

SBES Graduate Student Manual



**Virginia Tech – Wake Forest University
School of Biomedical Engineering and
Sciences**

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Introduction

Welcome to SBES

This handbook is intended to be a guide on the policies and procedures of the Virginia Tech – Wake Forest University School of Biomedical Engineering & Sciences (SBES) program.

Students admitted to the SBES program are responsible for following these policies and procedures as well as those of the respective Graduate Schools of each campus. (Wake Forest or Virginia Tech). These policies apply to ALL SBES students regardless of their campus location. Students should refer to the [Virginia Tech Graduate School Policies and Procedures](#) or to the [Wake Forest Graduate School Policies and Procedures](#).

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 the [Honor Codes of 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, there are certain aspects of its operation that will 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, MS, PhD 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, and orientation are handled separately in chapters or sections devoted to a specific campus. Where applicable, some topics (e. g., financial aid) present information for both campuses together.

SBES Culture

As a biomedical engineering program, our mission and commitment are to increase the quality of life for patients and humankind. We're proud of our innovative, entrepreneurial, inclusive, and supportive culture. Through student organizations and alumni functions, we provide opportunities for engagement on campus and beyond. We are committed to fostering a diverse community of faculty, staff and students. We strive to recruit and graduate a high quality, diverse student body. We are committed to upholding the Virginia Tech motto, *Ut Prosim* – That I May Serve. We support these goals by listening to the needs and wants of the program community and formulating strategies for fulfilling these needs and wants. In alignment with the Virginia Tech College of Engineering's strategic plan, we confirm our commitment to those five core values of inclusiveness, excellence, integrity, perseverance, and stewardship. Our community supports equity and fosters respect for every individual, enabling collaboration and collegiality to permeate our classrooms, research facilities, and offices, and to extend to the broader university community. We recognize the importance of allowing every voice to be heard in a spirit of mutual respect. For more information: <https://beam.vt.edu/about/diversity.html>

SBES Graduate Committee

The SBES Graduate Committee consists of the VT SBES Graduate Director, the WF SBES Graduate Director, 2 rotating faculty members from Virginia Tech SBES, and 2 rotating faculty members from Wake Forest SBES. In addition, the BMES Student Chapter elects 2 student reps from each campus (VT &

WF) to hold representation positions but not voting duties in the committee along with the Department Heads from each campus, the graduate coordinator, and a program support staff member from Wake Forest. All policies in this handbook are approved by the SBES Graduate Program Directors and/or the SBES Graduate Committee. Changes to policies should be requested through the SBES Graduate Coordinator who will add them to the monthly agenda for the SBES Graduate Committee to discuss.

Degree Types and Requirements

Types of Degrees

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 has two campus locations. The first is at Virginia Tech in Blacksburg, Virginia and is home to the College of Engineering, the VA-MD Veterinary College and the Virginia Tech Carilion Research Institute. The second is at Wake Forest School of Medicine in Winston- Salem, North Carolina and is home to the Wake Forest University Baptist Medical Center which consists of the Wake Forest University Health Sciences and the North Carolina Baptist Hospital. Additional contributors to SBES also include the clinical departments at Wake Forest and the Department of Biomedical Engineering and Mechanics at Virginia Tech.

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

Program	Degree	Location
BME	MS Thesis	Either campus
BME	MS Non-Thesis	VT only
BME	PhD	Either campus
BME	MD / PhD PhD	WFU only
BME	MBA / PhD	WFU only
BME	DVM / PhD	VT only
BME	Accelerated UG/G	VT only

The SBES curriculum currently consists of courses and research focused in broad areas of concentration which include but not limited to:

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

- Transportation Safety
- **And many more!**

Typically, a student's concentration area is directly related to the research specialty of the lab to which they are attached to. However, the final composition of an individual person's program is left in the hands of the student and their 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 which allows students to visit clinical settings at either the Medical Center in Winston-Salem and various clinical settings near Virginia Tech.

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: <https://beam.vt.edu/graduate/biomedical.html>

Students select a campus location during the application and admissions process. The choice is based on the student's anticipated area of concentration and/or a choice of faculty or research interests.

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 and be accepted into the Wake Forest University School of Medicine before being considered for the PhD degree in Engineering. Similarly, DVM/PhD degree applications must be accepted by the VT/MD DVM program before being considered for the PhD degree in Engineering.

The Accelerated Undergraduate/Graduate (UG/G) Degree program is also a specialty 'degree-path' in which qualified honors-level undergraduates from various engineering departments at Virginia Tech can begin working on a SBES MS or PhD degree during the senior year as they complete their BS degree.

Doctor of Philosophy Degree (Both Campuses)

Degree Requirements

Students pursuing a BME PhD must take a minimum of 90 course credit hours beyond the BS degree. An MS degree is not required for admission to the PhD program. The 90 hours may be distributed as follows:

For those who joined the program BEFORE Fall 2023:

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

For those who joined the program Fall 2023 and later:

- 29 - 44 credit hours of coursework (5000-level & above at VT)

- 46 - 61 credit hours of research & dissertation (BMES 7994 at VT)

All PhD students write and defend a dissertation. Most students spend an average of 4-5 years completing the PhD, although degree completion can take longer depending on the nature of their research project. In some cases, students entering the program with an MS may complete the degree in a shorter amount of time. The degree requirements pertaining to specific courses are shown in the table below: Credits shown represent the minimum required to obtain the degree. Seminar enrollment is required each semester, but the credits are not counted toward the degree.

Elective requirements for the program are courses that are considered “technical electives” in ENGINEERING, LIFE SCIENCE, or MATH. Students should refer to the section that details what an “Elective” is and the list of SBES approved Life Science and Math courses that may be considered as an elective. Courses that begin with GRAD are not considered technical elective courses for the program. A student who feels that a course not listed should be considered, they should send the course information and syllabus to the graduate directors and coordinator for prior approval.

**Table 1: Degree Requirements for the PhD Degree in Biomedical Engineering
For those who joined the program BEFORE Fall 2023:**

Course Category	Course # (VT/WF)	Title	No. Credits
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	5000 or 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Mathematics	5000 or 6000 level (600/700 at WFU)	Min. 6 hours approved by committee (<i>see approved options</i>) (only 3 credits can be statistics)	6
Electives	5000 or 6000 level (600-700 WFU)	Graduate courses in Engineering, Math, or Life Science approved by committee	9 – 24
Clinical Rotation	BMES 6064/706	Required of all PhD students	2
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304 (required) WF: GRAD 713, GRAD 714, GRAD 715, and GRAD 716 (required)	Does not count toward 90 hours
BME Seminar	BMES 5944/694	Min. 6 credits (6 semesters); additional attendance encouraged! (required)	Does not count towards 90 hours
Total course credits:			35 - 50
Dissertation Research	BMES 7994/797	Research & Dissertation	40 - 55
Minimum total credits:			90

PhD Requirements for those who joined the program Fall 2023 and later:

Course Category	Course # (VT/WF)	Title	No. Credits Required
Biomedical Engineering (12 credits)	BMES 5054/605 OR BMES 5064/606	Quantitative Cell Physiology OR 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	5000 or 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Mathematics	5000 or 6000 level (600/700 WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Electives	5000 or 6000 level (600/700 at WFU)	Graduate courses in Engineering, Math, or Life Science approved by committee	9 - 24
Clinical Rotation	BMES 6064/706	Required of all PhD students	2
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304 (required) WF: GRAD 713, GRAD 714, GRAD 715, and GRAD 716 (required)	Does not count toward 90 hours
BME Seminar	BMES 5944/694	Min. 6 semesters; additional attendance encouraged! (required)	Does not count towards 90 hours
Total course credits:			29 - 44
Dissertation Research	BMES 7994/797	Research & Dissertation	46 - 61
Minimum total credits:			90

NOTE: Course numbers cited above list Virginia Tech campus first (4-digit system), followed by 3-digit numbers at the Wake Forest campus. Course numbers for both campuses on all classes offered can be found on the SBES website: <https://beam.vt.edu/graduate/biomedical.html>

PhD Checklist

- 1- Clinical Rotation
- 2- Qualifying Exam
- 3- Plan of Study
- 4- Prelim Exam
- 5- Final Defense

MS Degree “Along-the-way” to the PhD (Both Campuses)

SBES PhD candidates who are on the “direct-to-PhD” path may elect to earn an MS degree. The student’s official enrollment status remains “PhD” while the MS degree is being sought. Students taking this path must submit an MS plan of study just as required of regular MS candidates. At Wake Forest the degree requires completion of a thesis and defense since there is no non-thesis MS degree offered at Wake Forest. The PhD 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 MS degree.

A form to indicate that you wish to do your MS along the way will need to be completed and approved prior to submitting your plan of study and scheduling your MS Defense. Students should meet with the graduate coordinator if they wish to go down this path.

After completing the proper documentation with the VT Graduate School and the SBES program, students on the Wake Forest campus should also notify Susan Pierce spierce@wakehealth.edu of your intentions to proceed with a MS along the way.

MD/PhD Joint Degree (Wake Forest Campus)

The combination medical and PhD biomedical engineering degrees are applied for and initially administered under the respective medical programs involved. The M. D. / PhD 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 their 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 PhD engineering program. Combination students do NOT apply to the SBES graduate program through the normal route of Virginia Tech's online application process. The basic degree requirements for the combination degrees will be the same as for the regular BME PhD degree with the exception that the life sciences requirement taken for the M. D. degree will satisfy the life science requirement for the SBES degree, and the clinical rotation requirements for the M. D. degree will satisfy the BME PhD requirement for clinical rotation.

More information can be found here: <http://www.wakehealth.edu/School/MD-Program/Combined-Degree-Programs.htm> . See Table 2 below for course requirements.

MBA/PhD Joint Degree (Wake Forest Campus)

The PhD/MBA program is a joint program of the School of Business and the Wake Forest Graduate School of Arts and Sciences. PhD/MBA candidates spend the first two years taking course work in their chosen PhD program of study. Students begin their MBA studies during the third year, taking classes in the School of Business Evening MBA program on the Wake Forest campus. Progression into the MBA portion of the degree is contingent upon successful completion of the qualifying exams administered by the student's program of graduate study and upon passing into doctoral candidacy. Please Note: PhD/MBA students must be recommended from the administration of the Graduate School of Arts and Sciences at Wake Forest University. Candidates for joint degree programs must be accepted by both schools.

