



Virginia Tech
Wake Forest University
School of
Biomedical Engineering &
Sciences

**GRADUATE STUDENT
HANDBOOK**

Virginia Tech
Blacksburg, VA

Wake Forest University
Winston-Salem, NC

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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://graduateschool.vt.edu/graduate_catalog/ for the Virginia Tech Graduate School Policies and Procedures or to <http://graduate.wfu.edu/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, and progress to the degree steps. The content dealing with items such as registration, enrollment, grades, student accounts, insurance, orientation, and the like are handled separately in chapters or sections devoted to a specific campus. Where applicable (e.g., financial aid) some topics present information for both campuses together.

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. The SBES curriculum currently consists of courses and research focused in seven broad areas of concentration or “theme areas” which include:

- Biomechanics
- Biomedical Imaging
- Cardiovascular Engineering
- Nanomedicine & Nanobioengineering
- Neuroengineering
- Tissue Engineering
- Translational Cancer Research

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 several of 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 in Winston-Salem.

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:

<i>Program</i>	<i>Degree</i>	<i>Location</i>
BME	M.S.	Either campus
BME	Ph.D.	Either campus
BME	M.D. / Ph.D.	WFU only
BME	D.V.M. / Ph.D.	VA Tech only
BME	M.S. Option	VA Tech only
BME	Ph.D. Option	VA Tech only
BME	Accelerated UG/G	VA Tech only

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 Accelerated Undergraduate/Graduate (UG/G) Degree program is also a specialty ‘degree-path’ in which qualified honors-level undergraduates from various engineering departments can begin working on an SBES M.S. or Ph.D. degree during the senior year as 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 – 24 credit hours of coursework (5000-level & above at VT)
- 6 -- 9 credit hours of thesis research

All master's students must complete and defend a thesis. There is no non-thesis M.S. 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

Course Category	Course # (VT# / WFU#)	Title	No. Credits Required
Biomedical Engineering (9 credits)	BMES 5054 / 605	Quantitative Cell Physiology (required)	3
	BMES 5074 / 606	Quantitative Organ Systems Physiology (required)	3
	5000 or 6000 level (600/700 at WFU)	3 credit hours of engineering courses approved by committee	3
Life Sciences (3 credits)	5000 – 6000 level	Min. 3 credit hours approved by committee -- (see approved list- Chap. 3)	3
Math Requirement (3 credits) (see Chapter 3 for suggested list of approved courses)	5000 – 6000 level	Min. 3 credit hours approved by committee – (see approved list)	3
Electives	5000 – 6000 level (600/700 at WFU)	Approved by advisory committee	6 - 9
		TOTAL COURSE CREDITS:	21 – 24
Research credits	BMES 5994	Research & Thesis	6 - 9
		MINIMUM TOTAL CREDITS:	30

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/catalog.php>.

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 or co-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 an affiliate serving as co-chair with a primary/core), and two other faculty members, one of whom must be an engineer. For purposes of SBES advisory committee composition an 'engineer' is defined as:

- 1) a *primary* SBES faculty member from either campus
- 2) a faculty member with a primary appointment in another engineering department
- 3) anyone with a degree 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 (2nd) 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:

- 35 – 50 credit hours of coursework (5000-level & above at VT)
- 40 – 55 credits of research & dissertation (BMES 7994 at VT)

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

Course Category	Course # (VT# / WFU #)	Title	No. Credits Required
Biomedical Engineering (15 credits)	BMES 5054 / 605	Quantitative Cell Physiology (required)	3
	BMES 5064 / 606	Quantitative Organ Systems Physiology (required)	3
	5000 or 6000 level (600/700 at WFU)	Min. 9 credit hours of engineering courses approved by committee	9
Life Sciences (3 credits)	5000 – 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee – (see approved list – Chapt.3)	3
Math Requirement (6 credits) (see Chapter 3 for suggested list of approved courses)	5000 – 6000 level (600/700 at WFU)	Min. 6 hours from approved list (see Chapter 3) (only 3 credits can be Statistics)	6

Electives (9 – 24 credits)	5000 – 6000 level (600-700 WFU)	Approved by advisory committee	9 – 24
Clinical Rotation	BMES 6064 / 706	Required of all Ph.D. students	2
Medical Ethics (0 credit)		Mandatory Seminar Responsible Conduct of Science	0
		TOTAL COURSE CREDITS:	35 – 50
Dissertation Research	BMES 7994	Research & Dissertation	40 - 55
		MINIMUM TOTAL CREDITS:	90

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/catalog.php>.

