

ATTACHMENT 3C

Academic Policy Series

1622.20A

ADD, CHANGE OR DELETE UNIT, PROGRAM REQUIREMENTS, OR ACADEMIC POLICIES

Complete this form consistent with the instructions in Academic Policy 1622.20. Use the form to add, change, or delete a program or unit or to change program policies. Proposed additions and changes must be consistent with Academic Policies 1100.40 and 1621.10 and any other policies which apply.

SECTION I: Approvals

Department / Program Chair Date Submitted Graduate Council Chair Date
College Dean Date Faculty Senate Chair Date
Honors College Dean Date Provost Date
Core Curriculum Committee Date Board of Trustees Approval/Notification Date
University Course and Programs Committee Date Arkansas Higher Education Coordinating Board Approval/Notification Date

SECTION II: Profile Data - Required Information and Name Change Information

Academic Unit: [X] Major/Field of Study [ ] Minor [ ] Other Unit (Add Biomedical Engineering Conc.)
[ ] Policy

Level: [ ] Undergraduate [X] Graduate [ ] Law Effective Catalog Year 2012

Program changes are effective with the next available catalog. See Academic Policy Series 1622.20

Current Name

College, School, Division ENGR

Department Code ENGR

Current Code (6 digit Alpha) ENGRPH

Proposed Code (6 digit Alpha)

Prior approval from the Office of the Registrar is required.

[ ] Interdisciplinary Program

CIP Code 14.0101

Prior assignment from Office of Institutional Research is required.

Proposed Name PhD, Engineering - Biomedical Engineering Concentration (BMEG)

When a program name is changed, enrollment of current students reflects the new name.

SECTION III: Add a New Program/Unit

[X] For new program proposals, complete Sections II and VII and use as a cover sheet for a full program proposal as described in 'Criteria and Procedures for Preparing Proposals for New Programs in Arkansas.' ADHE
http://www.adhe.edu/divisions/academicaffairs/Pages/academicaffairs.aspx

[X] Program proposal uses courses offered by another academic college, and that college dean's office has been notified. The signature of the dean of that academic college is required here:

Fulbright College of Arts & Sciences

SECTION IV: Eliminate an Existing Program/Unit

Code/Name Effective Catalog Year

No new students admitted to program after Term: Year:

Allow students in program to complete under this program until Term: Year:

SECTION V: Proposed Changes to an Existing Program or Program Policies

**Insert here a statement of the exact changes to be made: \_\_\_\_\_**

Check if either of these boxes apply and provide the necessary signature:

- Program change proposal adds courses offered by another academic college, and that college dean's office has been notified. The signature of the dean of that academic college is required here: \_\_\_\_\_
- Program change proposal deletes courses offered by another academic college, and that college dean's office has been notified. The signature of the dean of that academic college is required here: \_\_\_\_\_

Check all the boxes that apply and complete the required sections of the form:

- Change of Name and Code (Complete only sections I, II, V and VII.)
- Change Course Requirements: (Complete all sections of the form except "Proposed Name" in II, section III, and section IV.)
- Change Delivery Site/Method (Complete all sections of the form except "Proposed Name" in II, section III, and section IV.)
- Change Total Hours (Complete all sections of the form except "Proposed Name" in II, section III, and section IV.)
- Change in Program Policies

## **SECTION VI: Justification**

*Justify this change and state its likely effect on any other degree program (including those outside the school or college). Identify any program or program components (other than courses) to be eliminated if this program is implemented. (Program and course change forms must also be submitted for such related changes.)*

Biomedical Engineering is a field at the interface of engineering, medicine and biological sciences. It combines the practical problem solving ability of engineering to diagnostic, monitoring, and therapy needs of medical sciences. Even though engineers have designed medical devices for a long time, Biomedical Engineering has only been established as a discipline within the past two decades.

The evolution of academic disciplines often follows the sequence of first being a multi-disciplinary program evolving into an interdisciplinary program and then becoming a discipline in itself with a variety of sub-disciplines. Biomedical Engineering has followed that path and is now widely recognized as a separate discipline within engineering. In the United States, an undergraduate degree in Biomedical Engineering is offered at 99 universities of which three are in the SEC, but none in Arkansas. The SEC schools offering Biomedical Engineering include the University of Tennessee, University of South Carolina and Vanderbilt.

