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1.0 Introduction

This handbook is intended to be a guide for students in the Virginia Tech – Wake Forest University School of Biomedical Engineering & Sciences (SBES) to pursue graduate studies.

Students admitted to the SBES program are responsible for following the policies and procedures of the respective Graduate School (Wake Forest or Virginia Tech) where they will attend, as well as becoming thoroughly familiar with SBES policies and procedures in this handbook that apply to ALL students regardless of campus choice. Students should refer to http://www.grads.vt.edu/academics/gcat/index.html for the Virginia Tech Graduate School Policies and Procedures or to http://www2.wfubmc.edu/graduate/bulletin.html for the Graduate School Bulletin for Wake Forest University. Students are also reminded that they are being held to the highest standards of academic integrity, and thus are expected to adhere to the Honor Codes of Virginia Tech and Wake Forest University. Failure to comply with these codes could result in dismissal from the SBES program and from the universities. Honor codes are published on the respective Graduate School websites.

Even though SBES is a joint program, because of its unique nature (being comprised of universities in two different states) there are certain aspects of its operation that require some differences in processes and procedures between the two campuses. This handbook presents a description of the basic program components that apply to all students regardless of campus, but it also contains some material that is campus-specific. Where applicable certain topics are noted as applying to one campus or the other.

In general the following content applies to all SBES students: general program description, admission categories, M.S., Ph.D. and combination degree descriptions, academic requirements, plans of study, and progress to the degree steps. The content dealing with registration, enrollment, grades, student accounts, insurance, orientation, and the like pertain to the students on the Blacksburg campus. Where applicable (e.g., financial aid) some topics present information for both campuses.

1.1 Welcome to SBES: General Program Description

SBES is the Virginia Tech – Wake Forest University School of Biomedical Engineering & Sciences — a fully joint graduate program formed in 2003 that brings together three prestigious academic units: the VT College of Engineering, the Wake Forest School of Medicine, and the VA-MD Regional College of Veterinary Medicine. Each of these separate entities contributes unique strengths to the combined enterprise so that students are offered a wide spectrum of first-class educational and research opportunities in a beautiful part of the country.

The SBES program is available to students at two campus locations. Blacksburg, Virginia is home to the VT College of Engineering and the VA-MD Veterinary College, both of which provide faculty to the program, specifically from six of the engineering departments on campus; ME, ESM, CHE, MSE, ISE, and ECE. Winston-Salem, NC is the home of the Wake Forest University Baptist Medical Center consisting of Wake Forest University Health Sciences and North Carolina Baptist Hospital. Contributors to SBES include the clinical departments and the Department of Biomedical Engineering.

SBES is a graduate level only program offering the following degree programs: M.S. and Ph.D. in Biomedical Engineering, and two combination degrees; a DVM/PhD offered through the Veterinary School in Blacksburg, and an MD/PHD offered through the Wake Forest University School of Medicine. At SBES the curriculum currently consists of courses and research focused in five broad areas of concentration or “theme areas” which include:

- Biomechanics
- Biomedical Imaging
- Cell & Tissue Engineering
- Medical Physics
- Emerging Technologies

Students will normally choose to ‘specialize’ in one of these areas although it is not required that they do so. Suggested coursework and plans of study built around these themes are available to provide guidance for faculty and choices for students, however, the final composition of an individual person’s program is left in the hands of
the student and his/her advisor and committee. This permits flexibility and individualization in the SBES graduate program structure.

One campus is chosen as the “home campus” but students have the opportunity to experience both environments and the faculty of each through courses taught by video broadcast and by inter-campus visits. Many research projects are collaborative efforts between faculty and students across the two locations. All PhD students experience a required Clinical Rotation course much of which is given at the Medical Center.

Students successfully completing a graduate program in SBES will receive a joint degree from Virginia Tech and Wake Forest University. The diploma displays the names and seals of both institutions.

Details concerning the program can be found in this handbook as well as on our website at http://www.sbes.vt.edu.

2.0 Degree Programs and Requirements

2.1 General Information

The joint Biomedical Engineering program between Virginia Tech and Wake Forest University (SBES) offers the following degrees:

<table>
<thead>
<tr>
<th>Program</th>
<th>Degree</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME</td>
<td>M.S.</td>
<td>Either campus</td>
</tr>
<tr>
<td>BME</td>
<td>Ph.D.</td>
<td>Either campus</td>
</tr>
<tr>
<td>BME</td>
<td>M.D. / Ph.D.</td>
<td>WFU only</td>
</tr>
<tr>
<td>BME</td>
<td>D.V.M. / Ph.D.</td>
<td>VA Tech only</td>
</tr>
<tr>
<td>BME</td>
<td>M.S. Option</td>
<td>VA Tech only</td>
</tr>
<tr>
<td>BME</td>
<td>Ph.D. Option</td>
<td>VA Tech only</td>
</tr>
<tr>
<td>BME</td>
<td>5 yr. BS/MS</td>
<td>VA Tech only</td>
</tr>
</tbody>
</table>

Students select a campus location during the application and admissions process. The choice is based on the student's anticipated theme area of concentration and/or a choice of faculty or research projects which are of interest to the applicant.

The combination degree programs are specific to a particular campus and are intricately tied to admission into the respective medical schools associated with SBES. Combination MD/PhD degree applicants must apply to the Wake Forest University School of Medicine first (and be accepted into the program) before being considered for the PhD degree in Engineering. A comparable situation exists with the combination veterinary/engineering degree. Acceptance into the veterinary program is a necessary precursor to admittance into SBES for the biomedical engineering component of the degree.

Two special categories of SBES degrees are available only at the Blacksburg campus. The BME Option program is available to graduate students at VT who are pursuing degrees in other engineering departments, but whose work is biomedical in nature. The five-year BS/MS program is also a specialty ‘degree-path’ that involves honors-level undergraduates in various engineering departments crossing over into SBES when they complete their B.S. degree.

A discussion of the details pertaining to each degree type follows.

2.2 Master of Science Degree

Students pursuing a BME M.S. degree are required to complete a minimum of 30 total credit hours which may be distributed as follows:

- 21 – 23 credit hours of coursework
- 7 -- 9 credit hours of thesis research
All master’s students must complete and defend a thesis. There is no non-thesis degree in SBES. Most students spend an average of two years completing the M.S. The degree requirements pertaining to specific courses are shown in the table below. Note that the numbers of credits listed refer to the minimum requirements for the degree.

2.2 (a) **Table 1: Degree Requirements for the M.S. Degree in Biomedical Engineering**

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Course # (VT# / WFU#)</th>
<th>Title</th>
<th>No. Credits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering (9 credits)</td>
<td>BMES 5014 / 601</td>
<td>Quantitative Physiology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5000 or 6000 level</td>
<td>6 credit hours of engineering courses approved by committee</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(600/700 at WFU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Sciences (4 credits)</td>
<td>BMES 5004 / 600</td>
<td>Mammalian Physiology</td>
<td>4</td>
</tr>
<tr>
<td>Math Requirement (3 credits)</td>
<td>Various</td>
<td>Graduate level math course approved by advisory committee</td>
<td>3</td>
</tr>
<tr>
<td>(see Chapter 3 for suggested list of approved courses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td>5000 – 6000 level**</td>
<td>Approved by advisory committee</td>
<td>5 - 7</td>
</tr>
<tr>
<td></td>
<td>(600/700 at WFU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMES 5994</td>
<td>Research &amp; Thesis</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL COURSE CREDITS:</strong></td>
<td></td>
<td></td>
<td>21 – 23</td>
</tr>
<tr>
<td><strong>MINIMUM TOTAL CREDITS:</strong></td>
<td></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

**Note:** Course numbers cited above list Blacksburg campus first (4-digit system), followed by 3-digit numbers at the Winston-Salem location. Course numbers for both campuses on all classes offered can be found in the SBES Course Catalog located at [http://www.sbes.vt.edu/academics/course-catalog.html](http://www.sbes.vt.edu/academics/course-catalog.html).

2.2 (b) **Advisor/Major Professor**

As early as possible, but no later than the end of the second semester of study, students must choose an SBES faculty member who is going to serve as the advisor, direct the student’s research, and chair the advisory committee. At VT the SBES Graduate Program Chair often serves as a ‘temporary’ advisor until the student forms a relationship with a chosen faculty member. During the time of the interim advisor, the student should register for research hours under the temporary advisor’s name or under a ‘generic’ research section labeled “Staff”. (See section 4.1 on Registration) Once an advisor is chosen, the student will sign up for research hours under the advisor’s name.

2.2 (c) **Student Advisory Committee**

The function of the advisory committee is to approve the plan of study, provide advice, periodically assess the student’s progress toward the degree, and conduct the final examination. The M.S. degree advisory committee is composed of a minimum of three people: the major professor or advisor (who must be an SBES faculty member – either primary/core or affiliate), and two other faculty members, one of whom must be in engineering. Students may have more than 3 persons on the committee if so desired. The committee is established at the time of filing the Plan of Study with the graduate school which should take place no later than the end of the second (2\text{nd}) semester of study. Students are also encouraged to involve faculty from the opposite campus on their committees if possible.

2.2 (d) **Program of Study**
A program of study (also referred to as a Plan of Study) should be created and filed as soon as the student selects an advisory committee and **no later than the end of the second (2nd) semester of study**. The program of study must be approved by the advisory committee and by the SBES Graduate Program chair prior to submission to the graduate school. The program of study outlines the specific courses to be taken in fulfillment of the degree requirements as outlined in the chart above. A course may only be used once in the plan of study towards the satisfaction of a single requirement.

### 2.2 (e) Final Examination

All M.S. students must pass an oral comprehensive examination given by the advisory committee covering the student’s coursework and thesis research upon completing all other degree requirements. A copy of the thesis approved by the student’s major professor shall be provided to each of the committee members no less than one week prior to the examination. To complete the program students must pass the final examination, including approval of the thesis. A student is considered to have passed the examination and have the thesis approved if he/she receives no more than one negative vote on the oral exam or on the thesis. Students are allowed two attempts to pass the final exam. If the first one is not successful, a full semester (15 weeks) must pass before the student can re-schedule the examination with the graduate school.

**See “Progress to the Degree” (Chapter 9) for a fuller discussion of the above items including the VT graduate school’s requirements.**

### 2.3 Doctor of Philosophy Degree

Students pursuing a BME Ph.D. must take a minimum of 90 course credit hours beyond the B.S. degree. An M.S. degree is not required for admission to the Ph.D. program. The 90 hours may be distributed as follows:

- **36 – 50** credit hours of coursework
- **40 – 54** credits of research & dissertation (BMES 7994)

All Ph.D. students write and defend a dissertation. Most students spend an average of 4 years completing the Ph.D., however students entering the program with an M.S. may complete the degree in a shorter amount of time, and some students may take up to 5 years to complete depending on the nature of their research project. The degree requirements pertaining to specific courses are shown in the table below. Credits shown represent the minimum required to obtain the degree.

### 2.3 (a) Table 2: Degree Requirements for the Ph.D. Degree in Biomedical Engineering

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Course # (VT# / WFU #)</th>
<th>Title</th>
<th>No. Credits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering (12 credits)</td>
<td>BMES 5014 / 601 (required)</td>
<td>Quantitative Physiology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>5000 or 6000 level (600/700 at WFU)</td>
<td>9 credit hours of engineering courses approved by committee</td>
<td>9</td>
</tr>
<tr>
<td>Life Sciences (7 credits)</td>
<td>BMES 5004 / 600 (required)</td>
<td>Mammalian Physiology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5000 – 6000 Level (VT) – various departments</td>
<td>Min. 3 credit hours approved by committee –</td>
<td>3</td>
</tr>
<tr>
<td>Math Requirement (6 credits - only 3 can be in Statistics)</td>
<td>Various (see Chapter 3 for suggested list of approved courses)</td>
<td>Graduate level math courses approved by advisory committee</td>
<td>6</td>
</tr>
<tr>
<td>Electives (9 – 23 credits)</td>
<td>5000 – 6000 level (600-700 WFU)**</td>
<td>Approved by advisory committee</td>
<td>9 — 23</td>
</tr>
<tr>
<td>Clinical Rotation</td>
<td>BMES 6064 / 706</td>
<td>Required of all Ph.D. students</td>
<td>2</td>
</tr>
<tr>
<td>Medical Ethics (0)</td>
<td></td>
<td>Mandatory Seminar</td>
<td>0</td>
</tr>
</tbody>
</table>
**Note:** Course numbers cited above list Blacksburg campus first (4-digit system), followed by 3-digit numbers at the Winston-Salem location. Course numbers for both campuses on all classes offered can be found in the SBES Course Catalog located at [http://www.sbes.vt.edu/academics/course-catalog.html](http://www.sbes.vt.edu/academics/course-catalog.html).

**2.3 (b) Advisor/Major Professor**

As early as possible, but no later than the end of the second semester of study, the student must select an SBES faculty member (primary/core or affiliate) who will serve as the student's major professor, supervise the student's research, and chair the advisory committee. The major professor will report on the student's progress to the degree, and will issue the grades for research and dissertation since each student is asked to register for research hours under the advisor's section in the Timetable. The Graduate Program Chair will serve as a temporary interim advisor until a permanent advisor is found.

**2.3 (c) Student Advisory Committee**

The function of the advisory committee is to approve the plan of study, provide advice, periodically assess the student's progress toward the degree, and conduct the final examination. The SBES Ph.D. degree advisory committee is composed of a minimum of five (5) people: the major professor or advisor and four other faculty members. At least two of the five must be SBES (primary/core or affiliate) faculty members, including the Chair. At least three of the five must be engineers. Students may have more than 5 persons on the committee if so desired. The committee is established at the time of filing the Plan of Study with the graduate school which should take place no later than the end of the third (3rd) semester of study. Students are also encouraged to involve faculty from the opposite campus on their committees if possible.

**2.3 (d) Program of Study**

A program of study (also referred to as a Plan of Study) should be created and filed as soon as the student selects an advisory committee and no later than the end of the third (3rd) semester of study. The program of study must be approved by the advisory committee and by the SBES Graduate Program chair prior to submission to the graduate school. The program of study outlines the specific courses to be taken in fulfillment of the degree requirements as outlined in the chart above. See “Progress to the Degree”, Chapter 9, for a fuller discussion of the plan of study and how to prepare it. A course may only be used once in the plan of study towards the satisfaction of a single requirement. Note that in addition to the course requirements, the program requires a clinical rotation for all Ph.D. students along with completion of a medical ethics program.

**2.3 (e) Qualifying Examination**

A qualifying examination is required for all Ph.D. candidates and serves to evaluate the student's mastery of fundamental knowledge and to diagnose deficiencies. The examination must be taken by the end of the first year for students entering directly into the Ph.D. program or within one year of entering the program after completing the M.S. degree. It is the responsibility of the student and the advisor to obtain the latest information regarding the nature of this exam.

