COLLEGE OF ENGINEERING
GRADO DEPARTMENT OF
INDUSTRIAL AND SYSTEMS ENGINEERING
VIRGINIA TECH™

Undergraduate Student Handbook

2021-2022

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* The UPC was established to consider all undergraduate curricular matters and any issues that pertain to the ISE Undergraduate Program. Please see an Academic Advisor for questions pertaining to the UPC or for assistance with petitions for course substitutions.

Table of Contents

I. Introduction to the ISE Undergraduate Program

This ISE Undergraduate Student Handbook, along with the Undergraduate Catalog and the Timetable of Classes (both available online), provides supplemental information about the ISE Undergraduate Program including curriculum requirements, working with an ISE Academic Advisor, etc. This Handbook is intended to assist ISE undergraduate students in successfully completing requirements for the BSISE degree. It does not supersede directives in the Undergraduate Catalog, statements from the Office of the Academic Dean of Engineering, or information from the University Registrar.

The ISE Academic Advisors provide advice and guidance to students on matters of academic, career, and professional development. It is the student's responsibility to ensure that they fulfill all BSISE program requirements specified in the appropriate checksheet. For more information on student and advisor responsibilities, see Appendix B; for the most recent checksheet, see Appendix G.

Both advisors offer appointments for advising students. Maggie Johnson's office hours are typically 8:00 a.m. to 12:00 p.m. and 1:00 to 5:00 p.m. Paula Van Curen's office hours are typically 8:00 a.m. to 1:00 p.m. and 2:00 to 5:00 p.m. During the 2021-2022 academic year, the ISE Academic Advisors plan to offer both remote and in-person modality options for advising appointments. If this changes, students will be updated via the ISE Advising Canvas page. Remember that advisors' commitments may require they be out of the office at certain times. You may schedule an advising appointment by using Navigate, available at https://vt.campus.eab.com.

II. Mission of the ISE Department and Undergraduate Program

The Department of Industrial and Systems Engineering (ISE) has three primary objectives relating to its academic mission: 1) to provide the highest quality education for preparing undergraduate and graduate students for a life-long experience in the rapidly changing field of industrial engineering, and to further prepare these students for future leadership roles in the industrial engineering profession, in business, and in industry; 2) to conduct research toward advancing the frontiers of industrial engineering, supporting the industrial and economic growth of Virginia and the nation, and providing faculty with the latest knowledge and techniques for dissemination in the classroom; and 3) by serving the industrial engineering profession, industry, and society.

The mission of the ISE Undergraduate Program is to prepare industrial and systems engineering students to create value for organizations, the profession, and society. We achieve this mission by recruiting, retaining, and educating high quality and diverse students and by creating a rigorous and collegial environment enabling students to learn industrial engineering methods and tools, built upon a foundation of mathematical, physical, and engineering sciences, and to apply them in any global organizational setting. Students can achieve academic and professional success through opportunities to participate in various educational experiences, to develop capabilities as future leaders, and to embark on a lifelong journey of professional development and learning.

The Industrial and Systems Engineering program at Virginia Tech is accredited by the Engineering Accreditation Commission of ABET, Inc., http://www.abet.org.

ISE Program Educational Objectives and Student Outcomes

As required by ABET, the ISE Department has established Program Educational Objectives (PEOs) and Student Outcomes that support our Undergraduate Program mission. Program Educational Objectives describe the expected accomplishments of ISE graduates within 3-5 years after graduation, while Student Outcomes describe what students are expected to know and be able to do at time of graduation. Input from students, ISE Advisory Board members, faculty, alumni, and employers are used in developing and revising our PEOs.

Program Educational Objectives: Within 3-5 years after graduation, ISE alumni will have:

1. Created value by applying industrial and systems engineering methods, via critical thinking, to design/redesign integrated systems/processes via the identification, creation, and implementation of sustainable solutions.
2. Provided technical or administrative leadership.
3. Pursued professional development and knowledge enhancement via graduate study, continuing education, company training programs, etc., in order to enhance knowledge in existing areas or learn about emerging trends in industrial and systems engineering.
4. Communicated effectively with different audiences and stakeholders using written, oral, and visual media.
5. Worked effectively and inclusively in teams having attributes such as varying organizational backgrounds, positions, geographic locations, and demographic compositions.
6. Served the profession, community, and society as exemplified in our motto ***Ut Prosim*** (That I May Serve).

Student Outcomes: At the time of graduation, ISE students will have the following:

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

To support the ISE Undergraduate Program, the ISE Undergraduate Program Committee (UPC) was established to fulfill the following mission: To manage the ISE Undergraduate Program by overseeing the recruitment and retention of students; monitoring, implementing, and improving the BSISE curriculum and academic policies; and serving as an advocate for the Undergraduate Program in Departmental planning and decision making.

III. Advising in ISE

The ISE Department has two Academic Advisors who serve as a resource for all students. Students with interests or questions in specific technical areas are referred to the appropriate faculty in that research area. For assistance in scheduling an appointment with Dr. Shewchuk, please see an ISE Academic Advisor or the receptionist in 250 Durham Hall.

The ISE Academic Advisors are the primary contact for all students regarding questions about University, College, and Departmental policies and procedures, the ISE curriculum, program of study planning, registration procedures, course loads, course substitutions, prerequisite rules, transfer credit, changing majors, and other related matters. When appropriate, an ISE Academic Advisor will refer students to campus resources, such as Cook Counseling Center or Services for Students with Disabilities.

The Career and Professional Development Co-op Advisor assists students with the administrative details of the Cooperative Education and Internship Program (CEIP). For information on participating in the Co-Op program, visit the website at https://career.vt.edu/experience/ceip.html. Heidi Gilbert - the advisor in Career and Professional Development responsible for ISE students - can be contacted at (540) 231-6241. Ms. Maggie Johnson is the Co-Op liaison for ISE students enrolled in the Co-Op program.

Advisors in the Global Education Office (GEO) assist students with the administrative details of planning and participating in an Education Abroad Program. For information on selecting and enrolling in an abroad program, students should first visit the GEO website at www.globaleducation.vt.edu and make an appointment by email at vtabroad@vt.edu or by phone at (540) 231-5888. Ms. Paula Van Curen is the Study Abroad liaison for ISE students participating in an education abroad experience.

The Undergraduate Program Director resolves questions of a unique nature: for example, discussions concerning a particular class or the procedures in the class. If you are unsure who to see about a particular question or concern, please refer to Appendix C and see an ISE Academic Advisor.

Helpful Hints

- Keep this handbook as a reference, and obtain an updated copy at the start of each academic year. Each fall semester, check the ISE Department website for copies of the relevant checksheet and approved electives lists. The most recently approved checksheet is for students with a date of entry to Virginia Tech under Undergraduate Catalog 2021-2022. Prior checksheets can be found on the ISE Department website, ISE Academic Advising Canvas page, and the Registrar's website.
- Bring your updated Checksheet and Student ID with you when you meet with your Academic Advisor.
- Use the appropriate Checksheet and the approved current electives lists to guide you in your selection of courses when registering for classes. The following courses should take precedence in scheduling:

    - all required courses should be added first, followed by Pathways and electives,
    - courses that you have failed,
    - ISE, STAT, and MATH courses in which you received less than a C- and that are prerequisites for other ISE classes (see Appendix G), and
    - courses that you missed due to internships, study abroad, etc.
- Ensure that you have the proper prerequisites before registering for an ISE course. Students not meeting prerequisite requirements for a course are dropped from the course before the semester begins.
- Submit an Overload Request form to the Dean's office in 212 Hancock if you want to take more than 19 credits in a fall/spring semester or more than 18 credits during summer term.
- Discuss Ds and Fs as soon as possible with an ISE Academic Advisor.
- If you make less than 2.0 for any semester, reduce your course load.
- Keep track of your degree progress by checking your Degree Audit Report (DARS) each semester. The DARS is a computer-generated report that identifies degree requirements that you've completed and requirements that you still need to complete for your degree.
- Regularly check your email for notices concerning course offerings, Cook Counseling Center and Career and Professional Development seminars, summer internships, permanent job opportunities, and study abroad opportunities, etc.

IV. Academic Policies and Procedures

This section on policies and procedures is not meant to be completely exhaustive. Refer to the 2021-2022 Undergraduate Catalog for further information on these policies and procedures.

Academic Eligibility Policy

All students must maintain a cumulative GPA of 2.0. Academic performance is reviewed at the end of fall and spring semesters. Those earning less than a 2.0 are placed on academic probation until the GPA has reached a 2.0. A student placed on academic probation at the end of the academic year may enroll in the summer and/or fall semester to bring up their GPA. A student who does not raise their cumulative GPA to the minimum 2.0 is suspended for one (1st Suspension) or two (2nd Suspension) regular semesters. For all programs except Honors, the minimum cumulative and in-major GPA for graduation is 2.0.

Evaluation and Examination Policies

- Evaluation: The instructor is solely responsible for evaluating academic performance and assigning grades. Grades are based on assignments rather than on class attendance per se. However, instructors may use attendance as part of the grading criteria. Instructors are expected to prepare a syllabus outlining course objectives, covered topics, and grading scheme, and to make the syllabus available to enrolled students by the first day of class. Justifiable modification of the syllabus may result from classroom experience during the course, but the Department Head and enrolled students are informed if changes aremade.
- Final Examination Schedule: A final exam schedule is available through the online Timetable of Classes each semester. Failure to take an examination without pre-approval yields a zero grade for the exam. The grade is then weighted as specified in the course syllabus (grading scheme). Examination periods for one-credit and laboratory courses are scheduled during the last regular class period; for all other courses, check the final examination schedule. Students are entitled to review their graded examination papers.
- Rescheduling Final Examinations: Students with conflicting exams or more than three exams within 24 hours may reschedule an examination by arrangement with the instructor and permission of the student's Academic Dean. The final exam approval form is on the College of Engineering Academic Forms website (note: forms must be submitted to the College at least 10 days before the beginning of the examination period). Students unable to take an exam because of illness or circumstances beyond their control may reschedule an exam with permission from the Academic Dean and Schiffert Health Center and by making arrangements with the instructor. In some cases, an "I" (incomplete) grade is assigned. An "I" will not affect your GPA unless the

requirement is not made up before the end of the first subsequent semester of enrollment; i.e., failure to make up the "I" before the end of the next semester in which you are enrolled will result in an F grade.

