BIOL, FOR, HORT, MICR
PES, WFB 3000--level or above or other approved course.

Notes for Bioprocess and Ecological Engineering emphasis areas:
1. The following courses must
be completed with *C* or better: CE 2010, 2060, 2080, 3410; MATH 2060, 2080; ME 3100; PHYS 2210.
2. Biosystems Engineering students are encouraged to complete a Minor, Co-op Ed program, internship (BE 3700) and/or a Study Abroad Program.
3. Departmental Honors Thesis (BE 3000/3010/4000) is
available for qualifying Junior/Senior students.

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

000115

Course Abbreviation & Number:
X **New Undergraduate Course:** ENGR- 2200
.. **New Honors Course:** --
.. **New Graduate Course:** -

Effective Term: 01/2015
Catalog Title: Evaluating Innovations: Fixtures, Fads, and Flops
Transcript Title: Evaluating Innovations

Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	.. Natural Science No Lab
.. G-Studio	maximum credits:	.. Natural Science w/Lab
.. H-Field course		.. Math or Science
.. I-Study Abroad		.. A&H (Literature)
.. L-Lab (no/fee)		.. A&H (Non-Literature)
.. N/B-Lecture/Lab(w/fee)		.. Social Science
.. N/L-Lecture/Lab(no fee)		.. CCA
		X STS

Add cross-listing with the following child course(s):

Catalog Description: This course introduces foundational theories used to critically analyze the success of consumer products and other technological innovations. Case studies are utilized to exhibit the interactions between innovation and society. Critical thinking skills are emphasized.

Prerequisite(s): None

Projected Enrollment:
Year 1 - 20 Year 2 - 20 Year 3 - 20 Year 4 - 20

Required course for students in: None. Offered as elective only.

Statement of need and justification based on assessment results of student learning outcomes: This is a Critical Thinking Seminar (CT2) that is designed to actively engage students in thinking deeply about the relationships between innovation and society. CT2 seminars are part of the Clemson University's Quality Enhancement Plan – more information can be found here: http://www.clemson.edu/assessment/thinks2/

Critical thinking is a process of thinking in a clear and systematic way in order to gain a deeper understanding of a system and make informed, unbiased judgments. To do so requires engaging in metacognition to reflect on your own biases and assumptions, and considering how you create knowledge. Critical thinking does not come naturally to most people; but through this course, we will work to improve your critical thinking skills which is instrumental to becoming successful entrepreneurs.

A significant portion of the course will be peer-lead discussions of various products or companies that have made a lasting impression on society. Special focus will be on scientific, technological, and engineering innovations and how societal factors impacted the success or failure of these innovations.

Textbook(s): Gerald M. Nosich. 2012. Learning to think things through: A guide to critical thinking across the curriculum 4ed. ISBN 978-013-7085-149

Learning Objectives: Employ critical thinking elements to formulate judgments of innovations success
Evaluate sources of information based on intellectual standards of reasoning
Utilize intellectual standards of reasoning to self-evaluate judgments
Understand the product development process
Research past and present scientific or technological innovations
Classify scientific, technological, and engineering innovations as fixtures, fads, and flops
Recognize disruptive technologies and their impact on society
Evaluate the impact of society and culture on product success or failure
Synthesize alternative solutions to multidimensional challenges addressed by scientific or technological innovations
Extrapolate information from case studies to make predictions for emerging technologies
Work in interdisciplinary teams to critically analyze product success
Communicate critical analyses effectively through in-class presentations

Topical Outline: Critical Thinking – 20%
o Elements of reasoning
o Intellectual standards
o Heuristic Judgments

Foundational Theories for evaluating innovative technologies– 20%
o Product development
o Product Life Cycle
o Market/Situation Analysis
o Hierarchy of human needs

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print Change/Delete Course Form**

000116

X **Change a Course - Abbrev & Number: IE- 2010**
Corresponding Lab Course: IE--2011
Corresponding Honors course: --
.. **Add Honors course:** --
Corresponding Graduate course: --
.. **Add Graduate course:** --
Course Title: Systems Design I

Brief Statement of Change:
Students report that this class is much harder than the other 2000 level IE courses; to reflect this, we wish to renumber it as a 3000 level. Also, since General Engineering majors often struggle in this course, we wish to indicate to them that they must be in IE to take IE 2010 (now IE 3010) to see if the performance improves.

Last Term taught: 201401	.. **Change Abbrev to:**	
Effective Term: 01/2015	X **Change Number to:** 3010	
.. **Change Catalog Title:**	.. **Change Transcript Title:**	
from:	from: Systems Design I	
to:	to:	
.. **Change of Credit**	From: Fixed Credit: 4 (3,3) Variable Credit: - (-), (-)	To: Fixed Credit: (,) Variable Credit: - (-),(-)

.. **Add cross-listing with the following child course(s):**
.. **Delete cross-listing with the following child course(s):**
.. **Reverse Parent/Child relationship with:**

.. **Change Method of Instruction**		.. **Change Course Modifier**		.. **Change General Education Designation**	
from:	to:	from:	to:	from:	to:
.. A-Lecture Only	..	.. Pass/Fail Only	..	.. Creative Inquiry	..
.. B-Lab (w/fee)	..	X Graded	..	.. English Composition	..
.. D-Seminar	..	.. Variable Title	..	.. Oral Communication	..
.. E-Independent Study	..	.. Creative Inquiry	..	.. Mathematics	..
.. F-Tutorial (w/fee)	..	.. Repeatable	..	.. Natural Science w/Lab	..
.. G-Studio	..	maximum credits		.. Natural Science w/Lab	..
.. H-Field course	..	from:		.. Math or Science	..
.. I-Study Abroad	..	to:		.. A&H (Literature)	..
.. L-Lab (no/fee)	..			.. A&H (Non-Literature)	..
X N/B-Lecture/Lab(w/fee)	..			.. Social Science	..
.. N/L-Lecture/Lab(no fee)	..			.. CCA	..
				.. STS	..

.. **Change Catalog Description:**
from:
to:

.. **Change Prerequisite(s):**
from:
to:

Learning Objectives:

Topical Outline:

Evaluation:

Form Originator: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Created:** 11/12/2014
Form Last Updated by: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Last Updated:** 11/12/2014
Form Number: 7888

Approval

Chair, Department Curriculum Committee	11/14/14 Date	Chair, Undergraduate Curriculum Committee	12/5/14 Date
Department Chair	11/14/14 Date	Chair, Graduate Curriculum Committee	Date
Chair, College Curriculum Committee	11/21/14 Date	Provost	2/11/15 Date
College Dean	11/24/14 Date	President	Date
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

000117

Course Abbreviation & Number:
X **New Undergraduate Course:** IE- 4810
.. **New Honors Course:** --
X **New Graduate Course:** IE- 681

Effective Term: 01/2015
Catalog Title: Applications of probability models in industrial engineering
Transcript Title: App of Prob Models in IE

Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	.. Natural Science No Lab
.. G-Studio	maximum credits:	.. Natural Science w/Lab
.. H-Field course		.. Math or Science
.. I-Study Abroad		.. A&H (Literature)
.. L-Lab (no/fee)		.. A&H (Non-Literature)
.. N/B-Lecture/Lab(w/fee)		.. Social Science
.. N/L-Lecture/Lab(no fee)		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: This is a second probabilistic operations research course, but with a broader, more applied range of topics than the first (IE 3810). Potential topics include decision making; utility theory; portfolio risk, optimization and hedging; inventory models for perishable products; revenue management; risk analysis; and static simulation.