More information can be found here: <http://business.wfu.edu/joint-degree-programs/PhDmba-program/> See Table 2 below for course requirements.

DVM/PhD Joint Degree (Virginia Tech Campus)

Applicants apply to the Virginia- Maryland Regional College of Veterinary Medicine (on the Blacksburg campus) for consideration into its veterinary program. If accepted, the student can

then submit application materials to SBES for the engineering (PhD) 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 PhD degree with the exception that the life sciences requirement taken for the D.V. M. degree will satisfy the life science requirement for the SBES degree, and the clinical rotation requirements for the D.V.M. degree will satisfy the BME PhD requirement for a clinical rotation. See Table 2 below for course requirements.

Table 2: Course Requirements for the DVM / PhD, MD / PhD, and the MBA / PhD Joint Degrees

Requirements for those who joined the program BEFORE Fall 2023:

Course Category	Course # (VT/WF)	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		<i>Satisfied with DVM and/or MD courses</i>	3**
Mathematics	5000 or 6000 level (600/700 WFU)	Min. 6 hours approved by committee (<i>see approved options</i>) (only 3 credits can be statistics)	6
Electives	5000 or 6000 level (600/700 at WFU)	Graduate courses in Engineering, Math, or Life Science approved by committee	9 - 24
Clinical Rotation	BMES 6064/706	Satisfied with DVM and/or MD Clinical Rotation requirement	2**
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304 (required) WF: GRAD 713, GRAD 714, GRAD 715, and GRAD 716 (required)	Does not count toward 90 hours
BME Seminar	BMES 5944/694	Min. 6 credits (6 semesters); additional attendance encouraged! (required)	Does not count toward 90 hours
		Total course credits:	35 - 50
Dissertation Research	BMES 7994/797	Research & Dissertation	40 - 55
		Minimum total credits:	90

PhD Requirements for those who joined the program Fall 2023 and later:

Course Category	Course # (VT/WF)	Title	No. Credits Required
Biomedical Engineering (12 credits)	BMES 5054/605 OR BMES 5064/606	Quantitative Cell Physiology OR 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		<i>Satisfied with DVM and/or MD courses</i>	3**
Mathematics	5000 or 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Electives	5000 or 6000 level (600/700 WFU)	Graduate courses in Engineering, Math, or Life Science approved by committee	9 - 24
Clinical Rotation	BMES 6064/706	<i>Satisfied with DVM and/or MD Clinical Rotation requirement</i>	2**
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304 (required) WF: GRAD 713, GRAD 714, GRAD 715, and GRAD 716 (required)	Does not count toward 90 hours
BME Seminar	BMES 5944/694	Min. 6 credits (6 semesters); additional attendance encouraged! (required)	Does not count toward 90 hours
		Total course credits:	29 - 44
Dissertation Research	BMES 7994/797	Research & Dissertation	46 - 61
		Minimum total credits:	90

** Course credit numbers are the same as for the single SBES PhD degree, but the courses taken to satisfy these hours are not the “normal” SBES courses used in the regular PhD program requirements.

Course numbers for both campuses on all classes offered (excluding medical school courses) can be found on the SBES Advising site in Canvas and the SBES website: <https://beam.vt.edu/graduate/biomedical.html>

MASTER OF SCIENCE DEGREE Thesis (Both Campuses)

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

- 21 – 24 credit hours of coursework (5000/6000 at VT 600/700 at WFU)
- 6 -- 9 credit hours of thesis research

Most students spend an average of two years completing the MS 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. Seminar enrollment is required each semester, but the credits are not counted toward the degree.

Elective requirements for the program are courses that are considered “technical electives” in ENGINEERING, LIFE SCIENCE, or MATH. Students should refer to the list of SBES approved Life Science and Math courses that may be considered as an elective. Courses that begin with GRAD are not considered technical elective courses for the program. A student who feels that a course not listed should be considered, they should send the course information and syllabus to the graduate directors and coordinator for prior approval.

Table 3: Degree Requirements for the MS Degree in Biomedical Engineering

Course Category	Course # (VT/WF)	Title	No. Credits Required
Biomedical Engineering (9 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. 3 credit hours of engineering courses approved by committee	3
Life Sciences	5000 or 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Mathematics	5000 or 6000 level (600/700 at WFU)	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Electives	5000 or 6000 level (600/700 at WFU)	Graduate courses in Engineering, Math, or Life Science approved by committee	6 - 9
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304 (required) WF: GRAD 713, GRAD 714, GRAD 715, and GRAD 716 (required)	Does not count toward 30 hours
BME Seminar	BMES 5944/694	Min. 4 credits (4 semesters); additional attendance encouraged! (required) UG/GR students must attend while enrolled as graduate students if less than 4 semesters!	Does not count toward 30 hours
Total course credits:			21 - 24
Research credits	BMES 5994/797	Research & Thesis	6 - 9
Minimum total credits:			30

NOTE: Course numbers cited above list Virginia Tech campus first (4-digit system), followed by 3-digit numbers at the Wake Forest campus. Course numbers for both campuses on all classes offered can be found on the SBES website: <https://beam.vt.edu/graduate/biomedical.html>

MS Thesis Checklist:

1. Plan of Study
2. Defense

MASTER OF SCIENCE DEGREE- Non-Thesis Option (VT Campus)

Students pursuing a BME Non-Thesis MS degree are required to complete a minimum of 30 total credit hours which may be distributed as follows:

- 27 credit hours of coursework (5000/6000)
- 3 credit hours of project and report

Most students spend an average of one and a half to two years completing the MS 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. Seminar enrollment is required each semester, but the credits are not counted toward the degree.

Elective requirements for the program are courses that are considered “technical electives” in ENGINEERING, LIFE SCIENCE, or MATH. Students should refer to the list of SBES approved Life Science and Math courses that may be considered as an elective. Courses that begin with GRAD are not considered technical elective courses for the program. A student who feels that a course not listed should be considered, they should send the course information and syllabus to the graduate directors and coordinator for prior approval. Track elective courses (3-6 credit hours) and BMES 5904 (Project & Report) (3 credit hours) are required for students with the non-thesis MS degree option while research credits (6-9 credit hours) are required for students with the thesis-based MS degree option.

Table 3: Degree Requirements for the Non-Thesis MS Degree in Biomedical Engineering

Course Category	Course # (VT/WF)	Title	No. Credits Required
Biomedical Engineering (9 credits) (Core)	BMES 5054	Quantitative Cell Physiology (required)	3
	BMES 5064	Quantitative Organ Systems Physiology (required)	3
	5000 or 6000	3 credit hours of engineering courses	3
Life Sciences (Core)	5000 or 6000 level	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Mathematics (Core)	5000 or 6000 level	Min. 3 credit hours approved by committee (<i>see approved options</i>)	3
Electives	5000 or 6000 level	Graduate courses in Engineering, Math, or Life Science approved by committee	6 - 9
Track Electives	5000 or 6000 level	Graduate course(s) in the BME track elective courses	3 - 6
Project and Report	BMES 5904	Project and Report	3
Graduate School Requirements	Required by the Graduate Schools	VT: BMES 5004 and ENGE 5304	Does not count toward 30 hours
BME Seminar	BMES 5944	Min. 4 credits (4 semesters); additional attendance encouraged! (required) UG/GR students must attend while enrolled as graduate students if less than 4 semesters!	Does not count toward 30 hours
Minimum total credits:			30

In addition to the core courses (15 course credit hours) and technical elective courses (6-9 course credit hours), students are allowed to select track elective courses (3-6 course credit hours) depending on their selection of BMES track and BMES 5904 (Project & Report) to fulfill the course requirement for a non-thesis MS degree option. The approved courses meeting track electives requirement for the non-thesis option are listed in Table 4. Students who would like to take a class not listed in Table 4 must receive approval for a given track elective course from the graduate program director before taking the course.

MS Non-Thesis Checklist:

1. Plan of study
2. Final exam

Table 4: The list of approved track elective courses for the non-thesis option BMES Track

	Approved Track Electives
Automotive Vehicle Safety	BMES 5174 (ME 5174): Biomechanics of Crash Injury Prevention BMES 5234: Advanced Vehicle Safety Systems BMES 6164 (ESM 6164): Computational Modeling in Impact Biomechanics BMES 6174: Advanced Human Modeling: Injury and Tissue Biomechanics
Biomechanics	BMES 5124/ESM 5224: Advanced Musculoskeletal Biomechanics BMES 5164: Advanced Impact Biomechanics BMES 5204 (ME 5204): Laboratory Techniques in Injury Prevention BMES 5214 (BMVS 5224): Human Physical Capabilities BMES 6174: Advanced Human Modeling: Injury and Tissue Biomechanics BMES 6194: Advanced Movement Assessment ESM 5014: Introduction to Continuum Mechanics ESM 5024: Introduction to Solid Mechanics ESM 5054: Introduction to Fluid Mechanics ESM 5124 Theory of Elasticity ESM 5245G/5246G: Mechanics of Animal Locomotion ESM 5305: Mechanics of the Cardiovascular System ESM 5734 Introduction to Finite Element Method ESM 6024: Soft Tissue Mechanics HNFE 5474: Human Exercise Testing: Physiology & Biomechanics
Biomaterials and Nano bioengineering	BMES 5434: Polymeric Biomaterials BMES 5574: Advanced Biomaterials BMES 5724: Biomedical Nanoengineering MSE 5614: Advanced Nanomaterials
Biomedical Devices & Entrepreneurship	BMES 5154G: Advanced Commercialization of Biomedical Engineering Research BMES 5714: Biomedical Microdevices ACIS/BIT/FIN/HTM/MGT/MKTG 5000+ (College of Business) BMES 5984: Needs Assessment I BMES 5984: Needs Assessment II
Tissue Engineering & Regenerative Medicine	BMES 5314: Introduction to Regenerative Medicine BMES 5324: Advanced Topics in Regenerative Medicine TBMH 5064: Fundamentals of Tissue Engineering & Reparative Medicine
Translational Cancer Engineering	BMES 5604: Cancer Detection and Therapeutics BMES 5614: Multiscale Cancer Engineering HNFE 5164: Molecular Aspects of Diet and Cancer TBMH 5024: Fundamentals of Cancer

Final Exam

The Final Examination (Master's) section of Graduate School Policies in the Graduate Catalog (https://secure.graduateschool.vt.edu/graduate_catalog/policies.htm?policy=002d14432c654287012c6542e363001a) describes "An oral and/or written final examination or evaluation is required in all master's programs. For some non-thesis master's programs, final exams are structured in special ways, including evaluation of a project as the final examination. For non-thesis, coursework-only master's degree programs, the committee will conduct a final evaluation of the

student's record to confirm degree completion. All master's final examinations and non-thesis, coursework-only evaluations are scheduled through the Electronic Scheduling System." Based on the graduate school policy regarding the non-thesis master's degree program as described above, the BEAM graduate program director, who will serve as the student's major advisor, will conduct a final confirmation of completing all degree requirements by reviewing and evaluating the student's coursework record.