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 or co-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. If the advisor is an SBES affiliate, another faculty member (primary/core) must be named as co-chair. 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. For purposes of SBES advisory committee composition an 'engineer' is defined as:

- 1) a *primary* SBES faculty member from either campus
- 2) a faculty member with a primary appointment in another engineering department
- 3) anyone with a degree in engineering

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.

2.3 (h) M.S. Degree "Along-the-way" to the Ph.D.

SBES Ph.D. candidates who are on the "direct-to-Ph.D." path may elect to earn a Master of Science degree "along-the-way." The student's official enrollment status remains "Ph.D." while the M.S. degree is being sought. Students taking this path must submit an M.S. plan of study at the end of the second semester just as the regular Master's enrollees do. The degree requires completion of a thesis and defense since there is no non-thesis M.S. degree offered in SBES. The Ph.D. plan of study must be submitted on time at the end of the third semester regardless of the fact that the student is currently working on or finishing up the M.S. degree.

Further details regarding this degree path will be forthcoming in the near future from the SBES Graduate Program Committee.

****** 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 seven different theme areas offering students subject matter for concentrating their studies. These theme areas are:

- Biomechanics
- Biomedical Imaging & Medical Physics
- Cell & Tissue Engineering
- Bio-Nanotechnology
- Neuroscience
- Nanomedicine & Translational Oncology
- Cardiovascular Research

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. Several SBES theme areas are described in greater detail below. Additional concentration areas are anticipated in the near future as the faculty expands.

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:

Dept./Course #	Course Title
BMES 5124	Advanced Musculoskeletal Biomechanics
BMES 5134	Biomechanics & Simulation of Movement I
BMES 5164	Advanced Impact Biomechanics
BMES 5174	Biomechanics of Crash Injury Prevention
BMES 5184	Injury Physiology
BMES 5214	Human Physical Capabilities
BMES 5244	Biofluids
BMES 5984	Bioinstrumentation
BMES 5984	Biomedical Heat Transfer/Thermal Design
BMES 6164	Computational Modeling in Impact Biomechanics
BMES 6174	Advanced Human Modeling
ESM 5305	Cardiovascular Mechanics I

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)
- Bioinstrumentation (BMES 5984)
- Biomechanics & Simulation of Movement I (BMES 5134)
- 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)
- 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:

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

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

YEAR 1		
Semester	Course	Instructor
Summer	Imaging Sciences	Kraft
Fall	Math	
	Quantitative Cell Physiology	Gabler
	Probability and Random Processes	VA Tech
Spring	Medical Imaging I	Bourland/Munley
	DSP/IP	Wicks
	Quantitative Organ Systems Physiology	Kraft

YEAR 2		
Semester	Course	Instructor
Summer	Clinical Rotation	TBA
Fall	Medical Imaging II	Kraft
	Statistical Pattern Recognition	TBA
	Life Science	
Spring	Advanced Image Analysis	TBA
	Topics in Medical Imaging (specify modality)	TBA
	Math	

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

Dept./Course #	Course Title
BMES 5984	Introduction to Regenerative Medicine
BMES 5024	Biomedical Engineering and Human Disease
BMES 5304	Biological Transport Phenomena
BMES 5334	Cell Adhesion
BMES 5424	Fundamentals of Tissue Structure
BMES 5434	Polymeric Biomaterials
BMES 5984	Biomedical Instrumentation
BMES 5984	Computational Modeling in Cell & Molecular Biology
BMES 5714	Biomedical Microdevices
BMES 5984	Biomedical Heat Transfer/Thermal Therapy Design

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:

Quantitative Physiology I & II
 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://graduateschool.vt.edu/graduate_catalog/policies.htm?policy=002d14432c654287012c6542e363000c .