Prerequisite(s): 4810: IE 2800, 3600, 3810 , 3840 6810: IE 8030, 8090, 8840

Projected Enrollment:
Year 1 - 30 Year 2 - 30 Year 3 - 30 Year 4 - 30

Required course for students in:

Statement of need and justification based on assessment results of student learning outcomes: Students pick technical electives based on interest. IE 3810 is a more theoretical IE course, while IE 4810/6810 contains more applications of the material in which probability models, especially Markov Chains, are applied to IE applications.

Textbook(s): Wayne L. Winston (2004). Operations Research: Applications and Algorithms, 4/E, Duxbury Press, Belmont, CA.
Taha, Hamdy A. (2011). Operations Research: An Introduction, 9/E, Prentice Hall, New York, New York.

Learning Objectives: To construct probabilistic models to describe real-world systems.
To use probabilistic methods to support decision making.

Topical Outline: decision making; 3 weeks
utility theory; 2 weeks
portfolio risk, optimization and hedging; 2 weeks
inventory models for perishable products; 2 weeks
revenue management; 2 weeks
risk analysis; 2 weeks
static simulation 2 weeks

Evaluation: 4810:
Exams (40%)
Homework (15%)
Quizzes (20%)
Final Exam (25%)
6810:
Exams (30%)
Homework (10%)
Quizzes (20%)
Research Project (20%)
Final Exam (20%)

Add course requirements for honors and/or 600-level courses (if applicable): A project will be required for the graduate-level course. This project often takes the form of a case study or a research paper. A preliminary proposal is also required; it must be approved before the 8th week of the course.

Form Originator: MKURZ,Kurz-Edsall,Mary Elizabeth **Date Form Created:** 11/12/2014
Form Last Updated by: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Last Updated:** 11/12/2014
Form Number: 7887

Approval

	11/13/14		12/5/2014
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
	11/19/14		

000118

Department Chair	Date	Chair, Graduate Curriculum Committee	Date
	11/4/14		
Chair, College Curriculum Committee	Date	Provost	Date
	11/24/14	Robert M. Jones	2/11/15
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

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CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

Course Abbreviation & Number:
X **New Undergraduate Course:** IE- 4840
.. **New Honors Course:** --
X **New Graduate Course:** IE- 684

Effective Term: 05/2015
Catalog Title: Applied Engineering Economics
Transcript Title: Applied Engr Econ
Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	.. Natural Science No Lab
.. G-Studio	maximum credits:	.. Natural Science w/Lab
.. H-Field course		.. Math or Science
.. I-Study Abroad		.. A&H (Literature)
.. L-Lab (no/fee)		.. A&H (Non-Literature)
.. N/B-Lecture/Lab(w/fee)		.. Social Science
.. N/L-Lecture/Lab(no fee)		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: Application of principles and techniques required to perform economic analysis of engineering project in various sectors, such as manufacturing, public sector or the service sector. Includes topics such as replacement analysis, project selection and selecting an analysis technique.

Prerequisite(s): 4840 - (IE 3840 or CE 3520) and (IE 2800 or MATH 4400) and (IE 3600 or MATH 4000) and (IE 3610 or MATH 3020)
6840 - none

Projected Enrollment:
Year 1 - 40 Year 2 - 40 Year 3 - 40 Year 4 - 40

Required course for students in:

Statement of need and justification based on assessment results of student learning outcomes: A master's level (not PhD level) course is needed for graduate students with non-IE backgrounds. To create a 6000 level course, we must create a 4000 course as well.

Textbook(s): Newnan, Donald G., Lavelle, Jerome P. and Eschenbach, Ted G. Engineering Economic Analysis (Tenth Edition). Oxford University Press: Oxford. 2009.

Learning Objectives: After completing this course, student will be able to:
- use spreadsheets to model and evaluate the engineering economic aspects of project designs and components within those designs
- choose an analysis technique for various needs, such as replacement, public or service sector applications or project justification
- appropriately incorporate uncertainty into project selection

Topical Outline: Topical Outline (assumes a 15 week semester)
- Review of prerequisite material (1 week)
- Choosing an analysis technique and non-traditional analysis techniques (2 weeks)
- public and service sector applications (multiple objectives, longer time frames, difficulties in benefit estimation, and conflicts in stakeholder perspectives) (3 weeks)
- Project selection and rationing capital among competing projects (2 weeks)
- Uncertainty in project selection (using integer programming as a technique) (2 weeks)
- Selecting a Minimum Attractive Rate of Return (2 weeks)
- Replacement analysis (2 weeks)
- Tests and quizzes (1 week)

Evaluation: IE 4840 IE 6840
Module quizzes 75% Module quizzes (same modules as 4840) 50%
Final exam 25% Module quizzes (additional modules) 25%
Final exam 25%

IE 6840 is differentiated from 4840 based on additional material. This course is quiz based; hence the additional quizzes for 6840.

Add course requirements for honors and/or 600-level courses (if applicable): IE 6840 is differentiated from 4840 based on additional material. Possible topics for the additional material include
- decisions involving multiple criteria
- value engineering
- Revenue Management

Form Originator: FWILLIA,Ferrell Jr,William G **Date Form Created:** 11/12/2014
Form Last Updated by: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Last Updated:** 12/5/2014
Form Number: 7885

Approval

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

Course Abbreviation & Number:
X **New Undergraduate Course:** IE- 4840
.. **New Honors Course:** --
X **New Graduate Course:** IE- 684

Effective Term: 05/2015
Catalog Title: Applied Engineering Economics
Transcript Title: Applied Engr Econ

Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	.. Natural Science No Lab
.. G-Studio	maximum credits:	.. Natural Science w/Lab
.. H-Field course		.. Math or Science
.. I-Study Abroad		.. A&H (Literature)
.. L-Lab (no/fee)		.. A&H (Non-Literature)
.. N/B-Lecture/Lab(w/fee)		.. Social Science
.. N/L-Lecture/Lab(no fee)		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: Application of principles and techniques required to perform economic analysis of engineering project in various sectors, such as manufacturing, public sector or the service sector. Includes topics such as replacement analysis, project selection and selecting an analysis technique.

Prerequisite(s): 4840 - (IE 3840 or CE 3520) and (IE 2800 or MATH 4400) and (IE 3600 or MATH 4000) and (IE 3610 or MATH 3020)
6840 - none

Projected Enrollment:
Year 1 - 40 Year 2 - 40 Year 3 - 40 Year 4 - 40

Required course for students in:

Statement of need and justification based on assessment results of student learning outcomes: A master's level (not PhD level) course is needed for graduate students with non-IE backgrounds. To create a 6000 level course, we must create a 4000 course as well.

Textbook(s): Newnan, Donald G., Lavelle, Jerome P. and Eschenbach, Ted G. Engineering Economic Analysis (Tenth Edition). Oxford University Press: Oxford. 2009.

