



GALLOGLY COLLEGE OF ENGINEERING
STEPHENSON SCHOOL
OF BIOMEDICAL ENGINEERING
The UNIVERSITY *of* OKLAHOMA

UNDERGRADUATE ADVISING HANDBOOK

LAST UPDATED: MAY 2020

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Mission Statement

The Stephenson School prepares engineers to create new technologies that advance human health

Student Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Program Educational Outcomes

1. **Successful career advancement:** Graduates will be advancing in their careers in the healthcare industry or in related technical professions, or continuing their education in professional school (e.g., medicine, dentistry, law, business) or graduate school.
2. **Technical ability:** Graduates will be utilizing their skills as engineers to apply a creative approach to problem solving in their chosen career path.
3. **Positive contributors to society:** Graduates will be effective team members and communicators who infuse global perspective, economic evaluation, and safety into ethically responsible decision making.

General Advising Plan

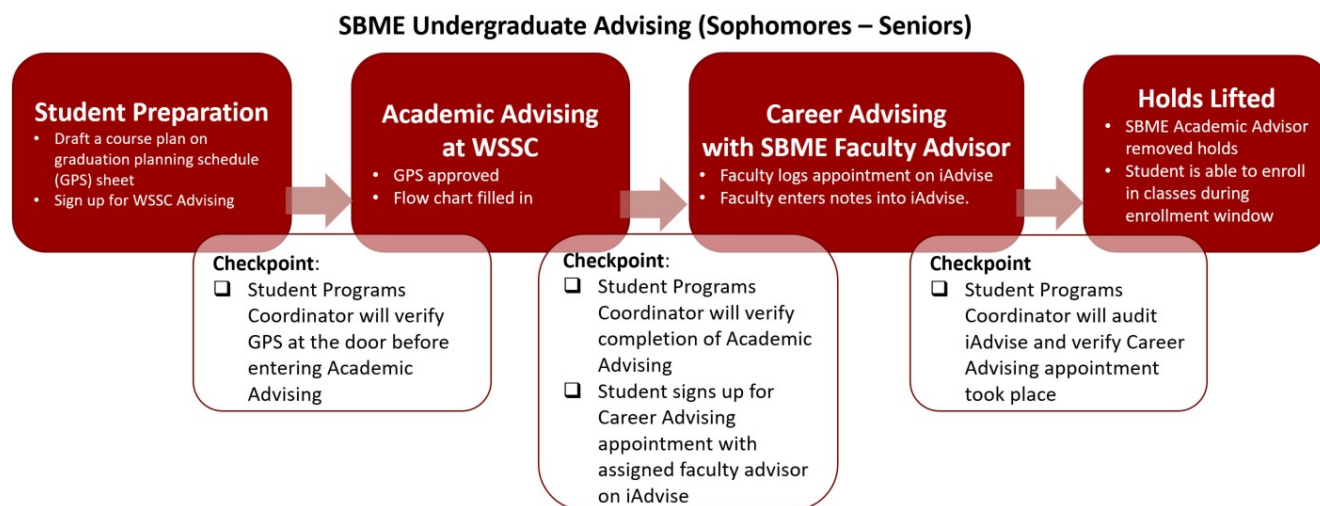
Freshman Advising

Freshmen (as defined by the program, not necessarily credit hours) are advised by University College or the OU Scholars office. In the rare case that a freshman comes in with sufficient credit hours to enroll in BME 2333 in their first year, they will be advised as sophomores (see below). Any freshman that wishes to be advised by an SBME Faculty Advisor may contact the SBME Student Programs Coordinator to seek an available appointment with an SBME Faculty Advisor.

The SBME Chair of Undergraduate Studies will meet with the advisors of University College and the Honors College twice per year to brief them on changes and answer any questions.

Overall Advising Plan

The overall advising process is done in three major steps: 1) student preparation, 2) academic advising at Williams Student Services Center (WSSC), and 3) career advising by an SBME Faculty Advisor at a separate time and location (See below).



Students must prepare a draft of their 4-year plan on the Graduation Planning Schedule (GPS) spreadsheet before attending academic advising at WSSC. The checksheet (<http://www.ou.edu/checksheets/engineering>) corresponding to the student's 1st year at OU will be the governing document, and the Flowchart (http://www.ou.edu/coe/academics/degreeplans_flowcharts) is an additional document of value in preparing the GPS.

Academic advisors at WSSC will not sign off on advising unless a GPS is completed. Academic advising will take place in Felgar Hall, in WSSC, during predetermined advising windows during an approximately 2-week period (approximately mid-September for fall semester and mid-February in the spring semester). After the academic advisor signs off, the student may sign up for a time slot on iAdvise for career advising with their assigned faculty advisor. Students unsure of their assigned SBME faculty advisor, may contact the SBME Student Programs Coordinator.

Career Advising with SBME Faculty Advisor

Sophomores, Juniors, and Seniors who have been admitted to the major, will be assigned to one SBME Faculty Advisor who will provide career advising until graduation. Faculty advisor assignment is randomly assigned, and by the need to balance the number of advisees per faculty member. The Faculty Advisors' primary role is to

discuss overall career directions, research opportunities, summer plans (e.g., REUs, internships, study abroad), leadership opportunities, pre-med strategies (e.g., shadowing physicians), and other professional development topics. Course plans and curriculum are only a small focus of the career advising meeting with the faculty advisor.

If the student wishes to change their faculty advisor, they may contact the SBME Student Programs Coordinator, who will coordinate with the SBME Undergraduate Studies Committee to review the request.

Scheduling Appointments & Using iAdvise

Faculty can access training to the iAdvise software at: <https://iadvise.ou.edu/training.php>. In addition, faculty must complete the FERPA training (OnPoint.ou.edu), before participating in advising.

Faculty Advisors will schedule blocks of time during the advising period (beginning ~2 to 3 weeks before enrollment opens) for students to sign up for appointments. Faculty Advisors will offer select windows on different days at different times of the day to accommodate students with varying course and work schedules to attend faculty advising. Note: students cannot make same day appointments. If it is after 3:00 pm, they are only able to make it for the day after the following day. The Student Programs Coordinator will verify that all students have signed up for a career advising appointment and send out reminder e-mails as necessary during the sign-up period.