**2.3 (f) Preliminary Examination**

All Ph.D. students must take an oral preliminary examination administered by the student's advisory committee. The student will present his/her dissertation research proposal, and the exam will cover all course material and the proposed research plan, including the student's knowledge of the literature, and the feasibility and originality of the proposed work. The examination should be taken at or near the completion of the coursework and must be
taken at least nine (9) months prior to the completion of the final examination. A written copy of the research proposal must be provided to each of the advisory committee members at least one week prior to the examination. The student’s advisory committee must approve the research topic and plan in order for the student to continue working.

2.3 (g) Final Examination

All Ph.D. students must pass an oral examination or defense of the dissertation upon completing all other degree requirements and at a minimum of one year after the preliminary examination. Prior to this examination, a copy of the dissertation approved by the student’s major professor shall be provided to each of the committee members at least two (2) weeks prior to the exam. To complete the program, students must pass the final examination, including approval of the dissertation in final form. A student is considered to have passed the examination and have the dissertation approved if he/she receives no more than one negative vote on the oral examination or on the dissertation. Students are allowed two attempts to pass the final exam. If the first one is not successful, a full semester (15 weeks) must pass before the student can re-schedule the examination with the graduate school.

**See Chapter 9, “Progress to the Degree” for a fuller discussion of the above items including the graduate school’s requirements.

2.4 Academic Theme Areas

Research in SBES falls broadly into five different theme areas offering students subject matter for concentrating their studies. These theme areas are:

- Biomechanics
- Biomedical Imaging
- Cell & Tissue Engineering
- Medical Physics
- Emerging Technologies

While it is not required that a student formally choose or ‘declare’ one, there are lists of recommended courses and/or sample plans of study available to serve as guidance for faculty and options for students. An SBES graduate student’s theme area is not ‘officially’ designated anywhere except within SBES and its departmental records. It does not appear on the transcript or on the diploma. Current SBES theme areas are described below.

2.4 (a) Biomechanics

The Biomechanics theme area in the School of Biomedical Engineering and Sciences (SBES) will provide the student with an extensive background in the study of mechanics as it relates to the human body.

SBES offers the following courses:

<table>
<thead>
<tr>
<th>Dept./Course #</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMES 5124</td>
<td>Advanced Musculoskeletal Biomechanics</td>
</tr>
<tr>
<td>BMES 5164</td>
<td>Advanced Impact Biomechanics</td>
</tr>
<tr>
<td>BMES 5174</td>
<td>Biomechanics of Crash Injury Prevention</td>
</tr>
<tr>
<td>BMES 5184</td>
<td>Injury Physiology</td>
</tr>
<tr>
<td>BMES 5214</td>
<td>Human Physical Capabilities</td>
</tr>
<tr>
<td>BMES 5244</td>
<td>Biofluids</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Bioinstrumentation</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Biomechanics &amp; Simulation of Movement I</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Biomedical Heat Transfer/Thermal Design</td>
</tr>
<tr>
<td>BMES 6125</td>
<td>Biodynamics and Control I</td>
</tr>
<tr>
<td>BMES 6126</td>
<td>Biodynamics and Control II</td>
</tr>
<tr>
<td>BMES 6164</td>
<td>Computational Modeling in Impact Biomechanics</td>
</tr>
<tr>
<td>BMES 6174</td>
<td>Advanced Human Modeling</td>
</tr>
<tr>
<td>ESM 5305</td>
<td>Cardiovascular Mechanics I</td>
</tr>
<tr>
<td>ESM 5306</td>
<td>Cardiovascular Mechanics II</td>
</tr>
</tbody>
</table>
**Suggested Courses for Biomechanics Specialties**

Biomechanics is a broad area with diverse research specialties ranging from musculoskeletal biomechanics to biofluids. Following are a set of suggested courses grouped by research specialization. The list below should be used as a guideline for course selection rather than a set of required courses. Final course selection should be made in consultation with the student’s advisor and committee.

**Musculoskeletal Biomechanics**
- Advanced Musculoskeletal Biomechanics (BMES 5124)
- Biodynamics and Control I (BMES 6125)
- Biodynamics and Control II (BMES 6126)
- Bioinstrumentation (BMES 5984)
- Biomechanics & Simulation of Movement I (BMES 5984)
- Human Physical Capabilities (BMES 5214)

**Impact Injury Biomechanics**
- Advanced Impact Biomechanics (BMES 5164)
- Advanced Human Modeling (BMES 6174)
- Biomechanics of Crash Injury Prevention (BMES 5174)
- Bioinstrumentation (BMES 5984)
- Computational Modeling in Impact Biomechanics (BMES 6164)
- Injury Physiology (BMES 5184)

**Biological Fluid Mechanics and Transport**
- Biofluids (BMES 5244)
- Cardiovascular Mechanics I (ESM 5305)
- Cardiovascular Mechanics II (ESM 5306)
- Biomedical Heat Transfer/Thermal Design (BMES 5984)
- Biological Transport Phenomenon (BMES 5304)
- Bioinstrumentation (BMES 5984)

2.4 (b) **Biomedical Imaging Theme Area**

Biomedical Imaging courses offered by SBES provide the student with a background in imaging processing, image analysis, and medical imaging modalities. Students should also check for Special Topics courses in medical imaging that are taught on various topics, or other pertinent imaging-related electives. Final course selection should be made in consultation with the student’s advisor and committee.

**Biomedical Imaging Courses:**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>655 / 5554</td>
<td>Biomedical Signal and Image Processing</td>
</tr>
<tr>
<td>750 / 6504</td>
<td>Medical Imaging I</td>
</tr>
<tr>
<td>751 / 6514</td>
<td>Medical Imaging II</td>
</tr>
<tr>
<td>652 / 5525</td>
<td>Stochastic Signals and Systems I</td>
</tr>
<tr>
<td>656 / 5526</td>
<td>Stochastic Signals and Systems II: Signal Detection and Estimation</td>
</tr>
<tr>
<td>758 / ECE 5524</td>
<td>Pattern Recognition</td>
</tr>
<tr>
<td>759 / ECE 6444</td>
<td>Advanced Image Analysis</td>
</tr>
<tr>
<td>N/A / 5984</td>
<td>Introduction to Biomedical Optics</td>
</tr>
</tbody>
</table>

**Sample Plan of Study:** (first 2 years – remainder of time in research)

<table>
<thead>
<tr>
<th>YEAR 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Summer</td>
</tr>
<tr>
<td>Fall</td>
</tr>
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<td></td>
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<tr>
<td></td>
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<tr>
<td>Spring</td>
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<tr>
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<td></td>
</tr>
</tbody>
</table>

## YEAR 2

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>Clinical Rotation</td>
<td>TBA</td>
</tr>
<tr>
<td>Fall</td>
<td>Medical Imaging II</td>
<td>Kraft</td>
</tr>
<tr>
<td></td>
<td>Statistical Pattern Recognition</td>
<td>Santiago</td>
</tr>
<tr>
<td></td>
<td>Life Science</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>Advanced Image Analysis</td>
<td>Santiago</td>
</tr>
<tr>
<td></td>
<td>Topics in Medical Imaging (specify modality)</td>
<td>TBA</td>
</tr>
<tr>
<td></td>
<td>Math</td>
<td></td>
</tr>
</tbody>
</table>

### 2.4 (c) Cell and Tissue Engineering Theme Area

The Cell and Tissue Engineering theme area in the School of Biomedical Engineering and Sciences (SBES) will provide the student with an opportunity to work in this revolutionary field with BME faculty who, in conjunction with the Wake Forest Institute for Regenerative Medicine, are pioneering methods for using the patient's own cells to grow new tissue and organs. Specific topics include:

- Introduction to regenerative medicine
- Biomedical engineering and human disease
- Biological transport phenomena
- Cell adhesion
- Biomaterials
- Fundamentals of tissue structure

#### Cell and Tissue Engineering Courses

<table>
<thead>
<tr>
<th>Dept./Course #</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMES 5984</td>
<td>Introduction to Regenerative Medicine</td>
</tr>
<tr>
<td>BMES 5024</td>
<td>Biomedical Engineering and Human Disease</td>
</tr>
<tr>
<td>BMES 5304</td>
<td>Biological Transport Phenomena</td>
</tr>
<tr>
<td>BMES 5334</td>
<td>Cell Adhesion</td>
</tr>
<tr>
<td>BMES 5424</td>
<td>Fundamentals of Tissue Structure</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Biomedical Instrumentation</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Computational Modeling in Cell &amp; Molecular Biology</td>
</tr>
<tr>
<td>BMES 5714</td>
<td>Biomedical Microdevices</td>
</tr>
<tr>
<td>BMES 5984</td>
<td>Biomedical Heat Transfer/Thermal Therapy Design</td>
</tr>
</tbody>
</table>
2.4 (d) Medical Physics Theme Area

Medical Physics courses in SBES will include basic radiation physics, radiation biology, the physics of imaging (X-ray, CT, Nuclear Medicine/PET, and MRI), and the physics of radiation treatment. Because the field of Medical Physics has requirements for certification, the suggested courses below have been designed to meet those requirements. Final course selection should be made in consultation with the student's advisor and committee.

At this time there are no provisions for a specialty in Medical Physics at the Master's level. All students interested in this specialty will pursue a Ph.D. degree.

Medical Physics Courses:

Required Core courses:

Physics and/or Biomedical Engineering
PHYS 712 Electromagnetism
PHYS 741 Quantum Mechanics
Radiation therapy Physics
Medical Imaging I
Medical Imaging II
MDEG 781 Clinical Rotation I
MDEG 782 Clinical Rotation II

Life Sciences:
Mammalian Physiology
TBA Radiobiology (Cancer Biol.) NEW
Medical Ethics (summer session)

Electives:
At least 9 hours from approved Physics electives

Approved Electives
PHYS 603 Biophysics
PHYS 604 Medical Imaging
PHYS 620 Physics of Macromolecules
PHYS 637 Analytical Mechanics
PHYS 651 Thermo and Statistical Mechanics
PHYS 652 Phys Optics & Optical Design
PHYS 654 Intro to Solid State Physics
PHYS 711 Classical Mechanics
PHYS 715 Nonlinear Optics & Quant Electro
PHYS 742 Quantum Mechanics
PHYS 743 Advanced Quantum Mechanics
PHYS 744 Intro to Quantum Field Theory
PHYS 745 Group Theory
PHYS 752 Solid State Physics

2.5 Residency Requirement for the Ph.D. Degree (VT Campus)

At least two consecutive semesters of full-time enrollment (at least 12 credit hours per semester) must be completed on the Blacksburg campus to fulfill the Residency Requirement. Individual degree programs, located at sites other than Blacksburg may request an alternative to the Blacksburg campus requirement by petitioning the Graduate School. The Graduate School will report annually to the Commission on Graduate Studies and Policies on the success of the alternative residency. The Graduate School retains the right to withdraw the permission for such alternative forms of residency, if deemed necessary.
SBES students on the Winston-Salem campus are considered to be Virginia Tech students for purposes of fulfilling degree requirements; therefore due to the nature of the joint program, their residency requirement is inherently met through their time on the Winston-Salem campus.

For an explanation of the purpose for the VT Ph.D. Residency Requirement, see the Graduate School’s Policies & Procedures on their website, [http://www.grads.vt.edu/academics/gcat/index.html](http://www.grads.vt.edu/academics/gcat/index.html).

### 2.6 M.D. / Ph.D. and D.V.M. / Ph.D. Degrees

The combination medical and Ph.D. biomedical engineering degrees are applied for and initially administered under the respective medical programs involved. The M.D. / Ph.D. combination is available only on the Winston-Salem campus. Interested students must first apply directly to the Wake Forest University School of Medicine following the standard application procedures required. During the course of the application process, the student would indicate his/her interest in the combination degree. Admission to the program only occurs if the student is first accepted into the WFU Medical School, and then is accepted by the normal SBES admissions process into the Ph.D. engineering program. Combination students do NOT apply to the SBES graduate program through the normal route of Virginia Tech’s online application process.

The combination D.V.M. / Ph.D. degree program works in a similar manner. Applicants apply to the Virginia-Maryland Regional College of Veterinary Medicine (on the Blacksburg campus) for consideration into its veterinary program. Following acceptance the student can then submit application materials to SBES for the engineering (Ph.D.) component of the combination degree. Again, this application process is separate from the one used by non-combination degree applicants.

The basic degree requirements for the combination degrees will be the same as for the regular BME Ph.D. degree with the exception that the life sciences requirement taken for the M.D. and D.V.M. degrees will satisfy the life science requirement for the SBES degree, and the clinical rotation requirements for both the M.D. and D.V.M. degrees will satisfy the BME Ph.D. requirement for a clinical rotation.

#### 2.6 (a) Table: Course Requirements for the D.V.M. / Ph.D. and the M.D. / Ph.D. Joint Degrees

<table>
<thead>
<tr>
<th>Subject</th>
<th>Course # (VT # / WFU #)</th>
<th>Title</th>
<th>No. Credits Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering (12 credits)</td>
<td>BMES 5014 / 601 (required)</td>
<td>Quantitative Physiology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>5000 or 6000 level (600 / 700 at WFU)</td>
<td>Min. 9 credit hours of engineering courses approved by committee</td>
<td>9</td>
</tr>
<tr>
<td>Life Sciences (7 credits)</td>
<td>Satisfied with DVM and/or MD courses</td>
<td></td>
<td>7**</td>
</tr>
<tr>
<td>Mathematics (6 credits – only 3 can be in Statistics)</td>
<td>5000 – 6000 level (600 / 700 WFU)</td>
<td>Min. 6 credit hours (see approved list in Chapter 3 of handbook)</td>
<td>6</td>
</tr>
<tr>
<td>Electives (9 - 23 credits)</td>
<td>5000 – 6000 level (600 / 700 at WFU)</td>
<td>Approved by Advisory Committee</td>
<td>9 - 23</td>
</tr>
<tr>
<td>Clinical Rotation</td>
<td>Satisfied with DVM or MD Clinical Rotation requirement</td>
<td></td>
<td>2**</td>
</tr>
<tr>
<td>Medical Ethics (0 credits)</td>
<td>Medical Ethics (only if not required by DVM program)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dissertation Research (40 – 54 credits)</td>
<td>BMES 7994</td>
<td>Research &amp; Dissertation</td>
<td>40 - 54</td>
</tr>
</tbody>
</table>

**Total Course Requirements:** 36 - 50

**Total Minimum Number of Credit Hours (Courses + Thesis):** 90

** = Course credit numbers are the same as for the single SBES Ph.D. degree, but the courses taken to satisfy these hours are not the “normal” SBES courses used in the regular Ph.D. program requirements. Course numbers for both campuses on all classes offered (excluding medical school courses) can be found in the SBES Course Catalog located at [http://www.sbes.vt.edu/academics/course-catalog.html](http://www.sbes.vt.edu/academics/course-catalog.html)
2.7 5-yr B.S. / M.S. Program (Blacksburg campus only)

SBES participates in the University Honors level 5-year B.S. / M.S. program on the Blacksburg campus. Application to this program is available to VT students who. . . .

a) are pursuing an engineering undergraduate degree at VT
b) have at least a 3.5 GPA or better
c) have completed 90 hours of undergraduate-level work
d) have at least two more semesters to complete all B.S. requirements

Acceptance into the program allows the student to ‘double-count’ up to 12 hours of graduate-level coursework which is chosen in advance and taken during the senior year. Successful completion of the courses with no less than a “B” average is required in order for them to count toward both degrees.

