Department of Biomedical Engineering
Undergraduate Handbook

2016-2017

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Department of Biomedical Engineering
University of Arkansas
120 John A. White Jr. Engineering Hall
Fayetteville, Arkansas 72701

*This document is intended to be a guide to students in the biomedical engineering program. Students should refer to the University Catalog of Studies for official degree requirements.
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Introduction

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 biomedical engineering 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 Education Objectives of the undergraduate BMEG program at the University of Arkansas, Fayetteville are to produce graduates that are capable of:

1. Succeeding in practice at the interface between life science and engineering, or in other professional activities, or in post-baccalaureate studies.
2. Utilizing their engineering education/experience in creating new knowledge or enabling technologies for improvement of human health and healthcare.
3. Conducting themselves with high standards of professional ethics and integrity
4. Being aware of the limits of their knowledge and initiate self-directed learning to create future professional opportunities for themselves in biomedical engineering.

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.
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<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Office</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Kyle Quinn</td>
<td>Assistant Professor</td>
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<td><a href="mailto:asaxena@uark.edu">asaxena@uark.edu</a></td>
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</tr>
<tr>
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<td>Media Specialist</td>
<td>ENGR 120</td>
<td>479-575-4667</td>
<td><a href="mailto:eademeo@uark.edu">eademeo@uark.edu</a></td>
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<td>479-575-4786</td>
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<tr>
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<tr>
<td>Stacy Sanchez</td>
<td>Project/Program Specialist</td>
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<td>(479)575-2333</td>
<td><a href="mailto:slperry@uark.edu">slperry@uark.edu</a></td>
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</table>
Facilities

**BMEG Office Suite**
The BMEG Office Suite is located at **ENGR 120** (479-575-4667, bmeginfo@uark.edu). Study tables are available for student use during office hours.

**Research Centers**
State-of-the art research facilities of our faculty are located in Engineering Research Center (ENRC, 535 W Research Center Blvd) and Cato Springs Research Center (CSRC, 1475 W Cato Springs Rd) approximately 2 miles south from the main campus. Shuttles are available for travel back and forth from BELL to ENRC and CSRC. Please refer to the shuttle schedule for more information.

**BMEG Teaching Laboratory**
BMEG Teaching Laboratory is located at **ENGR 119**, and is used for BMEG laboratory courses such as Bioinstrumentation, Biomaterials, Biomolecular Engineering, Systems and Signals Analysis and Biomedical Microscopy.

**BMEG Design Laboratory**
BMEG Design Laboratory is located at **ENGR 113**, and is used by students enrolled in Biomedical Design Courses. The laboratory is fully equipped with the resources needed to design, fabricate and test biomedical prototypes.

**BMEG Computer Lab**
BMEG Computer Lab is located at **ENGR 109**, and is available for all BMEG students to use during and after hours.

**vLab**
Students can access latest versions of several computer lab software (e.g. MATLAB) virtually from any computer through vLab, a virtual Windows desktop provided by the IT services. Please refer to the website (http://vlab.uark.edu/) for instructions and a list of available software.

**MATLAB**
Students may also download and activate MATLAB on their personal computers free of charge through IT services.
# Biomedical Engineering Curriculum

## Catalog Required Biomedical Engineering Curriculum

### Freshman Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENG 1111 Introduction to Engineering I</td>
<td>1</td>
</tr>
<tr>
<td>MATH 2554 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1103 University Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 2054 University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 1013 English Composition I</td>
<td>3</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td><strong>15</strong></td>
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</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</thead>
<tbody>
<tr>
<td>BMEG 2613 Introduction to BME</td>
<td>3</td>
</tr>
<tr>
<td>Sophomore Science Elective with Lab**</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2574 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 1543/41L Principles of Biology</td>
<td>4</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMEG 3634 Biomaterials</td>
<td>4</td>
</tr>
<tr>
<td>BMEG 3124 Biomed Signals &amp; Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 3603/01L Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEG 2313 or MEEG 2403 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>18</strong></td>
<td><strong>18</strong></td>
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</table>

### Senior Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
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</thead>
<tbody>
<tr>
<td>BMEG 4813 Biomedical Engineering Design I</td>
<td>3</td>
</tr>
<tr>
<td>BMEG 4623 Biomedical Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>BMEG Elective</td>
<td>3</td>
</tr>
<tr>
<td>Science Elective</td>
<td>3</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>15</strong></td>
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</tbody>
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*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 Science Elective) or CHEM 1123/1121L (if PHYS 2074 was chosen as the Freshman Engineering Science Elective. That is, both courses are required for the degree)**
# Pre-Med/Recommended Biomedical Engineering Curriculum

## Freshman Year

<table>
<thead>
<tr>
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<tbody>
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</tr>
<tr>
<td>CHEM 1103 University Chemistry I</td>
<td>3</td>
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<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMEG 2613 Introduction to BME</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 2074 University Physics II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2574 Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 3603/01L Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 2533 Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
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</tr>
<tr>
<td>CHEG 2313 or MEEG 2403 Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 2213/1L Human Physiology</td>
<td>4</td>
</tr>
<tr>
<td>Social Science Elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>
Science Electives
Students can select from the following or others approved by department:

BIOL 2323 General Genetics         CHEM 2263 Analytical Chemistry
BIOL 2443 Human Anatomy             CHEM 2613 Organic Physiological Chemistry
BIOL 2013 General Microbiology      CHEM 3203 Forensic Chemistry
BIOL 4263 Cell Physiology           CHEM 3453 Elements of Physical Chemistry
BIOL 4313 Molecular Cell Biology    CHEM 3504 Physical Chemistry I
BIOL 4653 Cancer Biology            CHEM 3514 Physical Chemistry II
BIOL 4713 Basic Immunology          CHEM 3813 Introduction to Biochemistry
                                    CHEM 4813H Honors Biochemistry I
                                    CHEM 4843H Honors Biochemistry II

BMEG Electives
Students should select from the following list based on their field of interest. Check with department regarding updated list every semester:

BIOL 4167 Dynamic Models in Biology
BIOL 4233 Genomics and Bioninformatics
BMEG 4404 Biomedical Microscopy (Irr)
BMEG 4243 Advanced Biomaterials and Biocompatibility (Irr)
BMEG 4103L/M Nanotechnology Laboratory (Fa)
BMEG 4213 Cell and Tissue Mechanics (Irr)
BMEG 4413 Tissue Engineering (Irr)
BMEG 4513 Biomedical Optics and Imaging
BMEG 470V Special Topics in Biomedical Engineering (Irr) : Varies by semester
BMEG 460V Individual Study*
BMEG 460VH Honors Individual Study*
BMEG 450V Honors Thesis*

Biomedical engineering-related courses in College of Engineering (4000 or above) approved by advisor and undergraduate coordinator