Accelerated Undergraduate/Graduate Degree (UG/G) (VT Campus)

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 MS or the PhD 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 3.3 or higher if applying for the MS degree
- Students must have a GPA of 3.5 or higher if applying for the direct PhD degree.
- A SBES faculty member (primary or affiliate) must have agreed to serve as the initial faculty advisor for the student's graduate degree.
- Students follow the regular graduate admissions process. Students must apply for the semester they will begin their graduate degree not the year they are dual enrolled.
- Students applying to the program are not required to submit GRE scores but may do so if they wish.
- Students must submit three or more letters of recommendation, one of which must be their faculty advisor.
- Applicants must be in the last 12 months of an undergraduate program from one of the Virginia Tech College of Engineering departments to be eligible.

Double-Counting Courses

Acceptance into the program allows the student to 'double-count' up to 12 hours (or up to four courses) of graduate-level coursework towards the undergraduate and graduate degree. This must be 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. Students may NOT triple count a course for the BS degree, the MS degree, and the PhD degree! Students are discouraged from taking BMES 5054, BMES 5064, BMES 5944, BMES 5994/7994 while they are still undergraduates and should wait to take these once they are full time graduate students.

Application Instructions

The deadline for applying to this program is June 1 for students who are finishing up their junior year. We recommend that applicants begin this process at the beginning of the spring semester of their junior year if possible. Participation in this program requires the student to work closely (and well in advance) with the advising offices of both departments to ensure that requirements for both degrees (undergraduate and graduate) are met without conflict. The student should confer with the SBES Graduate Coordinator as well as the undergraduate advisor in their 'home' department in order to choose the courses which will be double-counted. Applicants should apply through the normal VT

online application process and choose the semester/year following their completion of the BS degree. For example, if a student will be a senior during the Fall 2024-Spring 2025 academic year and plans to complete their BS degree in Spring 2025, they should apply for Fall 2025 (not Fall 2024).

NOTE: Students are advised to consult with the SBES Graduate Coordinator before beginning to work on the application and the Course Designation Form. Students should also notify the SBES Graduate Coordinator once they have submitted their application.

Campus Location

Students in this program will be assumed to finish their graduate degree at the Virginia Tech campus only. Ideally, students will begin doing some research with their faculty advisor during their final undergraduate year so that they stay on track to graduate on time.

If a student wishes to transfer their graduate degree to the Wake Forest Campus, they may do so but it is discouraged. Students should note that it will be up to the discretion of the Wake Forest Graduate School to determine if coursework taken during the final undergraduate year will be allowed to count towards the graduate degree (this is not guaranteed). It is also important for students to note that transferring their campus location will add to their time limit in the program. Since research most likely cannot begin until the student is a graduate student at the other campus, graduation plans will be delayed. Students should also note that the Wake Forest Campus has different tuition rates and graduate funding assistance which is not guaranteed nor common for students pursuing an MS degree.

SBES Academic Requirements Within the Degree (Both Campuses)

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. 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 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.)

Approved Virginia Tech Math Courses for SBES Mathematics Requirement:

- BIO 680 – Biostatistics
- CRM 732 - Data Management
- HES 721 - Data Analysis and Interpretation
- MTH - Any 600 level or higher with some exceptions*
- NEUR/IPP 741 - Quantitative Methods in Bioscience
- NEUR 751- Advanced Multivariate Analysis in Neuroscience
- STA - Any 600 level or higher with some exceptions*
- CSC 655- Intro to Numerical Methods
- CSC 652- Numerical Linear Algebra
- CSC 675- Neural Networks and Deep Learning
- THSS 720- Epidemiology

- THSS 730- Introduction to Biostatistics
- THSS 731- Introduction to Biomedical Informatics of the Learning Healthcare System
- THSS 732- Statistical Modeling

*Confirm with your Advisor(s) and the Graduate Directors/Graduate Coordinator

The following MATH and STAT courses do **NOT** meet the SBES mathematics requirement at the Virginia Tech campus:

- 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

Approved Wake Forest Courses for SBES Mathematics Requirement:

- BIO 680 – Biostatistics
- CRM 732 - Data Management
- HES 721 - Data Analysis and Interpretation
- MATH - Any 600 level or higher with some exceptions*
- NEUR 751- Advanced Multivariate Analysis in Neuroscience
- STA - Any 600 level or higher with some exceptions*
- CSC 655: Intro to Numerical Methods
- CSC 652: Numerical Linear Algebra
- CSC 675: Neural Networks and Deep Learning
- THSS 720: Epidemiology
- THSS 730: Introduction to Biostatistics
- THSS 731: Introduction to Biomedical Informatics of the Learning Healthcare System
- THSS 732: Statistical Modeling

* Confirm with your Advisor(s) and the Graduate Directors/Graduate Coordinator

Suggested Wake Forest Math Courses for Biomedical Imaging, Medical Physics, and Biomechanics concentrations:

- MATH 617 - Complex Analysis
- MATH 624 - Linear Algebra II
- MATH 626 - Numerical Linear Algebra
- MATH 652 - Partial Differential Equations
- MATH 655 - Introduction to Numerical Methods
- MATH 717 - Optimization in Banach Spaces
- MATH 753/CSC 752 - Nonlinear Optimization
- MATH 757 - Stochastic Processes and applications

Suggested Wake Forest Math Courses for Tissue Engineering concentrations:

- MATH 624 - Linear Algebra II
- MATH 626 - Numerical Linear Algebra
- MATH 652 - Partial Differential Equations
- MATH 753 - Nonlinear Optimization

Life Science Requirement

Life sciences are sciences that are focused on the study of living organisms and life processes of living organisms. Life sciences include but are not limited to: botany, ecology, biology, microbiology, neurobiology, molecular biology, biophysics, biochemistry, medicine, pharmacology, zoology, veterinary science/ medicine, entomology, bioinformatics, physiology, anatomy and morphology, genetics, immunology, epidemiology, and endocrinology.

To fulfill the life science requirement for the PhD degree in Biomedical Engineering students must acquire a minimum of three (3) credit hours in approved life science coursework beyond the required courses that contain life science content, i.e., Quantitative Cell Physiology (BMES 5054) and Quantitative Organ Systems Physiology (BMES 5064). These hours can be earned by enrollment in one or more upper division life science courses offered through one of three possible avenues:

Approved BMES Life Science Courses (Both campuses):

The following BMES courses have been designated as 'life science' courses suitable for degree requirements. Currently there are two choices:

- BMES 5184/618 - Injury Physiology
- BMES 5024/602 - Biomedical Engineering and Human Disease

Courses Meeting Life Science Requirement (Virginia Tech campus):

Courses outside of SBES meeting the life science requirement on the 5000 and 6000 level courses only from the following departments, but cannot include seminar, research credits, or professional development courses, e.g. BIOL 5154.

- ALS - Agriculture and Life Sciences - Any 5000-level or higher course with some exceptions*
- APSC 5604 – Grant Writing
- BIOL – Biology - Any 5000-level or higher course with some exceptions*
- BCHM – Biochemistry - Any 5000-level or higher course with some exceptions*
- BMES 5984 - SS: Functional Anatomy for Engineers
- BMVS - Biomedical & Veterinary Sciences - Any 5000-level or higher course with some exceptions*
- ENT – Entomology - Any 5000-level or higher course with some exceptions*
- GBCB - Genetics Bioinformatics, Computational Biology - Any 5000-level or higher course with some exceptions*
- HNFE 5164 - Molecular Diet and Cancer
- HNFE 5474 - Human Exercise Testing: Physiology and Biomechanics
- HNFE 5214 – Physical Activity and Health
- NEUR – Neuroscience - Any 5000-level or higher course with some exceptions*
- PSYC 5344 - Cognitive Psychology

- TBMH - Translational Biology, Medicine, and Health - Any 5000-level or higher course with some exceptions*
- VM - Veterinary Medicine - Any 5000-level or higher course with some exceptions*

* Confirm with your Advisor(s) and the Graduate Directors/Graduate Coordinator

Students should be aware that many courses listed in the above departments carry prerequisites 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, prerequisites, and/or restrictions in order to determine whether they have sufficient academic background to enroll in a particular course. If course descriptions fail to specify prerequisites and/or restrictions for registration, the student may find it useful to directly contact the department or the faculty member teaching the class.

Courses Meeting Life Science Requirement (Wake Forest campus):

Courses outside of SBES meeting the life science requirement on the students may use 600 and 700 level courses from the following departments, but cannot include seminar, research credits, or professional development courses.

- BAMB - Biochemistry and Molecular Biology - Any 600 level or higher with some exceptions*
- BMES 631- Intro to Regenerative Medicine
- BMSC - Biomedical Sciences - Any 600 level or higher with some exceptions*
- BIO - Biology - Any 600 level or higher with some exceptions*
- CABI - Cancer Biology - Any 600 level or higher with some exceptions*
- IPP - Integrative Physiology and Pharmacology - Any 600 level or higher with some exceptions*
- MCB - Molecular and Cellular Biosciences - Any 600 level or higher with some exceptions*
- MICR - Microbiology and Immunology - Any 600 level or higher with some exceptions*
- MOGN - Molecular Genetics and Genomics - Any 600 level or higher with some exceptions*
- MMTS - Molecular Medicine and Translational Science - Any 600 level or higher with some exceptions*
- MPHY – Medical Physics- Any 700 level or higher with some exceptions*
- NEUR- Neuroscience - Any 600 level or higher with some exceptions*
- HES 650- Human Physiology
- HES 653- Physiology of Exercise
- HES 763- Advanced Biomechanics
- HES 670 Biomechanics of Human Movement
- HES 675 - Advanced Exercise Physiology
- HES 780 – Advanced Topics in Exercise and Sport Science
- PSY 720 – Biological Psychology
- PSY 728 – Human Cognition

* Confirm with your Advisor(s) and the Graduate Directors/Graduate Coordinator

Questions about specific courses in these or other departments should be directed to the WFU Program Director. It is the student's responsibility to examine the course descriptions, prerequisites, and/or restrictions in order to determine whether they have sufficient academic background to enroll in a particular course. If course descriptions fail to specify prerequisites and/or restrictions for registration,

the student may find it useful to directly contact the department or the faculty member teaching the class.