The Biomedical education and research at the University of Arkansas is currently embedded within the department of Biological and Agricultural Engineering which reports to both the College of Engineering and to the Dale Bumpers College of Agriculture and Food and Life Sciences. Undergraduate students have the opportunity to choose Biomedical Engineering as a concentration within a BS degree in Biological Engineering. This stream produces approximately ten such graduates per year. A MS degree in Biomedical Engineering was initiated in 2004 and was accredited by ABET (the national engineering accreditation board) in 2009. The number of graduates in this program range from two to three per year. Doctoral students can choose Biomedical Engineering as a research area but their degree is recognized within the Biological Engineering PhD concentration.

The numbers of graduates at all degree levels with biomedical concentration at the University of Arkansas have been much lower than the national averages. In the past ten years, enrollments at the national level in Biomedical Engineering programs have increased by more than 200% while the overall engineering enrollment increases during the same period have only been at the level of approximately 20%. Similar impressive increases in students have also occurred at the MS and PhD levels. Significantly larger numbers of female students and faculty are attracted to this discipline because of the exciting career opportunities in the health care field. The time is right for the University of Arkansas to re-examine its position on Biomedical Engineering and develop stand-alone degrees at all levels (BS, MS and PhD). This proposal is for creating a new concentration in Biomedical Engineering within the existing PhD degree in Engineering. There are parallel proposals for creating a new undergraduate major in Biomedical Engineering and moving the existing MS degree in Biomedical Engineering into the proposed new Department of Biomedical Engineering and thereby create exciting educational opportunities in Biomedical Engineering for Arkansans at all levels.

## **SECTION VII: Catalog Text and Format**

*In the box below, insert the current catalog text which is to be changed, with changes highlighted with the color yellow. Include all proposed changes identified in Section V. Only changes explicitly stated in Section V will be considered for approval by the University Course and Programs Committee, the Graduate Council and the Faculty Senate. If you are proposing a new program, give proposed text with all of the elements listed below. If you are proposing modified text, include these elements as appropriate.*

**Include the following elements, in order, in the catalog text for proposed undergraduate program(s) or program changes:**

- State complete major/program name
- Briefly define or describe the major/program or discipline.
- Identify typical career goals or paths for graduates. (Optional)
- State admission requirements (if any) for entry or entry into upper/advanced level of major/program.
- Identify location in catalog of university, college/school, and department/program requirements which the student must meet in addition to hours in the major, but do not restate these requirements.
- State course requirements in the major and any allied areas, giving number of hours and specific courses; specify electives or elective areas and give numbers of hours and courses in elective pools or categories; identify any other course requirements.
- State any other requirements (required GPA, internship, exit exam, project, thesis, etc.).
- Identify name and requirements for each concentration (if any).
- Specify whether a minor or other program component is allowed or required and provide details.
- State eight-semester plan requirements

**For minors, state requirements in terms of hours, required courses, electives, etc.**

**For graduate program/units, include elements (as needed) parallel to those listed for undergraduate programs above.**

**For Law School program/units, prepare text consistent with current catalog style.**

**For centers, prepare text consistent with current catalog style.**

**BIOMEDICAL ENGINEERING (BMEG),  
DEPARTMENT OF**

Ashok Saxena  
Interim Head of the Department  
BELL 4183  
479-575-7455

**FACULTY**

Distinguished Professors Rardin, Saxena, Varadan (V.K.), Varadan (V.V.)  
Professors Ang, Beitle, Carrier, Deaton, El-Shenawee, Kim, Verma, Wickramasinghe  
Associate Professors Roper, Tung, Ye  
Assistant Professors Hestekin (C.), Jin, Servoss, Wejinya, Wolchok, Zaharoff

The Ph.D. Degree in Engineering with Biomedical Engineering (BME) focus is an interdisciplinary research degree awarded through the College of Engineering in cooperation with the Graduate School (at the University of Arkansas, there is a common Ph.D. degree for all engineering disciplines). The Ph.D. Degree is earned through advanced coursework and in-depth, specialized research. Graduates from this program will be well-prepared for research careers in academia, industry or government or as entrepreneurs in technology-based start-up companies.