- Reading Day: There is at least one full day for study between the last day of classes and the first day of the examination period each semester and at least one-half day each summer term.
- Tentative Grades for Spring Degree Candidates: Several days before the last day of classes, faculty submit tentative grades for degree candidates to the Registrar. Classes continue as scheduled; final exams are required except as noted. Final grades are submitted to the Registrar before Commencement.
- Grade Changes: Once grades are submitted to the Registrar, a grade change is permitted only to correct errors. Grade changes should be made before the end of the student's first subsequent term of enrollment. Reason(s) for the grade change is given on the change-of-grade submission, which is signed by the instructor and submitted to an ISE Academic Advisor. Approval by the Department Head and Academic Dean is required before acceptance of a grade change by the University Registrar.
- Re-examinations: A re-examination in one course, in which the final grade is C- or below, may be authorized when a student was enrolled in that course during the final term of his/her senior year and when satisfactory performance on the re-examination qualifies the student for graduation. A re-examination request must be made and the exam must be completed by the student as soon as possible after the first exam. Re-examination must be approved by the instructor, the student's Department Head, and the student's Academic Dean.

Honor System

The ISE Undergraduate Program operates within the guidelines of the University's Undergraduate Honor System. Violations of classroom, departmental, or university academic policy are dealt with as Undergraduate Honor System violations. Please understand that posted departmental information, homework solutions, homework returned through centralized mailboxes, and reserved library materials are included under the Honor Code. Please read the guidelines at www.honorsystem.vt.edu.

ISE Departmental Policy Regarding Term Projects

Students submitting reports in partial fulfillment of the requirements for an ISE course are not permitted to use reports, in whole or in part, which were done to satisfy requirements in another course. Reports must be prepared solely by the student (or group of students, when applicable), with the express purpose of satisfying the requirements of a particular ISE course. Information taken from other sources (including previous reports) must be properly credited. Use of another's report or failure to give credit constitutes a violation of the Undergraduate Honor Code. Exceptions to this policy may be made by individual instructors. Students wishing to be exempt from the policy must discuss their intentions with each instructor involved and receive written permission.

The Industrial and Systems Engineering curriculum, through instruction in both technical matters and their presentation, is designed to educate students to enter the engineering profession. Written documents constitute a vital part of the engineering profession; therefore, students are expected to submit written documents of professional quality. Reports with spelling, punctuation, or grammatical errors, are unprofessional and evaluated accordingly.

Students may request assistance through the Writing Center.

Pass/Fail Grade System

The P/F grading option is available to students who have completed a minimum of 30 credits and have a cumulative GPA of 2.5 or above. No required course or course used for Pathways to General Education may be taken on a P/F basis (with the exception of courses that are taught P/F only). Students using electives to complete Minor requirements may be required to take all courses as an A-F option - carefully check the Minor checksheet requirements and consult with an ISE advisor.

Once credit is received for a course taken P/F, the course cannot be repeated under the A-F option. A course to be taken as P/F should be designated as such upon request for the course. Course grading options may be changed to P/F until the drop deadline and can be changed to A-F until the resignation deadline for each semester.

Policy 91: Satisfactory Progress towards Degree

Satisfactory Progress towards Degree: University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The ISE Department fully supports this policy. In addition, upon completion of two semesters as an ISE major, students must have:

- a minimum in-major GPA of 2.0 or better (in-major GPA is determined from all ISE and required STAT classes); and
- completed ISE 2004, 2014.

Transferring Credits Back to Virginia Tech

The Registrar maintains a VCCS Guide for courses from Virginia Community Colleges and a Transfer Equivalency Database showing courses from colleges in Virginia and throughout the U.S. that have been evaluated in the past. If a course is listed in the VCCS Guide as equivalent to the course you want to transfer, sign up for and complete the course with a "C" grade or better. The Transfer Equivalency database is a historical list to be used as tool to help you find equivalent courses. It is NOT a guarantee that the course is still equivalent. Fill out a transfer credit request form (www.eng.vt.edu/forms) to have courses pre-approved, even if they are listed in the database. An approved form guarantees that you will receive the credits you expect.

If a course is not listed in the database, it has not been evaluated for transfer equivalency. Obtain a copy of a recent syllabus for the course you want to take, attach it to a transfer credit request form and turn it in to the Academic Dean's office in 212 Hancock. Allow at least three weeks for approval. Upon course completion, have an official copy of your transcript showing final grade(s) mailed to the Office of the University Registrar. The mailing address can be found on the Registrar's website.

Until the transfer credits appear on your VT transcript, they will not be recognized by the course registration software as satisfying prerequisite requirements. If you cannot add a class that requires a transfer course as a prerequisite, submit a force-add request on the ISE Undergraduate Programs website. Be prepared to provide a copy of your approved transfer credit request form and an unofficial copy of your grade to an ISE Advisor to review and add the course for you.

Course Withdrawal Policy and Procedure

Students may apply the W grade option to a maximum of 3 courses (regardless of credit hours) during their undergraduate academic tenure. This request must be submitted to the Undergraduate Academic Affairs Office via Microsoft Forms online submission with your signature and your advisor's signature no later than 5:00 p.m. on the last day of classes for courses taken during the current semester. Course(s) with a status of CW will appear on your transcript as a "W" grade and on Hokie Spa after final grades are posted but do not count in GPA hours nor in any GPA calculations.

Course Withdrawal Policy stipulations are listed below:

- Use of this grade option may affect Reasonable Academic Policy requirements for continued receipt of federal financial aid.
- A student decision to invoke this policy is irrevocable and may not be appealed.
- The "W" grade option may not be used to remove a penalty otherwise accruing to student under the University Honor System.
- If a registration hold exists at the time of application, the student must take action to remove the hold within five working days of the application or the request will be voided.

Credit Hour Loads and Credit Overload Permission

Minimum full-time enrollment for undergraduate students is 12 credit hours during the fall and spring semesters. Audit hours are not used in establishing minimum full-time enrollments. Students who want to take more than 19 credit hours during fall and spring and more than 9 credit hours for each summer semester must obtain "Overload Permission" from the Academic Dean before the add deadline closes for the semester. The overload request form is available online at: http://www.eng.vt.edu/forms/.

The University does not require you to be a full-time student. The number of credits you take each semester is your decision. It is important, however, for you to determine if there are

other considerations, such as health or car insurance, federal financial aid, scholarships, or on-campus housing that require you to be a full-time student. Any questions regarding financial aid should be addressed to your financial aid advisor. See the Scholarships & Financial Aid website at www.finaid.vt.edu.

V. Registration and Course Information

Details of registration procedures are not provided in this handbook, as these are specified in the Timetable of Classes and the Registrar's website for each semester. However, a few comments of importance are discussed below.

Course Scheduling

Required courses in ISE are offered during the academic year, with expected offerings indicated on each checksheet (See Appendix G: 'Credits' columns, p. 1) and in this Handbook (Section VII). ISE-required courses prior to the Senior year are offered during the summer as well, with expected offerings similarly indicated. Summer offerings are provided to accommodate students completing a co-op/internship or repeating a course for which they did not earn the minimum C- grade. Students should plan to take each course during the academic-year semester indicated on the appropriate checksheet, and take summer courses only as necessary to stay on-track. Time conflicts between required ISE courses and non-ISE courses are more likely during the summer.

ISE Technical Electives are typically offered once during the academic year with no offerings during the summer. Expected offerings are indicated on each ISE checksheet (see Appendix G: pg. 3) and in this Handbook (Section VII). New courses may be added under the course number ISE 4984 (Special Study) and are announced to students via the undergraduate listserv. Independent Study (ISE 4974) and Undergraduate Research (ISE 4994) hours are arranged with a faculty member; see an advisor for the registration process for these types of courses.

Note that actual ISE course offerings may differ from expected offerings indicated on each ISE checksheet and in this Handbook. Check the Timetable of Classes and/or consult with an ISE Academic Advisor if you have a question regarding when an ISE course will be offered.

Force-Add Policy & Procedure

If you are unable to add an ISE class or classes via add/drop (i.e. prerequisite is not recognized or transfer credit for prerequisite is not yet posted on transcript), submit a force-add request online through the ISE Undergraduate Programs Department website. Note that the department will not process force-add requests for time or professor preference. The ISE Department cannot force-add classes from other departments, students must contact the department of the course they need to force-add.

Plan of Study

The ISE Undergraduate Program provides students with a very strong foundation in all four areas of the discipline: human factors engineering and ergonomics, management systems engineering, manufacturing systems engineering, and operations research. However, the department does not currently offer options in any particular area at the undergraduate level.

Graduation Checksheets

Checksheets for each class are available in 241 and 243 Durham Hall, on the ISE Department website, and on the Registrar's website.

The university has recently changed how checksheets are classified for undergraduate students. They have transitioned from Date of Graduation (DOG) to Date of Entry (DOE) graduation requirements.

To know which checksheet to use, students must select the graduation checksheet for the year in which they entered Virginia Tech. For example, if a student entered in Summer/Fall 2020 or Spring 2021, then they will use the ISE Checksheet for students under UG Catalog 2020-2021. If a student started prior to 2020-2021, then they will follow the date of graduation checksheet, which is the year in which you plan to graduate.

Any student who has not graduated by 2022 will be transitioned to the 2021-2022 catalog program graduation requirements. For example: students who entered during the academic year 2019-2020 will follow the 2021-2022 undergraduate catalog checksheet requirements under the Date of Entry (DOE) requirements.

This means that students who will graduate in 2023 (with a 2019-20 date of entry) will now follow the 2021-22 checksheet.

Students must fulfill the checksheet requirements according to the calendar year of graduation, or per the academic year of their date of entry. Note that the Checksheet (Appendix G) indicates recommended course sequencing, based on prerequisite and co-requisite requirements.

During the sophomore year, students will apply for their degree and request a Degree Audit Report (DARS) from the University Registrar via Hokie Spa. The DARS lists all the student's completed and future graduate requirements. Students can make changes (i.e. graduation date) to their DARS through Hokie Spa as well.

Pathways to General Education

All students must complete the Pathways to General Education requirements. This section discussed the requirements for Pathways students:

- Critical Thinking in the Humanities (Pathway 2): 6 credits required.
- Reasoning in the Social Sciences (Pathway 3): 6 credits required.
- Critique and Practice in Design and Arts (Pathway 6a): 3 credits required.
- Critical Analysis of Identity and Equity in the US (Pathway 7): 3 credits required. Certain Pathway 7 courses may also double count with another Pathways Concept course requirement. These courses are designated as such in the UG Catalog, the Pathways database/guide, and in the Timetable of Classes. If a student uses one of these courses to double-count in two Pathways concepts, additional credits must be taken to maintain the required minimum of 124 credits for graduation.