* Between BMEG 460V, 460VH and 450VH, up to 3 hours total may be counted towards a BMEG elective requirement.
Fine Arts, Humanities Requirement (6 hours)
Select 3 hours each from categories “a” and “b”

a. Fine Arts:
   - ARCH 1003 Basic Course in the Arts: Architecture Lecture
   - ARHS 1003 Basic Course in the Arts: Art Lecture
   - COMM 1003 Basic Course in the Arts: Film Lecture
   - DANC 1003 Basic Course in the Arts: Movement and Dance
   - DRAM 1003 Theater Appreciation
   - LARC 1003 Basic Course in the Arts: The American Landscape
   - MLIT 1003 Basic Course in the Arts: Music Lecture
   - MLIT 1013 Music Lecture for Music Majors

b. Humanities
   - Any intermediate I foreign language*
   - ARCH 1013 Diversity and Design
   - CLST 1003 Intro to Classical Studies: Greece
   - CLST 1013 Intro to Classical Studies: Rome
   - COMM 1233 Media, Community and Citizenship
   - HUMN 1124H Honors Equilibrium of Cultures, 500-1600
   - HUMN 2003 Intro to Gender Studies
   - HUMN 2124H Honors Twentieth Century Global Culture
   - PHIL 2003 Intro to Philosophy
   - PHIL 2103 Intro to Ethics
   - PHIL 2203 Logic
   - PHIL 3103 Ethics and the Professions
   - WLIT 1113 World Literature I
   - WLIT 1123 World Literature I

*Typically numbered 2003. See Department of World Languages, Literatures and Cultures in the J. William Fulbright College of Arts and Sciences chapter in the Undergraduate Catalog.

Social Sciences Requirement (9 hours)
Select from at least two different fields of study

AGEC 1103 Principles of Agricultural Microeconomics
AGEC 2103 Principles of Agricultural Macroeconomics
ANTH 1023 Intro to Cultural Anthropology
COMM 1023 Communication in a Diverse World
ECON 2013 Principles of Macroeconomics
ECON 2023 Principles of Microeconomics
ECON 2143 Basic Economics: Theory and Practice
GEOG 1123 Human Geography
GEOG 2003 World Regional Geography
HESC 1403 Life Span Development
HESC 2413 Family Relations
HIST 1113 Institutions and Ideas of World Civilizations I
HIST 1123 Institutions and Ideas of World Civilizations II
HIST 2003 History of the American People to 1877**
HIST 2013 History of the American People 1877 to Present**
HUMN 1114H Honors Roots of Culture to 500 C.E.
HUMN 2114H Honors Birth of Modern Culture, 1600-1900
PLSC 2003 American National Government**
PLSC 2013 Intro to Comparative Politics
PLSC 2203 State and Local Government
PSYC 2003 General Psychology
RESM 2853 Leisure and Society
RSOC 2603 Rural Sociology
SOCI 2013 General Sociology
SOCI 2033 Social Problems

** If not selected to meet the three hours of U.S. History requirement

Please refer to the Undergraduate Course Catalog for more complete information on degree requirements and academic policy.
Biomedical Engineering Curriculum Flowchart
Please refer to the Student Resources section on the BMEG departmental website for the most up-to-date curriculum flowchart.

Advising Procedures
At the beginning of the sophomore year, each student is assigned an adviser to help select courses that fit within the required program of study and to assure that courses are taken in the appropriate sequence. **Prior to registering for the next semester, each student must meet with his/her adviser to go over the progress and to select courses.** Students will not be able to register unless their adviser removes the advising hold in UAConnect.

Procedures to complete before seeing your adviser:

1. Fill out/update your Biomedical Engineering Undergraduate Advising Sheet with all course credits you have earned. Bring this form to advising. It will be submitted to the adviser at advising.
2. Refer to the Biomedical Engineering Undergraduate Flow Chart and select courses for next semester and enter these into the Advising Sheet. Look up courses in UAConnect and/or the Undergraduate Course Catalog for a complete, up-to-date listing of pre-requisites and co-requisites.
3. Using UAConnect, access the Schedule of Classes and prepare a trial schedule. Make sure required course pre-requisites are complete and that you sign up for course co-requisites.
4. In UACONNECT, check your assigned advisor before your advising session.
5. Check the advising schedule provided by the Program Coordinator and/or by your academic advisor by email and plan on meeting with your advisor ASAP to ensure that their advising holds are removed in time for registration. Your advisor may choose to participate in group advising (pre-scheduled blocks of time) or by appointment only.
6. Remember that all registration holds (negative service indicators) must be removed before you can register. Such holds include advising holds but can also be financial holds from Parking and Transit, Student Health Center, or the Treasurer’s Office. Once all holds are removed, you may register in UACONNECT during your assigned registration period.

Academic advising is a service provided by the University to assist students in making thoughtful decisions related to their academic experiences, and maximizing their educational and career opportunities. Our faculty advisers do their best to work with you, but remember that the student possesses the final responsibility for successful completion of a degree.
Registration

UAConnect
The University requires students to use UAConnect to view the schedule of classes and to register for classes. For assistance with UAConnect for registration, contact the Registrar’s Office (575-5451) or UAConnect help.

Registration periods
Students must register during one of the formal registration periods. Visit UAConnect to view your available registration dates.

Schedule Changes and Add/Drop
Students can make changes to their schedules (add and/or drop courses) using UAConnect during the first five class days of the semester. A student may drop a full-semester course during the first 10 class days without having the drop shown on the official academic record. After the first 10 class days, and before the drop deadline of the semester, a student may drop a course, but a mark of “W” (withdrawal) will be recorded. For fee refund schedules and add/drop deadlines for specific semesters, refer to the Academic Semester Calendar at the Registrar’s Office.

Registration Overrides
Students unable to register for Engineering courses due to pending transfer credits causing pre- and co-requisite conflicts, time conflicts or class full may be placed in a course upon case-by-case approval from the course instructor(s) and the undergraduate coordinator within the enrollment period.

If a student needs a temporary override to register for a BMES course due to pre/co-requisites, class full, and/or instructor permission needed, the student should (for time conflict or non-BMES courses, see next section):

1. Fill out and submit the Biomedical Engineering Online Course Override Form available through the Student Resources section of the BMES departmental website.
2. Upon approval from the course instructor and the undergraduate coordinator, the student should be able to register for the course. It is the student’s responsibility to make sure that the credits for pre-requisite courses are transferred in time before the start of the semester. Pre- and co-requisite courses are checked at the beginning of the semester and students not meeting pre-requisites or co-requisites will be dropped from the enrolled course.

If a student needs an override to register for an Engineering course (outside of BMES) or a BMES course for reasons due to time conflict, the student should:

1. Fill out the College of Engineering Override Form. Obtain course information directly from UACONNECT and specifically indicate reason for override in “Comments” section in addition to checking all reasons that apply.
2. Contact the course instructor and obtain his/her approval and signature on the form.
3. Contact the **undergraduate coordinator** and obtain his/her approval and signature on the form in the section for Department Head’s Approval.
4. Submit the completed override form to the **Student Records Office, BELL 3189**.

Students that require override for courses **outside the College of Engineering** should contact the home department of the course for which they are enrolling and follow appropriate procedures required by the department.

**Transfer/Study Abroad**

- If you are transferring into BMEG from a different department/college/institution, please consult the **undergraduate coordinator** regarding your course transfers.
- If you wish to obtain credit for a class taken at another institution or by tests, you may look up **course equivalencies** on the [Registrar’s website](#). Please discuss further questions with your adviser and/or the undergraduate coordinator.