If a student is unable to attend their scheduled appointment, that student must consult the Student Programs Coordinator for an alternate appointment with a faculty advisor. Some professors may also designate other faculty colleagues to see their advisees should they be out of town, or otherwise unavailable during an advising period (sabbatical, leave, etc.).

Faculty advising windows will be scheduled, in conjunction with the Student Programs Coordinator, to allow creation of online appointments on iAdvise. Faculty are required to document every official advising session in iAdvise by logging the appointment and creating notes within the appointment. These notes are accessible to WSSC Advisors. These notes may include overall discussions with students about academic interests, internships, etc. The notes further serve as secondary documentation that the advising took place.

Removal of Advising Holds

Students must complete curriculum advising at WSSC and career advising with their assigned SBME Faculty advisor before holds are removed for enrollment. The Student Programs Coordinator will routinely audit iAdvise to verify that students attended career advising appointments. Students that have attended iAdvise appointments will be noted and the Student Programs Coordinator will e-mail batches of the OU IDs of the students to the BME Academic Advisor (Craig Swan). The BME Academic Advisor will remove holds for the students, and the students will be able to register for classes once their registry window is open. The Student Programs Coordinator will follow-up via e-mail with any students (cc their Faculty Advisor) who were logged as having missed career advising.

Williams Student Services Center (WSSC)

Curriculum advising is typically completed at WSSC. WSSC can answer student questions about degree requirements, prerequisites and enrollment.

Williams Student Services Center Contact:

865 Asp Ave, Felgar Hall 112
Norman, OK 73019-1052
(405) 325-4096
Toll Free: (800) 522-0772
Extension: 4096

SBME Academic Counselor: Craig Swan

E-mail: cswan@ou.edu
Phone: (405) 325-4096

SBME Faculty Advisors

Faculty Advisors Contact Information

Faculty Advisor	Office Location	E-mail	Office Phone
Handan Acar, PhD	GLG 319	HAcar@ou.edu	(405) 325-2186
Rachel Childers, PhD	GLG 321	Rachel.Childers@ou.edu	(405) 325-3867
Michael Detamore, PhD	GLG 101	Detamore@ou.edu	(405) 325-2144 (405) 325-0392
Marc Moore, PhD	GLG 320	MooreMC@ou.edu	(405) 325-3861
Qinggong Tang, PhD	GLG 307	Qinggong.Tang-1@ou.edu	(405) 325-6246
Stefan Wilhelm, PhD	GLG 318	Stefan.Wilhelm@ou.edu	(405) 325-4982
Han Yuan, PhD	2PP 125 / GLG 308	HanYuan@ou.edu	(405) 325-4665

Each Student is assigned to a faculty member, who will remain their "SBME Faculty Advisor" during their academic career.

Student Programs Coordinator: Shayla Glover, MBA. ShaylaGlover@ou.edu, (405) 325-3947

SBME Office: Gallogly Hall, suite 101

General Curriculum

Degree Requirement Checksheet

Checksheets for the Gallogly College of Engineering, including past versions can be found here:

<http://www.ou.edu/checksheets/engineering>. Students are required to fulfill the requirements for the year they entered. The most recent checksheet for Biomedical Engineering can be found in the Appendix 1.

BME 2333: Biomedical Engineering Fundamentals

BME2333 is essentially the gateway course into the Biomedical Engineering degree. Enrollment in BME 2333 requires a B or better in the following courses:

- CHEM 1315 or CHEM 1335
- CHEM 1415 or CHEM 1435 or CHEM 1425 (H)
- MATH 1914 or MATH 1823
- MATH 2924 or MATH 2423
- PHYS 2514

Overrides for Course Enrollment

Some graduate or 5000 level courses require instructor or sometimes departmental permissions prior to enrollment. If a student wishes to enroll in a graduate level/5000+ elective offered through the College of Engineering, e-mail the instructor of the course, cc your academic advisor (Craig Swan), and request permission to enroll in the course. Your WSSC advisor will be able to provide the override. To enroll in graduate level/5000+ in a science or other course outside the college of engineering (MATH, CHEM, PHYS, BIO, etc.), instructor permission is required, and the advisor for that department will have to provide the override. The instructor of the course or your WSSC advisor will be able to assist you in determining who that person is.

SBME Pre-Approved Electives

In general, electives need to be at a 3000-level or above. The sections below serves as a source of pre-approved course options, however approval from an SBME faculty advisor is recommended when selecting 'Math, Science, & Engineering' electives. Other courses not on this list may be approved with permission by the SBME faculty via the Undergraduate Studies Committee.

Not all classes are offered frequently. Students are responsible for ensuring that the courses will be offered in the semester they intend to take it, and that all prerequisites or other permissions are acquired before enrolling in electives.

Courses less than 3 credit hours will have to be supplemented with another course to account for the credit hour discrepancy. A total of at least 6 credit hours are required for BME electives and a total of at least 6 credit hours are required for 'Science, Math, & Engineering' electives. BME elective course credits, in excess of 6 credit hours can be counted toward 'Science, Math, & Engineering' elective credit hours.

List of Approved Courses for 'Upper Level Biology' Elective

- CHEM 3653 - Introduction to Biochemistry
 - Prerequisite: CHEM 3013, CHEM 3053, or CHEM 3064.
- BIOL 3113 - Cell Biology
 - Prerequisite: 1114, or 1124, or Biology 1134, or Botany 1114, and Chemistry 3053.
- BIOL 3333 - Genetics
 - Prerequisite: ZOO/BIOL 1124, or ZOO/BIOL 1114 and ZOO/BIOL 1121; Biology 1134 recommended
- BIOL 3833 - Introduction to Neurobiology
 - Prerequisite: BIOL 1124
- BIOL 4843 - Intro to Molecular Biology
 - Prerequisite: 1114 or 1124, or Botany/PBIO 1114, or Microbiology 3813 and 3812, and one course in organic chemistry

