

ATTACHMENT 2B

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 [] Policy
Level: [X] Undergraduate [] 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 BMEG

Current Code (6 digit Alpha)

Proposed Code (6 digit Alpha) BMEGBS
Prior approval from the Office of the Registrar is required.

[] Interdisciplinary Program

CIP Code 14.0501
Prior assignment from Office of Institutional Research is required.

Proposed Name Bachelor of Science in Biomedical Engineering

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 Bachelor of Science degree in Biomedical Engineering. There are parallel proposals for creating a new Department of Biomedical Engineering and a new doctoral concentration in Biomedical Engineering within the existing PhD degree in Engineering. These two new degree programs will complement the existing MS degree 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, Vasundhara Varadan, Vijay Varadan
Professors Ang, Beitle, Carrier, Deaton, El-Shenawee, Kim, Verma, Wickramsinghe
Associate Professors Roper, Tung, Ye
Assistant Professors Hestekin (C.), Jin, Servoss, Wejinya, Wolchok, Zaharoff

Biomedical engineering encompasses the creation, design, and operation, of processes / technology related to the broad field of human healthcare. The profession traditionally has focused on applications related to the development of instrumentation and diagnostic equipment, discovery of novel treatment options, production of new therapeutics, and the elucidation of underlying biophysical phenomena. Newer applications of bioengineering take advantage of the ever deepening understanding of human physiology and molecular genetics, as related to prevention, detection, and treatment of medical conditions. The program objectives of the Biomedical Engineering undergraduate program are to produce graduates who are capable of:

- succeeding in the practice of engineering or other professional activities, and
- succeeding in post baccalaureate studies.

Completion of the degree requirements provides for the following educational outcomes:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multidisciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal contexts
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

These educational outcomes are experienced within the context of biology and physiology appropriate to solving problems at the interface of engineering and biology.

Biomedical Engineering B.S.BM.E.

Eight-Semester Degree Program

The following section contains the list of courses required for the Bachelor of Science in Biomedical Engineering degree and a suggested sequence for students who enter the College through the Freshman Engineering Program. Not all courses are offered every semester, so students who deviate from the suggested sequence must pay careful attention to course scheduling and course prerequisites. Students wishing to follow the eight-semester degree plan should see page 43 in the Academic Regulations chapter for university requirements of the program.

Fall Semester Year 1

- 3 ENGL 1013 Composition I
- 4 MATH 2554 Calculus I
- 3 CHEM 1103 University Chemistry I
- 4 PHYS 2054 University Physics I
- 0 PHYS 2050L University Physics I Lab
- 1 GNEG 1111 Introduction to Engineering I
- 15 Semester hours**

Spring Semester Year 1

- 3 ENGL 1023 Technical Composition II
- 4 Freshman Science Elective *
- 0 Freshman Science Elective Lab *
- 4 MATH 2564 Calculus II
- 3 Humanities/Social Science Elective
- 1 GNEG 1121 Introduction to Engineering II
- 15 Semester hours**

Fall Semester Year 2

- 3 BMEG 2613 Introduction to Biomedical Engineering
- 4 MATH 2574 Calculus III
- 4 Sophomore Science Elective **
- 0 Sophomore Science Elective Lab **
- 3 BIOL 1543 Principles of Biology
- 1 BIOL 1541L Principles of Biology Lab
- 3 CHEG 2313 Thermodynamics
- 18 Semester hours**

Spring Semester Year 2

- 3 BMEG 2813 Biomechanics
- 3 BMEG 2633 Biomaterials
- 4 MATH 3404 Differential Equations
- 3 BIOL 2533 Cell Biology
- 3 ELEG 3933 Circuits and Electronics
- 16 Semester hours**

Fall Semester Year 3

- 3 Humanities/Social Science Elective
- 3 BMEG 3103 Biomedical Instrumentation
- 3 Organic Chemistry Elective
- 1 Organic Chemistry Elective Laboratory
- 3 BIOL 2213 Human Physiology
- 1 BIOL 2211L Human Physiology Laboratory
- 4 ELEG 3124 Systems and Signal Analysis
- 18 Semester hours**

Spring Semester Year 3

- 3 BMEG 3653 Biomedical Modeling and Numerical Methods
- 3 BMEG 3823 Biomolecular Engineering
- 1 BMEG 3811L Biomolecular Engineering Lab
- 3 CHEG 2133 Fluid Mechanics
- 3 Technical Elective
- 3 Humanities/Social Science Elective
- 16 Semester hours**

Fall Semester Year 4	
3 BMEG 4813 Biomedical Engineering Design I 3 BMEG 4623 Biomedical Transport Phenomenon 3 BMEG Technical Elective 3 Science Elective 3 Humanities/Social Science Elective 15 Semester hours	
Spring Semester Year 4	
3 BMEG 4923 Biomedical Engineering Design II 3 BMEG Technical Elective 3 Technical Elective 3 U.S. History 3 Humanities/Social Science Elective 15 Semester hours 128 Total hours	

* The Freshman Engineering Science Elective must be chosen from either CHEM 1123/1121L or PHYS 2074.

** The Sophomore Science Elective must be PHYS 2074 (if CHEM 1123/1121L was chosen as the Freshman Engineering Elective) or CHEM 1123/1121L (if PHYS 2074 was chosen as the Freshman Engineering Science Elective).

Technical Options in Biomedical Engineering

Elective courses must be selected from a faculty-approved list of courses found in the department's Undergraduate Advising Handbook, which is available on the department's web site at <http://www.bmeg.uark.edu>. Elective courses are chosen with the aid of an academic adviser to better prepare for employment or further study in areas such as:

- Bioengineering
- Pharmaceutical manufacturing or pharmacology
- Biomedical device design
- Medicine
- Business
- Law

Each student in biomedical engineering is required to complete six semester hours of biomedical engineering technical electives (see Undergraduate Advising Handbook for a list of courses), and four semester hours of Organic Chemistry (3 hour with 1 hour laboratory). Students interested in pursuing an undergraduate biomedical degree as a lead to medical school should be aware that a total of 8 hours of organic chemistry (6 hour with 2 hour laboratory) may be required (please see your adviser for more specific details).

Technical Elective Courses

Six hours of upper level technical electives will be chosen from upper division (3000 and above) courses in mathematics, engineering, and the sciences with the approval of their adviser. The department maintains a list of approved technical electives which may be found in the department's Undergraduate Advising Handbook, which is available on the department's web site at <http://www.bmeg.uark.edu>.

Honors Program Requirements

Students enrolled in the Honors College who are to receive the Bachelor of Science in Biomedical Engineering must complete a minimum of 12 hours of honors credit. At least 6 hours must be completed within the Biomedical Engineering program including at least 3 hours resulting in an Honors Thesis. The BMEG honors courses are acceptable as engineering electives and in some cases may be substituted for required courses.

SECTION VIII: Action Recorded by Registrar's Office

PGRM _____

SUBJ _____

CIP _____

CRTS _____

DGRE _____

PGCT _____

OFFC&CRTY VALID _____

REPORTING CODES

PROG. DEF. _____

REQ. DEF. _____

Initials _____

Date _____

Distribution

Notification to:

(1) College
(7) Treasurer

(2) Department
(8) Undergraduate Program Committee

(3) Admissions

(4) Institutional Research

(5) Continuing Education

(6) Graduate School

5/12/08