**Honors Program**

The Honors Program in the Department of Biomedical Engineering is designed for high-ability students who are interested in more vigorous and in-depth academic challenges. In order to graduate from the Honors Program, students must take a **minimum of 12 hours of honors courses**, with **at least 6 of the 12 hours in BMEG** including BMEG 450VH Honors Thesis as an honors student in the Department of Biomedical Engineering. Below are the honors courses offered in the BMEG department of which one is required:

- BMEG 3653H Biomedical Modeling and Numerical Methods
- BMEG 3824H Biomolecular Engineering
- BMEG 4623H Biomedical Transport Phenomena

In addition to the honors coursework, honors students are required to complete an **honors thesis research project** under the direction of a faculty mentor. Please refer to the [Biomedical Engineering Honors Program Handbook](#) for more details regarding the requirements and benefits of the Honors Program.
Undergraduate Research

Opportunities are available for undergraduate BMEG students to participate in research. Students can participate through the Honors Program, as well as just by working with an individual faculty member. Refer to the BMEG departmental website for descriptions of research activities within the department. A student may get involved in research by contacting individual faculty members about their research program. Research funding and/or student stipends are available through resources such as SURF (Statewide Undergraduate Research Fellowships) and Honors College Undergraduate Research Grants through the Honors College. Refer to the Honors College website for more information.

Student Organizations

Biomedical Engineering Society (BMES)

Faculty Advisor: Dr. Kartik Balachandran (kbalacha@uark.edu)

The Biomedical Engineering Society at the University of Arkansas promotes the education and advancement of biomedical engineering by engaging members in insightful discussions and organized events. Its goals are to:

1. Introduce current research being conducted by UA professors as well as those from other institutions.
2. Explore professional opportunities in industry, medicine and academia.
3. Provide a networking platform for members to gain experience in biomedical engineering through internships.

Refer to http://www.uark.edu/rso/bmes/ or email at bmes@uark.edu for more information.

Engineering World Health (EWH)

Faculty Advisor: Dr. Jeffrey Wolchok (jwolchok@uark.edu)

The Engineering World Health (EWH) chapter exists to inspire and mobilize the biomedical engineering community to improve the quality of health care in the developing world. Specifically, to provide members with enhanced opportunities to participate in EWH activities, such as designing novel medical technologies appropriate for developing countries building medical devices for use in developing countries, and promoting understanding and goodwill between the developed and developing world.

Email ewh@uark.edu for more information.
Master of Science in Biomedical Engineering
Handbook

Department of Biomedical Engineering
University of Arkansas
120 John A. White, Jr. Engineering Hall
Fayetteville, AR 72701

Approved by the BMEG Graduate Committee on 09/23/2016
Approved by the BMEG Department on 10/17/2016
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M.S. BIOMEDICAL ENGINEERING

The M.S. Biomedical Engineering program is designed to prepare graduates for careers in biomedical engineering in industry, government agencies, engineering firms or consulting firms and to provide a foundation for continued study at the post-master's level. Both thesis and non-thesis options are available for the M.S. Biomedical Engineering degree.

1. Admission Requirements

Admission to the M.S. Biomedical Engineering program is a two-step process. First, the prospective student must be admitted to graduate standing by the University of Arkansas Graduate School. For complete details visit [http://catalog.uark.edu/graduatecatalog/admissions/](http://catalog.uark.edu/graduatecatalog/admissions/).

Second, the student must be admitted to the M.S. Biomedical Engineering program on the basis of academic transcripts, standardized test scores, three letters of recommendation and a statement of purpose. See below for a summary of admissions requirements. Students with a non-engineering degree or a non-ABET-accredited engineering degree must demonstrate completion of the Basic Engineering Education Requirements prior to being admitted.

Summary of requirements for admission to the M.S. Biomedical Engineering program:

1. A B.S. or M.S. degree in engineering or engineering equivalent or completion of the Basic Engineering Education Requirements (see below) with a GPA of at least 3.0.
2. A GPA of 3.0 or higher on the last 60 hours of the baccalaureate degree.
3. A GRE score of 302 or above (verbal and quantitative).
4. A TOEFL score of at least 213 (computer-based) or 80 (internet based). This requirement is waived for applicants whose native language is English or who earn a bachelor’s or master's degree from a U.S. institution.
5. Three letters of recommendation (submitted through the Graduate School or directly to bmegrad@uark.edu)
6. Statement of Purpose (submitted through the Graduate School or directly to bmegrad@uark.edu)
7. A member of the core or affiliated BMEG faculty who is eligible (graduate status of group III or higher) must agree to serve as the Major Advisor to the prospective student.

1.1 Basic Engineering Education Requirements:

Prior to gaining admission into the M.S. Biomedical Engineering program, students with a non-engineering degree or a non-ABET-accredited engineering degree must demonstrate completion of the following coursework with a GPA of at least 3.0: 15 hours of Humanities/Social Sciences, 6 hours of English Composition, 16 hours of Mathematics (including Calculus I, Calculus II, Calculus III and Differential Equations), 8 hours of University-level Biology, 8 hours of University-level Chemistry, 8 hours of University-level (calculus-based) Physics, and 15 hours of Basic Engineering Topics (selected from courses such as Biomechanics, Thermodynamics, Bioinstrumentation, Fluid Mechanics, Transport Phenomena and others). Students are encouraged to consult the BMEG graduate coordinator regarding appropriate coursework. Upon completion, students must submit a completed Basic Engineering Education Requirements Form to the Graduate Coordinator.
1.2 Selection of Major Advisor

The Major Advisor must be either a core or affiliated faculty member in the Department of Biomedical Engineering. The name of the Major Advisor is provided to the Graduate School at the same time that admission to the department's graduate program is granted. Therefore, it is suggested that prior to applying, all prospective students contact faculty members with whom they share mutual research interests. It is essential that the prospective student and Major Advisor have open honest discussions concerning the expectations of each relative to the other before final selection is made.

Circumstances may arise in which the Major Advisor has not been selected prior to admission to the department's graduate program. In such cases, the department head or his/her designee will serve as the student's research advisor until a permanent advisor is selected. This should occur no later than the end of the first semester of graduate study and, in most situations, it is expected that the selection process will be made early in the first semester.

The selection of a research advisor is mutual; that is, the professor also chooses the students with whom he or she wishes to work. In addition, the interest of the Major Advisor is, by necessity, often driven by research contracts. Thus, the research area chosen by the student is expected to fit into the overall research program of the advisor.

If a student wishes to change Major Advisors, the request should be made both orally and in writing to the department head. The department head will consult with all parties involved before establishing the conditions, if any, under which the change may be made. Similarly, the student should consult with the department head in situations where his or her Major Advisor is unable to continue to serve in that capacity.