Requesting Approval for Courses Not Listed Above to Serve as a Life Science Course

Given that new or existing courses not currently listed above may meet the requirements to serve as a life science course, the Graduate Committee is always willing to evaluate whether or not a given course meets the requirements to serve as a life science course.

In order to qualify as a life science course, the following requirements must be met:

1. Graduate Level Course (i. e. , 5000-6000 level courses at VT, and 600-700 level courses at WFU)
 - a. Courses listed in the graduate catalog and Special Studies (SS) courses can be acceptable.
 - b. Independent studies, seminar, research, and professional development courses are not acceptable.
2. >50% of the course is dedicated to the knowledge, understanding, and/or application of life science principles and/or subject matter (see previous description and examples of life sciences)

Students wishing to petition for the approval of a course to serve as a life science course should send their request to the SBES graduate coordinator, along with the following:

1. A short explanation of their interest in the course
2. A short justification for why the course should qualify to serve as a life science course
3. A detailed course syllabus that includes the course title, course number, course description, learning objectives, prerequisites, and list of topics covered.

** Students wishing to petition for the approval of a course should determine whether he/she has sufficient academic background to enroll in a particular course (i.e., prerequisites and/or restrictions) and confirm with their advisor and/or the graduate chairs **before** submitting a petition.*

Engineering Requirements

The following have been approved as Engineering courses and may count for Engineering or Elective credit.

Courses meeting Engineering Requirement (Virginia Tech campus):

- AOE: Aerospace and Ocean Engineering - Any 5000 level or higher with some exceptions*
- BSE: Biological Systems Engineering - Any 5000 level or higher with some exceptions*
- BMES: Biomedical Engineering - Any 5000 level or higher with some exceptions*
- CHE: Chemical Engineering - Any 5000 level or higher with some exceptions*
- CEM: Construction Engineering and Management - Any 5000 level or higher with some exceptions*
- CEE: Civil and Environmental Engineering - Any 5000 level or higher with some exceptions*
- CS: Computer Science - Any 5000 level or higher with some exceptions*
- ECE: Electrical and Computer Engineering - Any 5000 level or higher with some exceptions*
- ENGE: Engineering Education - Any 5000 level or higher with some exceptions*
- ENGR: Engineering - Any 5000 level or higher with some exceptions*
- ESM: Engineering Science and Mechanics - Any 5000 level or higher with some exceptions*

- ISE: Industrial and Systems Engineering - Any 5000 level or higher with some exceptions*
- MACR: Macromolecular Science and Engineering - Any 5000 level or higher with some exceptions*
- MSE: Materials Science Engineering - Any 5000 level or higher with some exceptions*
- MINE: Mining Engineering - Any 5000 level or higher with some exceptions*
- NSEG: Nuclear Science and Engineering - Any 5000 level or higher with some exceptions*

Courses meeting Engineering Requirement (Wake Forest campus):

- BMES: Biomedical Engineering - Any 600 level or higher with some exceptions*
- CSC: Select Computer Science courses at 600 level or higher
- GRAD 706: Reg. & Reimb. of Novel Drugs, Biol., and Med. Devices
- Graduate Level Courses from WF Engineering Programs (please check with SBES program first!)

Technical Electives Requirement

The elective requirements for the MS and PhD programs are courses that are considered “technical electives” in Engineering, Life Science, or Math. Students may use any combination of approved engineering, life science, and math courses to fulfill the electives requirement for a given degree (i.e. 9-24 credits for PhD, and 6-9 credits for MS). However, students must receive approval for a given technical elective from their advisor and/or the graduate chairs before taking the course. In addition, the student’s graduate committee members must ultimately approve of the chosen technical electives when approving the plan of study.

Information regarding the criteria for each type of elective (i.e. engineering, life science, or math) that must be met for a course to serve as a technical elective is provided below. It should be noted that courses that begin with GRAD are not considered technical elective courses for the program. If a student is uncertain whether or not a course qualifies to serve as a technical elective or feels that a course not listed should be considered, they should send the course information and syllabus to the SBES graduate coordinator and/or Graduate Committee for prior approval. In order to qualify as a technical elective course, the following requirements must be met:

1. Graduate Level Course (i.e. 5000-6000 level courses at VT, and 600-700 level courses at WFU)
 - a. Courses listed in the graduate catalog and Special Studies (SS) courses can be acceptable.
 - b. Independent Studies may be acceptable but must first be approved by the graduate committee.
 - i. No more than **two** Independent Study (max 6 credits) can be used as a technical elective.
 - ii. Students wishing to petition for the approval of an Independent Study to serve as an engineering technical elective should send their request to the SBES graduate coordinator, along with the following:
 1. A short justification for why the course should qualify to serve as a technical elective.
 2. A detailed course syllabus that includes the course title, course number, course description, learning objectives, justification, method of assessment, prerequisites/ requisites, textbooks/ teaching aids, and list of topics covered.
 - c. Seminar, research, and professional development courses are not acceptable.
2. >75% of the course is dedicated to the knowledge, understanding, and/or application of engineering principles and/or subject matter.

3. Course content and learning objectives have a clear, logical association/ connection with the student's thesis/ dissertation topic and/or field of study.
 - a. Decisions regarding the applicability/ relevance of a given engineering course are generally left to the discretion of the student's advisor and/or the graduate chairs. However, the graduate committee reserves the right to ask for justification and/or disallow courses that do not appear relevant to/ associated with a given student's thesis/ dissertation topic and/or field of study.
4. Seminar, research, and professional development courses are not acceptable.
 - a. With the exception of GRAD 704 and GRAD 706 which are approved technical elective courses for WFU students.
5. Course is offered by one of the following engineering departments listed previously.

Students should be aware that many courses offered by other departments carry prerequisites and/or restrictions, which would not make them suitable for all students. It is the student's responsibility to examine the course descriptions, prerequisites, 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 prerequisites and/or restrictions for registration, the student may find it useful to directly contact the department or the faculty member teaching the class.

Seminar Requirement

This course (BMES 5944/BME 694) is offered every fall and spring semester and is composed of weekly presentations from internal and external speakers. Content will mainly focus on research relevant to BME disciplines but may also incorporate professional development topics such as mentorship, entrepreneurship, presentation skills, alternative careers in science and engineering, and others. Seminar is meant to encourage SBES students to enhance their academic/research development by attending talks/presentations on subjects pertinent to their own programs and projects as well as those outside their own professional interests. Seminar attendance is mandatory unless excused due to acceptable research/class conflicts or documented illness.

All SBES degree-seeking students are required to register for and complete BME Seminar. PhD students are required to register and complete a minimum of 6 credits (i.e. 6 semesters of seminar) and MS students are required to register and complete a minimum of 4 credits (i.e. 4 semesters of seminar). Seminar credits must be recorded on the plan of study but will not be included in the calculation of credits required to earn the graduate degrees. Seminar credits must be recorded on the plan of study (under "Supporting Courses") but will not be included in the calculation of credits required to earn the graduate degrees. Note that students who do not meet the full seminar requirements will be given an "F" in the course which will in turn affect your overall GPA.

Accelerated Undergraduate/Graduate students should only attend Seminar when they are a full graduate student and should be enrolled for as many seminar semesters as they can take until graduation but no more than 4 for MS and 6 for PhD is required. Should a UG/GR MS student finish their degree in 1 year of graduate school, 2 semesters of seminar are acceptable on their plan of study.

Non-SBES Student taking SBES Courses

The following set of requirements applies to class enrollment in the specific case of a non-SBES student wishing to take an SBES course at the partner campus (i.e., a non-SBES student enrolled at VT wishing to take an SBES class originating at WFU or vice versa). 1. The advisor of the student must be an SBES primary or affiliate faculty on either campus. 2. The class must be cross-listed, and the student must

enroll in the section on their home campus. 3. The course must be set up for distance learning and the instructor at VT or WFU must agree to allow the student to enroll (e.g., enrollment doesn't exceed the cap). Non-SBES Students who wish to enroll in SBES courses originating at their home campus (e.g., a non-SBES VT student wishing to take an SBES class at VT or vice versa) only require instructor permission to enroll.

Student 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. This is an all-day conference at which students present their research through posters and/or oral presentations, and it is one of the major events that allow the students from both campuses to share in a significant academic experience. SBES degree-seeking students must present either a poster or podium talk at the Symposium as one of the requirements of the program.

The following guidelines govern the attendance/presenting requirements for SBES degree-seeking students:

- BME- students are required to attend and participate in the symposium as part of the general requirements for the program.
- UG/GR Students who are still undergraduate students are encouraged to attend and participate with a poster but are not required to attend or present a poster until they become full graduate students.
- Direct 1st year MS/PhD SBES Graduate Students are required to attend the symposium and encouraged to present a poster (but not required to) until their 2nd year.
- MS-Thesis students are required to attend symposium every year, as well as present an oral presentation within the 2-year term of the degree. Again, you're encouraged to present a poster your first year but are not required.
- PhD students are required to attend symposium every year, as well as present an oral presentation within the 4–5-year term of the degree. Years 2 and above you are required to present a poster or lightening talk. Again, you're encouraged to present a poster the first year, but it is not required.
- MS/PHD (earning both degrees) one oral presentation PER degree earned is required for all defending SBES Graduate Students. If you are a MS/PhD student, you will be doing 2 oral presentations (one for the MS degree and one for the PhD degree). Years 2 and above when you are not presenting an oral presentation you are required to present a poster or lightening talk. Again, you're encouraged to present a poster the first year but are not required.
- MS Non-Thesis students are required to attend symposium each year but are not required to present a poster, oral presentation, or lightening talk.
- Any student may elect to give an oral presentation if time allows (you will need to check with the department's BMES student chapter.) Also, students should discuss this decision with their advisor(s). Please note that preference is given to graduating students first.
- All SBES degree-seeking students who will or have defended the spring semester of the symposium, or the plan to defend the following summer/fall semesters, are required to give an oral presentation if they have not done so previously.
- All participating students must submit (as directed) written abstracts of the research projects which are published in a Symposium Program book given to all attendees.