Students from other undergraduate majors wishing to complete an SBES M.S. degree must meet the same SBES requirements as those expected of regular program graduate applicants and must be admitted into the program through the normal admission process. GREs and three letters of recommendation are required. Even though this category involves VT students only, admittance into the 5-year program requires acceptance of the candidate by both university admissions committees, and admission must take place before the start of the student’s senior year.

Participation in this program requires the student to work closely (and well in advance) with the advising offices of two departments to ensure that requirements for both degrees are met without conflict. The application procedure should begin during the spring semester of the student’s junior year, so that processing can take place during the normal application season for new students beginning the following fall semester. The student needs to confer with the Graduate Coordinator of SBES as well as the undergraduate advisor in his/her ‘home’ department in order to choose the courses which will be double-counted.

2.7 (a) Other Instructions/Considerations (5-year Program)

Coursework taken prior to acceptance into the 5-yr program cannot be double-counted. Additionally, coursework double-counted for this program cannot be used on a Ph.D. plan of study (cannot “triple-count”).

Students are advised to consult with the SBES Graduate Coordinator before beginning to work on the forms involved in this process, particularly the Course Designation Form.

The application packet proceeds from the department to the Graduate School for processing. A decision letter is sent to the student from the Graduate School with enclosed forms.

Upon completing the B.S. degree and the designated courses, the student submits the forms enclosed in the graduate school’s letter. One is a Change of Status which goes to the Graduate School. The other is a form which goes to the Registrar’s office listing the courses that have been completed and are to be double counted. This action initiates the formation of a graduate transcript.

Five-year students are not eligible for graduate scholarships, fellowships, or graduate financial aid (GTA/GRA) until the B.S. degree is awarded and their status changes to Master’s level.

2.8 BME Option Program (Blacksburg campus only)

Engineering graduate students on the Blacksburg campus may earn a Biomedical Engineering Option while pursuing an advanced degree in another department. Upon completion of certain requirements the option is placed on the student’s transcript when the ‘home’ department degree is conferred.

The ME, ESM, MSE, ISE, ECE, and CHE departments offer concentrations in biomedical engineering in conjunction with their graduate degree programs. These departments have faculty involved in research endeavors of a biomedical nature, and many of them are directly affiliated with SBES as core or affiliate faculty.

Students from these departments expressing interest in the Option are referred to the SBES Graduate Coordinator’s office where the necessary application procedure is begun. The student’s entrance into the Option
program should take place no later than the second semester of graduate school. Ideally the decision to participate and apply is done during the first semester.

2.8 (a) Procedure

The student declares his/her intent to pursue the BME Option by completing the SBES Option /Transfer form (http://www.sbes.vt.edu/documents/BME_option_app_form.pdf) which specifies the program requirements. The student collects the signatures of the advisor (who must be an SBES affiliate), and the home department chair (or designee). The form is returned to the SBES Graduate Coordinator who obtains the signature of the SBES department head (or designee).

In order to fulfill the Option requirements the student must:....

a) take a minimum of six (6) credit hours of BMES-designated courses

b) do graduate level research in the area of biomedical engineering

c) participate in the SBES seminar program (attend SBES presentations)

d) present (research) at least once at the annual Research Symposium before graduation

A copy of the student’s file (obtained with student permission from the home department) is maintained in the SBES Graduate office. The initial SBES Option form is sent to the graduate school to inform them of the student’s intent to pursue the option along with the regular graduate degree.

When the student is nearing graduation the BME Option Completion-Data form, which can be found at http://www.sbes.vt.edu/documents/BME%20Option_letter_compl_data_form.pdf, is filled out and sent to the Graduate Coordinator. A formal letter of completion is then generated which is signed by all interested parties to indicate that the requirements were met and to so inform the graduate school. The student gathers the signatures of the advisor and the ‘home’ department head, then brings the letter to the SBES Graduate Coordinator for final sign-off by her and the SBES department head, after which it is sent to the graduate school.

If the student fails to complete the final paperwork steps, the option (if placed on the transcript at the time of degree conferral) will be removed.

3.0 SBES Academic Requirements within the Degrees

In addition to the general course credit minimums established for degree conferral, there are certain other academic requirements that must be met by all SBES students which are presented below.

3.1 Math Credit Requirement

- An M.S. degree student must complete a minimum of three (3) semester-hours approved by the advisory committee.

- A Ph.D. degree student must complete a minimum of six (6) semester-hours approved by the student’s advisory committee. No more than three hours may be in statistics; however, the math requirement does not require statistics.

Courses offered at Virginia Tech and at Wake Forest that are approved for the math requirement are listed below. Engineering courses often have considerable mathematics content; however, these courses will not count toward the mathematics requirement but can be used to fulfill the engineering course requirement. Students who would like to take a class not listed below should first get permission of their major advisor and then submit a request to the chair of the graduate program committee. (Students are encouraged to investigate this option as we can not anticipate all the math courses that could be available or would be applicable for an individual student’s needs.)

3.1 (a) Approved VA Tech Math Courses for SBES Mathematics Requirement

<table>
<thead>
<tr>
<th>Course</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH</td>
<td>Any 5000-level or higher course with some exceptions*</td>
</tr>
<tr>
<td>STAT</td>
<td>Any 5000-level or higher course with some exceptions*</td>
</tr>
<tr>
<td>CHE 5984</td>
<td>Engineering mathematics</td>
</tr>
</tbody>
</table>
ESM 5725  Mathematical methods in engineering I
ESM 5726  Mathematical methods in engineering II
ME 5744  Methods of mechanical engineering analysis

**NOTE:** A list of suggested courses by individual theme areas for the VT campus can be found in Appendix I.

### 3.1 (b) Approved Wake Forest Statistics Courses

- CPTS 730  Introduction to statistics
- CPTS 732  Applied linear models
- MATH 656  Statistical methods
- MATH 657/658  Mathematical statistics I, II
- MATH 658  Multivariate statistics

### 3.1 (c) Approved Wake Forest Math Courses for the Biomedical Imaging and the Medical Physics Theme Areas

- MATH 610  Advanced calculus
- MATH 617  Complex analysis
- MATH 624  Linear algebra II
- MATH 626  Numerical linear algebra
- MATH 652  Applied partial differential equations
- MATH 655  Introduction to numerical methods
- MATH 717  Optimization in Banach spaces
- MATH 753  Nonlinear optimization
- MATH 761  Stochastic processes

### 3.1 (d) Approved Wake Forest Math Courses for the Biomechanics Theme Area

- MATH 610  Advanced calculus
- MATH 617  Complex analysis
- MATH 624  Linear algebra II
- MATH 626  Numerical linear algebra
- MATH 652  Applied partial differential equations
- MATH 655  Introduction to numerical methods
- MATH 717  Optimization in Banach spaces
- MATH 753  Nonlinear optimization
- MATH 761  Stochastic processes

### 3.1 (e) Approved Wake Forest Math Courses for the Cell & Tissue Engineering Theme Area

- MATH 610  Advanced calculus
- MATH 624  Linear algebra II
- MATH 626  Numerical linear algebra
- MATH 652  Applied partial differential equations
- MATH 753  Nonlinear optimization

### 3.1 (f) *The following MATH and STAT courses do not meet the SBES mathematics requirement:*

- MATH 5984  Final examination
- MATH 5974  Independent study
- MATH 5994  Research & thesis
- MATH 7994  Research & dissertation
- STAT 5984  Final examination
- STAT 5904  Project & report
- STAT 5924  Graduate seminar
- STAT 5974  Independent study
- STAT 5994  Research & thesis
3.2 Life Sciences Requirement

In order to fulfill the life science requirement for the Ph.D. degree in Biomedical Engineering students must acquire a minimum of seven (7) credit hours in approved coursework.

Four (4) of the seven hours are earned with the required BMES 5004 Mammalian Physiology class usually offered in the fall semester. The remaining hours can be earned by enrollment in one or more upper division life science courses offered through one of two possible avenues:

3.2 (a) Approved BMES Life Science Courses

The following BMES courses have been designated as ‘life science’ courses suitable for degree requirements. At this time there are two choices (besides Mammalian Physiology mentioned above):

- BMES 5184 Injury Physiology
- BMES 5024 Biomedical Engineering and Human Disease

3.2 (b) Courses Meeting Life Science Requirement (Virginia Tech campus)

Students may use 5000 or 6000-level courses offered from the following VT departments to meet the SBES life science requirement:

- BMVS Biomedical & Veterinary Sciences
- BIOL Biology
- BCHM Biochemistry
- ALS Agriculture and Life Sciences

Students should be aware that many courses listed in the above departments carry pre-requisites and/or restrictions which would not make those classes suitable for all students. For example, in the Vet School any course designated VM is restricted to professional veterinary students. It is the student's responsibility to examine the course descriptions, pre-requisites, and/or restrictions in order to determine whether he/she has sufficient academic background to enroll in a particular course. If course descriptions fail to specify pre-requisites and/or restrictions for registration, the student may find it useful to directly contact the department or the faculty member teaching the class.

3.2 (c) Courses Meeting Life Science Requirement (Winston-Salem campus)

Students may use 600 and 700 level courses from the following departments:

- BIO Biology
- CHM Chemistry
- BICM Biochemistry and Molecular Biology

Additional approved courses include:

- Comparative Medicine (COMD) 706 Animal Models in biomedical Research
- Health & Exercise Science (HES) 675 Advanced Exercise Physiology

Questions about specific courses in these or other departments should be directed to the WFU Program Director, Dr. Kate Holzbaur.

3.3 Ethics Requirement

All SBES Ph.D. students are required to complete a segment of training in "Medical Ethics" the purpose of which is to acquaint the student with the legal, moral, and ethical considerations involved in using human and animal subjects in biomedical research. The training is not offered to the students as a single ‘regular’ course for which course credits toward the degree are given. It is not listed on the VT or WFU Timetable of Courses so it is not
registered for, but it is to be listed on the Plan of Study as a “supporting course” (for zero credits) since it is a required component of the Ph.D. program and must be completed before graduation.

It is usually offered during the fall orientation week before classes begin at both campus locations. The exact content and nature of the class may differ slightly between the two campuses. At Winston-Salem the requirement is satisfied through a series of one-credit mandatory courses taken by all graduate students in the health and medical sciences programs.

3.4 Clinical Rotation

The Clinical Rotation is a required 2-semester hour class for SBES Ph.D. students. Its purpose is to provide engineering students with real experience in the medical arena in order to better understand how their biomedical research projects relate to clinical practice. The rotation consists of 4 weeks during which the students take part in Gross Anatomy, Patient Simulation and clinical situations under the mentorship of faculty and other medical personnel. Rotations are held at Wake Forest University Baptist Medical Center in Winston Salem, and opportunities exist at the VA-MD Regional College of Veterinary Medicine located on the Blacksburg campus.

Students are expected to complete the rotation in the sequence in which it is given, and attendance at all sessions is mandatory. Students will participate in the Gross Anatomy Lab, Patient Simulation Lab, and receive exposure to many clinical experiences including surgical cases, rounds, clinics and labs. Gross Anatomy and Patient Simulation are to be completed at the Medical School in that order with surgical and medicine rotations to follow.

Orientation at Wake Forest University Health Sciences is required and must be completed prior to the start of the rotation. Students will be required to submit immunization records, complete a confidentiality agreement, adhere to Medical Center policies and procedures, and are held to the same HIPPA policies as Medical Center employees. Notification of the clinical rotation dates are given prior to the end of the fall semester. Gross Anatomy and Patient Simulation may include sessions during winter and spring breaks. Surgical and medicine rotations are typically held following the end of the spring semester – usually May or June.

3.5 Research Symposium

At the end of the spring semester SBES hosts an annual graduate student Research Symposium which is held at each campus location rotating on alternate years. It is an all day conference at which biomedical engineering students present research projects through posters and/or oral presentations. It is one of the major events that allow the students from both campuses to share in a significant academic experience. Students are expected to attend and participate in some way, depending upon their status or levels in the program.

The following guidelines govern the attendance/presenting requirements for both SBES degree-seeking students and students from other engineering majors seeking the BME option (Blacksburg campus only). BME-Option students are required to participate in the symposium as part of the general requirements for obtaining the Option.

First-year SBES and BME-option students should attend and may present a poster. (Students should discuss this decision with their advisor.)

All non first-year SBES and BME-option students must attend and present a poster. These students may elect to give an oral presentation if time allows. (Students should discuss this decision with their advisor.)

All SBES degree-seeking and BME-option students who will graduate in May, or the following August or December, are required to give an oral presentation.

All students showing a poster or giving an oral presentation submit a written abstract of the research project as directed which are published in a Symposium Program book given to all attendees.

3.6 SBES Seminar Series
All SBES students are required to attend at least five (5) seminars per semester. This requirement is meant to encourage SBES students to enhance their academic/research development by attending talks/presentations on subjects pertinent to their own programs, interests, and projects. The seminars can originate from any relevant department including SBES or others (for example, any engineering discipline, biology, chemistry, math, etc.), therefore the selection of what to attend is to be left up to the individual student. However, any announced seminar that is designated as ‘SBES required’ must be attended barring an approved conflict. Required seminars may be different at each campus and will be announced to the students by the administration throughout the term.

At the end of each semester students must submit a list of the five seminars attended (title, speaker name, date) to their advisors for approval. The list may contain both required and elective ones.

_The completed list, approved and signed by an advisor, must be submitted to the SBES graduate student coordinator before the end of semester exams._

A Seminar Tracking form for submission to the graduate office can be found on the SBES website.

### 4.0 Enrollment and Registration Procedures (Blacksburg Campus)

#### 4.1 Registration/Pre-registration

New students entering the SBES program will be registered in advance for the first semester by the Graduate Coordinator. This will occur sometime during late summer. Students will be registered into one or two required courses, with the remainder of the credit hours assigned to research. Once the student arrives for orientation and registration is opened on Hokie SPA to all students, the SBES student will be allowed to make schedule adjustments by adding more classes of his/her choice, and reducing the number of research credits to maintain a “normal” load of 12-15 credit hours. After the first semester of study, students will register for classes online thru Hokie SPA after consulting with their advisors.

On the Timetable of Classes all SBES faculty have their own individual Research & Thesis (5994) and Research & Dissertation (7994) sections designated by separate CRN (Course Registration Number) numbers. Each student is to sign up under his/her respective advisor’s research section ensuring that a 5994 section is chosen for those pursuing the M.S. degree and 7994 is chosen for Ph.D. candidates. If a student does not have an assigned advisor, he/she may use a generic section taught by “Staff”.

Pre-registration for continuing students is an eight-day period in the middle of each semester during which currently enrolled students may select classes for the next semester. During spring semester, students register for summer school (if they plan to attend) and for fall semester classes. Consult the registrar’s website, [http://www.registrar.vt.edu/](http://www.registrar.vt.edu/), for information. Pre-registration is also referred to as “course request”.