List of Approved Courses for 'BME' Electives

Aerospace and Mechanical Engineering

AME 4213/5213 Biomechanics I

AME 5203 Bioengineering Principles

AME 5223 Biomechanics II

AME 5233 Biomaterials

AME 5293 Transport in Biological Systems

†BME 3141 Biomechanics Lab

†BME 3151 Mol, Cell, & Tissue Engineering Lab

†BME 3161 Biomedical Micro- & Nanotechnology Lab

BME 3440/3980 Mentored Research (See [Research for Credit Policy](#))

BME 5233 Biomaterials

BME 5970 Topics in Biomedical Engineering

Biomedical Engineering

†BME 3113 Bioimaging

†BME 3123 Biotransport

†BME 3133 Bioelectricity

†BME 3143 Biomechanics

†BME 3153 Molecular, Cellular, & Tissue Engineering

†BME 3163 Biomedical Micro- & Nanotechnology

†BME 3111 Bioimaging Lab

†BME 3121 Biotransport Lab

†BME 3131 Bioelectricity Lab

Chemical, Biological & Materials Engineering

CH E 4203 Bioengineering Principles

CH E 5203 Bioengineering Principles

CH E 5243 Biochemical Engineering

CH E 5273 Biomedical Engineering

CH E 5293 Transport in Biological Systems

Electrical and Computer Engineering

ECE 4843/5843 Medical Imaging Systems

† If taken in excess of the required BME core area course requirements (4 BME Core Area Courses and 3 BME Core Area Labs).

List of Approved Courses for 'Science, Math, & Engineering' Elective

Anthropology

ANTH5273 Bioethics, Biotechnology,
Biomedicine

Biology

*BIOL 3333 Genetics
*BIOL 3113 Cell Biology
*BIOL 3833 Intro to Neurology
*BIOL 4843 Intro to Molecular Biology
MBIO 3813 Fundamentals of Microbiology
MBIO 3812 Fund. Microbiology Lab
MBIO 4833 Basic Immunology
BIOL 3103 Principles of Physiology
BIOL 3201 Animal Development Lab
BIOL 3203 Animal Development
BIOL 4244 Animal Histology
BIOL 4233 Neurobiology of Disease
BIOL 4853 Neurobiology of Memory
BIOL 4893 Behavioral Neurobiology
BIOL 4913 Quantitative Biology
BIOL 5153 Endocrine Physiology
BIOL 5293 Cytology Ultrastructure
BIOL 5343 Developmental Genetics
BIOL 5364 Transmission Electron Microscopy
BIOL 5374 Scanning Electron Microscopy
BIOL 5843 Molecular Biology

Chemistry

CHEM 3423 Physical Chemistry
CHEM 3523 Physical Chemistry II
CHEM 3153 Organic Chemistry II
*CHEM 3653 Biochemistry
CHEM 3753 Intro to Biochemical Methods
CHEM 4023 Instrumental Methods in Chemical
Analysis
CHEM 4333 Advanced Inorganic Chemistry
CHEM 5453 Polymer Science
CHEM 5753 Principles of Biochem I
CHEM 5853 Principles of Biochem II
CHEM 6813 Intro to Biochemical Methods
CHEM 6823 Protein, Nucleic Acids, & Gene
Expression
CHEM 6833 Structure & Function of
Membranes & Hormones
CHEM 6843 Enzyme Mechanisms & Metabolic
Regulation

**If not taken as Upper-Level Biology Requirement*

CHEM 6853 Protein Structure & Function

Physics

PHYS 3043 Physical Mechanics
PHYS 3233-001 Modern Physics for Engineers

Engineering

ENGR 3401 Engineering Economics
ENGR 3431 Electromechanical Systems
ENGR 3441 Fluid Mechanics
ENGR 4003 Engineering Practice
ENGR 4013 Leadership & Management for
Engineers
ENGR 4023 Disruptive & Innovative Technology
Ideation
ENGR 4510G Global Environmental Health

Electrical and Computer Engineering

ECE 3323 Intro-Solid State Elec Devices
ECE 3813 Introductory Electronics
ECE 4813 Electronics
ECE 4823 Engineering Principles of the Human
Body
ECE 5213 Digital Signal Processing
ECE 5273 Digital Image Processing
ECE 5523 Random Signals
ECE 5363 Optical Engineering

Industrial Systems Engineering

ISE 4223 Fundamentals of Engineering
Economics
ISE 4553/5553 Data Driven Decision Making I
ISE 4804 Ergonomics in Systems Design
ISE 5033 Systems Engineering

Physics

PHYS 3043 Physical Mechanics
PHYS 3233-001 Modern Physics for Engineers

Math

MATH 3333 Linear Algebra
MATH 3423 Physical Math II
MATH 4163 Intro Partial Diff. Equations
MATH 4373/5373 Abstract Linear Algebra
MATH 4383/5383 Modern Algebra

Courses not approved as electives:

- Anything below 3000 level
- *Courses cannot be double counted for the 'Upper-Level Biology Elective' and a 'Science, Math, & Engineering' Elective
- Courses cannot be double counted for 'Science, Math, & Engineering' and 'BME electives'.
- Any other courses already fulfilling another graduation requirement (e.g., ENGR 3511 Transfer Engineering Experience).

Potential Minor Degrees

Talk to your advisor about potential minors. Many intro classes and/or classes used for [Science, Math, & Engineering electives](#) can be used toward a minor degree. Some minors that compliment well with the BME degree are:

- Physics
- Mathematics
- Computer Science
- Biology
- Chemistry
- Health and Exercise Science
- General Business for Non-Business Majors
- Entrepreneurship for Non-Business Majors
- Water and Sanitation for Health and Sustainable Development

There is a list of many more minors available online: <http://www.ou.edu/checksheets/minors>

Water and Sanitation for Health and Sustainable Development ("the WaTER Minor")

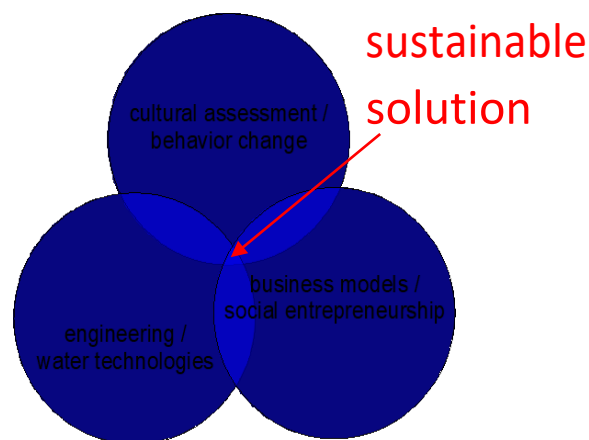
The WaTER Minor is designed to prepare students for development work in emerging regions, particularly in the sectors of water, sanitation, and hygiene/health (WaSH). The Minor curriculum assumes that the sustainable solutions to human health and development are found in the nexus between the appropriate **technological, business and human factors** (see Figure below). Accordingly, students will take professional electives in each of the three major areas, especially in those areas that complement their Major field.