- It is expected that ALL students attend symposium. If you have a conflict you should contact Dr. Lee and Dr. Gayzik with your request for a waiver. Please note these waivers are RARELY given but are considered on a case by case basis.

Inclusion and Diversity / Ethics Requirements (Required by VT and WF Graduate Schools)

1. All new graduate students at the Virginia Tech campus are required to complete the BMES 5004: BME Ethics Professional Development during their first fall semester. The instructor of this course will cover (a) plagiarism and other violations of the Graduate Honor Code. (b) proper use of professional conventions in citation of existing research and scholarship, accurate reporting and ownership of findings, and acknowledgement of contributions to the work (c) ethical standards in teaching, mentoring, and professional activities (d) avenues for reporting alleged misconduct (e) appropriate research protocols involving human and animal subjects: Institutional Review Board (IRB) and Institutional Animal Care and Use Committee (IACUC) and (e) oral and written communications across boundaries to create a diversity statement for professional use as required by the Virginia Tech Graduate School Ethics requirements. In addition, students will be required to successfully complete the NIH Responsible Conduct of Research (RCR), Conflict of Interest (COI), Biomedical Research, IRB, and IACUC online courses created and maintained by the Collaborative Institutional Training Initiative (CITI) to satisfy additional Virginia Tech requirements.

SBES students at the Virginia Tech campus must include one of the following on the Plan of Study for the Inclusion and Diversity Requirement:

- a) ENGE 5304: Graduate Student Success in Multicultural Environments
- b) GRAD 5214: Diversity in a Global Society

The ENGE 5304 course is currently approved for the College of Engineering and the GRAD 5214 course is currently approved for the Graduate School. Students in the SBES program at the Virginia Tech campus may take either one to meet the Inclusion and Diversity requirement.

2. All new graduate students at the Wake Forest campus are required to complete the Wake Forest University Ethics courses including: GRAD 713: Foundations of Scientific Integrity & Professionalism, GRAD 714: Scientific Integrity and Professionalism, GRAD 715: Career Planning in Biomedical Sciences, and GRAD 716: Seminar in Professional Development.
 - a. MS students are currently only required to take GRAD 713 and GRAD 714.
 - b. PhD students are required to take GRAD 713, GRAD 714, GRAD 715 and GRAD 716.

As stated, all new SBES graduate students must satisfy these requirements. When students submit their plans of study for Departmental and Graduate School approval, the completion of SBES Ethics and Integrity Requirement will be noted.

Additional Program Requirements

The procedure proposed by SBES consists of the following four requirements to be made of all entering SBES graduate students. All entering SBES graduate students are required to attend an orientation session prior to the beginning of the fall semester. Attendance is taken at this orientation and will be

recorded in each student's departmental record. In addition, an orientation website has been created that has a list of required safety and ethics trainings as well as forms that students at each campus must complete prior or by the end of the first semester of enrollment. This will be collected and tracked by the graduate coordinator.

Program & Graduate School Requirements at Virginia Tech:

- Chemical Safety/Lab Training – Met through Orientation
- Personal Protective Equipment Training – Met through Orientation
- Portable Fire Extinguisher Training – Met through Orientation
- Bloodborne Pathogens Training – Met through Orientation
- Title IX Training – Met through Orientation
- SBES Manual Certification – Met through Orientation
- Clinical Rotation Forms and Vaccinations/Shots (PhD only)
- ENGE 5304: Graduate Student Success in Multicultural Environments Seminar or GRAD 5214 Diversity for Global Society (VT Graduate School Diversity Requirement)
- BMES 5004 BME Ethics and Professional Development course (VT Graduate School Ethics Requirement) which includes:
 - Conflict of Interest Training (COI)
 - Responsible Conduct of Research (RCR) Training
 - VT Human Subjects Protection Training
 - Ethics Training

*Additional trainings may be required by the graduate school and/or Virginia Tech

Program and Graduate School Requirements at Wake Forest:

- Clinical Rotation Forms and Vaccinations/Shots (PhD only)
- SBES Manual Certification- met through orientation

PROGRAM CHANGES

Change of Campus Location

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.

Virginia Tech Students moving to Wake Forest

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 SBES representative 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 representative, it must be submitted to the SBES 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.

Wake Forest Students moving to Virginia Tech

- 1) The student submits a request in writing that a change of campus be made.
- 2) The faculty advisor (and/or committee) submits a letter supporting this request, and proposes a timeline (semester effective) for the change to take place.
- 3) Both letters are submitted to the graduate school for the Dean's approval.
- 4) 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.

Change of Status

- Students may apply to the SBES program as MS students and later switch to a PhD or they may finish their MS degree and decide to stay for a PhD degree. The following steps must be done regardless of the situation for students wishing to switch from MS to PhD:
- 1) Submit a letter from the advisor recommending you to the PhD program.
 - 2) Submit the "Request to Change Degree" form (provided by the graduate coordinator)
 - 3) Submit a 1 paragraph personal statement or justification on why you want to switch to or begin the PhD degree.

Once the packet of information has been sent to the graduate coordinator, the graduate coordinator will send it to the graduate committee to review the packet of info and make the final vote before making the recommendation to each of the graduate schools.

The student will be notified of the recommendation once the committee has voted. The graduate schools at each campus will be given the necessary information needed for making the change. The packet will also go in the student's official record in SBES.

PhD students may opt to drop down to a MS degree only for various reasons. Students who wish to do this should see the graduate coordinator for the VT Change of Degree form (regardless of campus). Students at the Wake Forest campus will also need to work with their graduate school on additional requirements.

- Wake Forest students going from a MS to a PhD at Wake Forest must also apply through CollegeNet with just the demographic information. See the WF Graduate School for help.
- Virginia Tech students going from a MS at Virginia Tech to a PhD at Wake Forest will have to apply through CollegeNet
- Wake Forest students going from a MS to a PhD at Wake Forest must also apply through CollegeNet with just the demographic information. See the WF Graduate School for help.

Additional SBES Policies

Non-Traditional Student Expectations and Responsibilities

Although the majority of students enrolled in the SBES graduate program are considered traditional students (i.e., full-time students living on or in close proximity to either the VT or WFU campus), there are

occasionally non-traditional students enrolled in the SBES graduate program. For the purposes of this document, non-traditional students are defined as part-time students with or without full/part-time external employment and/or students (part-time or full-time) that do not live close enough to either the VT or WFU campus to regularly attend in-person activities.

It is important to note that the SBES graduate program does not currently offer degrees that can be obtained entirely through remote/online activities. There are minimum residency requirements, required in-person activities, and program time limits that must be met in order to fulfill the degree requirements. However, in rare instances a student may need to leave the VT or WFU campus or switch to part-time student status due to extenuating circumstances (e.g., marriage, child birth, family illness, change in employer's policy for allowing/supporting an advanced degree while employed, etc.) after starting the graduate (i. e. , MS or PhD) program as a full-time student. This would result in the student's classification changing from being a traditional student to being a non-traditional student.

Although it is possible to complete the degree requirements after switching to a non-traditional student status, it does present certain challenges in regard to residency requirements, program completion time limits, program activities, coursework, and research. The following describes some of the challenges, as well as the respective expectations and responsibilities of the non-traditional student.

Program Time Limit Policy

In accordance with the SBES policy, there is a maximum allowable time to complete degrees in the SBES program regardless of campus location:

- MS degrees in SBES must be completed within 6 years from the date of first enrollment in the SBES program.
- PhD degrees in SBES must be completed within 7 years from the date of first enrollment in the SBES program.

For special circumstances, an excused leave of absence may be approved by the Dean of the College, the Graduate School and the SBES Program Directors at each campus. If approved, the one-year leave of absence does not count towards your time earning the degree.

Good Standing Policy

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. Students who are not making satisfactory progress in the program will be contacted along with their advisors through a letter from the department and/or Graduate School and expected to improve their status in the time limit given in the letter.

GPA Policy

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.

Residency Requirements

The general expectation is that these requirements will be met during the first year of enrollment for VT students and during the first three years of enrollment for WFU students.

Residency Requirement for the PhD Degree

All SBES graduate students must meet the residency requirements for the SBES university campus in which they are enrolled. At least two consecutive semesters of full-time enrollment (at least 12 credit hours per semester) must be completed on the Virginia Tech campus to fulfill the Residency Requirement for Virginia Tech campus students in the SBES program.

For an explanation of the purpose for the VT PhD Residency Requirement, see the Graduate School's Policies & Procedures on their website: https://secure.graduateschool.vt.edu/graduate_catalog

Courses and Program Activities

Given that the SBES program is a joint program between VT and WFU, SBES students may participate in a variety of courses that are in-person, hybrid, and/or fully virtual. The following describes the expectations and responsibilities of all SBES students for different types of course offerings and required SBES graduate program activities.

Required SBES Program Activities and Courses

- All SBES graduate students must complete all of the required courses to graduate.
- Requests to substitute courses offered by outside institutions will not be considered.
- These courses are normally taken during the first year of program, which typically overlaps with the residency requirement.
- A number of non-required courses (e.g., Life Science, Math, and Engineering Elective Courses) offered by other departments at VT or WFU are NOT taught in virtual format (i.e., in-person only). Remote accommodations will not be made for these courses.

Student Responsibilities:

- If remote accommodations are desired, it is the responsibility of the student to make the request and arrangements with the faculty member(s) primarily responsible for teaching the course.
- If remote accommodations are granted, the student may still be required to attend in-person on essential days (e. g., exams, project presentations, etc.), at the discretion of the instructor(s). Given the limited resources of the program, the student must make the necessary arrangements (e.g., time off from work, travel arrangements, etc.) to attend required, in-person components.

Graduate Research Policy

Performing graduate research for a thesis or dissertation is an essential component of the graduate degrees currently offered by the SBES graduate program. All SBES graduate students are expected to perform their graduate research on campus or in an off-campus VT or WFU laboratory. However, the SBES Program Directors and faculty advisor(s) may allow remote graduate research at their discretion.