Learning Objectives: After completing this course, student will be able to:
- use spreadsheets to model and evaluate the engineering economic aspects of project designs and components within those designs
- choose an analysis technique for various needs, such as replacement, public or service sector applications or project justification
- appropriately incorporate uncertainty into project selection

Topical Outline: Topical Outline (assumes a 15 week semester)
- Review of prerequisite material (1 week)
- Choosing an analysis technique and non-traditional analysis techniques (2 weeks)
- public and service sector applications (multiple objectives, longer time frames, difficulties in benefit estimation, and conflicts in stakeholder perspectives) (3 weeks)
- Project selection and rationing capital among competing projects (2 weeks)
- Uncertainty in project selection (using integer programming as a technique) (2 weeks)
- Selecting a Minimum Attractive Rate of Return (2 weeks)
- Replacement analysis (2 weeks)
- Tests and quizzes (1 week)

Evaluation: IE 4840 IE 6840
Module quizzes 75% Module quizzes (same modules as 4840) 50%
Final exam 25% Module quizzes (additional modules) 25%
Final exam 25%

IE 6840 is differentiated from 4840 based on additional material. This course is quiz based; hence the additional quizzes for 6840.

Add course requirements for honors and/or 600-level courses (if applicable): IE 6840 is differentiated from 4840 based on additional material. Possible topics for the additional material include
- decisions involving multiple criteria
- value engineering
- Revenue Management

Form Originator: FWILLIA,Ferrell Jr,William G **Date Form Created:** 11/12/2014
Form Last Updated by: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Last Updated:** 12/5/2014
Form Number: 7885

Approval

			12/5/14
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date
	12/5/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
	12/5/14		
Chair, College Curriculum Committee	Date	Provost	Date
	12/5/14		
College Dean	Date	President	Date
	12/16/14		
Director, Calhoun Honors College	Date		

CLEMSON UNIVERSITY **Curriculum and Course Change System - Print New Course Form**

000121

Course Abbreviation & Number:
X **New Undergraduate Course:** IE- 4860
.. **New Honors Course:** --
X **New Graduate Course:** IE- 686

Effective Term: 01/2015
Catalog Title: Scheduling
Transcript Title: Scheduling
Fixed Credit Course: 3 (3,0)
Variable Credit Course: - (-), (-)

Method of Instruction	Course Modifier	General Education Designation
X A-Lecture Only	.. Pass/Fail Only	.. Creative Inquiry
.. B-Lab (w/fee)	X Graded	.. English Composition
.. D-Seminar	.. Variable Title	.. Oral Communication
.. E-Independent Study	.. Creative Inquiry	.. Mathematics
.. F-Tutorial (w/fee)	.. Repeatable	.. Natural Science No Lab
.. G-Studio	maximum credits:	.. Natural Science w/Lab
.. H-Field course		.. Math or Science
.. I-Study Abroad		.. A&H (Literature)
.. L-Lab (no/fee)		.. A&H (Non-Literature)
.. N/B-Lecture/Lab(w/fee)		.. Social Science
.. N/L-Lecture/Lab(no fee)		.. CCA
		.. STS

Add cross-listing with the following child course(s):

Catalog Description: This course introduces the development and application of operations research approaches for sequencing and scheduling problems. Emphasis is placed on heuristic- and optimization-based solution methods and how they relate to practical approaches for scheduling and sequencing. Prior programming experience in any structured language or environment is required (e.g., C/C++/VBA/Matlab/etc.).

Prerequisite(s): IE 4860: (IE 3860 or MGT 3900) and (IE 4400 or CPSC 1010 or CPSC 1110 or MATH 3600 or MATH 3650)

Projected Enrollment:
Year 1 - 30 Year 2 - 30 Year 3 - 30 Year 4 - 30

Required course for students in:

Statement of need and justification based on assessment results of student learning outcomes: Students selected technical electives based on interest. This course expands on scheduling, which is introduced in IE 3860, and how practitioners actually use this material, which is in implemented code.

Textbook(s): Scheduling by Pinedo, Springer 2012

Learning Objectives: Students will be able to
Classify problems according to standard characteristics
Develop algorithms for common scheduling objectives
Implement algorithms for common scheduling objectives
Compare schedules for common scheduling objectives

Topical Outline: 1. Introduction, notation, and objectives (1 week)
2. Single machine models (3 weeks)
3. Parallel machine models (2 weeks)
4. Flow line, hybrid flow line and flexible flow line models (3 weeks)
5. Job shops (3 weeks)
6. Open shops (2 week)
7. Tests and Project presentations (1 week)

Evaluation: 4860:
Exam 1 (25%)
Exam 2 (25%)
Implementation Project (25%)
Final Exam (25%)
6860:
Exam 1 (20%)
Exam 2 (20%)
Implementation Project (20%)
Research Project (20%)
Final Exam (20%)

Add course requirements for honors and/or 600-level courses (if applicable): The 6000 level students will have an additional, literature based problem.

Form Originator: MKURZ,Kurz-Edsall,Mary Elizabeth **Date Form Created:** 11/12/2014
Form Last Updated by: MKURZ, Kurz-Edsall,Mary Elizabeth **Date Form Last Updated:** 11/14/2014
Form Number: 7886

Approval

	11/13/14		12/5/2014
Chair, Department Curriculum Committee	Date	Chair, Undergraduate Curriculum Committee	Date

00C122

	11/19/14		
Department Chair	Date	Chair, Graduate Curriculum Committee	Date
	11/21/14	Robert W Jones	2/11/15
Chair, College Curriculum Committee	Date	Provost	Date
	11/24/14		
College Dean	Date	President	Date
Director, Calhoun Honors College	Date		

Minor

Name: Mathematical Sciences **Lead Dept:** Mathematical Sciences

000123

Change Minor

Effective Catalog Year: 2015-2016

☐

☑ **Change Minor Requirements:**

Current Catalog Description

A minor in Mathematical Sciences requires MATH 2080 and 12 additional credits in MATH or STAT courses numbered 3000 or higher, excluding MATH 3080, 3150, 3160, 3820, 3990, 4080, 4300, 4320, 4810, 4820, 4910, 4920, and 4990, and STAT 3090.

Proposed Catalog Description

A minor in Mathematical Sciences requires MATH 2080 and 12 additional credits in MATH or STAT courses numbered 3000 or higher, excluding MATH 3080, 3150, 3160, 3820, 3990, 4080, 4300, 4320, 4810, 4820, 4910, 4920, and 4990, and STAT 3090. Students may not use both MATH 3650 and MATH 4600.

Summary / Explanation

MATH 3650 and 4600 are similar enough that they should not count as 6 hours toward the 12 additional credits in MATH or STAT courses numbered 3000 or higher.

Rationale for Change Minor

- ☑ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☐ **Other (Please specify.)**

Form

User ID: warner **Name:** Daniel Warner
Date: 11/11/2014 **Number:** 4501

Chair, Department Curriculum Committee — Date 11/11/2014

Department Chair — Date 11/11/2014

Chair, College Curriculum Committee — Date 11/21/14

College Dean — Date 11/21/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date 12/5/14

Chair, Graduate Curriculum Committee — Date

Provost — Date 2/11/15

President — Date

006124

Change 4000/6000 Course

000129

Change a Course

Subject: MATH-Mathematical Sciences

Number: 4120/6120

Effective Term: Spring 2015

Title: Intro to Modern Algebra

Honors Course: Abbr | Num

☐ Add Honors Course: Abbr | Num

Last Term Course was taught: 201401

Brief Statement of Change Based on Assessment Results:

Added a prerequisite and

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☑ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