The Minor makes its home in the Gallogly College of Engineering and the OU WaTER Center, a Center which aims to promote peace by advancing health, education and economic development through sustainable water and sanitation solutions for impoverished regions. "WaTER" is an acronym for "Water Technologies for Emerging Regions".

Students seeking to pursue the WaTER Minor may be a student of any major.

The student must:

- arrange an advisory meeting and complete curriculum plan to determine appropriate coursework
- submit a one-page essay in response to the question: "Why I wish to pursue the 'Water and Sanitation for Health and Sustainable Development' minor"
- maintain a GPA of at least 2.75
- participate in one intercultural immersion trip of 3-6 weeks in length, in addition to completing required coursework. The trip will include experience with medical professionals and/or work on a water or sanitation project.



The WaTER Minor will:

- Prepare students for work in international development as participants and leaders in Peace Corps, USAID, State Department, service organizations (e.g., Engineers Without Borders), and faith-based organizations.
- Increase the awareness of tomorrow's societal leaders on the specific challenges and opportunities facing developing countries, including WaSH, and
- Give the student experience in hands-on humanitarian work for those in need, utilizing the skills and competencies that they have gained in their Major and Minor curriculums.

The Minor consists of 18 hours of coursework, including courses that may be double-counted with their Major requirements, such as Professional electives and General Education (GenEd) electives.

Required Core Courses (9 hours):

- CEES 4243G WaTER Technologies for Emerging Regions (3 hrs, Spring)
- CEES 4273G WaTER Technical Field Methods (3 hrs, May)
- CEES 3422 Intercultural Immersion Experience in an Emerging Region (2 hrs)
- CEES 3251 WaTER Center Integrated Seminar (1 hr, Fall after Immersion trip)

Recommended Elective Courses (9 hours):

ELECTIVE TRACK 1: ENGINEERING, PUBLIC HEALTH, NATURAL AND PHYSICAL SCIENCES:

- ENGR 4510G Global Environmental Health
- PHCH 3513 Public Health & Health Care Systems
- PHCH 3113 Introduction to Epidemiology
- PCHC 3613 Determinants of Health
- GEOG 4293 Hydrologic Science
- GEOG 4513/5513 Applied Climatology

ELECTIVE TRACK 2: POLICY, ECONOMICS, AND BUSINESS:

- ENT 3193 Fundamentals of Social Entrepreneurship
- IAS 3063 Politics of Developing Countries
- IAS 3323 The Political Economy of Development
- HSCI 3483 Technology, Politics, and International Development

ELECTIVE TRACK 3: SOCIAL / CULTURAL / BEHAVIORAL SCIENCES:

- IAS 3283 Culture, Power and Global Environment
- ANTH 4303 Women and Development in Africa
- IAS 2003 Understanding the Global Community
- GEOG 3443 Environment and Society
- ANTH 3423 Anthropology of Religion

For more information, contact:

Jim F. Chamberlain, Ph.D., P.E. | jfchamb@ou.edu | 405.325.5140

David A. Sabatini, Ph.D., P.E. | sabatini@ou.edu | 405.325.4273

Career Advising and Professional Development Topics

Research

Research is a balance between collaborative and individual work. Being involved to this experience as early as possible gives undergrad students a perspective of collaborative work. They can understand the way of scientific development and appreciate the published research. Also, by demonstrating their individual contribution to the collaborative work in a lab, they can apply variety of awards and fellowships. Students can have an opportunity to understand their own interest to graduate school, any particular field of science, and collaborative work. If the student finds interest in research, then this experience can be beneficial for obtaining research related recommendation letters from the principal investigators that they worked with. Moreover, based on their contribution, undergrad students' names can be added to the scientific papers, which is an important contribution for landing a high-level graduate college and application for awards and fellowships.

Undergraduate students can work in the lab by helping a graduate student in the beginning. It is important to watch and understand the procedure for at least a couple of months. Students can help the procedure by doing simple lab works under a graduate supervisor. Students, who prefer to work in the same lab more than a semester, can start to be independent in the lab work and produce their results. Under these circumstances, these students can be encouraged to present their results as a poster or a presentation in the OU campus, undergrad related research seminars. If the student is at senior level and has produced results as an undergrad researcher in the same lab in more than two semesters, then those students should be encouraged to attend BMES undergrad symposium and present their results as a poster. Such attempt can increase the graduating successful graduate students from SBME.

Moreover, the students in the senior level and working in a research lab can be encouraged to apply graduate school fellowships from NSF and NIH.

Current research opportunities for undergraduates are listed on the SBME website:

<http://www.ou.edu/coe/sbme/undergrad/research>

Research for Credit: BME 3440/3980 Research Credit Policy

Research as a BME or 'Science, Math, Engineering' elective

Mentored research credit (BME 3440 or BME 3980, honors) may count for a maximum 3 hours of BME elective OR a maximum of 3 hours 'Science, Math, Engineering' (SME) elective credit for a maximum total of 3 hours of research credit counting toward the degree.

To count as a BME elective, mentored research must be completed under the mentorship of either an SBME faculty member or IBEST faculty member. Mentored research in other departments may be applied toward a 'Science, Math, Engineering' Elective with advisor approval.