All courses taken to fulfill Pathways requirements must be taken on an A-F (not P/F) basis. Consult the latest issue of the Undergraduate Catalog or the Pathways Guide for course descriptions, prerequisite requirements, and restrictions.

Curriculum for Liberal Education

Please note: only for students who entered VT in Fall 2017 or earlier.

All students who were admitted to Virginia Tech in Fall 2017 or earlier must follow the Curriculum for Liberal Education (CLE). All transfer students admitted prior to Fall 2019 must also follow CLE requirements. This section discusses the requirements for CLE students.

There are different types of electives in the ISE curriculum. An updated list of classes that meet CLE requirements is available online in the Curriculum for Liberal Education Guide. Please note comments under each elective type as follows:

- Humanities/Social Science Electives (Areas 2 and 3): The current policy requires completion of 6 credits in Area 2, ***Ideas, Cultural Traditions, and Values*** and 6 credits in Area 3, ***Society and Human Behavior***.
- Creativity and Aesthetic Experience (Area 6): 1 credit required. With the exception of MUS 3314, which requires an audition, and ALS 1004, 1-credit Area 6 courses are no longer offered. A 3-credit Area 6 course will fulfill Area 6 and 2 credits of Free Electives.
- Global Issues Elective (Area 7): 3 credits required. Certain Area 7 courses may also fulfill an Area 2 or 3 course requirement. These courses are designated as such in the UG Catalog, the Curriculum for Liberal Education Guide, and in the Timetable of Classes. If a student uses one of these courses to double-count in two areas, additional credits must be taken to maintain the required minimum of 127 credits for graduation.

Electives within the BSISE

- Pathways (or CLE) courses (please refer to previous sections for more information)
- Technical Electives (Appendix G). 6 credits required. See latest checksheet when selecting courses.
- ISE Technical Electives (Appendix G). 9 credits required.
    - ISE 2204 and ISE 3000- or 4000-level courses are used to fulfill this requirement.
    - Non-ISE courses may not be substituted for ISE Technical Electives.
    - An ISE graduate level course may be taken to fulfill this requirement if student:
        - is within one semester of graduation, ***and***
        - has a 3.0 GPA or better, ***and***

- has obtained permission of the course instructor.

Students may take either **ISE 4974 (Independent Study) or ISE 4994 (Undergraduate Research)** to satisfy up to 6 credits of ISE Technical Electives. These courses are arranged on an individual basis with an ISE faculty member, and a request for approval is submitted on the appropriate form to your advisor by the deadline specified by the College of Engineering. A list of potential ISE 4994 Undergraduate Research projects is sent to the undergraduate student listserv before the start of each semester; however, students are not limited to this list. See an ISE Academic Advisor or faculty member about using ISE 4974 or ISE 4994 for technical elective credit. Updated lists of ISE Technical Elective offerings are available each semester from an ISE Academic Advisor. **ISE 4984** (**Special Study**) courses are also on these lists. Changes affecting course offerings are sent to the undergraduate student listserv.

- **Engineering & Science Elective** (Appendix G). 3 credits required. Choose from either ECE 3054 Electrical Theory, ESM 2304 Dynamics, ESM 2204 Mechanics of Deformable Bodies or MSE 2034 Elements of Materials Engineering.
- **Free Electives** (Appendix G). 2-3 credits required. Can be taken P/F.

When selecting electives, **do not enroll in courses that duplicate requirements** you have already taken or will be required to take later. Duplicated course credit cannot count toward degree requirements.

Minors for ISE Students

A minor is a program of study requiring some depth in a subject, but not as extensive a program as a major. A minor enhances what you are already learning with an ISE degree. It will specialize your learning while in ISE and will make you more marketable to future employers. In general, minors consist of at least 18 and no more than 22 credits of coursework. At least six credits for the minor must be advanced (3000-level or 4000-level courses).

If there is a minor that you are interested in pursuing, talk to an advisor for more details on requirements. A list of all available minors can be found on the University Registrar website at www.registrar.vt.edu. Three popular minors for ISE students to pursue are the Business Minor, Green Engineering Minor, and Finance Minor, all described below. Other minors that can be taken include, but are not limited to, Biomedical Engineering, Computer Science, Economics, Math, Psychology, Sociology, Statistics, Language (Spanish, French, etc.).

Business Minor

A Business Minor will enhance a student's skill set in order to pursue a position in management or leadership.

Classes such as Principles of Economics and Principles of Accounting will augment skills learned in ISE classes such as Engineering Economy and Project Management and System Design. A broader understanding of business concepts will benefit ISE graduates when entering the business world.

With proper planning, an ISE student may complete the Business Minor requirements by purposeful selection of elective courses and by taking 15 credits above and beyond the BSISE requirements. Based on an agreement between the College of Business and the ISE Department, several classes which fulfill ISE departmental requirements also fulfill Business Minor requirements. Students may select specified electives to fulfill both Business Minor and CLE/Pathways requirements (e.g., ECON 2005-2006). Interested students may obtain the application/checksheet from the College of Business, an ISE Academic Advisor, or the ISE website.

Green Engineering Minor

A Green Engineering Minor is desirable for ISE majors because it provides a basic understanding of environmental issues when it comes to manufacturing and industrial systems. With this understanding, industrial and systems engineers will be able to make these systems more efficient and more environmentally friendly. An increasing emphasis on making processes and systems more “green” has resulted in companies recruiting ISE graduates with a Green Engineering Minor.

With proper planning, students may complete the Green Engineering Minor requirements by taking no additional course requirements. Required Minor Core courses can satisfy 6 credits of Technical Elective credits for ISE students, and the Engineering Elective courses include required ISE courses. The Interdisciplinary Elective Course List requires 6 credits; there are several classes that double-count for CLE Area 2 and/or Area 7 credit, or Pathways 2 & 7 credit. Refer to the Green Engineering Minor Checksheet and see an ISE Academic Advisor for more information.

See Appendix D for the list of classes required for the Business Minor and Green Engineering Minor and how they fit into the ISE curriculum.

Finance Minor

A Finance Minor is a good choice for students planning to pursue a career in financial data analytics, portfolio analytics, risk management modeling & analysis, etc. This minor can be especially useful for students who want to earn a master's degree in Financial Engineering. Industrial and systems engineering students may substitute ISE 3004, STAT 4706, ISE 2404 and ISE 3414 for 4 out of the 10 courses required for this minor. The Finance Minor checksheet can be found here. If you have questions about the Finance Minor, please contact Dr. Greg Kadlec, the finance professor who led the development of this minor (which started in Fall 2020). Dr. Kadlec has a master's degree in Operations Research and a bachelor's degree in Industrial Management and helped develop this minor with industrial and systems engineering students in mind.

VI. Professional Development and Student Organizations

Students are advised to explore ways in which to develop themselves professionally, not only as engineers, but as individuals preparing for the workplace. Students are encouraged to take advantage of both work and organizational opportunities to enhance their professional competencies. Students may participate in extracurricular activities, study abroad, undergraduate research, and work experiences such as a co-op or an internship. This section provides information on the student professional societies, the Cooperative Education and Internship Program, summer internships, and study abroad. See an ISE Academic Advisor for further advice.

ISE Student Organizations

Institute of Industrial and Systems Engineers (IISE)

- The primary professional society in the discipline is IISE, an organization of practicing Industrial and Systems Engineers which exists to enhance the development of the profession. The Virginia Tech student chapter is very active and has achieved the highest level of recognition possible (Gold Award) from the international organization.
- Chapter activities include organizing and attending regional and national technical conferences; presentations by speakers from industry and government; industry plant tours; and professional certification workshops for students (i.e. Six Sigma Green Belt). IISE student members also participate in community service activities and sponsor annual events such as the spring departmental picnic, departmental Constructive Curriculum Review session, and various social activities to promote student and faculty interaction.

Alpha Pi Mu (APM)

- Alpha Pi Mu is the national honor society for Industrial Engineering, which recognizes and promotes scholastic achievement and professional development in Industrial Engineering. There are currently 72 society chapters and national membership has reached 45,000. The VT Student Chapter has approximately 50 active members and is among the most active chapters in the nation. The student chapter's activities support the ISE Department, the College of Engineering, and the University. Initiation into Alpha Pi Mu is by invitation and is restricted to registered students pursuing a graduate or undergraduate degree in ISE. At the undergraduate level, consideration is given to juniors in the upper one-fifth and seniors in the upper one-third of their classes who have demonstrated leadership and ethical behavior. Membership invitation is made subsequent to a chapter election held in the fall and spring semesters of each academic year.

ISE Ambassadors

- Students who serve as ISE Ambassadors support the ISE Department in a complementary way, along with IISE and APM. The Ambassadors assist with Department, College, and University recruiting events for prospective students, (e.g.,

the Engineering Open House, University Open House weekends, etc.), and conduct information sessions for first-year engineering students. The Ambassadors also plan and conduct many activities for current students and alumni, including social events, curriculum improvement, alumni relations, and community service. Ambassadors are selected through an application and interview process in the spring semester, with service as an Ambassador to begin the following fall semester. See Ms. Maggie Johnson for more information.

Human Factors and Ergonomics Society (HFES)

- HFES is an interdisciplinary organization of professionals involved in the human factors field. The society promotes the discovery, exchange, and application of knowledge concerning the relationship of people to machines and the environment. HFES also support the development of working and living environments that are comfortable and safe. It encourages the appropriate education and training of those who conceive, design, develop, manufacture, test, manage, and participate in systems. The student chapter promotes human factors as an interdisciplinary profession in the University community and sponsors external and internal speakers on wide-ranging human factors concerns.

Institute for Operations Research & Management Science (INFORMS)

- The INFORMS student chapter at Virginia Tech aims to stimulate interest in the fields of Operations Research, Manufacturing Systems and Processes, and Management Sciences, as well as to provide professional development opportunities for students in ISE and other related programs at Virginia Tech. The student chapter seeks to be a platform for students and faculty to get familiar with research and industry professionals.
- Chapter activities include weekly seminars with speakers from Virginia Tech, other universities, and industry. Presentations cover a wide range of topics including manufacturing processes and systems, quality control, management systems, operations research, and data analytics.

Cooperative Education & Internship Program (CEIP)

The Cooperative Education & Internship Program is an undergraduate academic program that incorporates real world work experience and learning into the student's college academic experience. Co-ops and internships enhance students' educational experience with real-world career-related work experience as well as help students develop skills and knowledge applicable to their career fields. Participation in CEIP is an excellent way to build credentials for employment or admission into graduate school.