**Admission to Degree Program:** Admission into the Ph.D. program with Biomedical Engineering focus is a two-step process. First, the prospective student must be admitted to graduate standing by the University of Arkansas Graduate School. Second, the student must be accepted into the Biomedical Engineering program which depends on transcripts, recommendations, statement of purpose and standardized test scores. Because of the multi-disciplinary nature of Biomedical Engineering, students holding either Engineering or Non-Engineering degrees are eligible to apply. Eligibility criteria are outlined below:

- **Engineering Academic Background:** Students with a BS or MS degree in engineering or engineering equivalent are eligible to apply for the PhD program in engineering with Biomedical Engineering focus.
- **Non-engineering Academic Background:** Students with a non-engineering degree are eligible to apply for conditional admission to the Ph.D. program. These students must first fulfill the admission requirements for the M.S. in Biomedical Engineering (MSBME) as described in the Biomedical Engineering Department Graduate Student Handbook. Upon completion of the "Broader Preparation in Engineering Requirement" with a GPA of at least 3.0, students may be fully admitted into the Ph.D. program. However, students with a non-engineering background are encouraged to first complete

the MSBME degree before entering the Ph.D. program.

Complete details for admission are in the Biomedical Engineering Department Graduate Student Handbook, available at <http://bmeg.uark.edu/>.

**Requirements for the Doctor of Philosophy Degree:** In addition to the requirements of the Graduate School, the department follows the College of Engineering's requirements with additional requirements.

1. All students must complete a minimum of 72 semester hours of graduate-level credit beyond the bachelor's degree, including a minimum of 42 semester hours of course work and a minimum of 30 semester hours of dissertation research credits.
2. A minimum of 30 semester hours of course work must be at the graduate level (5000 or above).
3. Upon recommendation of the student's advisory committee, a student who has entered the Ph.D. program after a master's degree in engineering may receive credit for up to 24 hours of coursework and up to 6 hours of thesis research toward the minimum dissertation research requirement.
4. Earn a minimum cumulative grade-point average of 3.0 on all graduate courses attempted.
5. Develop a Plan of Study within the first year after matriculation
6. Complete an Annual Progress Report for each year of study (after the initial year.)
7. Satisfactorily pass both a written and oral candidacy examination. The candidacy exam will be given by the student's advisory committee. Students may retake a failed candidacy exam once, contingent upon approval of the student's advisory committee. A student who fails the candidacy examination twice will be terminated from the program.
8. Complete two semesters of teaching assistant assignments.
9. Complete and defend a dissertation on some topic in the student's major field of study.

Detailed requirements are in the Biomedical Engineering Department Graduate Student Handbook, available at <http://bmeg.uark.edu/>.

**Coursework Requirements:** Students are required to complete 42 credit hours of coursework beyond the BS degree in engineering or equivalent in the following four categories. NOTE: A maximum of 4 credit hours of Special Problems listings or any other catalog offering which does not have a regular meeting schedule/syllabus may be used to fulfill coursework requirements.

**(i) Biomedical Engineering (BMEG) – minimum of 17 credit hours**

- The following three core courses (9 credit hours) are required for every student.
  - a) BMEG 5203 Mathematical Modeling of Physiological Systems or a graduate level modeling or applied mathematics course with biomedical focus
  - b) BENG 5103 Advanced Instrumentation or a graduate level instrumentation with biomedical focus
  - c) BENG 5703 Experimental Design and the Statistical Analysis of Experimental Data for Engineering Research
- Two courses (6 credit hours minimum) must be chosen from BMEG 5000-6000 level courses. (BMEG 5801 Graduate Seminar cannot be counted for this requirement.)
- Two semesters (2 credit hours) of BMEG 5801 Graduate Seminar.

**(ii) Life Science – minimum of 6 credit hours**

- Coursework must be chosen from the life sciences with the approval of the student's advisory committee.

**(iii) Engineering Electives – minimum of 9 credit hours**

- Coursework must be chosen from engineering with the approval of the student's advisory committee.

**(iv) Electives – minimum of 6 credit hours**

- Coursework must be chosen with the approval of the student's advisory committee.

**SECTION VIII: Action Recorded by Registrar's Office**

PROGRAM INVENTORY/DARS

PGRM \_\_\_\_\_ SUBJ \_\_\_\_\_ CIP \_\_\_\_\_ CRTS \_\_\_\_\_  
DGRE \_\_\_\_\_ PGCT \_\_\_\_\_ OFFC&CRTY VALID \_\_\_\_\_

REPORTING CODES

PROG. DEF. \_\_\_\_\_ REQ. DEF. \_\_\_\_\_  
Initials \_\_\_\_\_ Date \_\_\_\_\_

**Distribution**

Notification to:

- (1) College
- (2) Department
- (3) Admissions
- (4) Institutional Research
- (5) Continuing Education
- (6) Graduate School
- (7) Treasurer
- (8) Undergraduate Program Committee

5/12/08