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

Subject	Course # (VT # / WFU #)	Title	No. Credits Required
Biomedical Engineering (15 credits)	BMES 5054 / 605	Quantitative Cell Physiology (required)	3
	BMES 5074 / 606	Quantitative Organ Systems Physiology (req.)	3
	5000 or 6000 level (600 / 700 at WFU)	Min. 9 credit hours of engineering courses approved by committee	9

Life Sciences (3 credits)		<i>Satisfied with DVM and/or MD courses</i>	3**
Mathematics (6 credits – only 3 can be in Statistics)	5000 – 6000 level (600 / 700 WFU)	Min. 6 credit hours (see <u>approved list</u> in Chapter 3 of handbook)	6
Electives (9 - 24 credits)	5000 – 6000 level (600 / 700 at WFU)	Approved by Advisory Committee	9 - 24
Clinical Rotation		<i>Satisfied with DVM or MD Clinical Rotation requirement</i>	2**
Medical Ethics (0 credits)		Medical Ethics (only if not required by DVM program)	0
		Total Course Requirements:	35 - 50
Dissertation Research (40 – 55 credits)	BMES 7994	Research & Dissertation	40 - 55
	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/catalog.php>.

2.7 Accelerated Undergraduate/Graduate (UG/G) Degree Program (Blacksburg campus only)

SBES invites application to the Accelerated Undergraduate/Graduate Degree Program (UG/G) for highly qualified VT undergraduate engineering students. Students may apply for admission to either the SBES M.S. or the Ph.D. program as part of this program. Application to this program is available to VT engineering students who meet the following qualifications:

- ▶ Students must have a GPA of 3.5 or higher on their last 60 hours of course work and an overall GPA of 3.3 or higher.
- ▶ An SBES faculty member must have agreed to serve as the initial faculty advisor for the student's graduate degree.
- ▶ Students follow the regular graduate admissions process. A student must apply for the semester the student will begin his/her graduate degree.
- ▶ Students applying to the program are required to submit GRE scores.
- ▶ Students must submit three or more letters of recommendation. One letter must be from an SBES faculty member who should consider serving as an advisor.
- ▶ Applicants must be in the last 12 months of an undergraduate program from one of the College of Engineering departments.

2.7 (a) Other Instructions/Considerations

Double-Counting Courses

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. All double-counted courses must be at the 5000-level or higher. Courses included on a UG/G student's list of proposed coursework must be consistent with the course requirements for the appropriate SBES graduate degree. They must also meet the requirements of the student's undergraduate degree program.

Application Instructions

The deadline for applying to this program is **May 1** for students entering fall semester. We recommend that applicants begin this process at the beginning of the spring semester of their junior year since GRE exams must be scheduled and taken. 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 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.

Students should apply through the normal VT online application process. **NOTE:** There is no "Accelerated UG/G Program" choice listed on the application, so students will choose either the M.S. or the Ph.D. degree in Biomedical Engineering, and the effective term will be the semester in which the student becomes a full-time graduate student (not the beginning term of the senior year). Instructions for applying to SBES are listed at the following link: <http://www.sbes.vt.edu/admissions.php>. Students are advised to consult with the SBES Graduate Coordinator before beginning to work on the application forms involved in this process, particularly the Course Designation Form.

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 Application form (http://www.sbes.vt.edu/pdf/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 a biomedical engineering area under an SBES-affiliated advisor
- 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/pdf/BME_Option_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 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 cannot 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

MATH	Any 5000-level or higher course with some exceptions*
STAT	Any 5000-level or higher course with some exceptions*
CHE/BSE/BMES 5044	Engineering mathematics
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) Exceptions at VA Tech (not allowed)

*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
STAT 7994	Research & dissertation

3.1 (c) 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 (d) Approved WFU Math Courses for Biomedical Imaging and Medical Physics

MATH 610	Advanced calculus
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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 WFU Math Courses for Biomechanics

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 (f) Approved WFU Math Courses for Cell & Tissue Engineering

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

3.2 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 three (3) credit hours in approved coursework beyond the required courses, Quantitative Physiology I and II which contain life science content.