A “co-op” usually refers to a work agreement with one employer for at least three work terms alternated with school terms, resulting in a five-year degree program for what would otherwise take four years. Co-ops are full-time, paid positions. An “internship” usually refers to a one-term work assignment, most often in the summer (not always) and can be full-time or part-time. Keep in mind that not all employers use these terms consistently or with

consistent meanings. Once enrolled in the CEIP program, students are required to complete a form provided by the Career and Professional Development staff. This form will require the signature of the ISE Department Co-Op Liaison, Ms. Maggie Johnson.

The Engineering Expo Career Fair, sponsored by the Student Engineers' Council, is held in September. Students are encouraged to bring their resumes and meet with recruiters to identify potential internships or co-ops. The Connection Job Fair, which includes opportunities for students looking for co-op and internship experience, is held in February. For a detailed explanation of co-ops and internships, information on participating in the CEIP program, and other career fairs, refer to the Career and Professional Development website at www.career.vt.edu.

ISE Study Abroad Exchange Programs

The ISE Department participates in a student exchange agreement with a top university in Parana, Brazil. ISE students take pre-approved ISE and other courses that transfer back to meet BSISE degree requirements. Students may also identify other courses of interest and request approval before departure from Virginia Tech. Program costs includes VT tuition & fees, travel, housing & food.

Pontifical Catholic University of Paraná (PUCPR)

- PUC-PR is a private, not-for-profit university with a high percentage of students from different countries and a strong support infrastructure for international students. The main campus is in Curitiba, the capital city of the State of Parana in Brazil. Completion of PORT 1106 or equivalent before departure is recommended. Students arrive approximately one month before the start of the semester to spend that time studying Portuguese in an immersion class and acclimating to the university and local community.

To reach the recommended language proficiency before departure, students may take academic courses and use resources available through the VT Library's Language Resource Center (i.e. Rosetta Stone). Free tutoring to meet students' learning needs can also be arranged. Students may also learn about available scholarships and financial aid for study abroad through the Scholarships and Financial Aid office and the ISE study abroad advisor, Ms. Paula Van Curen.

ISE students are not limited to this exchange program, however. Interested students can research all study abroad opportunities at the Global Education website www.globaleducation.vt.edu and at the College of Engineering website at https://www.eng.vt.edu/international. Afterwards, meet with Ms. Van Curen to see how a study abroad experience can fit into the ISE curriculum.

VII. ISE Courses and Faculty

ISE undergraduate courses offered by the department are listed below, along with a course description, and prerequisites. Courses denoted with an asterisk (*) are required for the BSISE degree. For course offerings, please check with an ISE Academic Advisor.

ISE 2004: INTRODUCTION TO INDUSTRIAL AND SYSTEMS ENGINEERING*	(1H, 1C)
Introduction to the Industrial and Systems Engineering profession through exposure to problems, principles, and practice. Systems thinking, critical thinking, and contemporary issues in industrial and systems engineering. Introduction to the ISE Department, focusing on faculty and research areas. Importance of ethics and professionalism. Academic planning for the BSISE degree.	
ISE 2014: ENGINEERING ECONOMY*	(2H, 2C)
Concepts and techniques of analysis for evaluating the value of products/services, projects, and systems in relation to their cost. Economic and cost concepts, calculating economic equivalence, comparison of alternatives, purchase versus lease decisions, financial risk evaluation, cash flow sensitivity analysis, and after-tax analysis.	
ISE 2024: PROBABILITY FOUNDATIONS FOR INDUSTRIAL AND SYSTEMS ENGINEERS*	(3H, 3C)
Pre: MATH 2204 or MATH 2204H.	
Introduction to the mathematical foundations of probability theory for industrial engineers. Understanding of probability as a model for real phenomena, with applications of probability in an industrial engineering context. Review of set theory, counting (permutations and combinations), definition of probability axioms, sample spaces, random variables, independence, probability distribution functions, probability mass or density functions, expectations, moment-generating functions, joint and conditional random vectors and distributions, and distributions of functions of random variables, central limit theorem.	
ISE 2034: DATA MANAGEMENT FOR INDUSTRIAL AND SYSTEMS ENGINEERS*	(3H, 3C)
Pre: CS 1044, CS 1064, CS 1114, ECE 1574	
Investigation of data modeling, storage, acquisition, and utilization in industrial and systems engineering via manual and computerized methods. Development of effective spreadsheet applications. Design and implementation of relational databases via entity-relationship modeling, relational schema, and normalization. Web-based database applications. Interface design and the system development life cycle applied to data management applications. All topics covered within the context of typical industrial and systems engineering problems.	
ISE 2204: MANUFACTURING PROCESSES	(3H, 3C)
Pre: ENGE 1104, ENGE 1114, ENGE 1414 or ENGE 1216 (C- or better)	
Survey of manufacturing processes including casting, forming, machining, welding, joining, and non-traditional processes such as laser-beam and electrical-discharge machining. Basic structure of metals, physical, and mechanical properties and their relationship to manufacturing. Process planning and the effect of plans on cost, safety, and the environment. Impact of product design on manufacturability: design for manufacture, assembly, etc. Includes topics in inspection and testing, jigs and fixtures, and numerical control.	

ISE 2214: MANUFACTURING PROCESSES LABORATORY*	(3L, 1C)
Laboratory exercises and experimentation in manufacturing processes. Emphasis on using production machines and equipment to make products using multiple manufacturing processes, coupled with inspection per engineering drawings. Processes include assembly, casting, machining, forming, welding, and non-traditional machining, performed manually and/or via computer programming. Covers shop floor operation and documents used to monitor and control part production.	
ISE 2404: DETERMINISTIC OPERATIONS RESEARCH*	(3H, 3C)
Pre: MATH 1114 or 2114 (C- or better)	
Deterministic operations research modeling concepts; linear programming modeling, assumptions, algorithms, modeling languages, and optimization software; duality and sensitivity analysis with economic interpretation; network models (formulations and algorithms), including transportation problems, assignment problems, shortest path problems, maximum flow problems, minimum cost network flow problems, minimal spanning tree problems.	
ISE 2994: UNDERGRADUATE RESEARCH VARIABLE CREDIT COURSE	
ISE 3004: INDUSTRIAL COST CONTROL	(3H, 3C)
Pre: ISE 2014 (C- or better) or ME 2024	
Fundamentals of general and cost accounting practices applied to manufacturing and service organizations. Cost accounting, standard cost determination, cost and budgetary control systems.	
ISE 3034: TECHNICAL COMMUNICATION FOR ENGINEERS*	(3H, 3C)
Pre: ENGL 1106	
Fundamentals of effective technical writing. Structure, presentation, and utility of common engineering documents: laboratory reports, technical reports, proposals, progress reports, and project reports. Practice in writing common engineering documents, both individually and collaboratively. Strategies and practice for effective oral technical presentations, both individually and group-based. Ethical and legal considerations in technical writing and oral technical presentations. All topics covered within the context of typical engineering problems and practice.	
ISE 3214: FACILITIES PLANNING AND LOGISTICS*	(3H, 3C)
Pre: ISE 2014, 2404 (C- or better); co: 3414	
Theory, concepts, methods for designing and analyzing facilities and material flow in manufacturing, storage, distribution environments. Material handling systems, facility layout, facility location, warehousing, distribution, logistics, transportation.	
ISE 3414: PROBABILISTIC OPERATIONS RESEARCH*	(3H, 3C)
Pre: ISE 2004, ISE 2024, MATH 2214, (MATH 2224 or 2204) (C- or better), (CS 1044, 1064, 1114 or ECE 1574)	
Introduces probability models used to investigate behavior and performance of manufacturing, and service systems under conditions of uncertainty. Topics include probability, conditioning, elementary counting processes, and Markov chains & processes. Emphasis on the use of these tools to model queues, inventories, process behavior, and equipment reliability.	

ISE 3424: DISCRETE-EVENT COMPUTER SIMULATION*	(2H, 3L, 3C)
Pre: ISE 3414, ISE 2024 (C- or better)	
Analysis and design of work systems through static and dynamic simulation. Topics include an introduction to systems analysis and modeling, simulation optimization, model development, and testing and problem analysis through simulation.	
ISE 3434: DETERMINISTIC OPERATIONS RESEARCH II	(3H, 3C)
Pre: ISE 2004, 2404, (MATH 2224 or MATH 2204) (C- or better)	
Advanced concepts in deterministic operations research, including theory of complexity, integer programming, advanced linear programming techniques, nonlinear programming, and dynamic programming. Covers modeling languages and optimization software for integer programming and nonlinear programming problems.	
ISE 3614 HUMAN FACTORS ENGINEERING AND ERGONOMICS*	(3H, 3C)
Pre: ISE 2004, Co: ISE 2024	
Investigation of human factors, ergonomics, and work measurement engineering, with emphasis on a systems approach toward workplace and machine design. Discussion of basic human factors research and design methods, design/evaluation methods for work systems and human machine interactions, human information processing, visual and auditory processes, display and control design, and effects of environmental stressors on humans.	
ISE 3624: INDUSTRIAL ERGONOMICS*	(3H, 3C)
Pre: ISE 3614 (C- or better), ESM 2104	Offered: II, IV
Introduction to ergonomics and work measurement with an emphasis on people at work. Discussion of methods for work measurement, ergonomic assessment, and evaluation, with major topics including productivity and performance, manual materials handling, work related musculoskeletal disorders, safety, training and legal issues.	
ISE 4004: THEORY OF ORGANIZATION	(3H, 3C)
A theory of cooperative behavior in formal organizations, including the structure and elements of formal organizations. The executive process and the nature of executive responsibility also are examined.	
ISE 4005-4006: PROJECT MANAGEMENT AND SYSTEM DESIGN*	4005: (3H, 3C) 4006: (2H, 2C)
4005 Pre: ISE 2034, 2214, 3034, 3214, 3424, 3624, 4204 (C- or better); Co: 4404 4006 Pre: 4005 (C- or better)	
Capstone design sequence for ISE majors. 4005: Structured systems engineering and project management methods and tools to plan, manage, and execute technical industrial and systems engineering projects. Students work in teams to apply industrial and systems engineering and project management tools to define and analyze a real-world problem. 4006: Design, implement, and evaluate work system solutions. Communication of solutions to project stakeholders.	

