

School of Materials Science & Engineering
College of Engineering & Science
Clemson University


Proposal to the South Carolina Commission of Higher Education

Program Modification

To add two concentration
Polymeric Materials Concentration
Inorganic Materials Concentration

Bachelor of Science in Materials Science & Engineering

February 15, 2011



James F. Barker, FAIA
President

Program Contact

Dr. Igor Luzinov, Interim Director
School of Materials Science & Engineering
161 Surrin Hall, Clemson University
Clemson, SC 29634-0971
Luzinov@Clemson.edu

University Contact:

Dr. Debra B. Jackson
Vice Provost
Clemson University
dbj@clemson.edu/864-656-4592

Classification

Program Title – Materials Science & Engineering - Polymeric Materials Concentration, Inorganic Materials Concentration

Academic unit involved - School of Materials Science & Engineering, College of Engineering & Science, Clemson University

Designation, type, and level of degree - Bachelor of Science (4-year)

Proposed date of implementation - August 15, 2011

Current CIP code of the program to be modified - n/a

Proposed CIP code of the program after modification -
Materials Science 40.1001 and Materials Engineering 14.1801

Identification of Program as New or Modification - Modification

Site - Clemson University Campus

Program qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards: Yes
XXX No: _____

Delivery mode (See definition, p. 3) – Traditional

Justification

The School of Materials Science & Engineering was formed in 2001 through the merger of the School of Textiles, Fiber & Polymer Science and the department of Ceramic & Materials Engineering. Over the past ten years, the faculty of this new school has worked to combine three doctoral degree programs into a single Materials Science & Engineering Ph.D. program and combine three masters degree programs into a single Materials Science & Engineering MS program. This proposal is for the combination of the undergraduate degree programs.

The BS degree in Textile Science was closed in 2002. The BS degree in Textile Management was recently closed due to a decreased demand as a result of the decrease in the size of the Textile Industry. The last BS degree in Textile Management was awarded at commencement in May 2011.

The remaining BS degree program from the previous School of Textiles, the BS degree in Polymer & Fiber Chemistry, has had a low yet steady enrollment for the past twenty years. Due to recent retirements in the Schools' "textile" faculty, a number of the required and elective courses in this curriculum can no longer be offered.

However, it was deemed imperative to maintain the expertise and educational experience and job opportunities for students in the polymer & fiber area.

The Ceramic & Materials Engineering degree has been renamed, more appropriately, as the Bachelor of Science degree program in Materials Science & Engineering. The core courses (general education, mathematics, physics, and chemistry) are common.

The formation of two separate materials concentrations (Inorganic Materials and Polymeric Materials) will

provide for the following: an undergraduate degree program aligned with one of the major emphasis areas at Clemson University - the Advanced Materials Emphasis Area; a single degree program having the same name as the School will provide for a better identity for the students and will match name of School's MS & PhD degrees; the name better reflects the content of the degree curriculum and breadth of materials – covering all materials – both of which should help with marketing Materials and recruiting high school students in South Carolina.

There are no materials programs offered elsewhere in the state of South Carolina.

Enrollment

It is anticipated that the total enrollment in the Materials Science & Engineering BS Degree program to initially be same as the combined enrollment in the Materials Science & Engineering undergraduate degree and the Polymer & Fiber Chemistry undergraduate degree. While this merger may not result in an increase in overall enrollment at Clemson University, the number of students choosing Materials Science & Engineering from the freshman General Engineering program will more than likely increase. Previously, students in General Engineering were hesitant to switch into the Polymer & Fiber Chemistry program as this degree was not an Engineering degree.

YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2011 – 12	5	45	5	45	0	0
2012 – 13	10	150	10	150	0	0
2013 – 14	15	225	15	225	0	0
2014 – 15	15	225	15	225	0	0
2015 – 16	15	225	15	225	0	0

Curriculum

The two concentrations share a common core of 89 credits (29 courses), and differ by 38 credits. The major differences are described below.

The Inorganic Materials Concentration in the Materials Science & Engineering Degree program is essentially identical to the original Ceramic & Materials Engineering degree program. In addition to changing the semester in which several courses were offered, two courses that had been taught by MS&E faculty have been replaced with courses offered in other departments. Polymer & Fiber Chemistry 303 - Textile Chemistry (3 credit hours (3,0)) is being replaced with Chemistry 201 - Survey of Organic Chemistry (4 credit hours - (3,3)); and MS&E 324 - Statistics for Materials Science & Engineering (3 credit hours (3,0)) is being replaced with a choice of either Experimental Statistics 301 (3 credit hours (2,2)) or Mathematical Science 302 Statistics for Science & Engineering (3 credit hours (3,0)).