These 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:

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 them 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:

Department:	Course:	
Comparative Medicine	COMD 706	Animal Models in Biomedical Research
Health & Exercise Science	HES 675	Advanced Exercise Physiology
Cancer Biology	CABI 707	Topics in Cancer
Neurosciences	NEUR 701-1	Intro to Neurosciences 1: Neuroanatomy
Neurobiology and Anatomy	NBAT 707	Gross Anatomy

Questions about specific courses in these or other departments should be directed to the WFU Program Director, Dr. Kate Saul. **NOTE:** Check the Life Sciences Requirement information on the SBES website for the most updated list of approved courses at Wake Forest.

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 are given, but it is to be listed on the Plan of Study 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 which can be included as credits on the Plan of Study. On the VT campus, a workshop is attended by all new students to satisfy the requirement. Since it is not a 'class', it is listed on the Plan of Study in the "Supporting Courses" section.

3.4 Clinical Rotation

The Clinical Rotation is a required 2 credit 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 approximately 3-4 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 level 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 participating students submit (as directed) a written abstract of the research project 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 & 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 via Hokie SPA after consulting with their advisors.

On the Timetable of Classes all SBES faculty have 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 can register for summer school (if they plan to attend) and for fall semester classes. Consult the registrar’s website, <http://www.registrar.vt.edu/>, for information. Pre-registration is also referred to as “course request”.

NOTE: Continuing graduate students are advised to pay attention to the Bursar’s billing cycle when thinking about pre-registering for courses, particularly for fall semesters, since billing for fall occurs in mid-July, making comprehensive fees due on August 10 (prior to the start of school). Graduate students can now finance their comprehensive fees, but **ONLY IF** their assistantship is entered into Banner. If for some reason a grad student’s payroll record has not been set up by then, the full fees are due and if not paid, they will accrue a late fee. For this reason it may be a good idea *not* to pre-register for fall classes, unless it is believed to be necessary in order to gain a seat. See section 6.4(d) of this handbook for more information.

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/>. 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 (from the Graduate School) 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 under which they only have to be registered for one (1) credit hour.

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 (Pass: performance of C- or higher when enrolled for the P/F grade option), “I” (Incomplete), “X” (a temporary grade for the first semester in those courses that continue across more than one semester), NG (no grade: assigned when the student has not done any of the work for the course), NR (not reported: the instructor did not enter a grade), 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. An additional GPA is calculated for the coursework on the Plan of Study. Grades of “P”, “I”, “X”, “NR” and “EQ” do not calculate into the GPA, but “F” (on a course taken Pass/Fail) and “NG” calculate as 0.0 in computing 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. See the Graduate Catalog for a thorough explanation of the grading system.

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”, “X”, “NR”, and “NG” grades have been converted to a passing letter grade (C- or better for courses taken A-F, “P” for courses only offered P/F) on the Plan of Study.

If a student is ready to complete a graduate degree and grades of “I”, “X”, “NG” or “NR” are present on the transcript but off the Plan of Study, the department should investigate why these grades have not been remedied. In many cases these grades reflect unresolved problems or errors that can and should be remedied. However, as long as the student has a GPA of 3.0 or better, both on the Plan of Study and overall, these grades may remain on the transcript and not interfere with degree completion.

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.

4.5 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, as well as students from other disciplines, 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 5984/6984: 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. International students wishing to change campuses must check with the immigration personnel at both graduate school locations (VT and WFU) for information regarding visa changes, etc.

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 & 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 in Quantitative Cell 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. Students may enroll for up to 12 credits in the Fall and Spring semesters, and 6 credits in the summer.

Continuing students are notified via e-mail by the Graduate School office that registration is available. Registration is completed on-line using the Student Center in PeopleSoft. 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 (Withdrew), WP (Withdrew Passing), WF (Withdrew 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. In the School of Biomedical Engineering & Sciences, the required minimum grade point average is 3.0. 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 graduation 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.

5.5 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 at WFBMC (applies to ALL SBES students)

The dress code is applicable to all SBES students while on the WFBMC 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 WFBMC 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)

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 campus-wide for graduate students.

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 with the Graduate School and with the Cranwell Center (<http://www.international.vt.edu/>). They must also 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. Also, an Ethics Seminar is given which all new students are required to attend. It is a specific degree requirement for PhD students. During orientation week students will 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). Go to <http://www.computing.vt.edu/content/pid-generation-tool-process> 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. Permits are also available at the Parking Services satellite office located on the ground floor of the Perry Street Parking Garage on the north end of campus.