ISE 4015: MANAGEMENT SYSTEMS THEORY, APPLICATIONS, AND DESIGN	(3H, 3C)
Systems approach to management, domains of responsibility, structured and synergistic management tools, management system model, contextual frameworks, information portrayal, automation objectives model, evaluation, shared information processing, information modeling. Management process for definition, measurement, evaluation & control, an organization as an information processor, corporate culture, scoping agreements, schemas, management elements, structured design.	
ISE 4204: PRODUCTION PLANNING AND INVENTORY CONTROL*	(3H, 3C)
Pre: ISE 2404, 3414, STAT 4706 (C- or better)	
Theory & concepts in model formulation for analysis & control of production processes. Systems for planning and controlling production & inventory: material requirements planning (MRP), just-in-time (JIT), & synchronous production systems.	
ISE 4214: LEAN MANUFACTURING	(3H, 3C)
Pre: ISE 4204 (C- or better)	
Lean manufacturing principles, theory, methods, and techniques in modern manufacturing enterprises. Lean manufacturing philosophy, basic concepts, master production scheduling, production smoothing, assembly line sequencing, setup time reduction, U-shaped line balancing/operation, machine arrangement, Kanban, automation, quality control. Investigation and discussion of lean manufacturing case studies.	
ISE 4264: INDUSTRIAL AUTOMATION	(2H, 3L, 3C)
Pre: ISE 2204 or 2214 (C- or better)	
A survey of the various technologies employed in industrial automation. This includes an emphasis on industrial applications of robotics, machine vision, and programmable controllers, as well as an investigation into problems in the area of CAD/CAM integration. Examination of the components commonly employed in automation systems, their aggregation and related production process design. Laboratory work is required.	
ISE 4304: GLOBAL ISSUES IN INDUSTRIAL MANAGEMENT	(3H, 3C)
Industrial management topics of current interest explored from a global perspective. Current domestic and international challenges resulting from a global marketplace and the proliferation of information and technology. Industrial management and organizational performance, total quality management, business process re-engineering, leadership, organizational change, role of communication and information, and ethics. Examination and comparison across international boundaries.	
ISE 4404: STATISTICAL QUALITY CONTROL*	(3H, 3C)
Pre: ISE 3414, STAT 4706 (C- or better)	
Application of statistical methods and probability models to the monitoring and control of product quality. Techniques for acceptance sampling by variables and attributes are presented. Shewhart control charts for both classes of quality characteristics are examined in depth. The motivation for each method, its theoretical development, and its application are presented. The focus is upon developing an ability to design effective quality control procedures.	

ISE 4414: INDUSTRIAL QUALITY CONTROL	(3H, 3C)
Pre: ISE 4404 (C- or better)	
Implementation of statistical quality control techniques in an industrial setting. Development and analysis of cost models for use in the design of optimal quality control plans. Also included are new techniques, advanced quality control models, and an examination of the role of industrial statistics in the overall product quality assurance function.	
ISE 4424: LOGISTICS ENGINEERING	(3H, 3C)
Pre: ISE 3414 (C- or better)	
Introduction to key issues in the integrated support of a product of process. Synthesis of topics from earlier studies to provide a cohesive approach to their applications. Logistics engineering provides a survey of product support issues and methods of resolving them within the context of the overall production activity.	
ISE 4434: SUPPLY CHAIN AND OPERATIONS ENGINEERING	(3H, 3C)
Pre: ISE 2404, 3414 (C- or better)	
Mathematical models, algorithms, and tools to support the design/redesign and management of supply chain systems. Resiliency, reliability, efficiency, and effectiveness of supply chains; collaboration and coordination among the different decision-makers in supply chains; impact of new developments on supply chain engineering, including the growth of the internet and e-commerce, the need to build suitable and environmentally-friendly supply chains. Mathematical modeling and system-wide optimization of the entire supply chain system under certainty.	
ISE 4624: WORK PHYSIOLOGY	(3H, 3C)
Pre: ISE 3624 (C- or better)	
Anthropometry, skeletal system, biomechanics, sensorimotor control, muscles, respiration, circulation, metabolism, climate. Ergonomic design of task, equipment, and environment.	
ISE 4644: OCCUPATIONAL SAFETY AND HAZARD CONTROL	(3H, 3C)
Pre: ISE 3614 (C- or better)	
Survey of occupational safety. Topics include: history of occupational safety; hazard sources related to humans, environment, and machines; engineering management of hazards.	
ISE 4654: PRINCIPLES OF INDUSTRIAL HYGIENE	(3H, 3C)
Introduction to the foundations of the Industrial Hygiene field, the discipline devoted to the anticipation, recognition, measurement, evaluation, and control of occupational health hazards. Includes biological (microbial agents, allergens), chemical (solvents, carcinogens), and physical (radiation, temperature) hazards. Overview of health hazards control, such as protective equipment, administrative controls, and engineering controls. Lecture and participatory "case-study" activities provide ample opportunity for hands-on use of monitoring equipment, protective equipment and controls testing devices.	
ISE 4804 SYSTEM DYNAMICS MODELING OF INDUSTRIAL SYSTEMS	(3H, 3C)
Computer-aided approach to analyze and make better decisions in complex industrial systems. Systems thinking and causal loop modeling of complexity over time. Interconnectivity of industrial systems, production, and service. Stock-flow diagrams. Systems modeling of product development and market adoption. Simulation of dynamic problems arising in complex systems. Systems modeling and simulation-based decision analysis to improve performance in service and manufacturing.	

ISE 4974: Independent Study Variable credit course.
ISE 4984: Special Study Variable credit course.
ISE 4994: Undergraduate Research Variable credit course

The ISE Department **does not permit** an undergraduate student to work on an independent study, undergraduate research, or a senior design project while they are simultaneously being compensated for the same work.

Please see the **Graduate Catalog** for graduate course listings.

ISE Faculty

Bansal, Manish, Ph.D. (Texas A&M University, 2014), Assistant Professor.

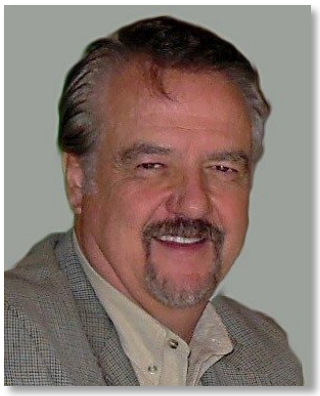
Main Area: Operations Research

Decision making with and without uncertainty in manufacturing (production planning), logistics (facility location), healthcare, geographical informative systems, and telerobotics. Methodologies: Mixed Integer Programming, Computational Geometry, Stochastic and Distributionally Robust Optimization.

Beling, Peter, Ph.D. (UC Berkeley, 1992), Instructor.

Main Area: Manufacturing Engineering

Cybersecurity, Autonomy and Controls/Control Systems, Human Machine Interface, Computational Statistics and Simulation/Statistical Modeling, Machine Learning.



Casali, John G., Ph.D. (Virginia Tech, 1982), John Grado Professor; Director, Auditory Systems Laboratory.

Main Area: Human Factors Engineering and Ergonomics

Human/machine interfacing; vehicular simulation and safety; industrial hearing protection and communications in noise.

Carper, Kathleen, Ph.D. (Virginia Tech, 2020), Collegiate Assistant Professor.

Main Area: Technical Communications. Dissertation entitled ***Systems Thinking and Hybrid Learning: An Exploration of Complexity Theory in an Undergraduate Writing Classroom***. For the past three years, has taught a professional writing course.

Chen, Xi, Ph.D. (Northwestern University, 2012), Assistant Professor.

Main Area: Operations Research

Stochastic modeling and simulation, applied probability, statistical methods, simulation experiment design and simulation optimization.

Dickerson, Deborah E., Ph.D. (Virginia Tech, 2007), Associate Professor

Main Area: Human Factors Engineering and Ergonomics

Prevention through Design; Usability; Design of tools, equipment, processes; Industrial Hygiene; Process Safety Risk-based Facility Maintenance Management.

Cherbaka, Natalie, Ph.D. (Virginia Tech, 2004), Collegiate Associate Professor.

Recent Courses Taught: ISE 5244: Facilities Planning & Material Handling, ISE 4204: Production Planning & Inventory Control, ISE 4005/6: Project Management & Systems Design, ISE 3434: Deterministic Operations Research II, ISE 3214: Facilities Planning & Material Handling, ISE 3004: Industrial Cost Control, ISE 2014: Eng Econ, ISE 2004: Introduction to ISE.

Earnest, Matt, Director for Center for High Performance Manufacturing (CHPM).

Manages client outreach activities, including coordinating consulting projects with ISE Faculty, recruiting external projects for the Senior Design Program and managing workforce development and continuing professional education engagements. Directs the daily internal activities of the center.

Ellis, Kimberly P., Ph.D. (Georgia Institute of Technology, 1996), Associate Professor.

Main Area: Manufacturing Systems Engineering

Design and analysis of manufacturing systems, production planning and control, applied operations research, information and systems design.

Ghaffarzadegan, Navid, Ph.D. (SUNY-Albany, 2011), Assistant Professor, Northern Virginia Graduate Center.

Main Area: Management Systems Engineering

Barriers for social and organizational learning in healthcare, education, and other public services, modeling the pipeline of biomedical workforce development in the U.S., potential impacts of federal organizations (such as NIH) on the medical research enterprise.

Gabbard, Joseph L., Ph.D. (Virginia Tech, 2008), Associate Professor.

Main Area: Human Factors Engineering and Ergonomics

Usability engineering, cognitive human factors, human- computer interaction, user interface, visualization challenges for emerging technologies and domains, perception, cognition, and usability in augmented and virtual reality, empirical methods (experimental design, user-centered design and evaluation, statistical analysis)

Harmon, L. Kenneth, Jr., MBA (Wright State University, 1970), Associate Professor, Northern Virginia Graduate Center.

Management of technology, performance improvement, and systems engineering; quality management; productivity/profitability improvement; total enterprise assessment; strategic planning and employee involvement techniques.

Hildebrand, Robert, Ph.D. (University of California, Davis, 2013), Assistant Professor.

Main Area: Operations Research

Complexity and geometry of optimization problems and applications in operations research. Favorite topics of mine include linear and non-linear integer programming, geometry of numbers, convex geometry, combinatorics, operations research, machine learning, and sub modular optimization.

Hosseinichimeh, Niyousha, Ph.D. (State University of New York at Albany, 2012), Assistant Professor, Northern Virginia Graduate Center.