1. Work that is already required to be performed as part of external employment should not be the basis of a student's graduate research. In cases where an external employer sponsors an employee's graduate research, it is possible that the student's graduate research is related to the

nature of their external employment. However, there should be a clear distinction/delineation between the graduate research performed by the student and the student's existing responsibilities as terms of their external employment. Consequently, conflict of interest management, discretion, and an agreement between the student, advisor(s), MS/PhD committee, and employer is imperative in these cases. Ultimately, the outcome of the research and its fitness/acceptability for a degree is at the sole discretion of the student's MS/PhD committee and not the employer.

Student Code of Conduct Policy

The Graduate Schools at Virginia Tech and Wake Forest University expect good citizenship and responsible behavior from SBES graduate students. When these expectations are not met, the non-academic misconduct process may be used to redirect students into more acceptable patterns of behavior. This process encourages students to take responsibility for their choices and actions, while also allowing the program to determine an appropriate disciplinary response.

Misconduct cases may result in the sanction of a formal reprimand and the imposition of an educational condition, or a more severe level of sanction, including disciplinary probation, suspension, or expulsion. Students need to be aware that certain types of behaviors may be deemed incompatible with membership in the school's community, and that choices they make can compromise their education and future.

The list below, while not exhaustive, includes examples of the types of prohibited conduct for which students are subject to disciplinary actions:

- a. Actual or threatened physical injury to any person (including self) on university owned or controlled property or at a university-sponsored or supervised function or conduct that endangers the health or safety of a person.
- b. Engaging in individual or group conduct that is violent (including sexual misconduct, attempted suicide, or threats of either), abusive, indecent, unreasonably loud, or similar disorderly conduct that infringes upon the privacy, rights, or privileges of others.
- c. Disturbing the peace or the orderly process of education on campus. This provision should not be interpreted to abridge the free speech rights guaranteed under the United States Constitution.
- d. Unauthorized use, possession, or storage of any weapon or explosive (including fireworks) on university premises or at university sponsored activities.
- e. Forgery, counterfeiting, alteration, or misuse of any University record, document, or identification card.
- f. Unauthorized entry into, or alteration of, any University computer records, or violation of computer use policies, including illegal use of university computer resources.
- g. Sending threatening, obscene or defamatory messages to another student or individual via e-mail, phone, voicemail, or social media.
- h. Knowingly filing a false report to any University authority: including police, human resources, student grievance, honor code or non-academic honor code bodies.
- i. Misrepresentation in seeking financial aid or University benefits.
- j. Unlawful possession, use, distribution, or sale of any illegal narcotic or illegal dangerous drug.
- k. Theft of, or unwarranted damage to, University property or property of any member of the University community.

- l. Failure to comply with the lawful directives of University employees or non-University contract employees acting within the scope of their duties; including those directives issued by a university administrator, police, or security officer to ensure the safety and well-being of students.
- m. Entry into, or use of, any building, facility, room or other University property or grounds without authorized approval. This also includes the unauthorized possession or use of university keys, lock combinations, or other access codes.
- n. Participation in illegal gambling activities on university-owned or -controlled property or at a function identified with the University.
- o. Possession or consumption of alcoholic beverages in contradiction of state law and/or University policy.
- p. Entering or attempting to enter any event without proper credentials for admission (e.g., ticket, identification card, or invitation).
- q. Failure to make satisfactory settlement for any debts to the University.
- r. Failure to comply with university traffic rules and regulations.
- s. Plagiarism in their academic work.

The Graduate Schools at Virginia Tech and Wake Forest University have the authority to hold students accountable under this Code of Conduct for certain off-campus behaviors (i.e., behavior that does not occur on university premises or in the context of a University, School, or student organization sponsored event or activity) that adversely affects a substantial University or School interest. In determining whether the conduct adversely affects a substantial University or School interest, the following shall be considered:

- a. Whether the conduct constitutes or would constitute a serious criminal offense, regardless of the existence of any criminal proceedings.
- b. Whether the conduct indicates that the student presented or may present a danger or threat to the health, safety or wellbeing of themselves or others.
- c. Whether the conduct demonstrates a pattern of behavior that impairs the University's, the School's, or the Program's ability to fulfill its mission or negatively impacts the learning environment.
- d. Whether the conduct is disruptive to the ability of faculty to carry out the academic mission of the university.

The disciplinary sanctions that may be imposed for violations of this Code of Conduct may include any of the following actions:

- a. A written reprimand.
- b. Denial of specified University privileges.
- c. Payment of restitution.
- d. Educational or service sanctions, including community service.
- e. Disciplinary probation.
- f. Imposition of reasonable terms and conditions on continued student status.
- g. Removal from a course in progress, or temporary or permanent removal from campus, including public areas.
- h. Enrollment restrictions on a course or program.

- i. Suspension.
- j. Dismissal.

Students that are accused of performing, or contributing to, allegations of misconduct will be subject to a review process that will include a review of the allegation, a hearing before a committee of the student's peers and faculty, and potential disciplinary action. These procedures will be undertaken by the Program and/or Graduate School Honor Council. However, in deciding each case, the Honor Council will use the guidelines of this document to determine if there was a violation of the institution's Code of Conduct as opposed to the Honor Code. The Honor Council will make a final and formal recommendation to the Dean. As outlined in the Honor Code guidelines, the student may appeal the decision to the Graduate Council within 10 days of the sanction hearing. The Graduate Council will review all pertinent information and make a recommendation to the Dean, who will consider the recommendations by the Honor Council and the Graduate Council, in the event of an appeal. The Dean will consider all recommendations, and may accept the sanction recommendation, but has the discretion to alter the recommendation as desired. The decision of the Dean is final.

Virginia Tech Code of Conduct: <https://graduateschool.vt.edu/academics/expectations.html>

Wake Forest University Code of Conduct: <https://studentconduct.wfu.edu/undergraduate-student-handbook/>

Grievance Policy

Students wishing to pursue or file an academic or non-academic grievance should contact their home campus graduate program director. The procedure for filing a grievance varies by campus. For Wake Forest students, further details on how to file either grievance type can be found in the graduate bulletin in the "Academic and Coursework Practices" section. For Virginia Tech students please reach out to the Graduate Coordinator as well as the Virginia Tech Graduate School Ombudsperson.

Honor Code Policy

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.

SBES Termination Policy

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

1. Lying
2. Cheating
3. Stealing
4. Data falsification
5. Plagiarism
6. Violations of the Virginia Tech "Principles of Community"

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

Special Accommodations Policy

SBES students should work with the Services for Students with Disabilities at their home campus for most accommodations. Additional accommodation requests can be made to the Graduate Program Directors and reviewed on a case-by-case basis.

SBES Student Representation Policy

Students may undertake service roles with the understanding that no service role should interfere with their primary responsibilities as a student, or satisfactory academic progress toward their degree. SBES students are eligible to apply for and serve as a representative for departmental and program committees, where student representation is available. Students must be in good academic standing and have the support from their advisors to be a student representative. Students are discouraged from running or serving in a student representative position if they are unable to fully commit to the position duties. This may include, but is not limited to, students on medical leave or away at an internship. Students may not run for a representative position if they are actively involved in a student conduct case. This may include, but is not limited to, students who are on academic probation, academic suspension, expulsion, or involved in a student conduct, honor code, ethics, or title IX type hearing. Furthermore, in the event that a student's status is changed during their representation time, they may request a temporary replacement until the situation is resolved or may wish to step down from the position. This is to ensure the students in these situations have the best advantage possible for handling their situation without distraction.

Graduate Student Financial Support

Continuation & Contingencies (Both Campuses)

Continuation of graduate student financial support (assistantship appointment, departmental fellowship, tuition scholarship) 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 their 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.

Progress to 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 differences between the sites, such as how preliminary and final exams are scheduled, how committee members are approved, etc.

Clinical Rotation (PhD Only)

The Clinical Rotation is a required 2 credit class for SBES PhD students. Its purpose is to provide engineering students with real experience in a medical environment in order to better understand how their biomedical research projects relate to clinical practice. The course runs 1 week during spring break, 1 week in May, and then a final presentation in June. Students will get an incomplete grade for the course for spring, but this will change to an A-F grade after the rotation requirements are completed. Students can choose between rotations at Wake Forest University Baptist Medical Center in Winston Salem, or at various locations at the Roanoke and Blacksburg campuses.

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 sessions are held during spring break. Surgical and medicine rotations are held following the end of the spring semester – late May to early June.

Students who enter in the spring semester as a deferred PhD student or as a MS to PhD student must wait until the following spring semester to take the Clinical Rotation course.

Qualifying Examination (PhD Only)

A Qualifying Examination is required for all PhD candidates in order to advance to a formal candidate for the PhD degree 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 PhD program or within one (1) year of entering the program after completing the MS degree (for terminal MS students). Students may not take the exam until they are officially PhD students in the program. Students enrolled in the PhD program earning an MS along the way are expected to meet the aforementioned deadlines and take the exam on the PhD schedule; they may NOT delay until completion of the MS degree. Requests to delay the exam must be made to the Graduate Program Directors with the support of the student's Advisor and must show exceptional academic need. If the delay request is approved, the student must take the Qualifying Exam the next time the Qualifying Exam is offered by SBES.

The examination is offered once a year over a three-week period, normally in July. During this time period, students should expect to work only on the exam and not travel during the exam period. Scheduling conflicts are not acceptable reasons to defer the exam. The current exam format is based upon a student's defense of an original research proposal addressing a problem designed by the Graduate Program Committee or its representative. Students are given the problem (via Canvas), after

which they have approximately 2 weeks to prepare a written proposal to be presented and defended orally to a 3-person qualifier exam committee at the end of the third week.

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. Instructions and information regarding the nature of the exam are made available to students through Canvas and Qualifier Exam Prep sessions.

There are three possible results for the exam: Pass, Conditional Pass, and Fail. 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.

A failure indicates that a student has significant weakness in the work or underlying fundamentals. A failure is also given if a student fails to meet the deadline for the written proposal, fails to meet the deadline for presentation of the oral defense of the proposal, or withdraws from the exam any time after the problem has been distributed.

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 failure evaluation. In such a case the committee chair submits a written statement to the student and to the SBES 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 for completion of the remediation. Students will be given a minimum period of two (2) weeks but no longer than two full semesters. Failure to meet the requirements by this deadline will result in a Fail result of the Qualifying Examination.