The maximum number of semester credit hours allowed for graduate students is 18. A normal load is from 12 – 15 per semester. If a student is on an assistantship he/she must carry a minimum of 12 credit hours per semester (excluding summers). Overloads (19 hours or more per semester, or 6 each summer session) require permission of the graduate dean.

Approximately three weeks after the close of pre-registration week, course request results (class ticket) are available and may be printed by accessing Hokie SPA at [http://hokiespa.vt.edu/](http://hokiespa.vt.edu/). The Web class ticket will include detailed information regarding sections which are full, conflicting, withdrawn, or restricted, and it explains why these sections were not added to the student’s schedule.

#### 4.2 Changes in Enrollment

Students may adjust their schedules on a space available basis using Web Drop/Add (available through [Hokie SPA](http://hokiespa.vt.edu/)), an electronic schedule adjustment program. The Add Period is restricted to a short period at the beginning of the semester, the Drop Period lasts for a longer period of time into the semester; deadlines for these electronic transactions that can be done by students are published in the Course Timetable for each semester.

##### 4.2 (a) Force-Add
A “force-add” form permits enrollment in a class over the set capacity for that course or to over-ride course restrictions. This transaction is done with the “force-add” form available in the department offering the course, and requires the instructor’s (or, in some departments, departmental) permission. Force-adds are processed by the department offering the course during the Add Period in the first week of classes of each semester. SBES students wishing to force-add a BMES class must go to the office of the Graduate Coordinator to obtain the necessary form for doing so. Students from other majors who wish to force-add SBES courses also need to follow this procedure.

4.2 (b) Late Adds & Drops

In unusual circumstances when adjustments to student schedules are needed after the last day to carry out an electronic change, SBES students must obtain a BMES Force-Add form from the Graduate Coordinator’s office, gather the necessary signatures from the instructor and the advisor, after which the form is turned in to the Graduate Coordinator for processing at the Graduate School. Permission from the Graduate Dean is required for this transaction. An explanation of the extenuating circumstances necessitating the change will be required. Late withdrawals from a course which are approved are designated on the student’s transcript as a “graduate withdrawal” (WG) and do not carry a grade penalty. This option is only allowed prior to the Friday of the last week of classes for the semester.

If a student wants to Withdraw from all courses for a semester or if a student who is enrolled for a single course wishes to drop that course, a Resignation/Withdrawal form must be submitted to the Registrar’s office by certain specific deadlines. See the VT graduate catalog for further information.

4.3 Continuous Enrollment Requirement

Unless on an approved leave of absence, graduate students in degree programs must be registered continuously during the academic year (fall and spring semesters) and pay the prescribed tuition and fees. Students working on research/scholarly activity toward their thesis or dissertation should enroll in the number of credit hours that reflects the extent of a student’s study or research. SBES students are expected to work closely with their advisors to determine the appropriate number of research credit hours that should be taken each semester.

Minimum enrollment is for 3 credit hours except in the case of a student who qualifies for Defending Student Status (see section on Progress to the Degree). To be considered “full-time” students must be registered for 9 or more graduate hours – anything less is considered “part-time”. Students on graduate assistantships must be enrolled for a minimum of 12 credits. Normally graduate students do not enroll for courses in the summer, but if a decision to enroll during one of the summer sessions is made, a full-time load is 3 credit hours.

4.3 (a) Student Responsibility for Enrollment

Each student is responsible for verifying his/her enrollment in courses and for making any changes in that enrollment. Students should check their enrollment in specific courses during the first week of classes of a semester (the Add Period) when any correction can be made electronically. Faculty cannot add or drop students from their rolls and cannot add or drop a student by including or removing his/her name on the final grade sheet.

4.3 (b) Enrollment at the Time of Examinations and for Degree Completion

Graduate students must be registered for the minimum number of credits in the semester or summer session when they take an examination required by Graduate School Policies and in the semester when a degree is completed. Students who have been out of residence and return to work with their advisor during their thesis/dissertation writing should be enrolled for a minimum of 3 credits of research (this presumes that all other coursework on the student’s Plan of Study has been completed). Faculty advisors and committee members should not agree to work with students who are not enrolled, i.e., a student who wishes to return to defend a thesis/dissertation needs to have a period of research enrollment for working with his/her advisor and committee prior to the defense.

Students who have a thesis/dissertation ready for defense by the beginning of a new semester may schedule that defense within the first 15 class days of the semester and qualify for Defending Student Status.
4.4 Grading and Grade Requirements

In addition to the university standard grading scale of A-F (see Graduate Catalog), SBES graduate students can also receive grades of P/F, “I” (Incomplete), “X” (course continues over more than one semester), NG (no grade), NR (not reported), EQ (equivalency credit – a “pass” for research). Grades in all courses, including those not counted for graduate credit on the student’s Plan of Study, are calculated into the overall GPA. If an instructor fails to report a grade (NR), it is calculated as a 0.0 into the GPA. Graduate students are expected to maintain a 3.0 overall GPA in order to be considered as making satisfactory progress and to be eligible for assistantships.

4.4 (a) Incomplete and X Grades

Incompletes do not calculate into the GPA and may be given when the requirements of a course have not been completed because of illness or extenuating circumstances. This judgment is made by the course instructor. Incompletes should be removed by completing the course requirements as soon as possible. SBES policy calls for the removal of an incomplete (“I”) grade no later than the end of the next academic semester (not including summers). Failure to comply could result in conversion of the “incomplete” to an F grade. Grades of “X” are assigned initially to course work that extends over more than one semester and are removed when the final grade for the course is entered. Graduate degrees cannot be completed until all “I” and “X” grades have been converted to a letter grade on the Plan of Study.

4.4 (b) Grading System Requirements

All courses on the Plan of Study, i.e., courses that satisfy degree requirements, must be taken for a letter grade (A/F) except for those courses offered on a pass/fail (P/F) basis only (for example, seminars and Independent Study courses are only P/F). Courses on the Plan of Study with grades below C- (C minus) must be repeated. Courses on the Plan of Study, once taken, cannot be removed from the Plan of Study.

Graduate students are permitted to take additional courses on a pass/fail basis only if those courses are not on their Plan of Study, are outside the department, and are approved by the student’s advisor. Such courses may not be used to satisfy minimum degree requirements. Once credit is received for a course taken P/F, the course may not be repeated for a regular grade.

4.4 (c) Repeating Courses

Courses originally taken on the P/F option, in which a grade of “F” is earned, may only be repeated on a P/F basis. Courses may not be repeated if a “P” grade or a grade of “C” or better is earned. When a course is repeated the grade for the earlier enrollment will be a Repeat Graduate (“RG” – defined as C- or lower) which will not calculate into the GPA. Only the grade earned for the final enrollment in the course will receive a letter grade and be calculated in the GPA.

4.5 Auditing SBES Courses (applies to both campuses)

SBES graduate students may audit courses according to the standard audit policy at Virginia Tech. An audit requires the approval of the instructor and the student’s graduate advisor. Auditing of laboratory work is not permitted. Registration for audit may not be changed to credit, or vice versa, after the last day to add classes, without the signature of the instructor, student’s major advisor, and the Dean of the Graduate School. Audited courses do not count toward full-time enrollment.

At the end of the course period, the instructor will determine if an audit is “satisfactory” or “unsatisfactory” based on participation and other expectations set forth at the beginning of the course period. Unsatisfactory audits will not appear on transcripts and therefore will not affect the GPA. Students will NOT be allowed to register for credit in any course previously audited.

4.5 (a) Audit Procedure

In order to add a BMES audit class to the schedule, SBES students must obtain a BMES Audit Request Form from the graduate office which is to be completed by the student and the course instructor. After the signatures of both are obtained, the form is submitted to the graduate coordinator for processing at which time the requested
audit is added to the student’s schedule. Any students signing up online for an AUDIT during DROP/ADD will be dropped from the course rolls. Audits will be added to classes based on seat availability.

4.6 Independent Study (5974), Special Study (5984), and Con-joint Courses

Independent study and special study courses allow students to pursue subject matter study in areas for which there are no approved formal courses. Independent study courses generally involve extensive reading and tutorial sessions with the faculty supervisor and also may involve written papers. The subject of Independent Study is a continuation in greater depth of a topic covered in a regular course, allowing students to study topics of particular individual interest.

Special study courses are designed for a group of students, rather than for a single individual. This type of course may be used to study a timely topic; one in which there is current, but not lasting, interest. It also may be used as an experimental course before incorporation into the regular curriculum.

On SBES plans of study the number of credits allowed for both independent study and special study courses is subject to the following limits:

- For the M.S. program a maximum of 6 hours of independent study courses and a maximum of 6 hours of special study courses, with the total for both independent study and special study courses of no more than 9 hours, may be used on the plan of study.

- For the Ph.D. a maximum of 12 hours of independent study courses and a maximum of 12 hours of special study courses, with the total for both independent study and special study courses of no more than 18 hours, may be used on the plan of study.

Note: The above restrictions may not always apply for SBES students because there may be cases in which students are taking several 'new or proposed' courses as special studies which are undergoing the university approval process and have not yet been assigned permanent numbers. In these cases students’ plans may exceed the prescribed limits stated above and these exceptional circumstances will be conveyed to the graduate school.

4.6 (a) Independent and Special Study Designations and Requirements

BMES 5974: Independent Study at the Graduate Level

Requires a syllabus, a title, justification, and the method of evaluation. Independent study courses are offered on a “pass/fail” basis only. The department head and college must approve syllabi for 5974 courses.

Process: Students do NOT register online for Independent Study courses. The decision to do an Independent Study is made between the student and the course instructor well before the start of a new semester. A form called “Request for Independent Study” is on the SBES website. This form must be completed by the instructor and the student prior to the start of the semester in which the course will be conducted, and the course description must be attached. The form is submitted to the Graduate Coordinator who will obtain the signatures beyond those of the student and the instructor. Once the course is approved by the Dean’s office, the SBES Graduate Coordinator will then register the student for the course.

This procedure is to be done no later than two weeks prior to the start of the semester during which the class will be held in order to provide sufficient time for processing.

BMES 5984: Special Study at the Graduate Level

Requires a syllabus and method of evaluation. Credits may be used for meeting degree requirements. Special studies are most often used when new courses are being tested and/or are going through the university approval process. These courses must be approved by the department head and the college before being submitted to the Graduate School.
4.6 (b) **Con-joint Courses**

On the Virginia Tech campus prior to fall 2009, there was a category of 4000-level (senior) courses which were also “approved for graduate credit” and these courses were allowed on graduate plans of study. As of fall 2009, the Graduate School eliminated this course category, and in its place a system was implemented whereby senior-level courses considered advanced enough for graduate credit would be offered at BOTH levels, and would be listed separately on the Timetable with individual CRN numbers. Any course listed with a 4000-level number and also a 5000-level (graduate) number is referred to as a “con-joint” class.

In such cases SBES policy requires students to sign up for the 5000-level section of the course – not the 4000-level section. In addition to the 5000-level number, some departments may also change the title by adding the word “Advanced” to the course title. Others may list the 5000-number with the letter “G” following it. **Students entering the program in fall of 2009 and thereafter will not be allowed to have any 4000-level course on their plans of study.**

4.7 **Change of Campus**

Because of the joint nature of the SBES program, it is occasionally advantageous for a student who starts off at one campus location to transfer or move to the other campus. This usually occurs when it is determined that the student’s research would be better served by relocating to the opposite campus.

The VT graduate school requires that a student submit a “Change of Campus” form which can be found on their website. This form must be completed and signed by the director/department head at the student’s current campus location. Note that the form does not offer “Wake Forest” as a campus choice, so it must be written in by hand.

Once the form is signed by the student and the SBES department head, it must be submitted to the graduate coordinator’s office for processing after which it is sent to the graduate school.

4.8 **Change of Status**

A change from one type of degree status to another while remaining in the SBES program requires the submission of a “Change of Status” form to the VT graduate school. This form would be used if an SBES advisory committee or advisor for a Ph.D. student decided that he/she needed to be placed in the M.S. program instead. Another example might be when a student enters the program intending to pursue an M.S., then decides to skip it and go straight for the Ph.D. These status changes require both departmental and graduate school approval.

The graduate school’s form which can be found on their website must be completed and then submitted to the SBES graduate coordinator for processing.

5.0 **Enrollment and Registration Procedures (Winston-Salem Campus)**

5.1 **Registration/Pre-registration**

New students entering the SBES program on the WFU campus will register for classes in person after they have arrived and gone through orientation. Courses will be chosen with the help of faculty advisors. Normally new students will enroll for Mammalian Physiology, an SBES required course for both MS and PhD candidates which is only offered in the fall semester. Advisors assist with the addition of other courses including research hours to create a full-time credit load.

Continuing students are notified via e-mail by the Graduate School office that registration is available. Forms for course registration are available at the WFU Graduate School website, and should be turned in to Susan Pierce or Kelly Reavis. Students with outstanding university debt (i.e. - unpaid health insurance premiums or thesis only fees) will not be allowed to register until those charges are paid in full. New students who have not fulfilled the health and vaccination history and TB testing through Employee Health will not be allowed to register. If your address and/or phone number has changed, please include the updated information on the registration form.
5.2 Changes in Enrollment

There is an official registration period for each semester (including the summer session), which can be found on the Graduate School Calendar. For a short period of time at the beginning of the semester students may request that changes be made to their schedules with the approval of their advisors and course instructors. Students are advised to pay attention to the deadline dates around dropping and adding classes. Changes to schedules are made in the Registrar’s office.

5.2 (a) Adding or Dropping a Course

With the approval of the advisor and instructor, a student may add a course during the first two weeks of classes or the equivalent period during a summer term. With the same approval, a student may drop a course during the first month of a semester or the equivalent period during a summer term without penalty or notation on the transcript. A student who is permitted to drop a course after the first month, with the approval of the dean of the Graduate School and the department concerned, is assigned a Drop (DRP). Courses marked Drop are not counted in determining the grade point average. The Add/Drop form may be accessed on the Graduate School website.

5.2 (b) Withdrawing from Classes

Students who wish to withdraw from the Graduate School must complete the appropriate form, which requires approval from the department concerned and the dean of the Graduate School. Students who leave without following this procedure shall receive a grade of F in each course in progress. Students who withdraw by the drop date, established by the academic calendar, of the semester will not have a grade recorded for courses in progress. Students who withdraw after the drop deadline shall be assigned a grade of Withdraw-Passing or Withdraw-Failing for each course in progress. The Withdraw form may be accessed on the Graduate School website.

5.3 Continuous Enrollment

Degree-seeking students must have continuous enrollment through the semester in which they graduate. Enrollment may be achieved by registering for courses, including research, or by registering as “thesis only” or Graduate Fee. To be considered full-time, a student must be registered for nine credit hours in the fall and spring semester and six credit hours for a summer session. This is especially important for international students who must be enrolled full-time (9 hours) to maintain their visa status. Students registered as “thesis only” or “graduate fee only” are considered full-time.