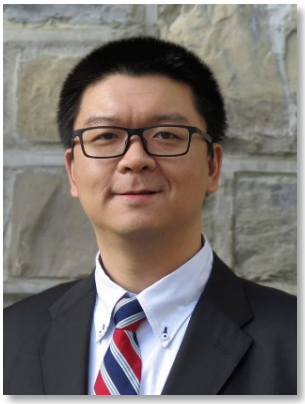
Main Area: Management Systems Engineering

Current research focuses on one of the most complex public health problems, major depressive disorder. I use systems approach to understand the complex feedback mechanisms among different drivers of the disorder. Using system dynamics method to develop simulation models which provide a lab for examining the evolution of the disorder under different conditions and treatments.

Jeon, Myounghoon ("Philart"), Ph.D. (Georgia Tech, 2012), Associate Professor.

Main Area: Human Factors Engineering and Ergonomics

Human-Computer Interaction/ Human-Robot Interaction, Sound and Music Computing, Affective Computing, Assistive Technologies, Automotive User Interfaces, Aesthetic Computing.



Jin, Ran, Ph.D. (Georgia Institute of Technology, 2011), Associate Professor.

Main Area: Manufacturing Systems Engineering

Engineering-driven data fusion for complete system modeling and performance improvements; sensing, modeling, and monitoring of high definition profile data; quality engineering in manufacturing systems and scale- up.

Johnson, Blake N., Ph.D. (Drexel University, 2013), Assistant Professor.

Main Area: Manufacturing Systems Engineering

Teaching interests: Manufacturing processes, Process modelling & control, Materials processing, Mechatronics Research interests: Bio-manufacturing, Additive manufacturing, Neural Engineering, Bio-interfaces, Biosensors, Bioelectronics Materials.

Kim, Sunwook, Ph.D. (Virginia Tech), Research Scientist.

Main Area: Human Factors Engineering and Ergonomics

Postural control and balance assessment, occupational biomechanics, and exposure assessment.

Kannan, Hanumanthrao ("Rao"), Ph.D. (Iowa State University, 2015), Assistant Professor.

Main Area: Management Systems Engineering

Systems Engineering Theory, Preference representation and communication system architecture, system design, satellite system design, data-driven decision making.

Klauer, Charlie, Ph.D. (Virginia Tech, 2005), Associate Professor.

Main Area: Human Factors Engineering and Ergonomics

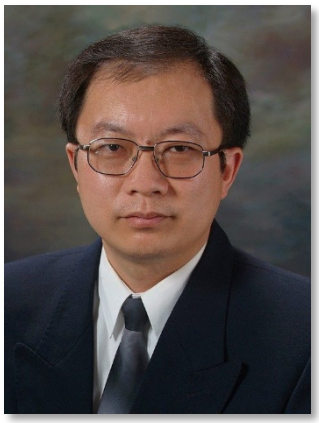
Driver distraction; Novice teen drivers; Driver fatigue.

Kleiner, Brian M., Ph.D. (State University of New York at Buffalo, 1990), Ralph H. Bogle Professor; Director, Macroergonomics and Group Decisions Systems Lab.

Main Area: Human Factors Engineering and Ergonomics

Macroergonomics (work system design); computer augmented work systems; computer supported collaborative work (CSCW); function allocation in automation and job design; human reliability and decision making in quality control.

Kwaramba, Christopher S., Ph.D. (Virginia Tech, 2018), Collegiate Assistant Professor.



Kong, Z. ("James"), Ph.D. (University of Wisconsin-Madison, 2004), Professor.

Main Area: Manufacturing Systems Engineering

Monitoring and control of micro/nano manufacturing operations (chemical mechanical polishing, ultra-precision machining) via MEMS sensor based predictive modeling, compressive sensing based modeling, synthesis, and diagnosis for large and complex manufacturing systems, online structural health monitoring of nonlinear/non-stationary data, data mining and machine learning for health care applications.

L'Afflitto, Andrea, Ph.D. (Georgia Institute of Technology, 2015), Assistant Professor.

Main Area: Manufacturing Engineering.

Autonomous robots and unmanned systems, control theory, lightweight robotics.

Lau, Nathan, Ph.D. (University of Toronto, 2012), Assistant Professor.

Main Area: Human Factors Engineering and Ergonomics

Human factors, developing user interfaces and quantifying human performance in automated, safety-critical systems.

Sol, Lim, Ph.D. (University of Michigan, 2019). Main Area: Human Factors Engineering and Ergonomics.

Combines principles from human factors and ergonomics (HF/E) and data analytics to develop new methods that can be used to improve human performance and well-being in daily lives, occupational settings, and constructed environments for diverse populations.

Lee, Kichol, Ph.D. (Virginia Tech, 2011), Research Assistant Professor.

Main Area: Human Factors Engineering and Ergonomics.

Auditory situation awareness; hearing, hearing projection, and communication; military ergonomics; product design and evaluation.

Madigan, Michael, Ph.D. (Virginia Commonwealth University, 2001), Professor.

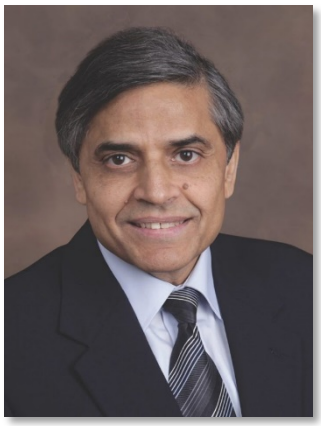
Main Area: Human Factors Engineering and Ergonomics

Occupational biomechanics and ergonomics, work-related musculoskeletal disorders, and in understanding the biomechanical and functional consequences of aging and obesity.

Nussbaum, Maury A., Ph.D. (University of Michigan, 1994), H.G. Prillaman Professor, Assistant Department Head, and Graduate Program Director.

Main Area: Human Factors Engineering and Ergonomics

Models of lumbar back kinetics & kinematics; occupational biomechanics; artificial neural networks; industrial ergonomics and work physiology; occupational safety and health; measurement of human performance and motion; statistics and design of experiments; quality control; statics and solid mechanics.



Sarin, Subhash C., Ph.D. (North Carolina State University, 1978), Paul T. Norton Professor.

Main Area: Operations Research

Production planning and scheduling; applied mathematical programming; design and mathematical analysis of manufacturing systems.

Patrick, Rafael, Ph.D. (North Carolina A&T State University, 2018), Assistant Research Professor.

Main Area: Human Factors Psychology and Systems Engineering

Applied psychophysics, auditory situation awareness, human-machine systems, human information processing, sensation & perception, usability interaction & experience (UI/UX), user-centered design, product design & evaluation.

Savage, Laura, Ph.D. (Virginia Tech, 2019), Collegiate Assistant Professor.

Recent Courses Taught: ISE 2014 Engineering Economy, ISE 2004 Introduction to ISE, ISE 2204 Manufacturing Processes.

Shewchuk, John P., Ph.D. (Purdue University, 1995), Associate Professor, Associate Department Head, and Undergraduate Program Director.

Main Area: Manufacturing Systems Engineering

Modeling and analysis of manufacturing systems; lean manufacturing, production systems, simulation, scheduling in manufacturing.

Taylor, G. Donald, Ph.D. (University of Massachusetts, 1990), Charles O. Gordon Professor, Vice Provost for Learning Systems Innovation and Effectiveness.

Main Area: Management Systems Engineering, Operations Research

Manufacturing, logistics, production systems, simulation and optimization.

Taaffe, Michael R., Ph.D. (Ohio State University, 1982), Associate Professor.

Main Area: Operations Research

Computational aspects of applied probability modeling and analysis, Monte Carlo simulation modeling and analysis methodology, and combined use of discrete-event simulation methods and computational probability models.

Triantis, Konstantinos P., Ph.D. (Columbia University, 1984), John Lawrence Professor, Northern Virginia Graduate Center.

Main Area: Management Systems Engineering

Productivity measurement and analysis; distributed database systems; engineering economics; operations research.

Tsui, Kwok-Leung, Ph.D. (University of Wisconsin-Madison, 1986), Professor. Main Area: Operations Research. Data mining, surveillance in healthcare and public health, prognostics and systems health management, calibration and validation of computer models, process control and monitoring, robust design, Taguchi methods.

Tunc, Sait, Ph.D. (University of Wisconsin-Madison, 2016), Assistant Professor. Main Area: Operations Research. Markov decision processes, stochastic modeling and simulation, queueing theory, information theory, medical decision making, healthcare operations, portfolio investment.

Van Aken, Eileen M., Ph.D. (Virginia Tech, 1995), Professor, Department Head.

Main Area: Management Systems Engineering

Performance measurement and management systems; organizational assessment and improvement; collaborative work systems; and lean work systems.

Xie, Weijun, Ph.D. (Georgia Tech, 2017), Assistant Professor.

Main Area: Operations Research

Data driven distributionally robust optimization as well as stochastic programming and discrete optimization. Also has application interests in transportation/logistics, machine learning, power systems, healthcare and manufacturing.

Yue, Xiaowei, Ph.D. (Georgia Tech, 2018), Assistant Professor.

Main Area: Industrial Analytics

Engineering-driven data mining and analytics for complex systems; surrogate modeling, uncertainty quantification and optimization of Engineering Systems; computational algorithms and information fusion for high-volume/ high-velocity data-intensive systems; predictive modeling, system informatics and automation.

VIII. Appendices

Appendix A: Frequently Asked Questions

If I get a D+, D, or D- grade in a required course, do I have to repeat it?

- Yes, if you receive less than a C- grade in an ISE, STAT, or MATH course that is a prerequisite for an ISE course, you must repeat the course to satisfy the prerequisite requirement. In other cases, you do not have to repeat the course, but you may do so if you are ill-prepared to take subsequent courses which build on the material from the class in which you received a "D" grade.

If I fail a required course, can I take it at another college or university during the summer?

- Yes, with permission from the Academic Dean's office. The grade you receive in the class taken elsewhere must be a "C" or better. Only credits transfer, the grade does not factor into your GPA, nor does it replace the grade you earned at Virginia Tech.

Do I need prior approval to take classes at another institution?

- Courses taken for transfer credit at an institution in the Virginia Community College System (VCCS) do not require preapproval. All other courses taken elsewhere for transfer credit require preapproval from the College of Engineering's Associate Dean for Academic Affairs and the ISE department. The Authorization to Take Courses Elsewhere form can be found at www.eng.vt.edu/forms.

Can I retake a course taken at VT to raise my GPA?

- Yes, if the initial grade was below "C" and the course is retaken at Virginia Tech. If you retake a course in which you earned a "C" or higher, that grade will be changed to a "P" grade, which will not count in your GPA.