For research credit outside of SBME/IBEST, in the areas of science, engineering, or math, enrollment in a designated 'SME' section of BME 3440/3980 will be required. Students with external research advisors will provide written feedback as a 1-page summary to the BME 3440/3980 section advisor for official grade entry. Grading will be on an A/B/C/D/F scale as opposed to Pass/Fail.

An SBME faculty member shall be the instructor of record for students enrolling in BME 3440/3980 to perform research for a primary advisor in another department. In those cases, in addition to the 1-page

summary, a written statement (e.g., email) from the primary advisor to the SBME faculty instructor to assess the student's performance will be required.

The responsibility for identifying and documenting the primary advisor of each student enrolled in BME 3440/3980 and accurate recording of BME vs. SME credit will reside with the Undergraduate Studies Chair with the assistance of the Student Program Coordinator and will be documented in Degree Navigator.

Senior Thesis

Overview

The Senior Thesis is an option for seniors who are especially interested in research and/or intending to continue on to a PhD program. Students from this program will be selected and invited by their faculty advisor. These selected students will continue on an established research project and complete a written thesis at the end of the academic year. The thesis will be defended orally in front of a committee of 2-3 faculty, and revisions will be incorporated into the final written thesis, which will go on file with the department.

Benefits to the Student

- 1) For students interested in pursuing a PhD, the experience of writing and defending a thesis will be outstanding preparation for the PhD dissertation.
- 2) Excellent for the resume, and for personal statements and essays for fellowship and graduate school applications.
- 3) Closer connection with primary mentor and committee, which may lead to greater professional development and stronger recommendation letters.
- 4) Go more in depth into a problem, with greater opportunity to make an impact, and possibly produce a manuscript for publication in a peer-reviewed journal.
- 5) Opportunity to meet as a group with SBME faculty to discuss topics related to graduate schools (e.g., applying for NSF Fellowships, what to look for during grad school visits, choosing between offers, etc.)

Logistics

Selection/invitation process

- SBME will provide faculty with a list of rising seniors and their GPAs.
- Based on GPA, past research performance, and relevance to career goals, faculty shall invite prospective students no later than **September 1**.
- Students may request an invitation. However, faculty are encouraged to limit the number of senior theses in their group, so invitations will be highly selective.

Committee:

- 2 faculty minimum, 3 preferred. Established no later than **October 1**.
- One faculty member serves as the Faculty Advisor for the Senior Thesis program. The Faculty Advisor serves as the contact point for Senior Thesis students and their advisors and other committee members if any questions or issues arise.

Course credit: Students enroll in BME 3440/3980 for both semesters.

- Students must complete at least 6 hours of research credit (BME 3440/3980) in total (including Freshman – Junior years) by the end of their undergraduate career to satisfy the Senior Thesis requirement.
- As long as these 6 total hours are achieved, students may elect to take only 1 hour of BME 3440/3980 in one or both semesters in the Senior year (e.g., to stay under 18 hours).
- The Fall semester grade will include the Semester Report (see below), and the Spring semester grade will include the Final written thesis.

Requirements/Expectations of students:

- Full academic year commitment, with a time commitment of ~10-15+ hours/week.
- Work must be novel and independent (as opposed to “service work”, e.g., to make materials or collect data on a given piece of equipment for a grad student’s project). The committee is responsible for ensuring these criteria are met.
- Semester report (5 pages maximum) due to committee in early December (before dead week) as a “check point.” Satisfactory progress is required to continue to the following Spring (determined by committee). For students with unsatisfactory progress or who elect to opt out, the exit is to discontinue the Senior Thesis in the Spring semester.
- Written thesis submitted to the committee in April no later than 3 weeks before dead week ends. Target = 20-30 pages, limit = 60 pages, double spaced (Tables, Figures, References excluded). Content may include work prior to the senior year. Format comparable to a Master’s thesis.
- Oral defense (public) defended before dead week (written thesis must be submitted at least 1 week prior to oral defense). Any revisions to the written thesis must then be submitted in final form by the end of dead week. This final thesis will form the basis for the grade for the course in the Spring semester (grade assigned by primary advisor, with input from committee).
- Expected, but not required, to attend the SBME department seminars (course schedule permitting). Will sign attendance log along with the grad students to document attendance.
- Expected to attend a lecture/discussion on thesis writing

Honors: Honors students will need to enroll in 3 hours of BME 3980 for their Honors research requirement, before they can enroll they must return an Honors research form, which can be found at the following website:

http://ou.edu/content/dam/honors/docs/Honors%20Research%20w_Instructions.pdf

Honors students must provide the Honors College with a copy of their final thesis paper.

Internships and Co-Ops

SBME has developed a Co-Op course which can count for credit toward the BS degree. A Co-op (cooperative education) experience is an excellent way to obtain industrial experience and perspective while progressing in the BME degree. The typical co-op program will have you working for a company full-time during three semesters while you are away from campus, but still a student in SBME. During the co-op, you are paid for your work. This typically extends your time for the bachelors by a year, however it provides an opportunity to grow professionally. Co-ops are a great way to gain work

experience before you graduate, get your foot in the door in industry, and help you stand out while looking for a job after graduation.

BME students can receive 'BME 4281: Engineering Co-Op Program' course credit for Co-Op/Internship experiences. Participation in the Co-Op Program is optional and open to students enrolled full-time in BME who have completed all the requirements of the first and second year of their degree program with a minimum 2.50 GPA. The student must make the request for BME 4281 course credit *before beginning* the experience.

The Co-Op experience can be considered as either a 'Science, Math, Engineering' elective, or BME elective depending on the nature of the work. In coherence with other GCoE Co-Op programs, BME 4281 counts for a total of 3 credit hours, when taken for 3 semesters (Spring, Summer, Fall).

As part of their application for course credit, students must submit an endorsement letter from the Co-Op supervisor outlining the Co-Op duties, and commit to submit two written status reports and make an oral presentation at OU in the semester following the Co-Op. The SBME faculty members, via the SBME Undergraduate Studies Committee, will review technical details of the request for course credit and approve the course credit if the Co-Op experience meets the technical plan and documentation requirements agreed to in the petition.