Updated topic outline to

Honors

- ☐ **Honors Students Only?**
- ☐ **Honors sections allowed to be offered?**

☐ Change Subject

To

☐ Change Number

To

☑ Change Catalog Title

From Introduction to Modern A

To Algebra I

☐ Change College

From Engineering and Science

To

☑ Change Transcript Title

From Intro to Modern Algebra

To Algebra I

☐ Change Grade Mode

From

To

☐ Change Course Attributes

From

To

☐ Change Schedule Type

From	To
◯ Field Course	◯ Field Course
◯ Independent Study	◯ Independent Study
◯ Internship	◯ Internship
◯ Lab No Fee	◯ Lab No Fee
◯ Lab With Fee	◯ Lab With Fee
◯ Lecture	◯ Lecture
◯ Other	◯ Other
◯ Seminar	◯ Seminar
◯ Studio	◯ Studio
◯ Tutorial	◯ Tutorial

☐ Change Course Modifier

From

- ☐ Variable Title
- ☐ Creative Inquiry
- ☐ Repeatable

Max Credits:

To

- ☐ Variable Title
- ☐ Creative Inquiry
- ☐ Repeatable

Max Credits:

☐ Change General Education Designation

From	To
☐ English Composition	☐ English Composition
☐ Oral Communication	☐ Oral Communication
☐ Mathematics	☐ Mathematics
☐ Natural Sci w/Lab	☐ Natural Sci w/Lab
☐ Math or Science	☐ Math or Science
☐ A&H (Literature)	☐ A&H (Literature)
☐ A&H (Non-Lit)	☐ A&H (Non-Lit)
☐ Social Science	☐ Social Science
☐ CCA	☐ CCA
☐ STS	☐ STS

☐ Change in Additional Fee

◯ Add ◯ Delete

Justification

☐ Change of Credit

From

Fixed Credit Course

Credit Hrs 3 **Contact Hrs** 3

Variable Credit Course

Credit Hrs Min	Credit Hrs Max	Contact Hrs Min	Contact Hrs Max

To

Fixed Credit Course

Credit Hrs **Contact Hrs**

Variable Credit Course

Credit Hrs Min	Credit Hrs Max	Contact Hrs Min	Contact Hrs Max

☐ Change a Cross Reference

☐ Add cross reference with course(s):

☐ Delete cross reference with course(s):

☑ Change Catalog Description

From

Introduction to the concepts of algebra. Topics include the number system and the elementary theory of groups, rings, and fields. Includes Honors sections.

To

This course gives a first introduction to algebra with topics including modular arithmetic, ring theory and group theory.

☑ **Change Prerequisite(s) / Corequisite(s)**

From MATH 3110

To MATH 3110 and MATH 3190

☐ **Change In Student Learning Objectives**

006131

Learning Objectives

At the end of the course the student will be able to:
- Perform computations using modular algebra in the integer and univariate polynomials.
- Prove if a given set is a ring or a group and provide families of examples of those.
- Perform computations using the structure quotient rings especially in the case of univariate polynomials.
- Prove that a map is an homomorphism and compute its kernel.

Topical Outline

1. Modular Arithmetic (3 weeks)
(a) Arithmetic in the integers
(b) Congruences in the integers and arithmetic

2. Ring Theory (7 weeks)
(a) Basic properties of rings
(b) Isomorphisms and Homomorphisms
(c) Arithmetic in the univariate polynomial ring
(d) Congruences in the univariate polynomial ring
(e) Ideals and congruences
(f) Quotient rings

3. Groups (5 weeks)
(a) Basic properties of groups
(b) Subgroups
(c) Isomorphisms and Homomorphisms
(d) Congruence and Normal Subgroups
(e) Quotient groups and homomorphisms
(f) Direct products

Duplication (if applicable)

Add course requirements for honors courses (if applicable)

Add course requirements for 6000-level courses

Since this is a MATH 4120/6120 course, students enrolled in MATH 6120 will be assigned between fifteen percent and twenty percent more problems on homework assignments and on exams. Moreover, these problems will be more difficult than the problems assigned to the MATH 4120 students.

Learning Activities associated with General Education competencies (if applicable)

Evaluation

4000

A	90	-	100
B	80	-	89
C	70	-	79
D	60	-	69
F	<		60

Homework and quizzes: 30%
2 in-class midterm exams: 40%
final exam: 30

000132

6000

A	90	-	100
B	80	-	89
C	70	-	79
F<			70

ignore this

Homework and quizzes: 30%
2 in-class midterm exams: 40%
final exam: 30

Syllabus

Upload File: math4120_syllabus-20141120143942.pdf

Upload File: Choose File No file chosen

Description:

Form

User ID:	manganm	**Name:**	Felice Manganiello
Date:	11/20/2014	**Number:**	4694

Chair, Department Curriculum Committee — Date 11/11/2014

Department Chair — Date 11/11/2014

Chair, College Curriculum Committee — Date 11/21/14

College Dean — Date 11/21/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date 12/5/2014

Chair, Graduate Curriculum Committee — Date

Provost — Date 2/11/15

President — Date

000133

Add 4000/6000 Course

000134

Course Attributes

Subject Abbreviation: MATH-Mathematical Sciences
Course Number: 4130 / 6130
Effective Term: Fall 2015
College: Engineering and Science
Department: Mathematical Sciences

Catalog Title: Algebra II
Transcript Title: Algebra II
Cross-reference(s):
Grade Mode: Standard Letter

☐ **Additional Fee?**
Justification

Form

User ID: manganm **Name:** Felice Manganiello
Date: 11/20/2014 **Number:** 4703

Syllabus

Upload File: Choose File No file chosen
Description:

Hours

Fixed Credit Course

Credit Hrs	Contact Hrs
3	3

Variable Credit Course

Credit Hrs Min	Credit Hrs Max	Contact Hrs Min	Contact Hrs Max

Rationale for Add Course

- ☐ Strengthen Program Requirement(s)
- ☐ Alignment of Student Learning Outcomes
- ☐ Alternative Delivery of Content
- ☐ Improve Time to Degree
- ☐ Evolution of the Discipline
- ☐ Changing Prerequisites
- ☐ Address DWF Rates
- ☐ General Education Modifications
- ☑ Other (Please specify.)

This course is needed to

Schedule Types

- ○ Field Course
- ○ Independent Study
- ○ Internship
- ○ Lab No Fee
- ○ Lab With Fee
- ◉ Lecture
- ○ Other
- ○ Seminar
- ○ Studio
- ○ Tutorial

General Education

- ☐ English Composition
- ☐ Oral Communication
- ☑ Mathematics
- ☐ Natural Science w/Lab
- ☐ Math or Science
- ☐ A&H (Literature)
- ☐ A&H (Non-Literature)
- ☐ Social Science
- ☐ CCA
- ☐ STS

Course Modifier

- ☐ Variable Title
- ☐ Creative Inquiry
- ☐ Repeatable

Max Credits:

Projected Enrollment

Year 1:	10
Year 2:	15
Year 3:	15
Year 4:	15

Evaluation

4000

A	90	100
B	80	89
C	70	79
D	60	69
F<		60

omework and quizzes: 30%
2 in-class exams: 40%
final exam: 30%

6000

A	90	100
B	80	89
C	70	79
F<		70

ignore this

omework and quizzes: 30%
2 in-class exams: 40%
final exam: 30%

Catalog Description

This course is a continuation of MTHS 4120. Topics to be covered are chosen from: advanced group theory (including Sylow theorems, some classifications of groups); advanced ring theory; field theory; Galois theory.

☑ **Prerequisite(s)** ☐ **Corequisite(s)**

MATH 4120/6120

Required course for students in

This course is not required

Statement of need and justification based on assessment of student learning outcomes

This course is needed by any student wishing to pursue a graduate degree in mathematics. A second course in algebra is standard preparation for graduate school in mathematics. Our peer institutions all offer a second course is algebra.