1.3 Deadlines

The application deadlines for the M.S. program are April 1, September 1, and February 1 for the Fall, Spring and Summer semesters, respectively. Applications sent after the deadline will be considered on a case-by-case rolling basis.
2. Degree Requirements

Both thesis and non-thesis options are available for the M.S. Biomedical Engineering degree. In general, students pursuing the thesis option are supported by research or teaching assistantships and conduct research under the guidance of a major advisor. Students pursuing the non-thesis options are typically not sponsored. For either option, all course work must be approved by the student's Program Advisory Committee. The cumulative grade-point average on all graduate courses presented for the degree must be at least 3.0.

**Thesis Option**: 24 graduate semester hours, including 12 hours of Biomedical Engineering Graduate Core as identified below, plus 6 hours of research resulting in a written master's thesis. Candidates must pass a comprehensive final examination that will include an oral defense of the master's thesis. The examination is prepared and administered by the student's Thesis Committee.

**Non-thesis Option**: 30 graduate semester hours, including 12 hours of Biomedical Engineering Graduate Core as identified below. Candidates must pass a comprehensive written final examination. The examination is prepared and administered by the student's Program Advisory Committee.

2.1 Curriculum

2.1.1 Biomedical Engineering Graduate Core (12 hours)

1. BMEG 5103 Design and Analysis of Experiments in Biomedical Research
2. BMEG 5203 Mathematical Modeling of Physiological Systems
3. BMEG 5504 Biomedical Microscopy
4. BMEG 5801 Graduate Seminar I
5. BMEG 5811 Graduate Seminar II

**NOTE**: BMEG graduate students must be enrolled in Graduate Seminar every semester. If the student has completed the 5801/5811 sequence, then they are required to enroll in 5800 and 5810 until graduation.

2.1.2 Transfer of Credit

A maximum of 6 hours of course work may be transferred from another institution towards a master's degree at the University of Arkansas. An official transcript must be on file with the Graduate School. The Request for Transfer of Graduate Credit Form must be submitted to the Graduate School.

The following are the criteria for acceptable transfer credit:
1. The course must have been regularly offered by a regionally accredited graduate school.
2. The course must have been a bona fide graduate level course, approved for graduate credit and taught by a member of the graduate faculty.
3. The student desiring to transfer graduate credit must have been enrolled as a graduate student in the graduate school at the institution offering the course.
4. The course must appear on an official transcript as graduate credit from the institution offering the course.
5. The grade on the course must be a "B" or "A". (The student's grade point average is NOT to include grades on transfer courses.)
6. The course must be recommended by the student's major advisor and be applicable to the degree requirement at the University of Arkansas.
7. The course must not have been taken by correspondence or for extension credit.
8. The course must be acceptable to the department concerned and to the Graduate Dean.
9. The student must have satisfied the 24-week state residence requirements.
10. The course must have been taken within the time limit of the student's program at the University of Arkansas.
11. Credit from foreign universities is typically not acceptable for transfer because of academic and procedural differences between U.S. regionally accredited and foreign institutions, but petition may be made to the Graduate Dean on a case by case basis.

2.1.3 Retroactive Graduate Credit

Graduate students fully admitted into a degree program may request that up to twelve hours of courses taken in the final semester of their undergraduate degree count toward their graduate degree, if these courses were taken on the University of Arkansas, Fayetteville campus. These courses may not have been used for the undergraduate degree, must be approved by the student's advisory committee, and must be at the 5000 level or above. The Request for Retroactive Graduate Credit Form must be submitted to the Graduate School.

Note: If a student receives financial aid in their final semester in the baccalaureate program, no courses used to fulfill the minimum enrollment requirement for financial aid will be retroactively changed to graduate credit.

2.1.4 Course Repetition

Graduate students who attended the University of Arkansas, Fayetteville for their bachelor's degree should not enroll in the graduate version of any course they completed as an undergraduate. If a student previously completed one of the required BMEG graduate core courses as an undergraduate, they will be allowed to replace that core course with any graduate level course.

2.1.5 3000-Level Courses

Courses numbered at the 3000-level may be taken by graduate students for graduate credit only when the courses are not in the student's major area of study and when the courses have been approved by the Dean of the Graduate School for graduate credit in the student's program before the Official Enrollment Report (commonly the eleventh class day). The instructor of the proposed course must hold graduate faculty status. No more than 20 percent of the graded course work in the degree program may be comprised of 3000-level courses carrying graduate credit. The Request for Graduate Credit for 3000 or 4000 Level Courses Form must be processed by the Graduate School before the course begins.

At least 50% of the credits (whether coursework or research) presented for the degree must be at the 5000 level or above.
2.1.6 4000-Level Courses

Because 4000-level courses can carry dual level credit, a 4000-level course which has specifically been created to carry ONLY undergraduate credit must be individually petitioned to carry graduate credit. The Request for Graduate Credit for 3000 or 4000 Level Courses Form must be processed by the Graduate School before the course begins.

At least 50% of the credits (whether coursework or research) presented for the degree must be at the 5000 level or above.

2.2 Master’s Program Advisory Committee

The Master's Program Advisory Committee is comprised of at least three members of the graduate faculty including the Major Advisor who serves as Chair. At least one member must be selected from the core Biomedical Engineering faculty and at least two members must be selected from the Biomedical Engineering program faculty which includes non-departmental affiliated faculty. All members of the committee must be members of the Graduate Faculty of the University of Arkansas. The Major Advisor, in consultation with the student, selects the Advisory Committee, subject to review and approval by the Engineering Academic Programs Committee and the Dean of the Graduate School.

The Program Advisory Committee should be assembled within one year of entering the program. Once the Advisory Committee has been selected, the Master's Program Advisory Committee Form must be submitted to the Graduate School.

The Advisory Committee oversees the student's program of study. All decisions of the Advisory Committee are made by majority vote. In the situation when there is a split decision among Advisory committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's advisory committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

The Advisory Committee must be kept at its full complement throughout the graduate career of the individual student. In the event of a vacancy on the Advisory Committee (occasioned by resignation, faculty leave, or inability to serve), an appropriate replacement must be made prior to the making of any committee decision. In the case of resignation, the Committee member must formally resign in a letter to the Graduate School. The Major Advisor must write a letter to add a new member, and the form specifying membership in the Advisory Committee must be resubmitted.

All decisions of the Advisory Committee are made by majority vote. The Major Advisor is responsible for transmitting Advisory Committee decisions to the Engineering Academic Programs Committee and the Dean of the Graduate School.
2.3 Master’s Thesis Title (thesis option only)

The Master’s Thesis Title Form, consisting of the title of the thesis and approved by the thesis director, should be submitted to the Graduate School as soon as the thesis topic has been established but no later than three months prior to the date of the comprehensive examination.

2.4 Master’s Thesis Committee (thesis option only)

The Master’s Thesis Committee, or Thesis Committee, is responsible for insuring that the thesis presented meets high academic standards and constitutes a significant contribution to the knowledge of the study area. The Thesis Committee supervises the preparation, submission and defense of the dissertation.