A great way to find internships and Co-Op experiences is by attending the annual SBME career fair. This is typically held during the month of April, so keep an eye out for e-mail announcements regarding the career fair time and location.

Preparation for Medical School

Pre-Medical students should contact the OU Pre-Med office for pre-med advising.

Pre-Med Office: 415 Cate Center #1, (405) 325-2457.

In addition to pre-med courses in the SBME program, students will need:

- CHEM 3153 – Organic Chemistry II
- PHYS 1311 and 1321
- PSY and SOC
- CHEM 3653 – Introduction to Biochemistry
- BIOL 3113 - Cell Biology or BIOL 4843 – Intro to Molecular Biology
- BIOL 3333 - Genetics
- BIOL 3103 – Principles of Physiology is recommended.

BIOL3113, BIOL4843, BIOL 3333, BIOL3103 can satisfy the 'Science, Math, Engineer' Elective credits required in the BME degree, as long as they are not already being used to satisfy the 'Upper-Level Biology' Elective.

Students should plan to take the MCAT in April of their Junior Year.

Study Abroad

Please see current information at: http://www.ou.edu/coe/student_life/studyabroad

Other Student Resources

Scholarships

CASH – the Centralized Academic Scholarship Hub – is where current OU students can apply for all merit and financial need-based OU scholarships from October 1 to February 1 each year.

College-wide scholarships, departmental scholarships, financial aid scholarships, study abroad scholarships, Sooner Parents scholarships, and campus awards are all housed in CASH. Undergraduate, graduate, liberal studies, international, and study abroad populations are encouraged to access the system to apply for scholarships.

To apply for scholarships through CASH, visit the [Scholarships homepage](#).

Gallogly College of Engineering Diversity and Inclusion Program

Please see current information at: <http://www.ou.edu/coe/diversity>

University Counseling Center

Students are eligible for affordable counseling services at Goddard Health. For counseling related to mental health, please visit: <http://www.ou.edu/ucc>

OU Advocates - Dial 911 (on campus) or (405) 615-0013 (off campus or by cell) and ask for OU Advocates regarding sexual assault issues.

Appendices

Appendix 1: 2018-2019 Degree Requirement Checksheet

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING GALLOGLY COLLEGE OF ENGINEERING THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education Summer 2018 through Spring 2019			GENERAL REQUIREMENTS Total Credit Hours 132 Minimum Retention/Graduation Grade Point Averages: Overall - Combined and OU 2.00 Major - Combined and OU 2.00 Curriculum - Combined and OU 2.00 A minimum grade of C is required for each course in the curriculum.			Biomedical Engineering (Standard) B108 Bachelor of Science in Biomedical Engineering					
OU encourages students to complete at least 32 hours of applicable coursework each year to have the opportunity to graduate in four years.											
Year	FIRST SEMESTER				Hours	SECOND SEMESTER				Hours	
FRESHMAN	ENGL	1113, Prin. of English Composition (Core I)			3	ENGL	1213, Prin. of English Composition (Core I), or			3	
	*CHEM	1315, General Chemistry (Core II)			5	EXPO	1213, Expository Writing (Core I)				
	*MATH	1914, Differential and Integral Calculus I (Core I)			4	*CHEM	1415, General Chemistry (Core II)			5	
	HIST	1483, U.S., 1492-1865, or 1493, U.S., 1865-Present (Core IV)			3	*MATH	2924, Differential and Integral Calculus II			4	
	ENGR	1411, Freshman Engineering Experience			1	*PHYS	2514, General Physics for Engineering & Science Majors (Core II)			4	
TOTAL CREDIT HOURS					16	TOTAL CREDIT HOURS					16
SOPHOMORE	MATH	2934, Differential and Integral Calculus III			4	MATH	3113, Introduction to Ordinary Differential Equations			3	
	PHYS	2524, General Physics for Engineering & Science Majors			4	C S	1213, Python Language			3	
	BIOL	1124, Molecules/Cells/Physiology (Core II)			4	CHEM	3053, Organic Chemistry I: Biological Emphasis			3	
	ENGR	2431, Electrical Circuits			1	CHEM	3152, Organic Chemistry Lab: Biological Emphasis			2	
	ENGR	2002, Engineering Professional Development			2	BME	2433, Signals and Systems for Biomedical Engineering			3	
BME	2333, Biomedical Engineering Fundamentals			3	ISE	3293, Applied Statistical Methods			3		
TOTAL CREDIT HOURS					18	TOTAL CREDIT HOURS					17
JUNIOR	*BME	Core Area Course 1 (Approved Area Core Course)			3	*BME	Core Area Course 3 (Approved Area Core Course)			3	
	\$BME	Core Area Lab 1 (Corresponding Area Core Lab)			1	\$BME	Core Area Lab 3 (Corresponding Area Core Lab)			1	
	*BME	Core Area Course 2 (Approved Area Core Course)			3	*BME	Core Area Course 4 (Approved Area Core Course)			3	
	\$BME	Core Area Lab 2 (Corresponding Area Core Lab)			1	BME	4813, Quantitative Physiology			3	
	BME	3722, Numerical Methods in Biomedical Engineering			2	BME	3533, Biomedical Instrumentation			3	
COMM	2613, Public Speaking (Core I-Other)			3	†Approved Elective, Social Science (Core III)				3		
†Upper-Division Biology Elective (per BME faculty approval)				3							
TOTAL CREDIT HOURS					16	TOTAL CREDIT HOURS					16
SENIOR	BME	4713, Biomedical Engineering Design I			3	BME	4823, Biomedical Engineering Design II (Capstone)			3	
	BME	3233, Biomaterials			3	#BME Elective, (BME Elective List Below -or- Per Advisor Approval)				3	
	#BME Elective, (BME Elective List Below -or- Per Advisor Approval)				3	Science, Math, Engineering Elective, (Per Advisor Approval)				3	
	Science, Math, Engineering Elective (Per Advisor Approval)				3	†Approved Elective: Western Civ. & Culture (Core IV)				3	
	P S C	1113, American Federal Government (Core III)			3	†Approved Elective: Non-Western Culture (Core IV)				3	
†Approved Elective: Artistic Forms (Core IV)				3							
TOTAL CREDIT HOURS					18	TOTAL CREDIT HOURS					15
NOTE: Engineering transfer students may take ENGR 3511 in place of ENGR 1411. CHEM 1315 and CHEM 1415 can be substituted with CHEM 1335 (Fall only) and 1435 (Spring only), respectively.											
Courses designated as Core I, II, III, IV or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list.											
†To be chosen from the University-Wide General Education Approved Course List . Three of these 12 hours must be upper-division (3000-4000).											
* The prerequisite courses for BME 2333 require a minimum grade of B.											
The College of Engineering requires a minimum grade of C for each course in the curriculum. Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course. Please refer to the General Catalog, College of Engineering, Undergraduate Study section for additional enrollment limitations.											
Note: Two college-level courses in a single foreign language are required; this may be satisfied by successful completion of 2 years in a single foreign language in high school. Students who must take foreign language at the University will have an additional 6-10 hours of coursework.											
• BME Area Core Courses: BME 3113, Bioimaging; BME 3123, Biotransport; BME 3133, Bioelectricity; BME 3143, Biomechanics; BME 3153, Molecular, Cellular and Tissue Engineering; BME 3163, Biomedical Micro-Nano-Technology.											
§ Corresponding BME Area Core Labs: BME 3111, Bioimaging Lab; BME 3121, Biotransport Lab; BME 3131, Bioelectricity Lab; BME 3141, Biomechanics Lab, BME 3151, Molecular, Cellular and Tissue Engineering Lab; BME 3161, Biomedical Micro-Nano-Technology Lab.											
† Pre-medical students should contact the OU Pre-Med Office 415 Cate Center #1 (405) 325-2457. In addition to pre-med courses in above program, students will need: CHEM 3153, PHYS 1311 and 1321, PSY and SOC, Cell or Molecular Biology, and Genetics. Recommend BIOL 3103. Students should also plan to take the MCAT in April of their junior year.											
# BME Elective Courses: BME 5213, Biomechanics I; BME 5223, Biomechanics II; BME 5233, Biomaterials; BME 5243, Biochemical Engineering; BME 5253, Implantable Devices; BME 5293, Transport-Biological Systems; BME 5373, Tissue Engineering; BME 5393, Intro-CAD Tissue Engineering; BME 5693, Cellular Aspects of Tissue Regeneration; BME 5970, Topics in Bioengineering; ECE 4843/5843, Medical Imaging Systems; ECE 4863/5863, Bioinstrumentation.											