SBES students on the WFU campus must be registered for “thesis only” during the semester in which graduation is anticipated.

5.4 Grading and Grade Requirements

Records of progress are kept by the institution on all students enrolled. Grade reports are furnished to students at the end of each semester or summer term. In addition to the university standard grading scale of A-C, then F (see the WFU Graduate Bulletin), SBES graduate students can also receive grades of “I” (Incomplete), AUD (Audit), DRP (Official drop), NC (no credit), NR (grade not reported), WD (Withdraw), WP (Withdraw Passing), WF (Withdraw Failing), S (Satisfactory), U (Unsatisfactory), and RPT (Course repeated, see section 5.4(b)).

5.4 (a) Incomplete and Unreported Grades

The grade of “I” (Incomplete) may be assigned only when a student fails to complete the work of a course because of illness or some other emergency. If the work recorded as “I” is not completed within thirty days after the student enters for his or her next semester, not counting the summer sessions, the grade automatically becomes “F”. The instructor must report the final grade to the registrar within forty-five days after the beginning of that semester.
The grade of “NR” (Not reported) must be resolved within forty-five days after the beginning of the next semester or the grade automatically becomes an F.

No degree will be granted with an NR or I on a student’s record.

5.4 (b) Grading System Requirements

A student whose cumulative grade point average (GPA) falls below 2.5 may be placed on academic probation. The student will have one semester to bring his/her GPA to 2.5 or greater; otherwise, the student may be dismissed from the Graduate School by the dean. The grade point average is obtained by dividing the total number of grade points earned by the total number of hours attempted for a grade, including hours for courses in which the grade is “F”. Grades of “S” (Satisfactory) or “U” (Unsatisfactory) do not enter into the GPA.

Individual departments or programs may require a higher grade point average than 2.5 for continuation. If there is such a requirement, it is stated in the departmental or program policies. A student may be dismissed from the Graduate School by the dean upon recommendation of his or her department or program if he or she does not make adequate progress in research. Adequate progress is determined by the standards of the department or program in which the student is enrolled. The minimum grade point average required for graduate is 3.0. Ph.D. candidates must have a grade point average of 3.0 in graduate courses at the time of the preliminary examination.

5.4 (c) Repeating Courses

Beginning with fall 1999 courses, a graduate student may repeat a course in which a B- or lower grade has been received. The course may be counted only one time for credit. The higher grade earned will be counted in calculation of grade point average. Both grades will appear on the transcript.

5.5 Auditing SBES Courses (applies to both campuses)

SBES graduate students may audit courses according to the standard audit policy at Virginia Tech. An audit requires the approval of the instructor and the student’s graduate advisor. Auditing of laboratory work is not permitted. Registration for audit may not be changed to credit, or vice versa, after the last day to add classes, without the signature of the instructor, student’s major advisor, and the Dean of the Graduate School. Audited courses do not count toward full-time enrollment.

At the end of the course period, the instructor will determine if an audit is “satisfactory” or “unsatisfactory” based on participation and other expectations set forth at the beginning of the course period. Unsatisfactory audits will not appear on transcripts and therefore will not affect the GPA. Students will NOT be allowed to register for credit in any course previously audited.

5.5 (a) Audit Procedure

In order to add a BMES audit class to the schedule, SBES students must obtain a BMES Audit Request Form from the graduate office which is to be completed by the student and the course instructor. After the signatures of both are obtained, the form is submitted to the graduate coordinator for processing at which time the requested audit is added to the student’s schedule. Any students signing up online for an AUDIT during DROP/ADD will be dropped from the course rolls. Audits will be added to classes based on seat availability.

5.6 Independent and Special Study Courses

Independent study and special study courses allow students to pursue subject matter in areas for which there are no approved formal courses. Independent study courses generally involve extensive reading and tutorial sessions with the faculty supervisor and also may involve written papers. The subject of Independent Study is a continuation in greater depth of a topic covered in a regular course, allowing students to study topics of particular individual interest.

Special study courses are designed for a group of students, rather than for a single individual. This type of course may be used to study a timely topic; one in which there is current, but not lasting, interest. It also may be used as an experimental course before incorporation into the regular curriculum.
5.6 (a) Independent and Special Study Designations and Requirements

**BMES 697: Independent Study**

WFU SBES students register for an independent study like they would any other class.

**BMES 698: Special Study**

Special studies at Wake Forest are handled under the same regulations as all other courses. They carry 3 credits and are usually used to launch a new course.

5.7 Change of Campus

Because of the collaborative nature of the SBES program, a circumstance may arise in which a student on the WFU campus would benefit from actually transferring to the Blacksburg campus. Should this change be desired, the process is as follows:

a) The student submits a request in writing that a change of campus be made.

b) The faculty advisor (and/or committee) submits a letter supporting this request, and proposes a timeline (semester effective) for the change to take place.

c) Both letters are submitted to the graduate school for the Dean’s approval.

d) Upon approval the student would be officially terminated at WFU and a Virginia Tech Change of Campus form would be completed at Blacksburg for the VT graduate school’s approval.

5.8 Change of Status

Provisions are made for WFU campus students wishing to change from the MS program to the PhD program and/or from the PhD program to the MS program.

a) The student must submit a request in writing to the Graduate Program Chair.

b) The student's advisor must submit a letter to the Graduate Program Chair indicating that an appropriate research project has been identified and that funding is available for the student's stipend for the period required to complete the proposed research.

c) The BME Graduate Program Chair will review the request and, if approved, will submit a written request to the Graduate School Dean for a change in the student's status.

5.9 Dress Code (applies to all SBES students)

The dress code is applicable to all SBES students while on the WFUBMC campus who will have patient or clinical contact. We must follow the same rules in these cases as physicians and staff. Patients expect to be treated with respect and to encounter a professional environment when they come to the Medical Center. Everyone must wear professional dress when they are in clinical areas (this applies to VT campus students when they are visiting the WFUBMC campus).

Professional dress is defined as neat and clean slacks, dresses / skirts and shirt. Clean lab coats are also acceptable, however dresses/skirts or slacks must be longer than the lab coat. DO NOT wear shorts underneath your lab coat. Lab coats are available from the bookstore and can be embroidered with the department name. Embroidered lab coats must use the BME standard for lettering and color (see the BME Administrative Assistant for this information). An alternative is to wear blue scrubs in the clinical areas. Students are responsible for keeping lab coats and scrubs clean.
If you have questions about the dress code, see the Graduate Program Director.

6.0 Survival Notes on Various Topics (Blacksburg campus only)

This section of the student handbook contains information on many important topics not covered in the other main sections. Additionally, there is a more detailed discussion of some crucial items such as doing plans of study, choosing an advisory committee, etc.

6.1 New Student Orientation

New students enter into the SBES graduate program only in the Fall semester which at VT begins in August (for assistantship purposes). The graduate school considers the academic year to run from August 16th to May 15th. However, slight calendar differences from year to year can affect these dates so that the actual starting and ending dates with respect to classes, graduation, etc can be different. Classes generally begin somewhere around the 20th, 21st, or 22nd of August. The week prior to the Monday on which classes begin is Orientation Week for graduate students campus-wide.

SBES students are expected to arrive and check in with the Graduate Coordinator no later than the Monday morning of orientation week. Students are encouraged to touch base with the SBES graduate office as soon as they arrive in Blacksburg. During orientation week there will be mandatory departmental and university-wide meetings that must be attended by all students. Upon arrival all international students new to Virginia Tech are required to check in at the Cranwell Center (http://www.uusa.vt.edu/cranwell/) and also to attend a university orientation session for new international students.

On the first day of orientation week, all new SBES graduate students will attend an SBES welcome/orientation session which will cover many important topics pertinent to getting started as a graduate student. During this week any student appointed to a GTA position must attend a mandatory GTA workshop held by the graduate school for which the student earns 1 credit hour. Occasionally short “prep” courses and lab safety seminars are planned for new SBES students which they must attend during that week. Additionally, an Ethics Seminar is given which all new students are expected to attend. It is a specific degree requirement for PhD students. During orientation week students will also be connecting with the faculty supervisors under whom they’ll be working as graduate assistants.

6.2 Orientation Week: Things To Do . . . . .

6.2 (a) Obtain a Hokie Passport

You should obtain your student identification card (Hokie Passport) as soon as possible upon arriving. It is used constantly across the campus for numerous things, including getting a parking permit. It can be obtained at the Student Services Building (100 Washington St.) between 8:00am and 5:00 pm, Mon-Fri. This should be one of the first things a new student does upon arrival.

6.2 (b) Create a PID

As soon as you know your student identification number (your Banner ID), you should create your Virginia Tech PID (Personal Identifier). Log onto http://www.computing.vt.edu/accounts_and_access/pid/index.html and follow the instructions given. You will be creating the “username” part of your VT email address, and your PID is needed for logon access to many VT services and functions.

6.2 (c) Purchase a Parking Permit

Students are encouraged to obtain parking permits as soon as they arrive in Blacksburg. Parking permits are sold on campus at two locations: 455 Tech Center Drive (the Parking Services building close to the stadium), and 130 Student Services building on Washington Street. Students should bring their Hokie Passport cards and their vehicle registrations.
Parking Permits are required to park on campus from 7:00 am—5:00 pm, Monday—Friday (unless signed otherwise). Parking regulations are always in effect, including when classes are not in session. Permits are not required on campus after 5:00 pm or on the weekends except in the following areas: Owens Lot, and Dietrich Lot. The Drill field is reserved for only faculty/staff from 7:00 am—5:00 pm, Monday—Friday. From 5:00 pm—8:00 pm, the Drill field is reserved for only faculty/staff and graduate student vehicles that display a current permit. The purchase of a permit does not guarantee a parking space, but merely allows for legal parking in specific areas of the campus. Parking rules and regulations can be found at http://www.facilities.vt.edu/ot/parking.asp. Be aware that legal parking is strictly enforced and the fines for illegal parking are quite steep!

6.2 (d) International Students and Social Security

International students should apply for a Social Security card either at the Cranwell Center on the day announced in August, or you may wait until September when representatives from the Roanoke Social Security office will be on campus. Contact the Cranwell Center (http://www.uusa.vt.edu/cranwell/) for information.

6.2 (e) Complete Payroll Paperwork

All newly funded graduate students (assistantships and fellowships) are required to fill out employment paperwork (I-9 and other Payroll Forms) which must be done on the first day the employee reports for work. This is normally taken care of at the SBES orientation which takes place on the first day of VT's campus-wide orientation week. Failure to complete the necessary paperwork by the deadlines can result in a delay of the employment start date regardless of the effective start date on the contract. Students are NOT allowed to work until this paperwork has been completed. The academic year start date for assistantship employment each fall is generally August 16 (although the payroll date will differ and some contracts may be written on payroll dates. The difference will be explained at orientation). Students must present proof of their eligibility to work in the United States and proof of their identity. New incoming graduate students are given more detailed information through email communications taking place in the summer prior to arrival.

6.2 (f) Have Student Photo Made

You will be given instructions during orientation for making arrangements to have your photo made for the SBES website. Normally it involves filling out a Photo Request form, and then you will be contacted by the VT photography office to make an appointment. Make sure you list the Graduate Coordinator's name and email address to be one of the recipients of the electronic photo.

6.2 (g) Find Your Mailbox

All SBES students will have a mailbox in the group office room – 345 ICTAS-on-Stanger. Check your mailbox frequently as this is one of the primary vehicles through which you will receive university and departmental mail. It is NOT to be used as a personal mailbox for regular U.S. postal mail.

6.3 About Hokie SPA

Hokie SPA (Student Personal Access) is a World Wide Web application that allows students to check grades, schedules, bills, or financial aid information from any computer running Netscape or Microsoft Internet Explorer. To log in, a Personal ID (PID) is required. New students will receive information on PID creation at the time of admission. The acceptance letter from the Dean of the Graduate School contains the information needed. A Banner ID number is assigned to each student by the graduate school, and an explanation of the PID is given along with the website address where the PID can be created by the student.

Hokie SPA is designed to provide student access to student data, the Drop/Add process, etc. from home or residence hall; it is not set up for advisor or departmental access to student records. The web address is http://hokiespa.vt.edu/.

It is the student’s responsibility to keep the information on Hokie SPA current with respect to current mailing address, email address, phone number, and other contact information that the university uses.

6.4 Student Account Information
6.4 (a) Electronic Billing

Virginia Tech does all billing electronically. No paper statements are sent out to students. Bills are generated for new charges shortly before or on the 15th of the month, and payment is due by the 10th of the following month. E-mails are sent out to the VT email address on file for students notifying them and their authorized payers that a bill has been generated and is available for viewing. Students use Hokie SPA to access their accounts. For more detailed information about billing and making payments, see the Bursar’s website at http://www.bursar.vt.edu/billing_payment/.

6.4 (b) Payroll

All Virginia Tech employees are required to have their pay directly deposited to a bank. All banks must be members of the Automated Clearing House. During orientation week you will either submit a paper form or apply online for Direct Deposit. Follow the directions given and submit the form to the Bursar in the Student Services Building. Normally the first paycheck generated will be issued as a paper check requiring the student to pick it up in person at the Bursar’s office. Subsequent paychecks will then be deposited directly into your account.

There are two pay periods per month which run from the 10th to the 24th of each month, and from the 25th to the 9th of the next month. This is how your assistantship appointments are entered into the Banner system. There are 24 pay periods in the calendar year distributed as follows during the semesters:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Pay Period Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring semester</td>
<td>9 pay checks</td>
</tr>
<tr>
<td>Summer I</td>
<td>3 pay checks</td>
</tr>
<tr>
<td>Summer II</td>
<td>3 pay checks</td>
</tr>
<tr>
<td>Fall semester</td>
<td>9 pay checks</td>
</tr>
</tbody>
</table>

Pay days are on the first (1st) and the 16th of the month, with some slight occasional variations due to holidays, weekends, etc.

6.4 (c) Late Fees and Holds on Accounts

Late fees will be added to student accounts if payments due are not made by the posted due date. If tuition charges are not paid on time, students can be dropped from class rolls so that they will have to register later, and a late fee is added to the amount due. The late fee, as of August, 2009, is 10% of the past due balance not to exceed $100.00 per term. It is strongly recommended that students refer to the payment deadlines for each semester’s tuition and fees posted on the Bursar’s website. Even if a graduate student’s tuition is being paid by the department through an assistantship, the payment deadline still applies to the comprehensive fees and the student is responsible for adhering to it. Under certain circumstances late fee charges can be appealed through a process described on the Bursar’s website.

If a student is dropped from classes for non-payment and then wishes to be reinstated, he/she will be charged a late fee of 10% of the past due balance not to exceed $100.00 pre term and also a $75 reinstatement fee. These are two separate fees.

A ‘hold’ is placed on a student account if there is a past due balance. Students are not able to carry out normal online transactions with holds on their accounts. They cannot view their schedules, access drop/add, access course request, or receive a transcript until the ‘hold’ is lifted by payment of the past due amount. This routine applies to ANY university monetary charges, not just tuition. Holds can be placed for unpaid parking tickets, library fines, etc.