In most instances, the student’s Advisory Committee and Thesis Committee will have the same composition. Like the Advisory Committee, the Thesis Committee is comprised of at least three members of the graduate faculty including the Major Advisor who serves as Chair. At least one member must be selected from the core Biomedical Engineering faculty and at least two members must be selected from the Biomedical Engineering program faculty which includes non-departmental affiliated faculty. All members of the committee must be members of the Graduate Faculty of the University of Arkansas and must possess full Graduate Faculty status. The Major Advisor, in consultation with the student, selects the Thesis Committee, subject to review and approval by the Engineering Academic Programs Committee and the Dean of the Graduate School. Once the Thesis Committee has been selected, the Master’s Thesis Committee Form must be submitted to the Graduate School at least three months prior to the date of the comprehensive examination.

All decisions of the Thesis Committee are made by majority vote. In the situation when there is a split decision among Thesis committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's thesis/dissertation committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

The Major Advisor is responsible for transmitting Thesis Committee decisions to the Engineering Academic Programs Committee and the Dean of the Graduate School.

2.5 Annual Progress Reports

Each student in the BMEG graduate program is required to submit a completed MS BMEG Progress Report to the graduate coordinator by June 30th of each year. The Progress Report includes a brief summary of the student's academic and research progress in the previous year as well as a brief discussion of plans for the upcoming year. The report must be presented in-person to the Advisory Committee (either via individual or group meetings) for full approval. The purpose of the Annual Progress Report is to keep the Advisory Committee informed of progress so that it can function in its intended capacity. It also provides an opportunity for the student and the Major Advisor to gauge progress and adjust the program if necessary.
In addition to the BMEG Graduate Student Progress Report, the student and the Major Advisor are required to submit the Annual Graduate Student Academic Review Form to the Graduate School by June 30th of each year.

2.6 Master’s Thesis (thesis option only)

The Master’s Thesis is the culmination of the student’s study and research in a M.S. degree program. This work should represent a significant contribution to the knowledge of the study area. It is expected that the Master’s Thesis be of sufficient quality to allow for at least 1 first author publication by the student in peer-reviewed, mid-tier journals indexed on PubMed. This guideline is not intended to represent a required minimum or maximum number of publications required for graduation. Evaluation of whether the student’s scientific contributions satisfy the MS degree requirements will ultimately be made by the Thesis Committee.

The subject should be current and pertinent to the discipline; the language should be clear and free from jargon; the grammar should be perfect; and the style, format, and quality of paper MUST meet requirements stated in the Guide for Preparing Theses and Dissertations. The Thesis must be distributed to the Thesis committee at least one week prior to the oral defense. It is expected that the Master’s Thesis be of sufficient quality to allow for publication in a peer-reviewed journal.

2.7 Comprehensive Examination

All students in the M.S. Biomedical Engineering program must pass a comprehensive examination. The exam should be scheduled at least two weeks before the final submission deadline to allow sufficient time for corrections to the thesis (Thesis option) or grading (Non-thesis option). Consult the Graduate School website for submission deadlines.

For the Thesis option, the comprehensive examination is an oral defense of the Master’s thesis. The student is expected to demonstrate technical competence in the field directly related to the thesis research as well as a broader understanding of biomedical engineering research and the scientific method. The oral defense also assesses the student’s ability to respond to questions in a rational, knowledgeable manner.

The comprehensive examination for the Thesis option is administered by the Thesis Committee. All members of the Thesis Committee must participate in the final oral defense of the thesis. This participation may be by distance. If they do not participate in the final oral defense, in person or by distance, they will be asked by the Graduate School to resign from the committee.

The Thesis Committee will evaluate the student using the M.S. Thesis Evaluation Form. Each committee member will fill out this form, provide comments/recommendations to the student and provide a (I) pass, (II) pass with contingency, or (III) fail decision. The student’s major advisor will then collate the forms and deliver the final decision with comments/recommendations to the student. An absolute majority pass decision is required for a student to pass the examination. If any committee member indicates a pass with contingency or fail decision, the deficiencies or concerns, together with recommendations have to be explicitly stated by the committee member. The student will then have to address any deficiencies or recommendations raised by that
member, to the satisfaction of each committee member. In rare instances, another defense may be required.

In the situation when there is a split decision among Thesis committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's advisory committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

After passing the oral defense, the Thesis Committee will sign the Master's Degree Record of Progress Form.

For the Non-thesis option, the comprehensive examination is an extensive written test of knowledge comprised of topics covered by the Biomedical Engineering Graduate Core courses. The comprehensive examination for the Non-thesis option is administered by the Program Advisory Committee. After passing the comprehensive examination, the Advisory Committee will sign the Master’s Degree Record of Progress Form.

Students may retake a failed comprehensive exam once upon the approval of the student's Thesis Committee (for Thesis option) or Advisory Committee (for Non-thesis option). A student who fails the comprehensive examination twice will be terminated from the program. Under no circumstances will a student be allowed to take the comprehensive examination more than twice.

2.8 M.S. BMEG Program Requirements Checklist

Prior to obtaining the BMEG Graduate Coordinator’s signature on the Master's Degree Record of Progress Form, students must complete the M.S. BMEG Degree Requirements Check Form.

3. Other Academic Requirements/Policies

3.1 Getting Ready to Graduate

At the beginning of the semester the student anticipates graduating, he/she should download the relevant Graduation Checklist (Spring, Summer or Fall). The Graduation Checklist contains all important deadlines that must be met prior to graduation.

3.2 Tax Guidelines

Students are strongly encouraged to consult the Tax Guidelines for Graduate Students to learn about tax rules of interest to graduate students.
3.3 Academic Dismissal and Grade Point Requirements

Students may be dropped from further study in the Graduate School if at any time their performance is considered unsatisfactory as determined by either the program faculty or the Dean of the Graduate School. Academic dishonesty and failure to maintain a specified cumulative grade point average are considered to be unsatisfactory performance.

The College of Engineering degree requirements state that all students must earn a minimum cumulative grade point average of 3.0 on all graduate courses attempted.

3.4 Time Limit

All requirements for a master's degree must be completed within six consecutive calendar years from the first semester of enrollment in that program.

3.5 Limits on Number of Appointments to a Graduate Assistantship

Students pursuing a master's degree may receive financial support as a graduate assistant for no more than four semesters, excluding summer appointments.

Students should consult the UA Graduate Student Handbook for complete information regarding academic requirements and policies.
4. Master’s Student Forms

4.1 Required Degree Forms

**Master's Program Advisory Committee Form** – Submitted to the Graduate School as soon as the committee has been assembled and within one year of entering the program.

**M.S. BMEG Progress Report** – Submitted to the BMEG Graduate Coordinator by June 30th of each year.

**Annual Graduate Student Academic Review Form** – Submitted to the Graduate School by June 30th of each year.

**Master's Thesis Committee Form** – (Thesis option only) Submitted to the Graduate School when the committee has been assembled and at least three months prior to the date of the comprehensive examination (Same as Program Advisory Committee Form)

**Master's Thesis Title Form** – (Thesis option only) Submitted to the Graduate School when the title of the thesis has been established and at least three months prior to the date of the comprehensive examination

**M.S. BMEG Degree Requirements Check Form** – Submitted to the BMEG Graduate Coordinator after all Coursework and Thesis hours have been completed.