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COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, atomic theory, electron configuration, periodicity, chemical reactivity and energetics, stoichiometry, gas laws and changes in state, bonding and molecular structure. A student may not receive credit for this course and CHEM 1335. **Laboratory.** (F, Sp, Su) [II-LAB]

1415 General Chemistry (Continued). Prerequisite: CHEM 1315 with a minimum grade of C or CHEM 1335 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include thermochemistry, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. A student may not receive credit for this course and CHEM 1435. **Laboratory.** (F, Sp, Su) [II-LAB]

3053 Organic Chemistry I: Biological Emphasis. Prerequisite: CHEM 1415 or CHEM 1425. Intended for life science majors. First course in a two-semester sequence (3053 and 3153). This course will cover the concepts of organic structure, nomenclature, and reactivity with an emphasis on biological applications. (F, Sp, Su) **3152 Organic Chemistry Laboratory: Biological Emphasis.** Prerequisite: CHEM 3053 or concurrent enrollment. Intended for life science majors. Laboratory course designed to accompany CHEM 3053 and CHEM 3153. Selected experiments designed to illustrate the fundamental techniques used in organic chemistry, to develop familiarity with the properties of organic compounds and to introduce analytical techniques including spectroscopy. (F, Sp, Su)

COURSES IN BIOLOGY (BIOL)

1124 Molecules/Cells/Physiology. Content is focused toward life science majors. Major principles and concepts are presented in the function and physiology of animals, plants, fungi and microbes. Emphasis is on biological chemistry, cell structure and function, cellular energetics, molecular genetics, homeostasis and physiology. Includes biological laboratory experience with emphasis on critical thinking and problem solving, and topics include biochemistry, molecular genetics, cell processes and physiology. **Laboratory.** (F) [II-LAB]

COURSES IN ENGINEERING (ENGR)

1411 Freshman Engineering Experience. Prerequisite: declared major in Engineering or permission of instructor. Required of all entering freshmen with a declared Engineering major. Lecture hours cover a variety of topics including: majors and minors; career planning; advising; and extracurricular activities. Students also work on multi-disciplinary engineering projects in smaller groups during the lab hour. (F)

2002 Professional Development. Prerequisite: sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

2431 Electrical Circuits. Prerequisite: MATH 2423 or 2924; and PHYS 2524 or concurrent enrollment. Introduction to basic principles of electrical circuits. Topics include DC circuits analysis, DC transients, static electrical fields, static magnetic fields, capacitors, inductors, and filters. (F, Sp)

COURSE IN INDUSTRIAL AND SYSTEMS ENGINEERING (ISE)

3293 Applied Engineering Statistics. Prerequisite: MATH 2433 or MATH 2924. Introduction to probability, one and higher dimensional random variates, function of random variables, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, use of statistical packages. (F, Sp)

COURSES IN MATHEMATICS (MATH)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the placement test or, for incoming freshmen direct from high school, satisfactory score on the ACT/SAT. Duplicates three hours of 1823 and one hour of 2423. Limits and continuity, differentiation, applications of differentiation to optimization and curve sketching, integration, the fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas. (F, Sp, Su) [I-M]

2924 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Duplicates two hours of 2423 and two hours of 2433. Further applications of integration, the natural logarithmic and exponential functions, indeterminate forms, techniques of Vector integration, improper integrals, parametric curves and polar coordinates, infinite sequences and series. (F, Sp, Su)

2934 Differential and Integral Calculus III. Prerequisite: 2924 with a grade of C or better. Duplicates one hour of 2433 and three hours of 2443. Vectors and vector functions, functions of several variables, partial differentiation and gradients, multiple integration, line and surface integrals, Green-Stokes-Gauss theorems. (F, Sp, Su)