Graduate assistants with a 100% assistantship will have the option to purchase the university parking permit with pre-tax dollars through payroll deduction. The department responsible for the assistantship appointment must enter the position into Banner before eligible students will be able to enroll in the program. Details will be available in the student’s University Account section of their Hokie SPA.

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 where otherwise signed. 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.parking.vt.edu/forms.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

New F-1 and J-1 visa international students should contact the Cranwell Center about applying for a Social Security card. The Cranwell Center will help students and employees make arrangements to go to the Roanoke office since they are no longer coming to the campus on a monthly basis. Information about Social Security can be found here: <http://www.international.vt.edu/currentstudents/socialsecurity.php>.

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 prior to or on the first day the employee reports for work. This is normally done prior to or during 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 student gallery on the SBES website.

6.2 (g) Find Your Mailbox

All SBES students will have a mail box on the 3rd floor of the ICTAS building. 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. Students are NOT to have personal packages delivered to the SBES offices or labs, and SBES staff should not be asked to sign for any such parcels.

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:

Spring semester	9 pay checks
Summer I	3 pay checks
Summer II	3 pay checks
Fall semester	9 pay checks

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 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 per 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, insurance issues, 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. 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. This process must be renewed each semester.

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 (f) Student Medical Insurance

Virginia Tech graduate students who are given assistantships are also offered an enhanced insurance benefit. Beginning in fall 2011, ninety percent (90%) of the student medical insurance premium will be paid on the Aetna student insurance plan (for a single student at the \$100,000 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 SBES Student Vacation / Holiday Policy (pertains to both campuses)

The following describes the default vacation policy for students in SBES. Individual labs may have their own policies that supersede this one; students should check with their advisor. In all cases, students should seek advance approval from their advisor before using a vacation day.

Default policy

Graduate students are allowed 20 vacation days each stipend year, including any set holidays that may be specified by your home campus). These dates will be announced to SBES students at the beginning of the fall semester.

Procedures for requesting vacation:

- Complete an Authorization for Absence form (see the SBES website)
- Submit to Advisor

Time frame for submitting vacation requests:

- Less than one week: must be approved at least three (3) working days in advance
- 1-2 weeks: must be approved at least one month in advance

Set Holidays

Local campus holidays will be announced at the beginning of the fall semester. However, if a holiday falls on a day when classes are being held due to the joint calendar between the Virginia Tech and Wake Forest Campus, students are responsible for the material covered and/or tests given. (The Martin Luther King, Jr. and Good Friday holidays have been such occurrences.)

Stipend Year

At Virginia Tech, the stipend year will include the fall, spring, summer I and summer II semesters. At Wake Forest, the stipend year runs from mid-August to mid-August; the exact dates will be announced at the beginning of the fall semester.

This policy is subject to review and modification by the SBES Graduate Program Committee at any time.

6.6 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 departure date and date of return to their program of study. 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.

6.7 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.graduateschool.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)

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@wakehealth.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. Additionally, information about orientation at WFU can be found on the website at <http://graduate.wfu.edu/Orientation/index.html>.

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/Orientation/index.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/content/your-pid>.

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 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.

7.3 (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 (pertains to both campuses)

The following describes the default vacation policy for students in SBES. Individual labs may have their own policy that supersedes this one; students should check with their advisor. In all cases, students should seek advance approval from their advisor before using a vacation day.

Default policy

Graduate students are allowed 20 vacation days each stipend year, including any set holidays that may be specified by your home campus). These dates will be announced to SBES students at the beginning of the fall semester.

Procedures for requesting vacation:

- Complete an Authorization for Absence form (see the SBES website)
- Submit to Advisor

Time frame for submitting vacation requests:

- Less than one week: must be approved at least three (3) working days in advance
- 1-2 weeks: must be approved at least one month in advance

Set Holidays

Local campus holidays will be announced at the beginning of the fall semester. However, if a holiday falls on a day when classes are being held due to the joint calendar between the Virginia Tech and Wake Forest Campus, students are responsible for the material covered and/or tests given. (The Martin Luther King, Jr. and Good Friday holidays have been such occurrences.)