**Master's Degree Record of Progress Form** – Completed after the comprehensive examination. A completed form with original signatures is submitted to the Graduate School

**Intellectual Property Disclosure Form** – (Thesis option only) This form must be submitted to the Graduate School with the final copies of the thesis submitted for deposit in the University Libraries

**Thesis/Dissertation Submission Form** - (Thesis option only) This form must be submitted to the Graduate School with the final copies of the thesis submitted for deposit in the University Libraries

4.2 Other Forms

**Request for Transfer of Graduate Credit Form**

**Request for Retroactive Graduate Credit Form**

**Request for Graduate Credit for 3000 or 4000 Level Courses Form**
Doctor of Philosophy in Engineering
with emphasis in Biomedical Engineering
Handbook

Department of Biomedical Engineering
University of Arkansas
120 John A. White, Jr. Engineering Hall
Fayetteville, AR 72701

Approved by the BMEG Graduate Committee on 09/23/2016
Approved by the BMEG Department on 10/17/2016
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Ph.D. DEGREE IN ENGINEERING
WITH EMPHASIS IN BIOMEDICAL ENGINEERING

The Ph.D. degree in Engineering with emphasis in Biomedical Engineering (BME) 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.

1. Admission Requirements

Admission to the Ph.D. program in Biomedical Engineering is a two-step process. First, the prospective student must be admitted to graduate standing by the University of Arkansas Graduate School. For complete details visit http://catalog.uark.edu/graduatecatalog/admissions/. Second, the student must be admitted to the Ph.D. Biomedical Engineering program on the basis of academic transcripts, standardized test scores, three letters of recommendation and a statement of purpose. See below for a summary of admissions requirements. Students with a non-engineering degree or a non-ABET-accredited engineering degree must demonstrate completion of the Basic Engineering Education Requirements prior to being admitted.

Summary of requirements for admission to the Ph.D. program in Biomedical Engineering:

1. A B.S. or M.S. degree in engineering or engineering equivalent or completion of the Basic Engineering Education Requirements (see below) with a GPA of at least 3.0.
2. A GPA of 3.0 or higher on the last 60 hours of the baccalaureate degree.
3. A GRE score of 302 or above (verbal and quantitative).
4. A TOEFL score of at least 213 (computer-based) or 80 (internet based). This requirement is waived for applicants whose native language is English or who earn a bachelor’s or master’s degree from a U.S. institution.
5. Three letters of recommendation (submitted through the Graduate School or directly to bmegrad@uark.edu)
6. Statement of Purpose (submitted through the Graduate School or directly to bmegrad@uark.edu)
7. A member of the faculty who is eligible (graduate status of group I) must agree to serve as the Major Advisor to the prospective student.

1.1 Basic Engineering Education Requirements:

Prior to gaining admission into the M.S. Biomedical Engineering program, students with a non-engineering degree or a non-ABET-accredited engineering degree must demonstrate completion of the following coursework with a GPA of at least 3.0: 15 hours of Humanities/Social Sciences, 6 hours of English Composition, 16 hours of Mathematics (including Calculus I, Calculus II, Calculus III and Differential Equations), 8 hours of University-level Biology, 8 hours of University-level Chemistry, 8 hours of University-level (calculus-based) Physics, and 15 hours of Basic Engineering Topics (selected from courses such as Biomechanics, Thermodynamics, Bioinstrumentation, Fluid Mechanics, Transport Phenomena and others). Students are encouraged to consult the BMEG graduate coordinator regarding appropriate coursework. Upon completion, students must submit a completed Basic Engineering Education Requirements Form to the Graduate Coordinator.
1.2 Selection of Major Advisor

The Major Advisor must be either a core or affiliated faculty member in the Department of Biomedical Engineering. The name of the Major Advisor is provided to the Graduate School at the same time that admission to the department's graduate program is granted. Therefore, it is suggested that prior to applying, all prospective students contact faculty members with whom they share mutual research interests. It is essential that the prospective student and Major Advisor have open honest discussions concerning the expectations of each relative to the other before final selection is made.

Circumstances may arise in which the Major Advisor has not been selected prior to admission to the department's graduate program. In such cases, the department head or his/her designee will serve as the student's research advisor until a permanent advisor is selected. This should occur no later than the end of the first semester of graduate study and, in most situations, it is expected that the selection process will be made early in the first semester.

The selection of a research advisor is mutual; that is, the professor also chooses the students with whom he or she wishes to work. In addition, the interest of the Major Advisor is, by necessity, often driven by research contracts. Thus, the research area chosen by the student is expected to fit into the overall research program of the advisor.

If a student wishes to change Major Advisors, the request should be made both orally and in writing to the department head. The department head will consult with all parties involved before establishing the conditions, if any, under which the change may be made. Similarly, the student should consult with the department head in situations where his or her Major Advisor is unable to continue to serve in that capacity.

1.3 Assistantships

All students in the Ph.D. program in Biomedical Engineering are supported by Graduate Assistantships or external Fellowships (e.g. NSF or other foundational fellowships) on a 50% appointment. A 50% appointed Graduate Assistant must earn a minimum of 6 credit hours and may register for a maximum of 12 credit hours per semester, although this limit may be exceeded with approval of the Department Head. Reduced appointments, e.g. 25% Graduate Assistantships, are discouraged by the Department and will only be approved in exceedingly rare circumstances.

1.4 Deadlines

The application deadlines for the Ph.D. program are April 1, September 1, and February 1 for the Fall, Spring and Summer semesters, respectively. Applications sent after the deadline will be considered on a case-by-case rolling basis.
2. Degree Requirements

The following list is a summary of the degree requirements for the Ph.D. in Engineering with emphasis in Biomedical Engineering. Detailed information can be found in subsequent sections.

1. Complete an Annual Progress Report for each year of study.
2. Complete at least 42 graduate semester hours. Students holding a MS degree may request a reduction of their program of study of up to 24 graduate semester hours with approval of their Program Advisory Committee.
3. Complete 30 dissertation hours. Students holding a MS degree may request a reduction of their program of study of up to 6 thesis hours with approval of their Program Advisory Committee.
4. Pass the candidacy exam.
5. Complete two semesters of teaching assignments.
6. Submit and defend the final dissertation.

2.1 Curriculum

Students pursuing a Ph.D. in Engineering with emphasis in Biomedical Engineering must complete 42 graduate semester hours beyond the B.S. degree including 12 hours of Biomedical Engineering Graduate Core, at least 6 hours of Life Sciences Electives and at least 9 hours of Engineering Electives. All coursework must be at the 5000 level or above unless a request has been approved to use 3000-level or 4000-level courses for graduate credit.

2.1.1 Biomedical Engineering Graduate Core (12 hours)

1. BMEG 5103 Design and Analysis of Experiments in Biomedical Research
2. BMEG 5203 Mathematical Modeling of Physiological Systems
3. BMEG 5504 Biomedical Microscopy
4. BMEG 5801 Graduate Seminar I
5. BMEG 5811 Graduate Seminar II

NOTE: BMEG graduate students must be enrolled in Graduate Seminar every semester. If the student has completed the 5801/5811 sequence, then they are required to enroll in 5800 and 5810 until graduation.