6.4 (d) Budget Tuition Plan and Payment of Comprehensive Fees

Virginia Tech offers students (or parents) the opportunity to spread out the cost of tuition, dining, and fees into monthly installments which are directly debited to the students’ bank accounts. Participation in the plan requires filling out an application. Inquiries about the plan should be directed to the Office of the University Bursar. Effective Fall of 2009, graduate students may utilize payroll deduction to pay comprehensive fees each semester.
This ONLY applies to graduate students on assistantships (no fellowships, etc) and application through Hokie SPA can only be made after the assistantship appointment has been entered into the Banner system.

6.4 (e) Student Health Care

All full-time graduate students are required to pay a health-service fee (part of the ‘comprehensive’ fees). The Health Services Office provides limited medical care at McComas Hall for students when school is in session and between semesters for those students required to work. The health fee does not cover family members, and students who are not registered for classes are not eligible for services. International students are required to have insurance on themselves and all family members. The insurance policy can be obtained through the university or through private U.S. and international insurance companies. International students should consult someone at the Cranwell Center if questions arise.

6.4 (e) Student Medical Insurance

Virginia Tech graduate students who are given assistantships are also offered an enhanced insurance benefit. Beginning in Fall 2009, eighty-two and a half percent of the student medical insurance premium will be paid on the GM Southwest insurance plan (for a single student at the $50,000 coverage level) as part of the assistantship offer package. In order to receive this benefit students must:

- a) remain on at least a half-time graduate assistantship
- b) enroll in the university-sponsored health insurance program
- c) sign up for payroll deduction for payment of the remainder of the premium

More detailed information regarding the insurance plan and its benefits can be found on the graduate school website.

6.5 Leave of Absence (VT University Policy)

Leaves of absence for personal, family, or health reasons may be taken as long as the graduate student follows Graduate School guidelines. Graduate students are expected to discuss with their advisor and/or supervisor prior to taking a leave of absence, the timing and duration of the leave, along with responsibilities associated with their appointment (if supported on a GRA, GTA, or GA).

Graduate students should inform their faculty advisor of any leaves of absence that may be needed as well as the expected date of return to their program of study. Graduate students should inform their faculty advisor of their departure and expected date of return. Graduate students should know that readmission is not guaranteed after extended leaves of absence (over one year).

Graduate students should understand that re-appointment on assistantship after a leave of absence is contingent upon the length of leave, resources available to cover the responsibilities left unmet by the leave of absence, and the contractual agreement with granting agency for a GRA. Where possible, arrangements should be made before leave is taken.

6.6 Paperwork

Part of your life as an SBES graduate student will be the completion and processing of many forms as you progress through the various stages to your degree. Some are departmental and many are from the graduate school. The forms generally require various signatures of administrative personnel such as the Graduate Program Chair, Department Head, Dean of the College, and Dean of the Graduate School.

SBES students must work through the Graduate Coordinator in getting these various forms submitted and processed. The SBES website contains departmental forms, but many that you will use are on the Graduate School’s website (http://www.grads.vt.edu/forms/index.html). Students are not to fill out the forms and gather signatures without the guidance of the Graduate Coordinator. In particular, students are not to ask the Graduate Program Chair or the Department Head (SBES Director) to sign forms. The Graduate Coordinator needs to process and make copies of all forms before anything goes out to other offices. This routine also applies to internal (within SBES) procedures which require forms and/or letters with administrative signatures.
Students are advised to pay attention to timelines around the submission of various graduate forms. Usually the websites (ours and the graduate school's) announce necessary deadlines and time constraints or they are printed on the forms themselves. The deadlines are particularly important when it comes to following the graduate school's requirements. Delays in the submission of certain forms can directly affect the student’s scheduling with respect to graduation.

7.0 Survival Notes on Various Topics (Winston-Salem campus only)

7.1 New Student Orientation

Orientation for new SBES graduate students at WFU occurs in early August before classes begin and is mandatory for all students. If a student has a situation which will not allow attendance at all phases, the student MUST contact the Registrar at 1-800-GET_GRAD, 336-716-4303, or by email to spierce@wfubmc.edu to discuss the particulars of the situation. Please do NOT contact the program (SBES) director.

A packet containing the course schedule, registration form, and other pertinent materials will be available along with the agenda containing the orientation schedule which covers 9 days.

7.2 Orientation Week: Things to Do ……

7.2 (a) Obtain a WFU ID card

Arrangement is made with security during orientation for each student to obtain a photo identification card. Students must wear their ID badges at all times while on campus.

7.2 (b) Parking Permits

Bowman Gray campus students may sign up for paid-monthly parking at orientation. Those who take classes on the Reynolda campus, including audit and thesis credit, or use other facilities, may register their vehicles to park in an off-campus lot at no charge. To park on campus, a commuter student decal must be purchased. Students are responsible for their visitors. Students will be held financially responsible for citations issued to vehicles driven by family members or by friends who use a WFU/Bowman Gray student’s vehicle.

7.2 (c) International Students & Social Security

Newly arrived international students should report to the Graduate School as soon as possible after arriving in the United States. The Registrar, Ms. Susan Pierce, will meet with each one of you, and she will give out a letter which should be taken to the Social Security Administrative office when making application for your Social Security number.

Detailed information on obtaining a Social Security card can be found on the WFU Center for International Studies website (http://www.wfu.edu/cis/intl_students/index.html).

7.2 (d) Complete Payroll Paperwork

During the first week of orientation you will meet with Human Resources where you will complete the necessary paperwork for being placed on the payroll. You will be required to present documentation confirming your identity, and a form containing a list of acceptable identification documents is available on the orientation website (http://graduate.wfu.edu/augorient.html).

7.2 (e) Create a Virginia Tech PID (Personal Identifier)

In order for WFU SBES students to have access to certain Virginia Tech online services – library access being the primary one – a VT PID must be created. The PID is your unique identifier and it is also the front part of your VT email address. The SBES acceptance letter from the deans of both graduate schools contains instructions for creating the PID. You are assigned a VT Banner (the campus computer system) ID number which you will use to create your PID. Please note: the Banner number is NOT the PID. Instructions and information on how to do this can be found at http://www.computing.vt.edu/accounts_and_access/index.html in the section on PIDs.
7.2 (f) **Have Student Photo Made**

You will be given instructions during orientation regarding having your photo made for the SBES website and the WFU yearbook. Once you have an electronic version of your photo, you must send it to Blacksburg so that it can be added to the website.

7.2 (g) **Student Mailboxes**

SBES students will have individual mailboxes set up in the department of Biomedical Engineering.

7.3 **WFU Student Health Care & Medical Insurance**

7.3 (a) **Student Health Care**

Students are assigned to physicians in the Department of Family and Community Medicine for the provision of primary care services. Spouses and dependent children may request the services of the assigned physician. Members of the faculty serve as students’ physicians. Clinics are held Monday through Friday, by appointment, for preventive and therapeutic services. Physicians are available for emergencies twenty-four hours a day, seven days a week, through an answering service.

Prior to matriculation, each student is required to complete a health assessment questionnaire, have a complete physical exam, and have updated immunizations at his/her expense. The Medical Center Employee Health Services will have the responsibility for monitoring compliance with the below mentioned immunization requirements as well as being responsible for ongoing tuberculosis screening done on a yearly basis. Employee Health Services also will manage any blood and body fluid exposures, as well as provide acute care clinics at no charge.

7.3 (b) **Student Medical Insurance**

Students are required to have adequate health insurance. The student’s medical insurance company will be billed for all visits to clinics and/or physicians. Any medical charges generated that are not covered by the student’s insurance policy will be the personal responsibility of the student. Students may enroll in the student health and accident insurance plan which is offered through the Graduate School from United Healthcare. Students choosing to sign up with this plan will receive a financial supplement which will pay $150 of the monthly premium. Links to the company’s insurance information and forms for enrolling are made available on the WFU Graduate School’s Orientation website.

7.4 **SBES Student Paid Vacations / Holidays (Winston-Salem Campus only)**

**Pending**

7.5 **Approval for Reimbursements**

SBES students requesting reimbursement for expenses from Biomedical Engineering must follow the procedures below PRIOR to registering for meeting or purchasing items:

7.5 (a) **Travel Reimbursement Process**

Travel will ordinarily be reimbursed from research accounts at the approval of your advisor. IF your travel is approved by your advisor, you must then complete an Authorization for Absence form and receive approval from your advisor and the Graduate Program Director.

A Travel Authorization must be completed and forwarded to the Department Chairman for approval. All expenses associated with the meeting should be listed in detail (i.e., registration costs, lodging, airfare, meals, etc). In addition, the account number that should be charged must also be listed.
Upon return from the meeting you must submit original receipts for the items approved for reimbursement. This includes original itemized meal receipts; credit card receipts are not sufficient. If you do not have receipts, reimbursement will not be granted. An Expense Voucher and original receipts should be given to the administrative assistant for processing. Do not submit expense reimbursements directly to the BME Accounting clerks.

Failure to follow these procedures may result in out of pocket expenses.

Forward all forms to the BME Administrative Assistant.

In some cases, funds may be available from the department to support student travel. A detailed budget must be submitted to the Graduate Program Director and approved prior to registering for a meeting or submitting a paper. All expenses associated with the meeting should be listed in detail (i.e., registration costs, lodging, airfare, meals, etc). The student should also request funds from the Graduate School. The Department will review your budget request for reimbursement and approve or deny your request. You will be notified in writing of the outcome.

7.5 (b) Purchase Reimbursement Approval Process

Provide the BME Administrative Assistant a quote of the items to be purchased, their use, where they will be stored, and the research account to be charged (pending advisor approval). If approval is granted, you will be notified in writing.

After purchasing the items the original receipt should be given to the Administrative Assistant for processing. Do not submit receipts for reimbursement to the BME Accounting clerks.

Failure to follow these procedures may result in out of pocket expenses.

7.6 Leave of Absence

Full-time students who wish to take a leave of absence must receive approval from the department concerned and the dean of the Graduate School. The student must submit a leave of absence request in writing, be in good academic standing, complete forms required by the Graduate School for courses in progress, and provide letters of support from the program director and advisor. The maximum time for a leave of absence is one academic year.

One month prior to the beginning of the semester in which the student plans to re-enter the Graduate School, a written reinstatement request must be sent to the dean of the Graduate School. The time spent during the leave of absence will not count in the maximum time allotted for the degree. If a student on an approved leave has not requested reinstatement after a year, the student will be considered to have withdrawn from Graduate School.

8.0 Assistantships and Financial Aid (both campuses)

Routinely all graduate applications are evaluated for financial aid possibilities as they are being assessed for admittance into the program. Generally financial aid offers go to Ph.D. applicants, although upon occasion an exception is made, and an offer will go out to an M.S. student. SBES applicants/students have several different sources of financial aid available to them depending on the campus to which they apply and are accepted.

At Wake Forest, new students are offered a Graduate Fellowship for the first year consisting of a stipend and a tuition scholarship. The fellowship may be renewed each year for the duration of the student’s program contingent upon the availability of funds and the student’s academic progress. New students are also issued an IBM ThinkPad during orientation. Fellowship recipients are required to carry a full academic load (9 credit hours during fall and spring semesters, 6 hours in the summer), and to perform duties as assigned which are established as part of the educational process and carried out at the program level. As an added benefit, the student may choose to enroll in the school’s health insurance program and have half of the monthly premium amount paid for by the WFU Graduate School.

8.1 Graduate Assistantships (Blacksburg campus only)
At Virginia Tech students are most commonly offered graduate assistantships in which the student is working for a specific faculty member or for the department under a formal contract. There are three types: GA (graduate assistantship), GTA (graduate teaching assistantship), and GRA (graduate research assistantship). Typically GRAs are more commonly awarded in SBES than GTAs. Virginia Tech has no undergraduate biomedical curriculum and the SBES faculty members are not teaching BME undergraduate classes, therefore the teaching assistantship category is not always applicable. However, any SBES student who is placed on a GTA appointment is required to be enrolled in and attend the GTA Workshop (GRAD 5004, 1 credit, P/F) in the first fall semester of their teaching appointment. The workshop consists of three half days during orientation week and two sessions from Phase II offerings during fall semester.

The assistantship pays a monthly stipend as well as tuition at the in-state rate and academic fees. Students are responsible for paying their own comprehensive fees. Graduate assistants are expected to work 20 hours a week to be considered as having a 100% (full-time) appointment. They also are required to carry at least 12 credit hours during the fall and spring semesters. They are not required to be registered for credit hours during the summer unless they are taking a preliminary or final examination. Audited courses do not qualify in satisfying the minimum of 12 hours.

See chapter 6.0 “Survival Notes” for information about payroll and how you receive your stipend payments. For information regarding taxes on assistantships and scholarships, please consult the Virginia Tech Graduate School website (http://www.grads.vt.edu/financial/taxes.html).

8.1 (a) Eligibility

Students are evaluated by their faculty supervisors and if the work performance is not satisfactory, it is possible for the student to lose the appointment. The Graduate School also requires that all students on assistantships maintain a 3.0 or better GPA (QCA) on all courses taken as a graduate student, regardless of whether or not the courses are listed on the plan of study. If the GPA drops below 3.0, the student could possibly lose the assistantship. The academic department or the Graduate School may allow a student one semester on probationary status to remedy grade deficiencies while holding an assistantship.

Graduate assistants must be able to meet the requirements to be eligible for employment in the United States, and they must demonstrate that they are making satisfactory progress toward the intended graduate degree. Failure to do so could result in loss of the assistantship appointment.

8.1 (b) Residency

If you are an out-of-state student on an assistantship you may receive a tuition scholarship and out-of-state fee waiver, but your out-of-state status is not changed. Should you go off the assistantship, you will be charged out-of-state tuition if you have not applied for and been granted state residency. Therefore, it is often to your advantage to apply for in-state residency, especially if you know you are going to be here for several years. The requirements for residency are as follows: You must be a U.S. citizen; a permanent U.S. resident; or hold an A, E, G, H-1 or H-4, K, or N visa to qualify for in-state tuition. You must also demonstrate intent to establish domicile. This determination is based on several factors, which include living in Virginia for one year, payment of Virginia income taxes, registering to vote, holding a Virginia drivers license, registering your automobile in Virginia, and ownership of property in Virginia.

If you are being charged out-of-state tuition and wish to be considered for in-state rates, you can go to the Graduate School’s website to locate a form called “Graduate In-State Tuition Request”. Allow two to three days after submitting the application to the Graduate School for it to show up on your student record, if you are approved. Out-of-state undergraduate students do not automatically receive in-state status when they enter Graduate School at Virginia Tech.

Graduate students who hold assistantships, who are classified as out-of-state residents, and earn more than $4000 during the academic year are eligible for a waiver of the out-of-state tuition fee. For additional information, refer to http://www.grads.vt.edu/financial/assistantships/index.html.