Students who pass the Qualifying Exam may continue with the program and begin to work towards their Plan of Study and Preliminary Examination.

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

Each student is permitted a total of two attempts to pass the Qualifying Examination. A student who fails the Qualifying Exam in the first attempt must retake the Qualifying Exam during the next opportunity that is offered by SBES. A student who fails the Qualifying Examination on their second attempt will be dismissed from the PhD program and given the option to pursue a MS degree (if available).

Plan of Study

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 or after the completion of the qualifying exam. A plan of study should be submitted to the graduate coordinator for review before signatures are obtained by program director and committee members. The plan 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. Students wishing to do their MS and PhD degrees in the program may double count their courses for both plans of study but may not triple count. Note that in addition to the course requirements, the program requires a clinical

rotation for all PhD students, ethics requirements and at VT, the graduate school has a diversity/inclusion requirement that must also be met.

All MS and PhD degree-seeking students are required to file a Plan of Study. 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. Remember: All forms must be reviewed by the SBES Graduate Coordinator prior to obtaining committee signatures.

The final plans of study for the Virginia Tech campus students are 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 students work with the WFU Graduate Coordinator to produce a written plan that must be signed by their committee and approved by the WFU 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. Once the plan is entered into Banner and approved by the VT Graduate School, you can view it on Hokie Spa to track its approval status (VT students only)

Plans of study should be submitted to SBES according to the following schedule:

- MS – no later than the end of the second academic semester
- PhD – by the of the third academic semester or once the qualifying exam is passed

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. Once the Graduate School has approved the plan it can only be changed by means of Graduate School procedures which are given below.

To make a change you must go to the VT Graduate School website and fill out the proper paperwork either to the plan itself, or to the composition of the advisory committee. Students gather committee signatures, then the form is submitted to the SBES 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 WFU 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.

Transfer of Credit

Students may transfer graduate course credit hours from another institution to count on their plans of study.

In order to do so, however, the courses:

...must be transferred from an accredited institution (preferably in the United States)

...must be classified as a graduate course

...must have earned a "B" or better, "B-" is NOT considered a "B" in this case

...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 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. Students may not transfer graduate level courses they took towards an undergraduate program unless they are officially in the Accelerated Undergraduate/Graduate Program at Virginia Tech.

Note: Transferred courses count only as credit hours and are not included in the calculation of the GPA.

At Virginia Tech

MS & PhD students may transfer up to 50% of the required coursework (does not include research credits) for the graduate degree (beyond the baccalaureate). Courses beyond 5 years old will be allowed but no more than 10 years and must be approved by the SBES Graduate Directors. Courses beyond 5 years must also include a course justification form (see Graduate Coordinator if this applies to you) that will be processed through the VT Graduate School and the SBES program. Please plan to have the syllabi available if needed. A copy of your official transcripts will also be required.

At Wake Forest

MS students may transfer up to 6 credits for the graduate degree (beyond the baccalaureate).

PhD students may transfer up to 50% of the required coursework (does not include research credits) for the graduate degree (beyond the baccalaureate). Courses beyond 5 years old will be allowed but no more than 10 years and must be approved by the SBES Graduate Directors. Courses beyond 5 years must also include a WF course justification form that will be processed through the WF Graduate School and the SBES program. Please plan to have transcripts and syllabi available if needed.

International students on the Bowman Gray campus wishing to transfer credits are responsible for having their transcript evaluated by World Educational Services (WES) and are to have the evaluation sent directly to Graduate Student Records.

A graduate course that was completed while the student was enrolled in a previous graduate program at Wake Forest University may be considered for transfer to a second program provided that the course was not counted toward the first degree and a grade is B or better was earned. The maximum number of hours that may be transferred to a different program within the University toward a Master's degree in another program is 6 credits.

Students at the Wake Forest campus should fill out the docusign found [here](#) in the semester prior to submitting their plan of study. Within docusign please make sure that you enter in transfer course information in addition to comparable Wake Forest course. It will then be routed to the appropriate signees and if approved you will be notified. For questions on transfer courses please consult the WFU graduate coordinator.

Advisory Committee

Upon admission students must select or assigned an SBES faculty member (primary or affiliate) who will serve as the student's advisor, supervise the student's research, and chair or co-chair the advisory committee. The advisor 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.

Advisor Requirements

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.

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.

SBES advisory committee primary/affiliate definition is defined as:

Primary SBES Faculty Requirements

- Faculty that has a primary appointment (or tenure) in the Biomedical Engineering Departments at either campus.
- And, whose primary research interests and funding are in the Biomedical Engineering Departments at either campus.
- And, who participate in teaching SBES courses.
- And, who participate in SBES activities, including committee appointments and faculty meetings.
- And, who fund and mentor SBES students and Post Docs in the Biomedical Engineering Departments at either campus.
- Students are always encouraged to involve SBES faculty from the opposite campus on their committees if possible.

Affiliate SBES Faculty Requirements

- Faculty that are affiliated with the SBES program but have a primary appointment (or tenure) with another department other than the Biomedical Engineering Departments at either campus.
- And, who have primary research interests and funding in biomedical engineering and/or mechanics in another department.
- And, who participate in teaching SBES courses or biomedical engineering courses in another department.
- And, who participate in SBES activities, including committee appointments and faculty meetings.

- And, who mentor SBES students and Post Docs, if possible, in addition to home department students.

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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.

All persons serving on a Master's and/or Doctoral committee are required to hold a terminal degree (i.e., M.D, PhD, DVM, etc.)

The MS degree advisory committee is composed of a minimum of three (3) people:

- The advisor (and co-chair if applicable) and two other faculty members.
- At least 1 of the 3 must be an SBES (primary or affiliate) faculty members, including the chair.
- At least 1 of the 3 must be an engineer.
- Students may have up to 4 persons on the MS committee if so desired.

The SBES PhD degree advisory committee is composed of a minimum of five (5) people:

- The advisor and at least 4 other faculty members
- At least 2 of the 5 must be SBES (primary or affiliate) faculty members, including the Chair.
- At least 3 of the 5 must be engineers.
- Students may have up to 6 persons on the PhD committee if so desired.

For purposes of SBES Advisory Committee composition an "engineer" is defined as:

- A primary or affiliate SBES faculty member from either campus that also has a degree in engineering or has a primary appointment in an engineering department or a faculty member associated with WFIRM.
- A non-SBES faculty member with a primary appointment in an engineering department.
- Anyone with a degree in engineering.

Outside Committee Members:

Personnel from outside the established graduate faculties of both campuses may serve on advisory committees if approved by the VT and WFU Graduate Directors as well as the students respective Graduate School. In order to obtain these approvals please reach out to the Graduate Coordinator. 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 delayed. This step must be done prior to plan of study submission to the SBES Graduate Coordinator. These personnel may make up no more than one-third of the minimum committee membership for a master's committee of three. In that case, two must be VT/WF/SBES, and one may be external (outside of VT/WF). For a doctoral committee, up to two of the five committee members may be external (outside of VT/WF), at least three must be VT/WF/SBES. Similarly, for a PhD committee of six members two of the six committee members may be external. The committee is established at the time of filing the Plan of Study. . For the purposes of SBES advisory committee composition, an 'outside member' is defined as:

- Anyone outside of SBES and/or anyone outside of the Virginia Tech or Wake Forest University Campus (i. e. faculty from other universities or industry partners). Faculty

located at VCOM in Blacksburg are not considered Virginia Tech faculty and therefore must be considered as outside committee members.

Faculty located at the Virginia-Maryland Veterinary School in Blacksburg can be used as internal members as long as they also have primary or affiliate faculty appointments with SBES. Those that do not, should also be considered outside committee members. Faculty at the Virginia-Maryland Veterinary School may request to become affiliate faculty through the BEAM department. Please see the graduate coordinator if you have outside committee members so that they can be approved by the graduate school and the SBES program prior to your final plan of study submission. Outside members will need to provide to the SBES Graduate Coordinator a full CV as well as contact information (full name, email address, VT ID# if they have one, etc.) The SBES Graduate Coordinator will work with the SBES Graduate Directors and the VT/WF Graduate School for obtaining necessary approvals.

Committee Member Conflict of Interest:

When choosing committee members, SBES adopts the VT Graduate School policy on committee member conflict of interest. This applies to all campus locations.

https://secure.graduateschool.vt.edu/graduate_catalog/policies.htm?policy=002d14432c654287012c6542e38200d8. In selecting members of your advisory committees, students and their Committee Chair should take pains to avoid situations that might create conflicts of interest for the student or be impacted by coercive relationships among the committee members or between the student and committee members. It is of paramount importance that all committee members be free to evaluate the student's work based on its academic merit alone.

Advisor Chair Change

At Virginia Tech the procedure for changing advisors (after a plan of study has been filed) involves submitting a "Change of Committee/Advisor" form which can be found on the Graduate School's website.

Generally, students enter the SBES program with an assigned advisor. If a student is accepted to the WFU campus, a fellowship offer is made, and the student is assigned to an appropriate advisor. If a student accepts a funded offer from a particular faculty member, that person becomes the student's advisor. At Virginia Tech faculty members 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 graduate assistantships. This can become either a GRA or a GTA offer or some combination of the two.

Preliminary Examination (PhD Only)

All PhD students must take an oral Preliminary Examination administered by the student's Advisory Committee. Your final Plan of Study must be submitted to the advisory committee at least 1 semester PRIOR to scheduling your preliminary examination. The Preliminary Exam should have the participation of all committee members from the approved final plan of study. The preliminary examination is normally given near the end of the student's second or third year of graduate study and must be passed before the student can schedule their final PhD defense. The timing of examination must meet the minimum requirement of 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 PhD dissertation. The exam consists of an oral presentation of the research proposal and provides 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 two weeks prior to the examination. Students should check with your entire committee to determine the format that the committee requires for their particular area of research. SBES does not have a template or required format. 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 exam will cover all course material and the proposed research plan including the student's knowledge of the literature as well as the feasibility and originality of the proposed work. The student's advisory committee must approve the research topic and plan in order for the student to continue working on their dissertation.

During the exam, the examining committee passes or fails the student and notifies the VT or WFU Graduate School and the SBES graduate coordinator of the results.

At Virginia Tech, to pass any of the required examinations, a graduate student is allowed, at most, one "unsatisfactory" vote. Two or more unsatisfactory votes are considered a failure (not the committee majority). At Wake Forest, to pass any of the required examinations, a graduate student must have all committee members agree to either a pass or a failure.