2.1.2 Transfer of Credit

For doctoral degrees, UA does not officially transfer graduate credits from other institutions. However, students holding a MS degree may apply up to 24 graduate semester hours to their degree requirements with approval of their Program Advisory Committee. The student’s program of study can be adjusted in lieu of work taken at other colleges or universities and recognized by the candidates’ committee but it will not appear on the University of Arkansas academic record.
2.1.3 Retroactive Graduate Credit

Graduate students fully admitted into a degree program may request that up to twelve hours of courses taken in the final semester of their undergraduate degree count toward their graduate degree, if these courses were taken on the University of Arkansas, Fayetteville campus. These courses may not have been used for the undergraduate degree, must be approved by the student’s advisory committee, and must be at the 5000 level or above. The Request for Retroactive Graduate Credit Form must be submitted to the Graduate School.

Note: If a student receives financial aid in their final semester in the baccalaureate program, no courses used to fulfill the minimum enrollment requirement for financial aid will be retroactively changed to graduate credit.

2.1.4 Course Repetition

Graduate students who attended the University of Arkansas, Fayetteville for their bachelor's degree should not enroll in the graduate version of any course they completed as an undergraduate. If a student previously completed one of the required BMEG graduate core courses as an undergraduate, they will be allowed to replace that core course with any graduate level course, as recommended by their Program Advisory Committee.

2.1.5 3000-Level Courses

Courses numbered at the 3000-level may be taken by graduate students for graduate credit only when the courses are not in the student's major area of study and when the courses have been approved by the Dean of the Graduate School for graduate credit in the student's program before the Official Enrollment Report (commonly the eleventh class day). The instructor of the proposed course must hold graduate faculty status. No more than 20 percent of the graded course work in the degree program may be comprised of 3000-level courses carrying graduate credit. The Request for Graduate Credit for 3000 or 4000 Level Courses Form must be processed by the Graduate School before the course begins.

A minimum of 50% of the first 30 hours and at least 42 of the total credit hours presented for the degree must be at the 5000 level or above.

2.1.6 4000-Level Courses

Because 4000-level courses can carry dual level credit, a 4000-level course which has specifically been created to carry ONLY undergraduate credit must be individually petitioned to carry graduate credit. The Request for Graduate Credit for 3000 or 4000 Level Courses Form must be processed by the Graduate School before the course begins.

A minimum of 50% of the first 30 hours and at least 42 of the total credit hours presented for the degree must be at the 5000 level or above.
2.2 Doctoral Program Advisory Committee

The student's Doctoral Program Advisory Committee, or simply Advisory Committee, is comprised of at least four members of the graduate faculty including the Major Advisor who serves as Chair. At least two members must be selected from the core Biomedical Engineering faculty and at least one member must not be affiliated with the Biomedical Engineering program. All members of the committee must be members of the Graduate Faculty of the University of Arkansas.

The Program Advisory Committee should be assembled within one year of entering the program. Once the Advisory Committee has been selected, the Doctoral Program Advisory Committee Form must be submitted to the Graduate School.

The Program Advisory Committee oversees the student's program of study and administers the BMEG Doctoral Candidacy Examination. All decisions of the Advisory Committee are made by majority vote. In the situation when there is a split decision among Advisory committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's advisory committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

2.3 BMEG Doctoral Candidacy Examination/Proposal

The Ph.D. candidacy examination consists of both written and oral components not only covering general didactic knowledge in biomedical engineering but also measuring the student’s potential preparedness in a narrowly focused area sufficient to propose a rigorous research plan. The written component is a proposal encompassing the student's dissertation research and should include the following seven components: 1) Background or literature review; 2) Preliminary Data; 3) Hypothesis or Objective; 4) Specific Aims; 5) Research Strategy; 6) Timeline for completion of the proposed work; and 7) Cited References.

The proposal must be distributed to the committee at least one week prior to the oral examination. The candidacy examination should be scheduled after enough preliminary data has been gathered to allow the Advisory Committee to assess the feasibility of the proposed research, yet
sufficiently early so that revisions to the research plan do not result in significant lost effort. The candidacy examination should be completed by the end of the 3rd year after enrolling in the program with a B.S. degree or by the end of the 2nd year after enrolling in the program with a M.S. degree.

The Program Advisory Committee will evaluate the student using the Ph.D. Candidacy Evaluation Form. Each committee member will fill out this form, provide comments/recommendations to the student and provide a (I) pass, (II) pass with contingency, or (III) fail decision. The student’s major advisor will then collate the forms and deliver the final decision with comments/recommendations to the student. An absolute majority pass decision is required for a student to pass the examination. If any committee member indicates a pass with contingency or fail decision, the deficiencies or concerns, together with recommendations have to be explicitly stated by the committee member. The student will then have to address any deficiencies or recommendations raised by that member, to the satisfaction of each committee member.

In the situation when there is a split decision among Advisory committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's advisory committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

Only after passing the candidacy exam is the student recognized by the Graduate School as a Ph.D. candidate. The Major Advisor submits the Candidacy Exam Notification Form to the Graduate School on behalf of the Advisory Committee.

Students may retake a failed candidacy exam once upon the approval of the student’s Advisory Committee. A student who fails the candidacy examination twice will be terminated from the program. Under no circumstances will a student be allowed to take the candidacy examination more than twice.

### 2.4 Doctoral Dissertation Committee

The Doctoral Dissertation Committee is responsible for insuring that the dissertation contributes new knowledge of fundamental importance or significantly modifies, amplifies, or interprets existing knowledge in a new and important manner. The Dissertation Committee supervises the preparation, submission and defense of the dissertation.

In most instances, the student’s Advisory Committee and Dissertation Committee will have the same composition. Like the Advisory Committee, the Dissertation Committee is comprised of at least four members of the graduate faculty including the Major Advisor who serves as Chair. At least two members must be selected from the core Biomedical Engineering faculty and at least one member must not be affiliated with the Biomedical Engineering program. All members of the committee must be members of the Graduate Faculty of the University of Arkansas and three (including the Major Advisor) must possess full Graduate Faculty status. Once the Dissertation Committee has been selected, the Doctoral Dissertation Committee form must be submitted to the department head and Graduate School at least one year prior to the defense of the dissertation.

All decisions of the Dissertation Committee are made by majority vote. In the situation when there
is a split decision among Dissertation committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's thesis/dissertation committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).

2.5 Annual Progress Reports

Each student in the BMEG graduate program is required to submit a completed PhD BMEG Progress Report to the graduate coordinator by June 30th of each year. The Progress Report includes a brief summary of the student’s academic and research progress in the previous year as well as a brief discussion of plans for the upcoming year. The report must be presented in-person to the Program Advisory Committee, if prior to the candidacy exam, or Dissertation Committee, if after the candidacy exam (either via individual or group meetings) for full approval. The purpose of the Annual Progress Report is to keep the student’s committees informed of progress so that they can function in its intended capacity. It also provides an opportunity for the student and the Major Advisor to gauge progress and adjust the program if necessary.

In addition to the Annual Progress Report, the student and the Major Advisor are required to submit the Annual Graduate Student Academic Review Form to the Graduate School by June 30th of each year.