Textbook(s)

Abstract Algebra: An Introduction by Thomas Hungerford ISBN: 1111569622 or a suitable alternative

Learning Objectives

At the end of the course the student will be able to:
- Compute the p-Sylow subgroups of groups of small order
- Classify all finite abelian groups of a given degree
- Distinguish between different types of domains (Euclidean, Principal ideal and Unique factorization), provide examples and perform simple proofs.
- Construct examples of rings and fields
- Prove a given set is a ring or field
- Calculate the Galois group of a field extension of small degree

Topical Outline

1. Group Theory (2 weeks)
(a) Finite abelian groups
(b) Sylow theorems and applications

2. Ring Theory (3 weeks)
(a) Euclidean Domains, Principal ideal domains and Unique factorization domain
(b) Unique factorization in polynomial domains

3. Field Theory (6weeks)
(a) Bases and dimension
(b) Simple extensions
(c) Algebraic extensions
(d) Splitting fields
(e) Separability
(f) Finite fields

4. Galois Theory (4 weeks)
(a) The Galois group
(b) The fundamental theorem of Galois theory
(c) Solvability by radicals

Duplication (if applicable)

Support Document: Choose File No file chosen

Add course requirements for honors courses (if applicable)

Add course requirements for 6000-level courses

Since this is a MATH 4130/6130 course, students enrolled in MATH 6130 will be assigned between fifteen percent and twenty percent more problems on homework assignments and on exams. Moreover, these problems will be more difficult than the problems assigned to the MATH 4130 students.

Learning Activities associated with General Education competencies (if applicable)

Chair, Department Curriculum Committee — Date 11/11/2014

Department Chair — Date 11/11/2014

Chair, College Curriculum Committee — Date 11/21/14

College Dean — Date 11/24/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date 12/5/2014

Chair, Graduate Curriculum Committee — Date

Provost — Date 2/11/15

President — Date

000136

000137

Change 4000/6000 Course

Change a Course

Subject: MATH-Mathematical Sciences
Number: 4530/6530
Effective Term: Fall 2015
Title: Advanced Calculus I
Honors Course:
☐ Add Honors Course:
Last Term Course was taught: 201408
Brief Statement of Change Based on Assessment Results:
The catalog description is being revised to accurately reflect the materials covered in a semester for the last five years.

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☑ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☐ **Other (Please specify.)**

☑ Change Catalog Description

From MATH 4530* Advanced Calculus I 3 (3) Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. Includes Honors sections.

To MATH 4530, H4530, 6530 Advanced Calculus I 3(3,0) Basic properties of the real number system, sequences and limits, continuous functions, uniform continuity, differentiation Preq: MATH 2060 and 3190.

☑ Change Prerequisite(s) / Corequisite(s)

From MATH 2060
To MATH 2060 and MATH 3190

Learning Objectives

1. Students will be able to prove mathematical statements involving sequences of real numbers, continuous functions, and differentiable functions. [(a), (e), (k)] 2. Students will be able to distinguish formal expression and mathematically meaningful expression in applications. [(a), (d), (e), (g), (k)] 3. Students will be able to check whether the functions describing physical quantities are continuous or differentiable. [(a), (e), (k)] 4. Students will demonstrate some pathological cases that violate common physical assumptions and will be able to figure out what additional conditions are needed. [(a), (e)] 5. Students will be able to express problems in mathematically rigorous ways. [(d), (e), (g)] 6. Students will be able to discern deeper mathematical structure of functions describing physical systems. [(a), (d), (e), (g), (k)] 7. In applications, students will be able to understand what can be accepted and what must be verified. [(a), (d), (e), (g)]

Topical Outline

1. Real Number System (4 weeks) (a) Sets and Functions (b) Mathematical Induction (c) Finite and Infinite Sets (d) Real Number System (e) Absolute Value and the Real Line (f) The Completeness Property of R (g) Applications of the Supremum Property (h) Intervals 2. Sequences of Real Numbers (4 weeks) (a) Sequences and Their Limits (b) Limit Theorems (c) Monotone Sequences (d) Subsequences and the Bolzano-Weierstrass Theorem (e) Cauchy Sequences (f) Properly Divergent Sequences (g) Introduction to Infinite Series 3. Limits and Continuity (4 weeks) (a) Limits of Functions (b) Limit Theorems (c) Extensions of the Concept of Limit (d) Continuous Functions (e) Combinations of Continuous Functions (f) Continuous Functions on Intervals (g) Uniform Continuity (h) Monotone and Inverse Functions 4. The Derivative (3 weeks) (a) Definition of the Derivative (b) The Mean Value Theorem (c) L' Hospitals Rule (d) Taylors Theorem

Add course requirements for 6000-level courses

The requirement is the same as MATH 4530.

000138

Evaluation

4000

A	90	-	100
B	80	-	89
C	70	-	79
D	60	-	69
F	<		60

Quizzes (10%), homework (30%), 3 tests (30%), final exam (30%).

6000

A	90	-	100
B	80	-	89
C	70	-	79
F	<		70

Students enrolled in 6530 will be required to answer additional questions in the exams and the final, for example, undergraduate students in the a test may be required to answer 10 questions where graduate students will be required to answer 10 questions plus an additional 4-5 questions.

Syllabus

Upload File: MATH4530SampleSyllabus-20141121133058.docx

Form

User ID: khan **Name:** Taufiquar Khan
Date: 11/21/2014 **Number:** 4739

Chair, Department Curriculum Committee — Date: 11/11/2014

Department Chair — Date: 11/11/2014

Chair, College Curriculum Committee — Date: 11/21/14

College Dean — Date: 11/21/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date: 12/5/2014

Chair, Graduate Curriculum Committee — Date

Provost — Date: 2/11/15

President — Date

006139

Change 4000/6000 Course

003140

Change a Course

Subject: MATH-Mathematical Sciences
Number: 4540/6540
Effective Term: Fall 2015
Title: Advanced Calculus II
Honors Course:
☐ Add Honors Course:
Last Term Course was taught: 201408
Brief Statement of Change Based on Assessment Results:
The catalog description is being revised to accurately reflect the materials covered in a semester for the last five years.

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

The catalog description is being revised to accurately reflect the materials covered in a semester for the last five years.

☑ Change Catalog Description

From MATH 4540* Advanced Calculus II 3 (3) Continuation of MATH 4530. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals. Includes Honors sections. Preq: MATH 4530.

To MATH 4540, H4540, 6540 Advanced Calculus II 3(3,0) Continuation of MATH 4530. Riemann integrals and improper integrals, infinite series. sequences and series of functions. Preq: MATH 4530.