If a student fails an examination, one full semester (a minimum of 15 weeks) must elapse before the second examination is scheduled. A student failing any of the examinations required by Graduate Policies two times will be dismissed from graduate studies by the Graduate School. If a student decides to downgrade to a MS degree, they may not use their preliminary exam as the MS Defense. A new MS Defense will have to be scheduled a minimum of 15 weeks from the date of the failed preliminary.

https://secure.graduateschool.vt.edu/graduate_catalog/policies.htm?policy=002d14432c654287012c6542e3630018

At Wake Forest this step is referred to as "advancing to candidacy" and it involves completing an application form after taking the preliminary exam and submitting it to the WFU Graduate School for approval. The Preliminary Exam itself is not scheduled by the WFU Graduate School as it is at Virginia Tech. It is scheduled by the students committee.

Scheduling and Follow-up (Virginia Tech Campus)

At VT the Preliminary Examination must be scheduled through the Graduate School and should 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 for the semester in order to take the exam.

The Graduate School has created an Electronic Signature System for scheduling and completing exams. **AT LEAST 2 WEEKS PRIOR** to the planned exam date, students must go to the Forms page on the grad school website and click on “Request to Admit the Candidate to the Preliminary Exam” after which the student logs in with their PID and creates a form detailing the time, date, and location of the exam. The form will populate with a chart at the bottom listing the committee names. Committee members will be notified by email to go in and approve the schedule request. Once the approvals are received the graduate school schedules the exam and everyone is officially notified. This same form will be used to track the results of the exam. In order for the Graduate School deadline to be met students are advised to see the SBES Graduate Coordinator at least three weeks in advance in order to address any special situations that may need attention.

Summer Prelim Exams (Virginia Tech Campus)

In order to hold your preliminary exam during summer sessions, students must sign up for a minimum of 3 credits of BMES 7994. Students are responsible for covering any costs associated with summer tuition unless the faculty advisor agrees to cover the costs. If the faculty advisor is covering the cost an email should be sent to the Graduate Coordinator with the fund number to be used for covering the cost as well as the total amount to be paid.

Final Defense

All PhD students must pass an oral examination or defense of the dissertation upon completing all other degree requirements and at a minimum of nine months 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 weeks prior to the exam. To complete the program, students must pass the final examination, including approval of the dissertation in final form. 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 reschedule the examination with the Graduate School. At Virginia Tech, to pass any of the required examinations, a graduate student is allowed, at most, one “unsatisfactory” vote. Two or more unsatisfactory votes are considered a failure (not the committee majority). At Wake Forest, to pass any of the required examinations, a graduate student must have all committee members agree to either a pass or a failure.

Doctoral Final Defense Process:

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 “unsatisfactory” 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. No more than two opportunities to pass any one examination are allowed. A student failing any of the examinations required by Graduate Policies two times will be dismissed from graduate studies by the Graduate School. In the case of any failure, the committee may recommend that the candidate be dropped from the program, change to a MS degree seeking student, or re-take the final examination (only once). If a student decides to

downgrade to a MS degree, they may not use their final PhD defense to count as the MS exam. A new MS exam will have to be scheduled a minimum of 15 weeks from the date of the original examination.

Scheduling the Defense (Virginia Tech Campus):

The PhD 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 has created an Electronic Signature System for scheduling and completing exams.

AT LEAST TWO WEEKS PRIOR to the defense date students must go to the Forms page on the grad school website and click on “Request to Admit the Candidate to Final Exam” after which they’ll log in with their PID and create a form detailing the time, date, and location of the exam. The form will populate with a chart at the bottom listing the committee names. Committee members will be notified by email to go in and approve the schedule request. Once the approvals are received the graduate school schedules the exam and everyone is officially notified. This same form will be used to track the results of the exam and the subsequent submission of the thesis/dissertation.

In order for the Graduate School deadline to be met students are advised to see the SBES Graduate Coordinator at least three weeks in advance in order to address any special situations that may need attention.

Scheduling the Defense (Wake Forest Campus):

At Wake Forest students submit a form to the Graduate School called ‘Intent to Graduate’ early in the semester of expected graduation. The deadline to submit the ‘Intent to Graduate’ form is listed on the academic calendar (<http://graduate.wfu.edu/academic-calendars.html>). Once received, a checklist is generated for the student with a copy sent to the advisor. This checklist outlines the steps needed to prepare for defense and graduation.

Coordinate with the WF Graduate Coordinator the time, date, and location of the defense, they will notify the Graduate School. The defense must occur on or before the last day to defend (date posted on the academic calendar). The thesis is sent to the committee three weeks prior to the defense. A defense scheduling memo is sent to the committee with instructions for polling. The ballot for the exam is included in this correspondence. Polling of the committee will take place at least 10 days prior to defense. If the committee finds the thesis acceptable, the defense will proceed as scheduled.

After the Defense (Virginia Tech Campus)

Following the defense, the committee chairperson is required to log into the electronic system and report the exam results on behalf of everyone on the committee, after which emails are sent to each individual committee member asking them to log in and ‘approve’ the exam results, including the chairperson. This should be done within 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. Once the student submits the dissertation to the graduate school, the committee members must log into the system once more to approve the ETD. If an extension of time is required, the student’s advisor must email the Graduate School dean to explain why more time is necessary. Students at the Virginia Tech campus should check the graduate checklist in Hokie Spa as well as see the VT graduate school for requirements in applying for the completion of the degree, acquiring regalia,

attending graduation, and receiving their diploma. In addition, students who have successfully defended their dissertation will be asked to send a final STAR report, complete an exit survey, and complete an alumni survey.

After the Defense (Wake Forest Campus):

After the exam is held, the committee chair completes the ballot and submits that to the Graduate School. Upon successful completion of the defense the student will complete all necessary revisions under the direction of the committee. The final approved thesis will be submitted via the ETD system. The advisor and student complete the ETD release form and return it to the Graduate School. The ETD as well as any required forms and surveys must be submitted to the Graduate School by the deadline listed on the academic calendar. Students who do not meet the deadlines for graduation on the calendar will be moved to the next degree conferral date. In addition, students who have successfully defended their dissertation will be asked to send a final STAR report, complete an exit survey, and complete an alumni survey.

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. Advisors provide comments and an overall rating. All students must also submit a CV/resume and a diversity statement with their STAR reports each year. Format for the CV/DEI statement is up to the student and is not part of the evaluation portion. Required signatures of both student and advisor must be submitted with the STAR report. The originals are added to the student's file and copies of these evaluations may be requested or required by the VT Graduate School. This is MANDATORY for ALL students (both campuses). Should you finish your degree in the fall or middle of the semester, you will be required to submit a final STAR report at the time of your final defense.

Candidacy Status Tuition Reduction (VT campus)

The Virginia Tech Graduate School offers a 10% tuition reduction for students who are in candidacy status in the upcoming academic year. The student is the one who must submit the request form. Doctoral candidates must submit the [Graduate Candidacy Status Tuition Reduction Request Form](#) to Graduate School each semester they wish to utilize the discounted tuition rate. Applications are due by the last day to add course registration for the semester. For more information about this policy as well as a link to the form, please see [this website](#).

Degree Completion

MS-Thesis and PhD students at both campuses are expected to complete their degree with a final examination that consists of a written thesis/dissertation and an oral presentation in front of their committee members. Once students have informed the Graduate Coordinator of their intent to graduate, students will be sent an email with a final list of requirements that include an oral presentation at the SBES Symposium, a final STAR report, information for creating a defense flyer announcement, an exam evaluation form that each committee member must sign, an exit survey and an alumni survey. Students will also be given a graduation gift on behalf of the program upon degree completion. Each campus has its own deadlines for defenses and students should be sure to check with

the graduate coordinator as well as the graduate schools on when these dates are the semester they are planning to defend.

Degree Completion at Virginia Tech

Graduate Checklist

Students at the Virginia Tech campus should log into HokieSpa to review the graduation checklist and make sure all items have been taken care of prior to leaving.

Start of Semester Defense Exception (SSDE – Virginia Tech Campus)

Occasionally a student will have completed all degree requirements by the end of a particular semester in which they hope 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, they may qualify for this 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.

If the forms are approved the Graduate School will register the student for 1 credit. Students cannot enroll themselves in SSDE. If the student does not qualify for SSDE, they must register (and pay for) the minimum 3 credits required. Students enrolled in SSDE will be classified as less than half-time students. This could create issues with health insurance, student loans and financial aid. International students should consult the Graduate School for the visa implications of this status. Students on SSDE are NOT eligible to hold assistantships or fellowships.

ETD "Electronic Thesis/Dissertation" (Virginia Tech Campus)

Virginia Tech requires that all MS theses and PhD 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 through the electronic sign-in system for administering exams created by the Graduate School.

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://graduateschool.vt.edu/academics/commencement_deadlines, 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 Virginia Tech Graduate School.

Graduation/Commencement at the Virginia Tech Campus

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.

The Hooding and Awards Ceremonies are held twice a year. Spring graduation is in May and summer/fall graduation is held in December. Watch for more information on graduation dates and regalia ordering from the graduate school. Students who do not wish to “walk” during the fall ceremony are welcome to come back and attend the spring ceremony instead.

Diplomas will be sent to students in the mail. Students who need degree completion letters should check HokieSpa. Please note these are delayed up to a month past commencement so there may be a delay in getting one if you need it.

Degree Completion (Wake Forest Campus)

The Wake Forest Graduate School has set up a Canvas site (on the WF side) that has very detailed and specific instructions as to how the process works. The steps in Canvas walk students through every item that is needed and what they need to do to complete each step, in order to move onto the next step. Students should also be sure to check in with the WF Graduate School when they are ready to defend to make sure they have completed all necessary forms and procedures. It is EXTREMELY important that if you are getting ready to defend (MS, Prelim, or PhD) that you also keep the WFU Graduate Coordinator in the loop! There are additional program requirements that you will also need to complete in addition to the items that the WF Graduate School requires of you.

Graduation/Commencement at the Wake Forest Campus

To be eligible for hooding at Commencement, the Final Defense 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.

The Hooding and Awards Ceremonies are held once a year in May. All September and January graduates will be invited to attend the May ceremony at WFU. Watch for more information on graduation dates and regalia ordering from the graduate school.