Can I participate in May Commencement if I have not completed all required course work to graduate?

- Yes, but you should be able to finish by the end of the second summer term. You must also have a 2.0 or better overall and in major GPA and the Dean's Office approval to participate. You will receive your diploma after you have finished all requirements for graduation satisfactorily.

If a course is not on the approved Pathways for General Education list, can I request that it be counted toward a Concept 2, 3, 6a or 7 requirement?

- Yes. A student may follow the instructions on this web page for requesting course substitutions for Pathways requirements: https://www.pathways.prov.vt.edu/proposal-forms.html. Please see an ISE Academic Advisor with questions.

What is the difference between Academic Warning and Academic Probation?

- Academic Warning: Students earning less than a 2.0 term GPA, but with a cumulative GPA of 2.0 or higher, are placed on academic warning without a notation on the academic transcript. Students are required to meet with an academic advisor to fill out a contract, which is then submitted to the Academic Dean's office.
- Academic Probation is imposed when the cumulative GPA is less than 2.0 and lifted when the cumulative GPA is at least 2.0. Academic performance is reviewed at the end of each regular semester (fall and spring).

The Business Minor application/checksheet lists courses that aren't listed in Appendix D in the UG Student Handbook. Do I have to complete these classes too?

- No. A student who completes the ISE major requirements and takes the courses listed under the Business Minor section in Appendix D has completed requirements for the Business Minor. Ms. Johnson or Ms. Van Curen will substitute the required ISE classes for the additional courses listed on the Business Minor checksheet.

Appendix B. Framework for Advising at Virginia Tech

Advising at Virginia Tech is a collaborative process between student and advisor leading to the exchange of information that encourages the individual student to make responsible academic and career decisions.

Statement of Student Responsibility

The student shares the responsibility for developing an advising partnership with the advisor. Over time, the partnership results in increased responsibility for the student. This is achieved through the student:

- Communicating goals, needs, wants, concerns to the advisor in a respectful and sincere manner;
- Keeping abreast of her/his own academic progress and requirements related to their academic programs;
- Making, keeping, and being prepared for appointments with the advisor;
- Informing the advisor of changes in plans and/or circumstances that might impact academic performance; and
- Bringing concerns regarding quality of advising to the attention of the advisor.

Statement of Advisor Responsibility

The advisor shares the responsibility for developing an advising partnership with the student. This is achieved through the advisor:

- Communicating with students and delivering individualized and accurate information in a professional and sincere manner;

- Being informed of, and providing, accurate information about current academic policies and procedures;
- Keeping appointments and being available for assistance;
- Providing appropriate referrals, contacts, and information;
- Conducting appropriate follow-up with students; and
- Seeking out and taking advantage of opportunities for professional development.

Appendix C. Department and Advising Information Referral

This section is designed to direct students to the appropriate person for given areas of concern.

Ms. Paula Van Curen
Academic/Career Advisor
241 Durham Hall
(540) 231-2364
pcuren@vt.edu

Ms. Maggie Johnson
Academic/Career Advisor
243 Durham Hall
(540) 231-6388
mlecos@vt.edu

- Academic progress toward degree and Degree Audit Report (DARS)
- Career counseling and job opportunities
- Personal counseling (problems or concerns impeding academic progress)
- Program-of-study planning
- Course scheduling and registration information
- Course substitutions and petitions for curriculum committee
- Concerns with courses, Graduate Teaching Assistants (GTAs), or instructors
- Administrative details pertaining to the Cooperative Education and Internship Program
- Transferring into or out of ISE
- General information regarding:
    - graduate study
    - study abroad or other international opportunities
    - university, college, departmental policies, procedures, resources
    - scholarships, fellowships, awards, grants
    - tutors available for selected courses
    - student organizations

Dr. John P. Shewchuk
Undergraduate Program Director and Associate Department Head
259 Durham Hall
(540) 231-6656; shewchuk@vt.edu

- Undergraduate policies
- Career information and advice
- Undergraduate Program Committee petitions
- Concerns with specific courses or faculty

Dr. Maury Nussbaum
Graduate Program Director and Assistant Department Head
521 Whittemore Hall
(540) 231-6053; nussbaum@vt.edu

- Information about graduate study
- Career information and advice
- Graduate program policies and procedures

Ms. Hannah Parks
Graduate Program Advisor
239 Durham Hall
(540) 231-5586; hsswiger@vt.edu

- General information and applications for graduate study in ISE
- Information about departmental and graduate school policies and procedures

Dean's Office, College of Engineering

Dr. Keith Thompson, Associate Dean for Academic Affairs
Ms. Christi Boone, Director of Academic Support Services
212 Hancock Hall
(540) 231-3244; http://www.eng.vt.edu

- Exam time changes and approval
- F.E. exam information and applications
- Late drops, adds, and force-adds
- Readmission
- Resignations
- Transfer course approval and transfer credit evaluation
- Transferring into or out of the College of Engineering
- Overload requests
- See www.eng.vt.edu/forms for COE forms and documents referenced throughout the Handbook.

Other Campus Resources

Career and Professional Development Smith Career Services Bldg. www.career.vt.edu 540-231-6241	**Services for Students with Disabilities** Lavery Hall, Suite 310 www.ssd.vt.edu 540-231-0858
Cook Counseling Center 240 McComas Hall www.ucc.vt.edu 540-231-6657	**Student Success Center** 110 Femoyer Hall www.studentsuccess.vt.edu 540-231-5499
Dean of Students 109 East Eggleston Hall www.dos.vt.edu 540-231-3787	**Undergraduate Honor System** 104 Hillcrest Hall www.honorsystem.vt.edu 540-231-9876
Honors College 137 Hillcrest Hall www.honorscollege.vt.edu 540-231-4591	**University Scholarships and Financial Aid** 200 Student Services Bldg. www.finaid.vt.edu 540-231-5179
Recreational Sports 142 McComas Hall www.recsports.vt.edu 540-231-6856	**Writing Center** Newman Library, 2nd Floor www.composition.english.vt.edu/writing-center 540-231-5436
Schiffert Health Center McComas Hall www.healthcenter.vt.edu 540-231-5313	**Global Education Office** 526 Prices Fork Road, Room 131 www.globaleducation.vt.edu 540-231-5888

Appendix D. Common Minors for ISE Majors

Business Minor

Requirements	Course Counts As
ACIS 2115 Principles of Accounting	Additional course requirement
HTM or MGT 2314 Introduction to International Business	Additional course requirement
MGT 1104 Introduction to Business	Additional course requirement
ECON 2005 Principles of Economics	Pathways Concept 3/CLE Area 3
ECON 2006 Principles of Economics	Pathways Concept 3/CLE Area 3
FIN 3054 Legal Environment of Business (Pre: Junior Standing)	Free Elective
MKTG 3104 Marketing Management (Pre: Econ 2005, Junior Standing)	Additional course requirement
FIN 3104 Intro to Finance (Pre: ACIS 2115)	Additional course requirement
ISE 3004 Industrial Cost Control (Pre: ISE 2014)	ISE Technical Elective; ACIS 2116 substitution
ISE 4004 Theory of Organization	ISE Technical Elective; MGT 3304 substitution

The Business Minor requires 56 total credits of coursework, but 26 credits are taken as part of the ISE curriculum. An additional 15 credits will count as electives or for General Education courses (see table above). Only five courses, ACIS 2115, MKTG 3104, MGT 1104, HTM/MGT 2314 & FIN 3104, need to be added to the ISE degree requirements to complete the minor. Required courses taken by ISE students which satisfy Business Minor requirements are: MATH 1225-1226, MATH 2204; STAT 4706 and ISE 2034, ISE 2404, ISE 3414, ISE 4204.

In summary, courses listed in the table above, with the BSISE requirements, fulfill Business Minor requirements. Business Minor applications are available on the Pamplin College of Business website, in 1046 Pamplin Hall, on the ISE Academic Advising Canvas page, and from an ISE Academic Advisor.

Green Engineering Minor

Requirements	Course Counts As
ENGR 3124: Introduction to Green Engineering	Technical Elective
ENGR 4134: Environmental Life Cycle Assessment	Technical Elective
*ISE 2204: Manufacturing Processes	ISE Technical Elective
*ISE 2214: Manufacturing Processes Lab	Already in ISE Undergraduate Curriculum
*ISE 4304: Global Issues in Industrial Management	ISE Technical Elective and CLE Area 7
*ISE 4644: Occupational Safety and Hazard Control	ISE Technical Elective

*ISE 4654: Principles of Industrial Hygiene	ISE Technical Elective
**PHIL 2304: Global Ethics	Pathways Concept 2/CLE Areas 2 & 7
**FREC 2554: Nature and American Values	Pathways Concept 2 & 3/CLE Area 2
**STS 4304: Contemporary Issues in Humanities, Sciences, and Technology	CLE Area 2

*These courses fulfill the Engineering Electives requirement of the Green Engineering Minor.

** Two courses (6 credits) are needed for the Interdisciplinary Electives requirement of the minor.

In summary, the Green Engineering Minor can be completed with no additional courses above and beyond the ISE curriculum provided careful planning of electives.

Finance Minor

Requirements	Course Counts As
ACIS 2115 Principles of Accounting	Additional course requirement
ACIS 2116 Principles of Accounting	Substituted with ISE 3004 Industrial Cost Control
ECON 2005 Principles of Economics	Pathways Concept 3/CLE Area 3
BIT 2405 Intro to Business Statistics, Analytics and Modeling	Substituted with ISE 2024 Probability Foundations + STAT 4706 Statistics for Engineers
FIN 3134: Financial Analytics	Free Elective
FIN 3144: Investments: Debt, Equity, and Derivatives	Additional course requirement
*FIN 3154: Corporate Finance	Additional course requirement
*Elective Course (3 credits)	Additional course requirement
*Elective Course (3 credits)	Additional course requirement

Appendix E. Honors Program

The Honors College provides a combination of special sections of regular courses, honors seminars and colloquia, tutorials, independent study, and undergraduate research for students pursuing an Honors Diploma. Honors courses enable students of superior academic talent to be challenged to their full intellectual capacity. Honors represents a combination of study within departments and course work cutting across departmental lines. The program is

designed both to broaden and deepen the student's intellectual life. For more information go to: http://www.honorscollege.vt.edu/.