2.6 Teaching Assignments

Teaching is an integral part of the doctoral student experience. It prepares students for academic and research careers by providing experience in lecturing, tutoring/mentoring and developing laboratory experiments. Teaching also helps students improve their overall communication skills.

Ph.D. students are required to fulfill two teaching assignments as a degree requirement. To count as a teaching assignment, students must be actively engaged in the teaching process. Grading alone will not be sufficient to fulfill this requirement.

For example, Ph.D. students are used in undergraduate courses to:

- Set up and conduct laboratory exercises;
- Periodically deliver lectures;
- Grade homework, lab reports and exams; and
- Supplement faculty office hours.

Upon completion of a teaching assignment, the student will describe his/her teaching responsibilities in section C. Teaching Assignments of the PhD BMEG Degree Requirements Check Form and have the Course Instructor sign off.

2.7 Dissertation

The Doctoral Dissertation is the culmination of the student’s study and research in a Ph.D. degree program. The dissertation should make substantial original contributions through generation of
important new knowledge. It is expected that the Doctoral Dissertation be of sufficient quality to allow for at least 3 first author publications by the student in peer-reviewed, mid-tier journals indexed on PubMed. This guideline is not intended to represent a required minimum or maximum number of publications required for graduation. Evaluation of whether the student's scientific contributions satisfy the PhD degree requirements will ultimately be made by the Dissertation Committee.

The subject should be current and pertinent to the discipline; the language should be clear and free from jargon; the grammar should be perfect; and the style, format, and quality of paper MUST meet requirements stated in the "Guide for Preparing Dissertations" which can be found at: http://grad.uark.edu/dean/PreparingDissertationGuide.pdf. The dissertation must be distributed to the dissertation committee at least one week prior to the oral defense.

2.8 Defense

The oral defense is an oral presentation of the dissertation to the Dissertation Committee. The candidate is tasked with constructing a convincing scientific argument which demonstrates: 1) the ability to clearly define a biomedical engineering research problem; 2) technical competency within his/her field; and 3) an understanding of the impact of the project relative to a broader scientific field.

All members of the dissertation committee must participate in the final oral defense of the dissertation unless the Dean of the Graduate School has approved an exception. This participation may be by distance. If they do not participate in the final oral defense, in person or by distance, they will be asked by the Graduate School to resign from the committee.

The candidate’s defense is mandatorily open to the public. After the presentation, members of the public are excused and the Dissertation Committee is permitted to ask questions related to any aspect of the student's work.

Similar to the Candidacy Examination, the Dissertation Committee will evaluate the student using the Ph.D. Dissertation Evaluation Form. Each committee member will fill out this form, provide comments/recommendations to the student and provide a (I) pass, (II) pass with contingency, or (III) fail decision. The student’s major advisor will then collate the forms and deliver the final decision with comments/recommendations to the student. An absolute majority pass decision is required for a student to pass the examination. If any committee member indicates a pass with contingency or fail decision, the deficiencies or concerns, together with recommendations have to be explicitly stated by the committee member. The student will then have to address any deficiencies or recommendations raised by that member, to the satisfaction of each committee member. In rare instances, another defense may be required.

In the situation when there is a split decision among Dissertation committee members, the situation must be resolved to the satisfaction of each committee member. In the event that each committee member is not satisfied, the committee member may insist on the necessary steps to reach a resolution or elect to step down from the committee. In unusual circumstances, the Dean of the Graduate School may remove a faculty member from a student's advisory committee, or make an alternative arrangement (e.g. assign a representative from the Graduate faculty to serve on the committee).
TWO WEEKS before the defense, the student should request the Doctoral Record of Progress form at the Graduate School office. Upon successful completion of the defense, the Dissertation Committee will sign this form followed by the BMEG Graduate Coordinator. Students should bring the completed PhD BMEG Degree Requirements Form when requesting the graduate coordinator’s signature.

TWO WEEKS before the defense, the student must complete the Doctoral Student Announcement on the Graduate School Website.

2.9 Ph.D BMEG Degree Requirements Form

Prior to obtaining the BMEG Graduate Coordinator’s signature on the Doctoral Record of Progress Form, students must complete the Ph.D. BMEG Degree Requirements Check Form.
3. **Other Academic Requirements/Policies**

3.1 **Getting Ready to Graduate**

At the beginning of the semester the student anticipates graduating, he/she should download the relevant [Graduation Checklist](#) (Spring, Summer or Fall). The Graduation Checklist contains all important deadlines that must be met prior to graduation.

3.2 **Tax Guidelines**

Students are strongly encouraged to consult the [Tax Guidelines for Graduate Students](#) to learn about tax rules of interest to graduate students.

3.3 **Academic Dismissal and Grade Point Requirements**

Students may be dropped from further study in the Graduate School if at any time their performance is considered unsatisfactory as determined by either the program faculty or the Dean of the Graduate School. Academic dishonesty and failure to maintain a specified cumulative grade point average are considered to be unsatisfactory performance.

Students must obtain a minimum 3.0 cumulative grade point average on all graded graduate course work to receive a doctoral degree from the University of Arkansas.

3.4 **Time Limit**

All requirements for a doctoral degree must be completed within seven consecutive calendar years from the date of admission to the program.

3.5 **Limits on Number of Appointments to a Graduate Assistantship**

Students pursuing a doctoral degree beginning with the baccalaureate degree may receive financial support as a graduate assistant for no more than ten semesters beyond the baccalaureate degree. Petitions for exceptions to these rules may be made to the Graduate School.

*Students should consult the [UA Graduate Student Handbook](#) for complete information regarding academic requirements and policies.*
4. **Doctoral Student Forms**

4.1 **Required Degree Forms**

*Doctoral Program Advisory Committee Form* – Submitted to the Graduate School as soon as the committee has been assembled and within one year of entering the program.

*Ph.D. BMEG Progress Report* – Submitted to the BMEG Graduate Coordinator by June 30th of each year.

*Annual Graduate Student Academic Review Form* – Submitted to the Graduate School by June 30th of each year.

*Doctoral Dissertation Committee Form* – Submitted to the Graduate School when the committee has been assembled and at least one year prior to the date of the dissertation defense (Same as Program Advisory Committee Form)

*Doctoral Dissertation Title Form* – Submitted to the Graduate School when the title of the dissertation has been established and at least one year prior to the date of the dissertation defense

*Ph.D. BMEG Degree Requirements Check Form* – Submitted to the BMEG Graduate Coordinator after all coursework, dissertation and teaching requirements have been met.

*Record of Progress Form* – Completed after the dissertation defense and conveys the completion of the student’s program. A completed form with original signatures is submitted to the Graduate School

*Intellectual Property Disclosure Form* – This form must be submitted to the Graduate School with the final copies of the dissertation for deposit in the University Libraries

*Thesis/Dissertation Submission Form* - This form must be submitted to the Graduate School with the final copies of the dissertation for deposit in the University Libraries

4.2 **Other Forms**

*Request for Retroactive Graduate Credit Form*

*Request for Graduate Credit for 3000 or 4000 Level Courses Form*