For detailed information on paying taxes on assistantships, fellowships, and scholarships, see the VT Graduate School’s website at http://www.grads.vt.edu/financial/taxes.html.
8.2 Fellowships/Scholarships (Blacksburg Campus)

SBES encourages its students to apply for externally-sponsored fellowships and scholarships to help defray their educational expenses. There are federal agencies, private foundations, and companies which offer graduate students opportunities to apply for funding. The graduate school serves as the coordinating office for fellowships and scholarships awarded from outside the university. Some of the organizations granting them include NIH, NSF, Packard Foundation, Ford Foundation, and the Fulbright Scholar program. There are also fellowships and scholarships which specifically target certain populations of students or seek to encourage students who are entering into a particular research area. Website searches can often uncover these opportunities.

Internally there are occasional offers of fellowships/scholarships from university units such as the VT Graduate School itself, the College of Engineering Dean's Office, the Office of Multicultural Affairs, and others. Departments often nominate candidates for these awards from the applicant pool since many of them are competitive across the campus or the College.

At Virginia Tech fellowship and scholarship recipients are required to take at least 12 credit hours each semester in which they are receiving funding. These credit hours must represent work toward satisfying minimum degree requirements. Audited courses do not qualify in satisfying this minimum.

See the Graduate School’s website (http://www.grads.vt.edu/) for further information and help in seeking these out.

8.3 Funding on the Winston-Salem Campus

Pending

8.4 Outside Employment for Graduate Students (Blacksburg Campus)

Graduate students on full-time assistantships work a maximum of 20 hours a week which is considered full-time employment for payroll purposes. They are not allowed to be employed elsewhere on the campus beyond this restriction, except under certain circumstances in which they might hold a wage position (restricted to 10 hours a week) between semesters or other times when school is not in session. Special permission from the Graduate School must be obtained in these cases. For determining credit load, the students on full assistantships are assumed to be 50 percent employed and can enroll in 12-18 credit hours of course work in academic year semesters, and/or 6-9 credit hours during each summer session. The maximum credit hours total for both summer sessions is 12 and the maximum is 9 credit hours in any one summer session.

8.5 Outside Employment for Graduate Students (Winston-Salem campus)

Students are not allowed to engage in any outside remunerative work without written permission from the department/program.

9.0 Progress to the Degree

This section of the handbook contains a more detailed discussion of the various steps toward the SBES degree and items that relate to obtaining it. Topics crucial to the student's progress such as creating a Plan of Study are presented along with instructions and additional information not given elsewhere about Graduate School involvement in the student's progress. Much information with respect to the main considerations for obtaining the degree pertains to both campus locations, but in some instances there will be procedural difference between the sites, such as how prelim and final exams are scheduled, etc.

9.1 Good Standing
SBES graduate students are expected to remain in “good standing” throughout their academic careers. This designation means that the student is making satisfactory progress toward the degree being sought.

9.1 (a) GPA

One measure of good standing is the GPA. The VT Graduate School requires that students maintain a 3.0 or better GPA. If the GPA falls below 3.0, the student is placed on “academic probation” by the Graduate School, and the department is notified. Maintaining a 3.0 is also a condition for remaining on a graduate assistantship. Enrollment for one semester of probation is normally permitted to remedy an unsatisfactory GPA. If the student does not achieve a 3.0 GPA within one semester after being placed on probation, the Graduate School will consult with the department about dismissal of the student from Graduate School.

Other factors assessed which pertain to the student’s “good standing” status are research progress, filing plans of study and other degree-step documents in a timely manner, carrying a sufficient course load each semester, and participation in SBES seminars and symposiums.

9.1 (b) Progress to Degree Form / Annual Evaluation

At the end of each Spring semester at VT and 3 times a year at WFU, faculty advisors are required to formally evaluate the progress of their advisees by means of a face-to-face meeting with the student which is followed by the submission of a Progress to Degree form to the SBES Graduate Office. The forms are available to faculty on the SBES website, and require the signatures of both student and advisor. The originals are added to the student's file and copies of these evaluations may be requested/required by the VT Graduate School. At the present time the two campuses use separate forms.

9.2 Choosing an Advisor / Major Professor

One of the most important things a new SBES graduate student needs to do during the first year of study is to select an advisor who will serve as the chair of the student's Advisory Committee. This is an important decision because of the nature of the commitments involved. The advisor supervises the student's research, usually supporting him/her financially, and the eventual success of the work can be markedly affected by the working relationship established. Students are advised to make this choice carefully, but to also be aware that if it needs to be changed, it can be. At Virginia Tech the procedure for changing advisors involves submitting a “Change of Committee/Advisor” form which can be found on the Graduate School's website.

There are three scenarios under which new students may enter the SBES program and be attached to an advisor. If a student is accepted to the WFU campus, a fellowship offer is made, and the student is assigned to an appropriate advisor. At Virginia Tech there are two possibilities. In one case a faculty member may make a direct assistantship offer to a student in which case that faculty member is considered to be making a commitment to serve as the student’s advisor. These offers are generally research assistantships. In the other case, an assistantship offer originates from the department in general instead of coming from a specific person. This can be either a GRA or a GTA offer.

New SBES students who have not received assistantship offers from specific faculty members are temporarily “assigned” to the Graduate Program Chair who serves as an interim advisor until such time as the student makes a connection with a faculty member or files a Plan of Study. The interim faculty advisor gives new students helpful information in selecting courses for the first one or two semesters of work. Another function is to help students become familiar with research opportunities among the faculty, and often to assist the student in choosing a permanent advisor.

At Virginia Tech the SBES faculty are listed on the Timetable of Classes under their own individual research sections (5994 for the M.S. level, and 7994 for the Ph.D. level), therefore students signing up for research hours must look for their advisor's name and sign up for that particular section each semester. If an advisor has not yet been selected, students are directed to sign up under a section that is labeled “Staff”. Make sure that you sign up for the proper section that matches the degree you are pursuing. You also need to make sure you do not accidentally sign up under a section that doesn’t belong to your advisor. If you do, you may not receive a grade at semester's end, and this could adversely affect your GPA.

9.2 (a) Course Advisor Requirements
If not assigned or established at the time of admission, the course advisor should be selected no later than the end of the second semester of study and must be an SBES faculty member (either Primary/Core or Affiliate). In the case where a student comes into the SBES program from another department and wishes to remain with the previous advisor, that faculty member must become an official SBES affiliate. The procedure for doing so involves the submission of an MOU (Memorandum of Understanding) to the SBES department head’s office. This is done at both campus locations.

Graduate Advisors (i.e., Chairs of Advisory Committees) must be full-time, tenured or tenure track faculty. This applies to both campuses. Research Professors also may serve as advisors and advisory committee members if they have been approved as Graduate Program Faculty by the department/program and notification of that approval has been sent to the Graduate School. Faculty are not permitted to serve as major advisor or committee member for individuals with whom they have a personal or professional relationship (e.g., spouse, son, daughter, business associate, etc.) Graduate students (including those employed at Tech and working on degrees) may not serve on a graduate advisory committee. For information regarding committee service by personnel other than tenure track teaching/research faculty at VT, please see the VT Graduate Catalog at [http://www.grads.vt.edu/academics/gcat/gcat_2007_2008.pdf](http://www.grads.vt.edu/academics/gcat/gcat_2007_2008.pdf).

Advisors are “officially” named when the student’s Plan of Study is submitted to the graduate school at which point the advisor is designated to be the chairperson of the student’s graduate committee. If it becomes necessary to change advisors after the Plan of Study has been approved, the student is advised to see the Graduate Coordinator who will help with submitting the proper Graduate School form. It is permissible for students to have co-advisors for their program in which case responsibility for the student’s degree progress is shared.

### 9.3 Advisory Committee: Additional information

Prior to submitting the Plan of Study, the student must form a graduate Advisory Committee the composition of which is described in the section on Degree Requirements. (See Chapter 2)

#### 9.3 (a) Two other very important things to know about committees are:

1) If an SBES student chooses to include a person who is NOT a VT full-time faculty member (or a previously approved WFU faculty member), the graduate school requires the completion of a one-page document (Non-Virginia Tech Committee Member Registration Form) which must be submitted along with a copy of a current curriculum vita. This form and accompanying vita should be sent initially to the SBES Graduate Coordinator’s office, and from there it will be forwarded to the graduate school for processing. Students are responsible for ensuring that this process is carried out in a timely manner so that the submission of the Plan of Study is not unduly delayed. This step must be done prior to the electronic submission of the student’s Plan of Study by the SBES Graduate Coordinator. Plans will NOT be approved by the graduate school if a Non-VT committee member has not been appropriately processed.

2) If it becomes necessary to make changes to the committee after the Plan has been approved, the student must see the Graduate Coordinator who will assist with filing the necessary paperwork with the Graduate School. Committee changes must be approved by all members.

Students are to seek the advice of their faculty advisor when it comes to choosing committee members. Since committees are named on the Plan of Study, and the plans are expected to be filed by certain deadlines, it may be necessary to name members at the time of filing the plan who might not ultimately serve. Often it is not known so early in the student’s study who should sit on the committee – it is often based on the development of the student’s research project. Changes can be made to advisory committees by following a process in the graduate school involving the submission of a form. Students are advised to see the SBES Graduate Coordinator for help with this process.

### 9.4 Plans of Study:

All M.S. and Ph.D. degree-seeking students are required to file a Plan (or Program) of Study with the Graduate School of Virginia Tech. The document serves as an outline of the anticipated academic details making up the
student’s course of study. Students work with their advisors in developing the plan which is then approved by the advisory committee and the Graduate Program Chair. The plan is submitted on paper to the SBES Graduate Coordinator on the VT campus where it is added to the student’s file. The plans of Blacksburg campus students are then entered into the university database system and sent electronically to the Graduate School for final approval. At this time there is no provision for the same routine on the plans of WFU students.

The Plan of Study (POS) is the first major benchmark assessed by the Graduate School as it monitors student progress through all steps of the degree-seeking process, and it is the first thing checked when students are being cleared for graduation.

**Plans of study should be submitted to the Graduate School according to the following schedule:**

- **M.S. Plans** – no later than the end of the second academic semester
- **Ph.D. Plans** – no later than the end of the third academic semester

9.4 (a) **Instructions and Notes for the Student**

The Plan of Study is the first “formal” document you will produce during your graduate career. Working with an advisor as well as faculty who will serve on your research committee, you must plan a projected schedule of coursework and research leading to your degree. Some students enter the program with an advisor already established while others need a semester or two to connect with someone who will serve in that capacity. It is to your advantage to find an advisor as quickly as possible, so that your plan can be developed and submitted in a timely manner. **This should be done by the end of your first year.** If you have problems finding an advisor the Graduate Program Chair will act as an interim advisor until you arrange for someone to fill that role.

The plan details the minimum required course work and research hours for the degree being pursued. SBES Ph.D. plans must carry a minimum of 90 total credit hours; the M.S. must carry 30. Note that even though all courses taken at VT will appear on the transcript, they are not all necessarily listed on the plan. All courses on the Plan of Study must be taken for a grade (A/F) except for BMES 5974 (Independent Study) which is only offered as pass/fail (P/F). All plan courses must earn no lower than a C- grade, and a 3.0 GPA is required on all Plan of Study courses, as well as on the overall graduate record.

9.4 (b) **Making Changes to the Plan**

Keep in mind that the plan is a “projection” into the future and is subject to change when circumstances dictate. Before the Graduate Coordinator sends your plan electronically to the graduate school for approval, it can be altered and edited at will (with approval of your advisory committee and the Graduate Program Chair). However, **once the Graduate School has approved it, it can only be changed by means of Graduate School procedures which are given below.**

To make a change you must go to the Graduate School website and fill out the proper paperwork if you need to make changes to the plan itself, or if you change advisors or committee members. There are two (2) separate forms for this purpose at [http://www.grads.vt.edu/academics/forms/index.html](http://www.grads.vt.edu/academics/forms/index.html). Students gather committee signatures, then the form is submitted to the Graduate Coordinator at VT who will obtain Department Head or Program Chair signatures, make a file copy, sign off on it, and forward it to the Graduate School. WFU students can send the Graduate Coordinator the completed form as a scanned attachment to an email or by fax to 540-231-9738, marked “ATTN: Tess”. Their forms will not go to the VT Graduate School, but will remain in the SBES student file.

9.4 (c) **Additional Important Information**

- Once the plan is entered into Banner, you can view it on Hokie Spa to track its approval status (VT students only).

- Be aware that if you have transfer courses on your plan which you took over five years ago, measured from the semester you submit the plan, the Graduate School will require a Course Justification Form completed by your committee. This form is also found at the website mentioned above. **The completed form should be sent to the Graduate Coordinator at the Tech campus so that it can be submitted when the Plan of Study (POS) is filed.**
As mentioned in the section on Advisory Committees, if a member of your committee is someone who does not have a VA Tech ID number, you must have that person fill out a Non-Virginia Tech Committee Member Registration form and submit it accompanied by a current curriculum vita. This must be done before that committee member can be included on the Plan of Study. The form is on the Graduate School's website.

**Remember: All forms must go through the Graduate Coordinator’s office.**

The SBES website contains a link (http://www.sbes.vt.edu/links/forms.html) which will take you to a page where you can see sample plans for the Ph.D., M.S. and 5yr BS/MS degrees. Students are strongly advised to study these sample plans before constructing their own in order to understand the format and related requirements. There are also links to the actual online fill-in Plan of Study forms that must be used for submission to the SBES Graduate Coordinator.

### 9.5 Transfer of Credit

Students may transfer graduate course credit hours from another institution, up to 50% of those required for the graduate degree (beyond the baccalaureate), toward a Biomedical Engineering M.S. or Ph.D. degree. In order to do so, however, the courses . . .

- . . . must be transferred from an accredited institution
- . . . must have earned a “B” or better
- . . . must have been earned as a graduate student in good standing
- . . . must be acceptable for the graduate degree program in Biomedical Engineering
- . . . must not carry grades of “S” or “P” unless the course is only offered on a pass/fail basis
- . . . must be acceptable to the student’s advisory committee
- . . . must have been completed within the time limits prescribed for satisfying degree requirement

Credit for courses from other universities which do not have a similar counterpart at Virginia Tech or Wake Forest may be permitted as long as they are graduate level courses, and approval from the student’s Advisory Committee has been obtained. **Note:** Transferred courses count only as credit hours and are *not* included in the calculation of the GPA.

Credits are transferred when they are entered on the Plan of Study and approved by the Graduate School. Transfers must be approved by the Advisory Committee before a student’s Plan of Study can be submitted to the Graduate School or approved by SBES.

#### 9.5 (a) Course Justification (Blacksburg campus only)

**NOTE:** If a course being transferred was taken *more than five years prior* to the time the Plan of Study is filed, it will be necessary to submit evidence to the VT Graduate School that the course content is still valid, and that it should be allowed on the Plan. This is done through the use of a form (currently called a *Course Justification Form*) found on the Graduate School Website. It must be filled out, signed by the committee, and submitted to the Graduate Coordinator who will send it to the Graduate School when the Plan of Study is filed. Plans with courses more than five years old will *not* be approved without having course justifications included.

#### 9.5 (b) Transfer of Credit Procedure

- Students will prepare a draft of the plan of study for the review of the advisory committee. The SBES plan of study format includes a section for listing transfer courses where students will identify those course(s) he/she wishes to transfer.