Learning Objectives

1. Students will be able to prove mathematical statements involving sequences and series involving real-valued functions, and integration of real-valued functions. [(a), (e), (k)] 2. Students will be able to distinguish formal expression and mathematically meaningful expression in applications. [(a), (d), (e), (g), (k)] 3. Students will be able to check whether the functions describing the physical quantities are continuous or differentiable. [(a), (e), (k)] 4. Students will demonstrate some pathological cases that violate common physical assumptions and will be able to figure out what additional conditions are needed. [(a), (e)] 5. Students will be able to express problems in mathematically rigorously ways. [(d), (e), (g)] 6. Students will be able to discern deeper mathematical structure of the functions describing physical systems. [(a), (d), (e), (g), (k)] 7. In applications, students will be able to see what can be accepted and what must be verified. [(a), (d), (e), (g)]

000141

Topical Outline

1. The Riemann & Riemann-Stieltjes Integral (4 weeks) (a) The Riemann Integral (b) Properties of the Riemann Integral (c) Fundamental Theorem of Calculus (d) Improper Riemann Integrals (e) The Riemann-Stieltjes Integral (f) Numerical Methods (g) Lebesgue's Theorem 2. Series of Real Numbers (4 weeks) (a) Convergence Tests (b) The Dirichlet Test (c) Absolute and Conditional Convergence (d) Square Summable Sequence 3. Sequences and Series of Functions (4 weeks) (a) Pointwise Convergence and Interchange of Limits (b) Uniform Convergence (1 week) (c) Uniform Convergence and Continuity (2/3 week) (d) Uniform Convergence and Integration (2/3 week) 4. Approximation of Functions (3 weeks) (a) The Weierstass Approximation (b) Power Series Expansions (c) The Gamma Function

Add course requirements for 6000-level courses

The requirement is the same as MATH 4530.

Evaluation

4000

A	90	-	100
B	80	-	89
C	70	-	79
D	60	-	69
F	<		60

Homework (30%), 3 tests (30%), final exam (30%).

6000

A	90	-	100
B	80	-	89
C	70	-	79
F	<		70

Students enrolled in 6530 will be required to answer additional questions in the exams and the final, for example, undergraduate students in the a test may be required to answer 10 questions where graduate students will be required to answer 10 questions plus an additional 4-5 questions.

Syllabus

Upload File: MATH4540SampleSyllabus-20141121133818.docx

Form

User ID:khan **Name:** Taufiquar Khan
Date: 11/21/2014 **Number:**4741

Chair, Department Curriculum Committee — Date 11/11/2014

Department Chair — Date 11/11/2014

Chair, College Curriculum Committee — Date 11/21/14

College Dean — Date 11/21/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date 12/5/2014

Chair, Graduate Curriculum Committee — Date

Provost — Date 2/11/15

President — Date

000142

Change Major

Major Name: Computer Info Systems
Degree: Bachelor of Science
Effective Catalog Year: 2015-2016

- ☐ **Change Major Name to:** CIS
- ☐ **Change Degree to:** Bachelor of Science
- ☑ **Change Curriculum Requirements**
- ☐ **Change General Education Requirements**
- ☐ **Add, Change, or Delete Concentration(s)**
- ☐ **Add, Change, or Delete Emphasis Area(s)**

Curriculum Map: BS-CIS-4 AY1516-20141111211019.docx

Description: revised course map
Additional Information:
Description:

Summary/Explanation

Add two footnotes and revise two footnotes: (a) Incorporate a common entry sequence for transfer students and students changing from engineering majors to reduce the need for course substitutions; (b) Allow MATH 1190 transfer credits to reduce the need for course substitutions; (c) Revise the statistics course alternatives to better handle transfer credits; and, (d) Revise the computer science requirement to identify DPA, ECE, and MATH courses that can be used as optional courses.

Rationale for Change Major

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

1

Form

User ID: mark **Name:** Mark Smotherman
Date: 11/11/2014 **Number:** 4525

1 Incorporate into the curriculum several common course substitutions for transfer students and change of major students. Better communicate choice of optional courses in the computer science requirement.

B.S. in Computer Information Systems Curriculum
2015-2016 Academic Year

Computer Information Systems
Bachelor of Science

Freshman Year
First Semester
4 – CPSC 1010 Computer Science I[1]
3 – ENGL 1030 Accelerated Composition
3 – MATH 1020 Introduction to Mathematical Analysis[2] *or*
4 – MATH 1060 Calculus of One Variable I[2]
4 – Natural Science Requirement[3]
1 – Elective[2]

15

Second Semester
4 – CPSC 1020 Computer Science II[1]
3 – MATH 2070 Multivariable Calculus[2] *or*
4 - MTHS 1080 Calculus of One Variable II[2]
3 – Arts and Humanities (Non-lit.) Requirement[4]
3 – Natural Science Requirement[3]
3 – Social Science Requirement[4]
1 – Elective[2]

17

Sophomore Year
First Semester
3 – CPSC 2070 Discrete Structures for Computing[5]
4 – CPSC 2120 Algorithms and Data Structures
3 – Arts and Humanities (Literature) Requirement[4]
3 – Oral Communications Requirement[6]
3 – Social Science Requirement[4]

16

Second Semester
3 – CPSC 2150 Software Development Foundations
4 – CPSC 2310 Intro. to Computer Organization
1 – CPSC 2910 Seminar in Professional Issues I
3 – MGT 2010 Principles of Management
3 – STAT 3090 Introductory Business Statistics[7]

14

Junior Year
First Semester
3 – ACCT 2010 Financial Accounting Concepts
3 – CPSC 2200 Microcomputer Applications
3 – CPSC 3220 Introduction to Operating Systems
3 – CPSC 3720 Intro. to Software Engineering
3 – Writing Requirement[8]

15

Second Semester
3 – ACCT 2020 Managerial Accounting Concepts
3 – CPSC 3600 Networks and Network Programming
3 – CPSC 3710 System Analysis *or*
3 – MGT 4520 Systems Analysis and Design
3 – ECON 2110 Principles of Microeconomics
3 – Computer Science Requirement[9]

15

Senior Year
First Semester
3 – CPSC 4200 Computer Security Principles *or*
3 – CPSC 4240 System Admin. and Security
3 – CPSC 4620 Database Management Systems
3 – CPSC 4910 Seminar in Professional Issues II
3 – Business Requirement[10]
3 – Computer Science Requirement[9]

15

Second Semester
3 – MGT 3120 Decision Models for Management
3 – MKT 3010 Principles of Marketing
3 – Business Requirement[10]
3 – Computer Science Requirement[9]
3 – Information Systems Requirement[11]

15

122 Total Semester Hours

[1] The sequence of CP SC 1110 and 2100 will be accepted in place of CPSC 1010 and 1020.
[2] Select either the MATH 1020/2070, 1060/2070 or 1060/1080 sequences. Students who select the 1060/1080 sequence will have satisfied the two elective credits in the freshman year.
[3] Select from courses in BIOL, BCHM, CH, GEOL, MICR, PHYS; or ENSP 2000. At least one course must include a laboratory and satisfy the Natural Science General Education requirement.
[4] See General Education Requirements.
[5] Or MATH 1190.
[6] One course of: COMM 1500, 2500, HON 2230; or the cluster of courses AS 3090, 3100, 4090, 4100; or ML 1010, 1020.
[7] Or MATH 3020 or STAT 3300 or transfer credit for MATH 3010.
[8] One course of: ENGL 3040, 3120, 3140, 3150, 3160, 3330; AS 3090, 3100, 4090, 4100; ML 3010, 3020, 4010, 4020.
[9] Select from 3000-level or higher CPSC courses or DPA 3070. No more than three credits of CPSC 3990 or 4810 may be used, and no more than six credits of CPSC 4820 may be used. Up to three credits of ECE 3000-level or higher; or MATH 3650; or MATH 4000-level may be used.
[10] Select from MGT 3900, 4000 and FIN 3060.
[11] Select from MGT 4520, 4540, 4550, 4560, or any 4000-level CPSC course. CPSC 4810 may not be used.

Notes:
1. For graduation, a candidate for the BS degree in Computer Information Systems must have earned a grade of C or better in each CPSC course applied to the non-elective requirements of the degree.
2. A grade of C or better must be earned in all prerequisite courses (including CPSC and MATH courses) before enrolling in the next CPSC course.
3. General Education Cross-Cultural Awareness and Science and Technology in Society requirements must be satisfied.