Stipend Year

At Virginia Tech, the stipend year will include the fall, spring, summer I and summer II semesters. At Wake Forest, the stipend year runs from mid-August to mid-August; the exact dates will be announced at the beginning of the fall semester.

This policy is subject to review and modification by the SBES Graduate Program Committee at any time.

7.5 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.

7.6 Approval for Reimbursement

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

7.6 (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.

7.6 (b) Purchase Reimbursement Approval Process

Provide a purchase request form to the BME Administrative Assistant and include 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). This form can be obtained from the BME Administrative Assistant. 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.

8.0 Financial Support for Graduate Students (both campuses)

Routinely all graduate applications are evaluated for financial aid possibilities as they are being assessed for admittance into the program. Common types of financial aid available at the graduate level consist of assistantships (GRA, GTA, GA), fellowships, scholarships, and the like. 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. Offers of admission to the program are normally accompanied by a financial aid offer (either simultaneously or separately), but admission offers can be made without an offer of employment. Financial offers can originate from the department itself, or from an individual faculty member affiliated with SBES. SBES applicants/students have several different sources of financial aid available to them depending on the campus to which they apply and are accepted.

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 currently 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 technology & engineering 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 summers 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://graduateschool.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 assistantship appointment. The Graduate School 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: In-state vs. Out-of-state

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 driver’s 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://graduateschool.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://graduateschool.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 VT 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://graduateschool.vt.edu/>) for further information and help in seeking these out.

8.3 Funding on the Winston-Salem Campus

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 (12 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.

8.3 (a) Program-based Scholarships and Awards

These are available to students on the Bowman Gray campus on a competitive basis with nominations solicited by either the program or the Graduate School. They include:

- The Camillo Artom Scholarship
- The Herbert C. Cheung PhD Award
- The Sandy Lee Cowgill Memorial Scholarship Fund
- The Norman M. Sulkin Scholarship Fund
- The Lucy Robbins Fellowship Fund

8.4 Financial Support: Continuation, Contingencies, Termination (both campuses)

Continuation of graduate student financial support (assistantship appointments, departmental fellowships) is subject to several important contingencies. The first is academic, as stated above (section 8.1(a)). Students are evaluated by their faculty advisors and if the academic performance is not satisfactory, it is possible for the student to lose the financial support. This holds for ALL aspects of a graduate student's progress toward the degree, not merely GPA requirements.

Students are also evaluated on other parameters which indicate whether or not the student is making adequate or satisfactory progress toward the degree. Unsatisfactory or deficient research progress could result in a loss of continued financial support at the discretion of the hiring faculty and/or department.

Finally, all SBES graduate students are expected to become familiar with and adhere to the University Honor Codes of the campus on which they reside. Both campus honor systems maintain that the codes establish and govern academic integrity among graduate students, and they require honesty and ethical behavior in all academic pursuits. Ethical behavior is defined as conforming to accepted professional standards of conduct as codes of ethics used by professional societies in the U.S. to regulate the manner in which their professions are practiced. (from the VT Honor Code website).

The VT Graduate Honor Code is available here: <http://ghs.graduateschool.vt.edu/>

The WFU Graduate Honor Code is available here:

http://graduate.wfu.edu/docs/academics/HonorCode_Nov2008GF.pdf

8.4 (a) SBES Departmental Policy: Termination

SBES graduate students may have their graduate assistantship or fellowship terminated for several reasons including the following:

- Lying
- Cheating
- Stealing
- Data falsification
- Plagiarism
- Violations of the Virginia Tech “Principles of Community” (<http://www.vt.edu/diversity/principles-of-community.html>)

Termination of graduate assistantships funded by contract or grant will be at the prerogative of the faculty adviser. Termination of graduate assistantships or fellowships administered by SBES will be at the prerogative of the Graduate Program Committee.

8.5 Outside/Additional Employment for Graduate Students (Blacksburg Campus)

Outside or additional employment for SBES graduate students is prohibited, with very few exceptions, for any students who are receiving any form of graduate assistantship from Virginia Tech or the faculty. A waiver of this rule will only be permitted with the express written consent of both the Graduate Program Chair at VT and the Department Head at VT.