- The list of transfer courses must meet Graduate School requirements in that not more than 50% of the *course credits* on the plan can be transferred. Other conditions as listed on the page above must also be met. Research hours do NOT qualify for use as transfer credits.
The student’s advisory committee will consider the request regarding transfer credits, and approve or disapprove the draft plan of study. There must be a transcript available (should the committee request) to demonstrate successful completion of the course(s).

At the committee’s discretion, the student may be required to supply the committee with some or all of the following:

1. a copy of the course syllabus as taught (don’t use a catalog description);
2. the title and author of the textbook used;
3. a sample of a graded assignment;
4. a copy of any test and/or the final exam.

In unusual cases, the committee may also decide to ask an outside expert to review the proposed course.

If the committee approves both the plan of study and the proposed courses for transfer, they will sign off on the plan of study. Committee signatures are gathered by the student.

The plan of study document is then submitted to the Graduate Coordinator at Virginia Tech for Graduate Program Chair approval (signature) and final processing.

Make sure the appropriate Graduate School has an official copy of the transcript(s) showing the course(s) you are transferring. Your Plan of Study cannot be approved without this documentation.

9.6 Ph.D. Qualifier Examination

All Ph.D. candidates are required to pass a Qualifying Examination in order to become formal candidates for the Ph.D. degree. The examination serves to evaluate the student’s mastery of fundamental knowledge and to diagnose deficiencies. The examination must be taken no later than the end of the second year for students entering directly into the Ph.D. program or within one year of entering the program after completing the M.S. degree. Students who do not pass the qualifier on the first attempt are given one more opportunity to take the exam. Failure to pass after two attempts will result in an automatic removal from the Ph.D. program; however, the option to complete an M.S. degree is available.

There are three possible results for the exam: Pass, Conditional Pass, and Fail. A ‘conditional pass’ is given when the examining committee feels that the student has some weaknesses in the work which need to be remedied, but which are not serious enough to warrant a ‘fail’ evaluation. In such a case the committee chair submits a written statement to the student and to the Graduate Coordinator outlining the nature of the weakness(es) and specifying what the student needs to do in order to earn a ‘pass’. This description also includes a time requirement.

Currently the examination is offered once a year – normally in July. The exam is based upon a student’s defense of an original research proposal developed to solve a problem designed by the Graduate Program Committee or its representative. Students are given the problem (usually through Blackboard) after which they have approximately 10 days to prepare a written proposal which is presented and defended in front of a 3-person qualifier exam committee. The student is expected to demonstrate proficiency in engineering, life sciences, and quantitative analysis, as well as show advanced understanding of the fundamentals which pertain to the problem’s solution.

Students indicate their intention to take the exam by submitting a form (on the SBES website) to the Graduate Coordinator by a specific deadline announced in advance by email. Instructions and information regarding the nature of the exam are made available to students through Blackboard and/or Qualifier Exam Prep sessions delivered by faculty. Students are evaluated on their ability to formulate a rational approach to solving the assigned problem as well as on their grasp of fundamental principles.

The Qualifier Examination is a departmental, ‘internal’ exam and therefore is not scheduled through the graduate school.

9.7 Ph.D. Preliminary Examination
All Ph.D. students are required to take a Preliminary Examination administered by the student’s advisory committee. The examination must be taken no later than 9 months prior to the completion of the final exam. At least 24 hours of course work and/or research must remain to be taken, including work for which the student is currently enrolled.

The purpose of the Preliminary Examination is to determine the student’s ability to formulate a plan to conduct original research on a problem and produce a Ph.D. dissertation. It shall consist of an oral presentation of the research proposal, and shall provide the advisory committee with an identification of the problem to be solved, a pertinent literature review, the proposed research plan to include the feasibility and originality of the proposed work, and any preliminary data gathered. A written copy of the research proposal must be provided to each member of the committee at least one week prior to the examination. Specific questions may be asked by the committee members, not only on the research proposal content, but also on any academic background or course work related to solving the problem.

The student’s advisory committee must approve the research topic and plan in order for the student to continue in his or her research studies. If the student fails to pass the exam the first time it is given, one more opportunity is offered for passing it. Failure to pass the second time will result in dismissal from the Ph.D. program.

9.7 (a) Procedure: Scheduling and Follow-up (Blacksburg campus)

The Preliminary Examination must be scheduled through the Graduate School and must be administered during regular academic semesters. Permission to schedule the exam during the time between semesters or sessions may be granted by a request from the Advisory Committee Chair to the Graduate School Dean explaining the special circumstances. Students must be registered in order to take the exam. A form found on the Graduate School website called “Request to Admit Candidate to the Preliminary Exam” must be printed out and completed (except for the department head signature) by the student. The form must go to the Graduate School at least two (2) weeks prior to the date of the exam and it must go through the SBES Graduate Coordinator’s office. Students will obtain the signature of their committee chair (advisor), bring the form to the Graduate Coordinator, who will then get the signature of the department head. In order for the Graduate School deadline to be met students are advised to get the form to the SBES Graduate Office no later than 3 weeks prior to the exam.

The Graduate School will process the form, then follow up with the student and the advisor regarding the signing and submission of the exam card. The exam card is sent to the advisor who is responsible for taking it to the exam and collecting the committee signatures. A copy of the signed card must go to the SBES Graduate Office before the card is returned to the graduate school.

Master of Science candidates are not required to do a Preliminary Examination.

9.8 Final Examination

9.8 (a) Master of Science Degree

All M.S. students must pass an oral comprehensive examination given by the advisory committee covering the student’s coursework and thesis research upon completing all other degree requirements. A copy of the thesis approved by the student’s major professor shall be provided to each of the committee members no less than one week prior to the examination. In order to ‘pass’ the candidate is allowed at most one negative vote from the examining committee. If a student fails the final examination, one full semester (a minimum of 15 weeks) must elapse before the second examination can be scheduled. The candidate is allowed no more than two opportunities to pass the exam. Failure the second time will result in dismissal from graduate studies by the Graduate School.

(1) Scheduling the Exam  (Blacksburg Campus)

The Final Exam is scheduled through the Graduate School and must be administered during regular academic semesters. Permission to schedule the exam during the time between semesters or sessions may
be granted by a request from the Advisory Committee Chair to the Graduate School Dean explaining the special circumstances. *Students must be registered to take the exam.*

The Graduate School’s website contains a Request to Admit the Candidate to Final Exam form which is to be printed by the student, filled out naming the time, date, and place, and signed by the committee chair. The form must reach the Graduate School at least two (2) weeks prior to the date of the exam, but first it must go through the SBES Graduate Coordinator’s office. Students will obtain the signature of their committee chair (advisor) and bring the form to the Graduate Coordinator who will gather the department head’s signature. In order for the Graduate School deadline to be met students are advised to get the form to the SBES Graduate Office no later than 3 weeks prior to the exam. *Students must be registered during the semester in which the final exam takes place.*

**(2) After the Exam (Blacksburg Campus)**

Following the completion of the M.S. defense, the student is expected to take the signed exam card to the SBES Graduate Coordinator’s office for a signature and for copying before the card is sent/taken to the Graduate School. Their deadline for return of the signed card is 1-2 days following the exam. Additionally, the Graduate School requires that the electronic thesis and all related documents be submitted within two weeks of the final defense. See the Graduate School’s website for specific instructions regarding electronic submission of the M.S. thesis. If an extension of time is required, the student’s advisor must email the Graduate School dean to explain why more time is necessary.

**9.8 (b) Doctor of Philosophy Degree**

All doctoral candidates must take a final oral examination which is primarily a defense of the dissertation. The exam is to be taken no earlier than nine months after the preliminary examination. Prior to the exam a copy of the dissertation approved by the student’s major professor shall be provided to each of the committee members at least two weeks prior to the date of the examination. To complete the SBES program students must pass the final examination, including approval of the dissertation in final form. A candidate is allowed at most one negative vote from the examining committee. In the case of a failure to pass, a full semester (a minimum of 15 weeks) must elapse before rescheduling the examination for a second (and final) attempt.

**(1) Scheduling the Final Exam (Blacksburg Campus)**

The Ph.D. Final Examination is scheduled through the Graduate School and must be administered during regular academic semesters. Permission to schedule the exam during the time between semesters or sessions may be granted by a request from the Advisory Committee Chair to the Graduate School Dean explaining the special circumstances. *Students must be registered in order to take the exam.*

The Graduate School website contains a form, Request to Admit the Candidate to Final Exam, which is to be printed and completed by the student, naming the time, date, and place, and signed by the committee chair. The form must reach the Graduate School at least two (2) weeks prior to the date of the exam, but first it must go through the SBES Graduate Coordinator’s office. Students will obtain the signature of their committee chair (advisor) and bring the form to the Graduate Coordinator who will gather the department head’s signature. In order for the Graduate School deadline to be met students are advised to get the form to the SBES Graduate Office no later than 3 weeks prior to the exam. *Students must be registered during the semester in which the final exam takes place.*

**(2) After the Exam (Blacksburg Campus)**

Following the defense, the student is expected to take the signed exam card to the SBES Graduate Coordinator’s office for a signature and for making a student-file copy before the card is sent/taken to the Graduate School. Their deadline for return of the signed card is 1-2 days following the exam. Additionally, the Graduate School requires that the electronic dissertation and all related documents be submitted within two weeks of the final defense. If an extension of time is required, the student’s advisor must email the Graduate School dean to explain why more time is necessary.

**(3) Commencement**
To be eligible for hooding at Commencement, the Final Examination must be completed and the Electronic Thesis/Dissertation (ETD) must be approved by the Graduate School by the published deadline for the semester. See the Graduate School's website for these deadlines.

9.9 Defending Student Status (DSS) (Blacksburg campus only)

Graduate students must be registered for the minimum number of credits in the semester or summer session in which they take an examination required by the Graduate School and in the semester when a degree is completed. The minimum enrollment is 3 credits except for students who may qualify for Defending Student Status (DSS).

Occasionally a student will have completed all degree requirements by the end of a particular semester in which he/she hopes to graduate except for the defense. Sometimes scheduling a thesis or dissertation defense at the end of a semester is problematic because of committee schedules. In these cases there is a mechanism in place at the Graduate School that can help alleviate the expense of registering for 3 credits the following semester just to defend.

If a student has a thesis or dissertation ready for defense at the end of a semester, but it cannot be scheduled until the beginning of the following semester, he/she may qualify for Defending Student Status if the defense can be held within the first 15 academic days of the semester. This mechanism is not intended to allow the student to continue working on an incomplete thesis/dissertation. The Graduate School assumes and expects that all degree requirements (including the ETD) are completed and that only the oral defense needs to be done.

The student submits a Defending Student Status form from the Graduate School’s website along with the form which is going to schedule the examination. Both forms must come to the SBES Graduate Office for final signatures and clearance before going to the Graduate School. The 2-week Graduate School deadline is strictly enforced, so the student is advised to see the Graduate Coordinator well in advance. If the forms are approved the Graduate School will register the student for 1 credit in GRAD 6864 (Master’s Defense) or GRAD 7864 (Doctoral Defense). Students cannot enroll themselves in DSS. If the student does not qualify for DSS, he/she must register (and pay for) the minimum 3 credits required.

If extenuating circumstances result in the Graduate Program Director and/or the student’s Advisor requesting an exception that allows DSS after the usual time, that request and the formal scheduling of the defense must be completed during the designated DSS period.

Students enrolled in DSS will be classified as less than half-time students. This could create issues with student loans and financial aid. International students should consult the Graduate School for the visa implications of this status. Students on DSS are NOT eligible to hold assistantships or fellowships.

9.10 ETD (Electronic Thesis/Dissertation)

Virginia Tech requires that all M.S. theses and Ph.D. dissertations be submitted to the Graduate School in electronic form in order for the degree to be conferred. The thesis/dissertation must be approved by the student’s Advisory Committee. Committee members signify their approval or disapproval by signing an ETD approval form which is included in the exam packet sent to the committee chair when the final exam is scheduled. The form can be found on the Graduate School’s website.

Complete instructions for the student on creating, formatting, and submitting an ETD can be found at www.etd.vt.edu. Additionally all SBES students are expected to go to the Graduate School’s website, http://www.grads.vt.edu/academics/completion/index.html, where there is an entire section dealing with ETDs, commencement, deadlines for document submission, etc. It is the student’s responsibility to learn the routines and procedures regarding ETDs and graduation required by the VT Graduate School.
Appendix I:  Suggested Math Courses at Virginia Tech

A comprehensive list of suggested courses available on the VT campus which are suitable for different BMES theme areas is presented below.

The math requirement should complement the student’s research. Biomedical Engineering students should recognize that one of their significant contributions is their ability to quantify physical and biological phenomena. This ability can be extended into design, discovery, and prediction. The math requirement is intended to develop this ability and the student should make the course selection based on these criteria.

**Suggested VA Tech Math Courses for the Biomechanics Theme Area**

- ESM 5725-5726  Mathematical methods in engineering I, II
- MATH 5245-5246  Ordinary differential equations
- MATH 5425-5426  Applied partial differential equations
- MATH 5444  Numerical methods for ordinary differential equations
- MATH 5465-5466  Numerical analysis
- MATH 5474/CS 5474  Finite difference methods for partial differential equations
- MATH 5485-5486  Numerical analysis and software
- MATH 5524  Matrix theory
- MATH 5545-5546  Calculus of variations and optimal control theory
- ME 5744  Methods of mechanical engineering analysis
- STAT 5044  Regression and analysis of variance (ANOVA)
- STAT 5615-5616  Statistics in research
- CHE 5984  Engineering mathematics

**Suggested VA Tech Math Courses for the Cell & Tissue Engineering Theme Area**

- ESM 5725-5726  Mathematical methods in engineering I, II
- MATH 5515-5516  Math methods for modeling & simulation of biological systems
- MATH 5465-5466  Numerical analysis I and II
- ME 5744  Methods of mechanical engineering analysis
- STAT 5615-5616  Statistics in research
- CHE 5984  Engineering mathematics

**Suggested VA Tech Math Courses for the Imaging Theme Area**

- MATH 5425  Applied partial differential equations
- MATH 5474  Finite differences
- MATH 5465-5466  Numerical analysis I and II
- MATH 5474/CS 5474  Finite difference methods for partial differential equations
- MATH 5485-5486  Numerical analysis and software
**Suggested VA Tech Statistics Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
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<tbody>
<tr>
<td>STAT 5044</td>
<td>Regression and analysis of variance (ANOVA)</td>
</tr>
<tr>
<td>STAT 5013</td>
<td>Introduction to statistical program packages</td>
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<tr>
<td>STAT 5104</td>
<td>Probability and distribution theory</td>
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<tr>
<td>STAT 5204</td>
<td>Experimental design and analysis</td>
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<tr>
<td>STAT 5594</td>
<td>Topics in biostatistics</td>
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<tr>
<td>STAT 5605-5606</td>
<td>Biometry</td>
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<tr>
<td>STAT 5615-5616</td>
<td>Statistics in research</td>
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