Change Major

Major Name: Computer Science
Degree: Bachelor of Science
Effective Catalog Year: 2015-2016

- ☐ **Change Major Name to:** CPSC
- ☐ **Change Degree to:** Bachelor of Science
- ☑ **Change Curriculum Requirements**
- ☐ **Change General Education Requirements**
- ☐ **Add, Change, or Delete Concentration(s)**
- ☐ **Add, Change, or Delete Emphasis Area(s)**

Curriculum Map: BS-CPSC-4 AY1516-20141111211356.docx
Description: revised course map
Additional Information:
Description:

Summary/Explanation

Add two footnotes and revise two footnotes: (a) Incorporate a common entry sequence for transfer students and students changing from engineering majors to reduce the need for course substitutions; (b) Allow MATH 1190 transfer credits to reduce the need for course substitutions; (c) Revise the statistics course alternatives to better handle transfer credits; and, (d) Revise the computer science requirement to identify DPA, ECE, and MATH courses that can be used as optional courses.

Rationale for Change Major

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

1

Incorporate into the curriculum several common course substitutions for transfer students and change of major students. Better communicate choice of optional courses in the computer science requirement.

Form

User ID: mark **Name:** Mark Smotherman
Date: 11/11/2014 **Number:** 4529

B.S. in Computer Science Curriculum
2015-2016 Academic Year

Computer Science
Bachelor of Science

Freshman Year
First Semester
4 – CPSC 1010 Computer Science I[1]
3 – ENGL 1030 Accelerated Composition
4 – MATH 1060 Calculus of One Variable I
4 – Natural Science Requirement[2]

15

Second Semester
4 – CPSC 1020 Computer Science II[1]
4 – MATH 1080 Calculus of One Variable II
3 – Arts and Humanities (Non-Lit) Requirement[3]
4 – Natural Science Requirement[2]

15

Sophomore Year
First Semester
3 – CPSC 2070 Discrete Structures for Computing[4]
4 – CPSC 2120 Algorithms and Data Structures
3 – Arts and Humanities (Literature) Requirement[3]
3 – Natural Science Requirement[2]
3 – Oral Communications Requirement[5]

16

Second Semester
3 – CPSC 2150 Software Development Foundations
4 – CPSC 2310 Intro. to Computer Organization
1 – CPSC 2910 Seminar in Professional Issues I
3 – STAT 3090 Introductory Business Statistics[6]
3 – Natural Science Requirement[2]
2 – Elective

16

Junior Year
First Semester
3 – CPSC 3300 Computer Systems Organization
3 – CPSC 3600 Networks and Network Programming
3 – CPSC 3720 Intro. to Software Engineering
3 – MATH 3110 Linear Algebra
3 – Social Science Requirement[3]

15

Second Semester
3 – CPSC 3220 Introduction to Operating Systems
3 – CPSC 3500 Foundations of Computer Science
3 – CPSC 3620 Distributed and Cluster Computing
3 – Arts and Humanities Requirement[7] *or*
3 – Social Science Requirement[7]
3 – Social Science Requirement[3]

15

Senior Year
First Semester
3 – CPSC 3520 Programming Systems
6 – Computer Science Requirement[8]
3 – Writing Requirement[9]
3 – Elective

15

Second Semester
3 – CPSC 4910 Seminar in Professional Issues II
3 – Arts and Humanities Requirement[7] *or*
3 – Social Science Requirement[7]
6 – Computer Science Requirement[8]
3 – Elective

15

122 Total Semester Hours

[1] The sequence of CP SC 1110 and 2100 will be accepted in place of CPSC 1010 and 1020.
[2] Two-semester sequence in the same physical or biological science, each including a laboratory is required. Select from BIOL 1030/1050, 1040/1060; 1100, 1110; CH 1010, 1020; GEOL 1010/1030 and 1020 or 1120/1140; PHYS 1220/1240, 2210/2230. The six remaining hours may be selected from BIOL, BCHM, CH, GEOL, MICR, PHYS; or ENSP 2000.
[3] See General Education requirements.
[4] Or MATH 1190.
[5] One course of: COMM 1500, 2500, HON 2230; or the cluster of courses AS 3090, 3100, 4090, 4100; or ML 1010, 1020.
[6] Or MATH 3020 or STAT 3300 or transfer credit for MATH 3010.
[7] Select from courses in AAH, ANTH, ART, CHIN, COMM, DANC, EAS, ECON, ENGL, FR, GEOG, GER, HIST, HUM, ITAL, JAPN, MUSC, PA, PAS, PHIL, POSC, PSYC, REL, RUSS, SOC, SPAN, THEA, WS.
[8] Select from 3000-level or higher CPSC courses or DPA 3070. No more than three credits of CPSC 3990 or 4810 may be used, and no more than six credits of CPSC 4820 may be used. Up to three credits of ECE 3000-level or higher; or MATH 3650; or MATH 4000-level may be used.
[9] One course of: ENGL 3040, 3120, 3140, 3150, 3160, 3330; AS 3090, 3100, 4090, 4100; ML 3010, 3020, 4010, 4020.

Notes:
1. For graduation, a candidate for the BS degree in Computer Science must have earned a grade of C or better in each CPSC course applied to the non-elective requirements of the degree.
2. A grade of C or better must be earned in all prerequisite courses (including CPSC and MATH courses) before enrolling in the next CPSC course.
3. General Education Cross-Cultural Awareness and Science and Technology in Society requirements must be satisfied.

000147

Change Major

Major Name: Computer Science
Degree: Bachelor of Arts
Effective Catalog Year: 2015-2016

- ☐ **Change Major Name to:** CPSC
- ☐ **Change Degree to:** Bachelor of Arts
- ☑ **Change Curriculum Requirements**
- ☐ **Change General Education Requirements**
- ☐ **Add, Change, or Delete Concentration(s)**
- ☐ **Add, Change, or Delete Emphasis Area(s)**

Curriculum Map: BA-CPSC-4 AY1516-20141111211221.docx
Description: revised course map
Additional Information:
Description:

Summary/Explanation

Add two footnotes and revise two footnotes: (a) Incorporate a common entry sequence for transfer students and students changing from engineering majors to reduce the need for course substitutions; (b) Allow MATH 1190 transfer credits to reduce the need for course substitutions; (c) Revise the statistics course alternatives to better handle transfer credits; and, (d) Revise the computer science requirement to identify DPA, ECE, and MATH courses that can be used as optional courses.

Rationale for Change Major

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

Form

User ID: mark **Name:** Mark Smotherman
Date: 11/11/2014 **Number:** 4527

Incorporate into the curriculum several common course substitutions for transfer students and change of major students. Better communicate choice of optional courses in the computer science requirement.