Appendix F. Taking Graduate Courses and Programs

Undergraduates Taking Graduate Courses

- Dual Enrolled: Seniors who are within the last year of graduation, and have a GPA of 3.0 or better, may take graduate level courses to satisfy a graduate degree program as dual registrants. Such work may only be used to satisfy graduate (not undergraduate) degree requirements and with the consent of the graduate advisory committee.
- Seniors: Students, who are within their last two semesters of graduation and have a 3.0 or better GPA, may enroll in 5000-level courses for undergraduate credit within their department when qualified by the course instructor and department head. Taking 5000-level courses outside the department requires Graduate School approval. These courses may not be used for graduate credit if the student is admitted into a graduate program.

Accelerated Undergraduate/Graduate Degree in ISE

- The ISE Department has a strong and diverse master's program that provides opportunities for study in specific areas in industrial and systems engineering, as well as general master's study. For qualified students in the BSISE program at Virginia Tech, the Department offers the opportunity to begin master's degree coursework in the final year of bachelor's studies. Both thesis and non-thesis tracks are available for all students. Students can select one of four general focus areas for their graduate study (human factors engineering and ergonomics, management systems engineering, manufacturing systems engineering, or operations research) or select the general industrial engineering area, which provides more flexibility in tailoring their study.

Admissions Requirements for the UG/G program

- Minimum 3.4 GPA in last 60 hours of bachelor's coursework completed
- Official GRE scores (optional)
- Statement of purpose with career objectives
- CV/Resume
- 3 letters of reference
- Official transcripts of all undergraduate coursework

Applicants must be in the last two semesters of their undergraduate degree and accepted into the program prior to the beginning of the semester in which they enroll in courses to be used in the UG/G program. An advisor will be assigned unless there is already an informal student/faculty relationship. Students may change advisors if they identify a faculty member that is more suited to their interest than that of the initially assigned advisor.

Additional Program Requirements:

- Maximum of 9 hours may double-count toward the undergraduate and graduate degree, none of which can include required undergraduate classes.
- No more than six credits double counted may be at the 4xxx level.
- Conjoint classes, to double count, must be taken at the 5xxx level.
- A grade of "B" or better must be earned in each course to count.
- Courses may not be taken pass-fail if a graded option is available.

Appendix G: BSISE 2021-2022 Checksheet

Please access this link to review the BSISE 2021-2022 Checksheet.

Appendix H: Glossary of Select University Terminology

STUDENT AFFAIRS
VIRGINIA TECH.

Glossary of Select University Terminology

Academic Advisor: The academic advisor is either a member of the teaching faculty or a professional who works with students on their academic progress, course selection, career and major options, and navigating the academic process at Virginia Tech. Students who work closely with their advisors often avoid costly mistakes.

Academic Year: The school year that begins with fall semester classes (August - December) and ends with either the spring semester (January - May) or Summer Sessions I and II (May - August) depending on your enrollment plan.

Add/Drop Period: This is a period of time during which a student may make changes to their schedule without any academic or financial consequences. Add/drop information can be found at: https://registrar.vt.edu/dates-deadlines-accordion/Drop-Add.html. Students will want to check with their academic advisor and Financial Aid before making a major change to their schedule. Students should also be careful about adding a new course after too much time has passed because they may have missed vital material at the beginning of the course.

Attendance Policy: Students are expected to attend class. Most professors announce their attendance policy on the first day of class or state their policy in the class syllabus. If no mention of attendance is made, ask! Many professors count attendance towards class participation grades and students who miss classes may receive lower grades.

Audit: To attend a class without receiving academic credit.

Bachelor's Degree: An undergraduate degree in a specific area of study. Depending on the major, this may be called a Bachelor of Science or Bachelor of Arts degree.

Blue Book: A small notebook with a soft blue cover that some professors require students to use when writing essay exams. Blue books are available at the University Bookstores.

Bursar: The Bursar is responsible for the billing and collection of tuition and related fees, the disbursement of financial aid and scholarship to student accounts, and processing payments, credits, and refunds.

Class Ticket: The original class ticket is the scheduling result of the course request entered by students each semester. The class ticket, available on the Hokie SPA, shows which section of each course the student has been enrolled in for a given semester. The sections are identified by a course request number (CRN). Once the add/drop period opens, students may make changes to their original class ticket.

Clery Act: This law requires any public or private college or university which receives federal financial aid to keep and disclose crime statistics on and near campus. Amendments to the Clery Act passed in 2008 require institutions to include a campus emergency response plan in their reporting. Institutions are required to publish their report each fall and it must contain information for the prior three years.

Co-Curricular or Extracurricular Activities: Activities, programs, and learning experiences that complement the formal academic curriculum. Research shows that students who are involved outside the classroom are more invested, more successful academically, and more satisfied with their college experience. Go to GobblerConnect (https://gobblerconnect.vt.edu/) to find ways to become involved and engaged. Be sure to check out the organization for first generation students by searching for 1st Generation at Virginia Tech.

College: Virginia Tech is a university made up of nine colleges: Agriculture and Life Sciences, Architecture and Urban Studies, Business, Engineering, Liberal Arts and Human Sciences, Natural Resources and Environment, Science, Virginia-Maryland Regional College of Veterinary Medicine, and Virginia Tech Carilion School of Medicine and Research Institute. Each of these colleges houses a number of departments, which in turn offer majors.

Course Number (CRN): The number your college or university uses to classify a course. This number is needed in order to register for a class in Hokie SPA.

CONTINUED

Course Request: This is the process through which students plan and indicate the courses they would like to enroll in for the upcoming semester. Course request for summer and fall classes occurs in the spring semester and during the fall semester for spring classes. Students are often asked, encouraged, or required to meet with their academic advisor before registering for courses to ensure that they understand their course requirements. NOTE: Submitting a course request is not an automatic registration in the courses requested. Course request results from registration week are sent to students via Hokie SPA immediately before the opening of add/drop for the semester. A tutorial to assist students with all the details regarding registration is located at https://registrar.vt.edu/content/dam/registrar_vt_edu/documents/Updates/registration/Registration_Tutorial.pdf.

Credit Hour: A credit hour is equivalent to one hour of class time per week. Courses are usually measured in credit hours, with most being three or four credit hours. Students may refer to how many credit hours or credits they are carrying for a particular semester. A general rule of thumb is that students should be averaging about two hours of work per week outside of class for each credit hour or hour of time spent in class. The number of credit hours a student enrolls in determines whether they are a full-time student or a part-time student.

Curriculum: A set of sequential courses that constitute a major.

Department: A department is an administrative unit at the university that offers classes and majors or minors in a subject or discipline.

Elective: An elective is a class students can take that is not specifically required by a major or minor.

FAFSA: This is the Free Application for Federal Student Aid and is the starting point for almost all financial aid. The FAFSA is available on October 1 prior to the upcoming aid year and must be submitted annually.

FERPA: The Federal Educational Rights and Privacy Act is a federal law that protects the privacy of student educational records. Without written permission from the student, parents or other family members will not have access to academic records - including grades.

Major: The primary area of study and the field a student plans to get a job in after graduation (for example: business, linguistics, anthropology, psychology, etc.).

Minor: A student's secondary area of study. Fewer classes are required for a college minor than for a major. A minor is optional.

Office Hours: Time set aside by professors or teaching assistants for students to visit their office and ask questions or discuss the course they teach. Professors or teaching assistants announce when and where office hours will be every week. This information is also listed on each course syllabus.

Pathways Planner: The pathways planner (https://registrar.vt.edu/graduation-multi-brief/index5.html) is a comprehensive way for students to plan their time at Virginia Tech. While planning courses is a central piece of this process, it is also crucial to begin thinking about long-term goals, extracurricular and co-curricular activities, and other aspects of the college experience. The pathways planner helps students do all of this.

Pre-Requisite: Pre-requisites are courses that students are required to take prior to registering for an upper-level course. Some courses may have no pre-requisites while others may require several introductory level courses before the student may take them.

Reading Day: Reading Day is the day between the last day of classes and the first day of final exams. It is included in the academic calendar to give students time to prepare for exams.

Registrar: The University Registrar is responsible for maintaining the permanent academic record for each student. In addition to maintaining student records, the Registrar's office is also responsible for scheduling of classes, registering students in classes, maintaining class lists, and recording student grades. Remember that FERPA restrictions require a student's written permission to discuss grades or academic progress with anyone else.

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Resident Assistant or RA: Resident assistants are trained student employees responsible for supervising students in the residence halls. They can assist with questions, social issues, roommate issues, or other problems that might arise. They are also responsible for enforcing university policy and rules.

Residential Learning Coordinator: A residential learning coordinator (RLC) is a professional, trained university employee responsible for the management and daily operations of campus residence halls. RLCs are usually college graduates or graduate students who oversee the resident assistants and are responsible for managing the overall well-being of the residence hall. Residential learning coordinators often live in the hall or in a separate adjoining apartment. They are on call 24 hours a day to assist RAs if problems arise.

Satisfactory Academic Progress: Satisfactory Academic Progress (SAP) is defined by the federal government as successful completion of coursework to maintain eligibility for financial aid. The federal government requires that universities establish, publish, and apply standards to monitor progress toward completion. These standards apply both to grade point average (GPA) and to progress toward degree completion. Students must maintain the standard minimum GPA established by their university and must complete the required number of credits for graduation within a maximum number of attempts.

School: A grouping of related departments in a college.

Syllabus: The syllabus is an outline or overview of a course distributed by the instructor at the beginning of the course. The syllabus contains a wealth of information about the course and may include requirements, expectations, textbook information, contact information for the instructor, office hours, objectives, assignments, and a daily schedule of topics. Students are encouraged to read the syllabus carefully and refer to it often throughout the course.

Teaching Assistant: A teaching assistant (TA) is an individual who assists an instructor or professor with teaching duties. TAs are qualified graduate students employed by the university on a temporary contract. They may assist by conducting labs or study groups, grading papers, or preparing lectures.

University Course Catalog and Academic Policies: This catalog is an important tool for understanding the university's course offerings and academic and administrative policies and procedures. The Virginia Tech undergraduate catalog can be found at https://www.undergradcatalog.registrar.vt.edu/.

VT Username: Your VT Username, formerly referred to as your PID, is the first part of your VT email address. It is used for a number of things, including registration, logins, etc.

Withdraw: To remove oneself from a registered course.

Work Study: Federal work study (FWS) is a program that provides part-time employment opportunities to eligible students to help meet expenses related to education. The federal work study portion of the financial aid package is the portion that a student can earn through a part-time job on campus. For information, consult Scholarships and Financial Aid, suite 200 in the Student Services Building.