The Polymeric Materials Concentration requires 38 credit hours of courses which differ from the Inorganic Materials concentration. Similar to the previous Polymer & Fiber Chemistry program, the Polymeric Materials Concentration requires the two semester sequence of Organic Chemistry (CH 223 & CH 224), the corresponding Organic Chemistry laboratories (CH 227 & CH 228), and the two semester sequence of Physical Chemistry (CH 331 & CH 332). Eighteen credit hours of courses from the previous Polymer & Fiber Chemistry program form the core of the Polymeric Materials Concentration. There are no new courses required for this concentration.

Materials Science & Engineering – Inorganic Materials 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 Requirement¹ *or*
___ 3 – Social Science Requirement¹
16

Second Semester

4 – CH 102 General Chemistry
3 – ENGR 141 Programming and Problem Solving
4 – MTHSC 108 Calculus of One Variable II
3 – PHYS 122 Physics with Calculus I
3 – Arts and Humanities Requirement¹ *or*
___ 3 – Social Science Requirement¹
17

Sophomore Year

First Semester

4 – CH 201 Survey of Organic Chemistry
3 – MS&E 210 Introduction to Materials Science
4 – MTHSC 206 Calculus of Several Variables
3 – PHYS 221 Physics with Calculus II
3 – Arts and Humanities Requirement¹ *or*
___ 3 – Social Science Requirement¹
17

Second Semester

3 – CE 201 Engineering Mechanics: Statics
2 – EG 208 Engineering Graphics with Computer Applications
1 – MS&E 241 Metrics Laboratory I
4 – MTHSC 208 Introduction to Ordinary Differential Equations
6 – Arts and Humanities Requirement¹ *and/or*
___ 3 – Social Science Requirement¹
16

Junior Year

First Semester

3 – ENGL 314 Technical Writing
3 – MS&E 319 Materials Processing I
3 – MS&E 326 Thermodynamics of Materials
3 – MS&E 327 Transport Phenomena
3 – MS&E 415 Introduction to Polymer Science and Engineering
15

Second Semester

3 – IE 384 Engineering Economic Analysis

- 3 – MS&E 328 Phase Diagrams for Materials Processing and Applications
- 2 – MS&E 342 Structure/Property Laboratory
- 3 – MS&E 361 Processing of Metals and Their Composites
- 3 – MS&E 422 Mechanical Behavior of Materials
- 3 – MTHSC 302 Statistics for Science and Engineering *or*
- 3 – EX ST 301 Introductory Statistics

17

Senior Year

First Semester

- 3 – COMM 250 Public Speaking
- 3 – MS&E 402 Solid State Materials
- 3 – MS&E 413 Noncrystalline Materials
- 3 – MS&E 432 Manufacturing Processes and Systems
- 1 – MS&E 441 Manufacturing Laboratory
- 3 – MS&E 491 Undergraduate Research

16

Second Semester

- 3 – MS&E 407 Senior Capstone Design
- 3 – MS&E 416 Electrical Properties of Materials
- 3 – MS&E 424 Optical Materials and Their Applications
- 3 – MS&E 433 Combustion Systems and Environmental Emissions
- 1 – MS&E 445 Practice of Materials Engineering

13

127 Total Semester Hours

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

Materials Science & Engineering – Polymeric Materials 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 Requirement¹ *or*
- 3 – Social Science Requirement¹

16

Second Semester

- 4 – CH 102 General Chemistry
- 3 – ENGR 141 Programming and Problem Solving
- 4 – MTHSC 108 Calculus of One Variable II
- 3 – PHYS 122 Physics with Calculus I
- 3 – Arts and Humanities Requirement¹ *or*
- 3 – Social Science Requirement¹

17

Sophomore Year

First Semester

- 3 – CH 223 Organic Chemistry I
- 1 – CH 227 Organic Chemistry Laboratory I
- 3 – MS&E 210 Introduction to Materials Science
- 4 – MTHSC 206 Calculus of Several Variables
- 3 – PHYS 221 Physics with Calculus II
- 3 - Arts and Humanities Requirement¹ *or*
- 3 – Social Science Requirement¹

17

Second Semester

- 3 – CE 201 Engineering Mechanics: Statics
- 3 – CH 224 Organic Chemistry II
- 1 – CH 228 Organic Chemistry Laboratory II
- 2 – EG 208 Engineering Graphics with Computer Applications
- 3 – MS&E 250 Polymer & Fiber Science I
- 4 – MTHSC 208 Introduction to Ordinary Differential Equations