†G313 Introduction to Ordinary Differential Equations. Prerequisite: MATH 2423 or MATH 2924. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transformations, phase planes and stability. (F, Sp, Su)

COURSES IN PHYSICS (PHYS)

2514 General Physics for Engineering and Science Majors. Prerequisite: Mathematics 1823 or Mathematics 1914 with grade of C or better. Not open to students with credit in 1205. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

2524 General Physics for Engineering and Science Majors. Prerequisite: 2514 and Mathematics 2423 or 2924 with a grade of C or better. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

COURSES IN BIOMEDICAL ENGINEERING (BME)

2333 Biomedical Engineering Fundamentals. Majors only; MATH 1914 or 1823; MATH 2924 or 2423; CHEM 1315; CHEM 1415; and PHYS 2514 all with a grade of B or better. Introduction to material, energy, charge, and momentum balances in biological systems. Steady state and transient conservation equations for mass, energy, charge, and momentum will be derived and applied using basic mathematical principles, physical laws, stoichiometry, and thermodynamic properties. (F)

2433 Signals and Systems for Biomedical Engineering. Prerequisite: BME 2333. Students learn circuits and linear systems concepts necessary for analysis and design of biomedical systems. Theory is motivated by examples from biomedical engineering. Topics covered include electrical circuit fundamentals, operational amplifiers, frequency response, electrical transients, impulse response, transfer functions, and convolution, all motivated by circuit and biomedical examples. Elements of continuous time domain-frequency domain analytical techniques are developed. (Sp)

3111 Bioimaging Lab. Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3113; majors only. Hands-on lab that teaches students technical skills associated with bioimaging. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3113 Bioimaging. Prerequisite: BME 2333; BME 2433; PHYS 2524 and MATH 3113. Introduction to medical imaging techniques such as x-ray, computed tomography, magnetic resonance, and ultrasound. (F, Sp)

3121 Biotransport Lab. Prerequisite: Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3123; majors only. Hands-on lab that teaches students technical skills associated with biotransport. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3123 Biotransport. Prerequisite: BME 2333; PHYS 2524 and MATH 3113. Covers key transport concepts in biomedical engineering. Emphasis is put on mass and momentum transport with applications related to biology, medical science and biotechnology. (F, Sp)

3131 Bioelectricity Lab. Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3133; majors only. Hands-on lab that teaches students technical skills associated with electrophysiology. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3133 Bioelectricity. Prerequisite: BME 2333; 2433; PHYS 2524 and MATH 3113. The electrophysiology of excitable cells from a quantitative perspective. Topics include the ionic basis of action potentials, quantitative models for nerve and muscle including the Hodgkin-Huxley equations, impulse propagation, synaptic dynamics, source-field relationships, and an introduction to functional electrical stimulation. (F, Sp)

3141 Biomechanics Lab. Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3143; majors only. Hands-on lab that teaches students technical skills associated with biomechanics. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3143 Biomechanics. Prerequisite: BME 2333; PHYS 2524 and MATH 3113. Mechanical characterization of biological tissues at the cellular, organ, and system level; exploration of biomechanical factors of physiological and pathological conditions. (F, Sp)

3151 Molecular, Cellular and Tissue Engineering Lab. Prerequisite: Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3153; majors only. Hands-on lab that teaches students technical skills associated with molecular, cell, and tissue engineering. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3153 Molecular, Cellular and Tissue Engineering. Prerequisite: BME 2333 and MATH 3113; majors only. Application of engineering methods to study, measure, repair, or replace biological functions at the molecular, cellular, or tissue-level length scales. (F, Sp)

3161 Biomedical Micro-/Nano-Technology Lab. Prerequisite: ISE 3293; completion or concurrent enrollment in BME 3163; majors only. Hands-on lab that teaches students technical skills associated with BME micro/nanotechnology. Lab components include hypothesis testing and analysis, computer simulation, lab safety and instrument training, and technical communication. (F, Sp)

3163 Biomedical Micro-/Nano-Technology. Prerequisite: BME 2333; PHYS 2524; MATH 3113. Introduction to micro/nanotechnology in biomedical settings, including micro/nanotechnologies used to investigate biological systems, physiological responses to nanotherapeutics, and first principles of microfluidics and microfabrication. (F, Sp)

3233 Biomaterials. Prerequisite: PHYS 2524; majors only and junior or senior standing in the Gallogly College of Engineering, or permission of instructor. Introduction to materials used in biomedical environment, the design and use of implantable materials, such as metals, polyethylene, ceramics, and composites, biocompatibility, test methods, and tissue growth on biomaterials. (F)

3533 Biomedical Instrumentation. Prerequisite: BME 2433. Measurement and analysis of biopotentials and biomedical transducer characteristics; electrical safety applications of FET's; integrated circuits, operational amplifiers for signal processing and computer interfacing; signal analysis and display on the laboratory minicomputer. (Sp)

3722 Numerical Methods in Biomedical Engineering. Prerequisite: C S 1213 and MATH 3113; majors only. Introduces principles and techniques of numerical analysis of biomedical engineering problems. Covers numerical methods of integration, differentiation, interpolation, curve fitting, data analysis, sampling and estimation, error analysis, analysis of ordinary differential equations, numerical modeling of biomedical engineering systems, symbolic computation, and scientific visualization. (F)

4713 Biomedical Engineering Design I. Prerequisite: Senior standing in the BS in BME curriculum. Structured methodologies for designing systems or to interface with living systems. Creative design, analysis, selection, development, and fabrication of biomedical components and systems. (F)

4813 Quantitative Physiology. Prerequisite: BME 3722. Introduces students to the mathematical and numerical techniques used to develop, solve, and analyze quantitative models of physiology systems. (Sp)

4823 Biomedical Engineering Design II (Capstone). Prerequisite: BME 4713. Development of team projects in biomedical engineering with emphasis on prototype development and quantitative analysis, and written and oral reporting of the outcome. (Sp)

Appendix 2: 2018 – 2019 Degree Flow Chart