B.A. in Computer Science Curriculum
2015-2016 Academic Year

Computer Science
Bachelor of Arts

Freshman Year
First Semester
4 – CPSC 1010 Computer Science I[1]
3 – ENGL 1030 Accelerated Composition
3 – MATH 1020 Introduction to Mathematical Analysis[2] *or*
4 - MATH 1060 Calculus of One Variable I[2]
4 – Foreign Language Requirement[3]
1 – Elective[2]

15

Second Semester
4 – CPSC 1020 Computer Science II[1]
3 – MATH 2070 Multivariable Calculus[2] *or*
4 - MATH 1080 Calculus of One Variable II[2]
3 – Arts and Humanities (Non-Lit.) Requirement[4]
4 – Foreign Language Requirement[3]
1 – Elective[2]

15

Sophomore Year
First Semester
3 – CPSC 2070 Discrete Structures for Computing[4]
4 – CPSC 2120 Algorithms and Data Structures
3 – Arts and Humanities (Literature) Requirement[5]
3 – Foreign Language Requirement[3]
3 – Oral Communications Requirement[6]

16

Second Semester
3 – CPSC 2150 Software Development Foundations
4 – CPSC 2310 Intro. to Computer Organization
1 – CPSC 2910 Seminar in Professional Issues I
3 – Foreign Language Requirement[3]
4 – Natural Science Requirement[7]

15

Junior Year
First Semester
6 – Computer Science Requirement[8]
3 – Mathematical Sciences Requirement[9]
3 – Minor Requirement
3 – Natural Science Requirement[7]

15

Second Semester
3 – Computer Science Requirement[8]
6 – Minor Requirement
3 – Social Science Requirement[5]
3 –Writing Requirement[10]

15

Senior Year
First Semester
6 – Computer Science Requirement[8]
3 – Departmental Humanities Requirement[11]
3 – Minor Requirement
3 – Social Science Requirement[5]

15

Second Semester
3 – CPSC 4910 Seminar in Professional Issues II
3 – Computer Science Requirement[8]
3 – Fine Arts Requirement[12]
3 – Minor Requirement
3 – Elective

15

121 Total Semester Hours

[1] The sequence of CP SC 1110 and 2100 will be accepted in place of CPSC 1010 and 1020.
[2] Select either the MATH 1020/2070, 1060/2070 or 1060/1080 sequence. Students who select the 1060/1080 sequence will have satisfied the elective credits in the freshman year. Students interested in computer graphics should select the 1060/1080 sequence.
[3] Four semesters (through 2020) in the same modern foreign language are required.
[4] Or MATH 1190.
[5] See General Education Requirements.
[6] One course of: COMM 1500, 2500, HON 2230; or the cluster of courses AS 3090, 3100, 4090, 4100; or ML 1010, 1020.
[7] Select from courses in BIOL, BCHM, CH, GEOL, MICR, PHYS; or ENSP 2000. At least one course must include a laboratory and satisfy the Natural Science General Education requirement.
[8] Select from 3000-level or higher CPSC courses or DPA 3070. No more than three credits of CPSC 3990 or 4810 may be used, and no more than six credits of CPSC 4820 may be used. Up to three credits of ECE 3000-level or higher; or MATH 3650; or MATH 4000-level may be used.
[9] Select from MATH 3020 or MATH 3110 or STAT 3300 or transfer credit for MATH 3010. MATH 3110 is required for computer graphics courses.
[10] One course of: ENGL 3040, 3120, 3140, 3150, 3160, 3330; AS 3090, 3100, 4090, 4100; ML 3010, 3020, 4010, 4020.
[11] Select from courses in AAH, ANTH, ART, CHIN, DANC, ENGL, FR, GER, HUM, ITAL, JAPN, MUSC, PA, PHIL, REL, RUSS, SPAN, THEA.
[12] MUSC 2100 or any course in AAH, ART, or THEA.

Notes:
1. For graduation, a candidate for the BA degree in Computer Science must have earned a grade of C or better in each CPSC course applied to the non-elective requirements of the degree.
2. A grade of C or better must be earned in all prerequisite courses (including CPSC and MATH courses) before enrolling in the next CPSC course.
3. General Education Cross-Cultural Awareness and Science and Technology in Society requirements must be satisfied.

Change Undergraduate Course

000149

Change a Course

Subject: CPSC-Computer Science
Number: 1010
Effective Term: Fall 2015
Title: Computer Science I
Honors Course:
☐ Add Honors Course:
Last Term Course was taught:201408
Brief Statement of Change Based on Assessment Results:
Change prerequisite of MATH 1050 to a corequisite of any one of several MATH courses to reduce number of overrides required.

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

Banner/iROAR

☑ Change Prerequisite(s) / Corequisite(s)

From Prereq: MATH 1050. Coreq: CPSC 1011. Students who have not completed MATH 1050, but who score a satisfactory score on the Clemson Mathematics Placement Test, may request a registration override from the instructor.

To Coreq: CPSC 1011 and any one of MATH 1020, MATH 1040, MATH 1050, MATH 2070, MATH 1060, or MATH 1080. Students who have not completed MATH 1050, but who score a satisfactory score on the Clemson Mathematics Placement Test, or have AP or transfer credit for their math requirements, may request a registration override from the instructor or academic advisor.

Evaluation

Undergraduate

A	90	-	100
B	80	-	89
C	70	-	79
D	60	-	69
F	<		60

Assignments 30%; Lab 10%; Quizzes 15%; Mid-Term Exam 20%; Final Exam 25%.

Syllabus

Form

User ID:mark **Name:** Mark Smotherman
Date: 11/11/2014**Number:**4505

000150

Change 4000/6000 Course

Change a Course

Subject: CPSC-Computer Science
Number: 4060/6060
Effective Term: Fall 2015
Title: GP Computation on Graphic Processing Unit
Honors Course:
☐ Add Honors Course:
Last Term Course was taught: 201308
Brief Statement of Change Based on Assessment Results:
We are changing the course number so that we can cross-list this course with ECE. We are also changing the undergraduate prerequisite to specify the data structures course from either CPSC or ECE. CPSC will be the home department for this course.

Rationale for Changing a Course

- ☐ **Strengthen Program Requirement(s)**
- ☐ **Alignment of Student Learning Outcomes**
- ☐ **Alternative Delivery of Content**
- ☐ **Improve Time to Degree**
- ☐ **Evolution of the Discipline**
- ☐ **Changing Prerequisites**
- ☐ **Address DWF Rates**
- ☐ **General Education Modifications**
- ☑ **Other (Please specify.)**

Cross list with ECE

☑ **Change Subject**

☑ **Change Number**
To 4780 / 6780

☑ **Change a Cross Reference**
☑ Add cross reference with course(s): ECE 4780/6780
☐ Delete cross reference with course(s):

☑ **Change Prerequisite(s) / Corequisite(s)**
From 4060: CPSC 2120 and MATH 2060. 6060: Students are expected to have completed coursework in data structures, calculus, and linear algebra.
To 4060: CPSC 2120 or ECE 2230. 6060: Students are expected to have completed coursework in data structures, calculus, and linear algebra.

Add course requirements for 6000-level courses

Additional requirements on each of four programming projects will be expected of students taking the course at the 6000 level along with an additional programming project.

Evaluation

4000
A 90 - 100
B 80 - 89
C 70 - 79
D 60 - 69
F < 60
4 (individual) programming projects, each counts 12.5% Exams: – Midterm 25% – Final 25%
6000
A 90 - 100
B 80 - 89
C 70 - 79
F < 70
5 (individual) programming projects, each counts 12% Exams: – Midterm 20% – Final 20%

Syllabus

Form

User ID: mark **Name:** Mark Smotherman
Date: 11/11/2014 **Number:** 4498

000151

Chair, Department Curriculum Committee — Date 11/11/14

Department Chair — Date 11/11/14

Chair, College Curriculum Committee — Date 11/21/14

College Dean — Date 11/21/14

Director, Calhoun Honors College — Date

Chair, Undergraduate Curriculum Committee — Date 12/5/2014

Chair, Graduate Curriculum Committee — Date

Provost — Date 2/11/15

President — Date