16

Junior Year

First Semester

- 3 – CH 331 Physical Chemistry I
- 3 – ENGL 314 Technical Writing
- 3 – MS&E 327 Transport Phenomena
- 3 – MS&E 415 Introduction to Polymer Science and Engineering
- 1 – MS&E 417 Polymer Science Laboratory I
- 3 - Arts and Humanities Requirement¹ *or*
- 3 – Social Science Requirement¹

16

Second Semester

- 3 – CH 332 Physical Chemistry II
- 3 – IE 384 Engineering Economic Analysis
- 3 – MS&E 422 Mechanical Behavior of Materials
- 3 – MS&E 456 Polymer & Fiber Science II
- 3 – MTHSC 302 Statistics for Science and Engineering *or*
- 3 – EX ST 301 Introductory Statistics

15

Senior Year

First Semester

- 3 – COMM 250 Public Speaking
- 3 – MS&E 458 Surface Phenomena in Fiber Science
- 1 – MS&E 460 Surface Phenomena Laboratory
- 3 – MS&E 461 Polymer & Fiber Science III
- 3 – MS&E 491 Undergraduate Research
- 3 – Technical Requirement²

16

Second Semester

3 – MS&E 407 Senior Capstone Design

1 – MS&E 445 Practice of Materials Engineering

3 – MS&E 457 Dyeing and Finishing

1 – MS&E 459 Dyeing and Finishing Laboratory

3 - Arts and Humanities Requirement¹ or 3 – Social Science Requirement¹

3 – Technical Requirement²

14

127 Total Semester Hours

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

²See Advisor

Faculty

This program modification does not require any changes to the faculty.

Physical Plant

This program modification will not have an effect on the physical plant's ability to support the program, now or in the foreseeable future.

Equipment

This program modification will not require any major equipment items, now or in the foreseeable future.

Library Resources

This program modification will not have an effect on the library's ability to support the program.

Accreditation, Approval, Licensure, or Certification

The Inorganic Materials Concentration has been & will continue to be ABET accredited, and is currently being evaluated as a Materials Engineering program. The Polymeric Materials concentration will be submitted for ABET accreditation in the next cycle, as the program needs to be run for a minimum of 2 years.

Estimated Costs

There are no New Costs associated with this program modification. Through merging of the BS Polymer & Fiber Chemistry degree program into the BS Materials Science and Engineering degree program, in addition to closing the BS in Textile Management, 24 courses and 12 laboratories have been deleted.

This program modification will not require any special state appropriation or other "unique costs." The following table represents the 2010 – 11 academic year budget for the School. The faculty and administration are in place and have been teaching in the School. The reorganization of the curriculum allows for greater efficiency and effectiveness.

Table G - New Costs to the Institution and Sources of Financing

ESTIMATED COSTS BY YEAR						
CATEGORY	1st	2nd	3rd	4th	5th	TOTALS
Program Administration	0	0	0	0	0	0
Faculty Salaries	1,376,213	1,376,213	1,376,213	1,376,213	1,376,213	6,881,065
Graduate Assistants	170,000	170,000	170,000	170,000	170,000	850,000
Clerical/Support Personnel	444,767	444,767	444,767	444,767	444,767	2,223,835
Supplies and Materials	83,350	83,350	83,350	83,350	83,350	416,750
Library Resources	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
Other (Travel)	25000	25000	25000	25000	25000	125,000
TOTALS	2,099,330	2,099,330	2,099,330	2,099,330	2,099,330	10,496,650
SOURCES OF FINANCING BY YEAR						
Tuition Funding	No new tuition is added, because no additional revenue will be collected. The total number of students in engineering will remain the same, the difference is the major selected in the sophomore year. Students can select a concentration rather than a separate major that was discontinued.					
Program-Specific Fees						
State Funding						
Reallocation of Existing Funds*-- departmental funds are being used for the concentration rather than for a separate degree program.	2,099,330	2,099,330	2,099,330	2,099,330	2,099,330	10,496,650
Federal Funding						
Other Funding (Specify)						
TOTALS	2,099,330	2,099,330	2,099,330	2,099,330	2,099,330	10,496,650

INSTITUTIONAL APPROVALS

Curriculum Committees:

Department, 8/27/2010

College, 9/7/10

University, 10/1/10

Provost, October 12, 2010

President, October 12, 2010

Board of Trustees, October 14, 2010