8.6 Outside/Additional 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 SBES graduate program 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: STAR Report / Annual Evaluation

At the end of each spring semester, SBES faculty advisors are required to formally evaluate the progress of their advisees by means of a Student Activity Report (STAR) which is completed by both the student and the advisor, then submitted to the SBES Graduate Office. The form is designed to allow the student to progressively track degree progress by providing places for recording goals achieved during the year, the year's activities, and goals for the next year -- across several categories: Courses/Academics, Scholarly Activity, and Professional Development. Advisors provide comments and an overall rating on each. The forms are sent out to students in mid-spring, 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 or required by the VT Graduate School.

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. He/she helps students become familiar with research opportunities among the faculty, and often assists the student in choosing a permanent advisor.

At Virginia Tech the SBES faculty are listed on the Timetable of Classes under 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". *Care must be taken to sign up for the proper section that matches the degree being pursued.* Accidentally signing up under the wrong section could jeopardize the final grade, thus adversely affecting the semester 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). Primary/Core faculty may serve alone as chairpersons – affiliate faculty members are eligible to co-chair an SBES student's committee along with another Primary/Core faculty member. 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 affiliated with SBES in one capacity or the other. 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://graduateschool.vt.edu/graduate_catalog/policies.htm?policy=002d14432c654287012c6542e38200c7.

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. 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. The student obtains the vita from the faculty member and sends it to the SBES Graduate Coordinator’s office, and from there it will be added to the required form and 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 in 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. Wake Forest SBES students work with the Graduate Coordinator in Blacksburg to produce a written plan that must be signed by their committee and approved by the VT Graduate Program Chair. WFU plans go into student files, but are not submitted electronically to the VT Graduate School.

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 SBES and 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://graduateschool.vt.edu/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. 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 obtain a recent curriculum vita from that person and submit it to the SBES Graduate Coordinator who will forward it to the Graduate School along with the required registration form. Approval by the Graduate School must precede the person’s inclusion on the Plan of Study.

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

The SBES website contains a link (<http://www.sbes.vt.edu/forms.php>) which will take you to a page where you can see sample plans for the Ph.D., M.S. and UG/G 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:
 - a) a copy of the course syllabus as taught (don’t use a catalog description);
 - b) the title and author of the textbook used;
 - c) a sample of a graded assignment;
 - d) 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 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. 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 Scholar) 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 Scholar 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.

At Wake Forest this step is often referred to as "advancing to candidacy" and it involves completing an application form (found here: http://graduate.wfu.edu/Forms/BG%20Campus/BG_PhDcandidacy_0609.pdf) after taking the prelim exam, and submitting it to the Graduate School for approval. The Preliminary Exam itself is not scheduled by the Graduate School as it is at Virginia Tech. It is scheduled by the student's committee.

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

At VT 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" is 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 signatures of their committee members and 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 members 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 or taken to the Graduate School. The 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 members 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 or 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 early in the following semester, he/she may qualify for Defending Student Status. 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. To be 'ready to defend' means the student's advisory committee members must have read the thesis/dissertation and agreed that it is in a form ready for defense (i.e., the paper is finished).

The "DSS scheduling period" is the first three weeks of an academic semester, and the Request for Final Exam and the DSS form must be received by the Graduate School within this scheduling period. To allow for time to process the exam request (two weeks), students should make every effort to submit the DSS form and the scheduling form to the Graduate School by the end of the second week of the semester. SBES student should see the Graduate Coordinator well in advance of this whole situation in order to ensure meeting deadlines.

If the student qualifies for DSS the exam date should be set for as early as possible in the semester. If the exam needs to be delayed, the student's advisor should explain the circumstances for the delay in a letter/email to the Dean's office.

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.

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 <http://etd.vt.edu>. Additionally all SBES students are expected to go to the Graduate School's website, <http://www.graduateschool.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



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/BSE/BMES 5044	Engineering mathematics

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



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/BSE/BMES 5044	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

STAT 5044	Regression and analysis of variance (ANOVA)
STAT 5013	Introduction to statistical program packages
STAT 5104	Probability and distribution theory
STAT 5204	Experimental design and analysis
STAT 5594	Topics in biostatistics
STAT 5605-5606	Biometry
STAT 5615-5616	Statistics in research

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