Graduate Handbook

Department of Modeling, Simulation and Visualization Engineering

Batten College of Engineering and Technology

Old Dominion University
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MSVE Department Graduate Handbook

This handbook has been designed to assist students in their pursuit of a graduate degree from the Department of Modeling, Simulation and Visualization Engineering (MSVE). The contents of this handbook complement the ODU Graduate Catalog by providing additional details about the graduate programs in modeling and simulation. This handbook is revised periodically as policies change at the departmental, college and university levels.

It is the responsibility of the individual student to be familiar with the information contained in the University Graduate Catalog. While every effort has been made to ensure accuracy with respect to official university policy and regulations, the Graduate Catalog will take precedence over any information contained in this handbook. A copy of the Graduate Catalog may be obtained by visiting http://www.odu.edu/catalog
Department Welcome
Welcome to the Modeling and Simulation Graduate Program and the Department of Modeling, Simulation and Visualization Engineering (MSVE) at Old Dominion University.

The MSVE Department offers an undergraduate four-year degree program leading to the Bachelor of Science in Modeling and Simulation Engineering (BS-M&SE). The department also offers programs of graduate study leading to the degrees Master of Engineering, Master of Science, Doctor of Engineering, and Doctor of Philosophy with a major in Modeling and Simulation.

The department's academic programs are coupled with a strong department research program conducted jointly with researchers from the Virginia Modeling, Analysis and Simulation Center (VMASC). Research activities range from investigation of fundamental modeling and simulation methods and technologies to applications of modeling and simulation in the domains of medicine and health care, transportation, education and gaming, science and engineering, homeland security and defense, and business enterprise decision support.

The MSVE Department is located on the first floor of the E. V. Williams Engineering and Computational Sciences Building (ECSB) on the Old Dominion University Norfolk Campus. In addition to the department and faculty offices, this facility also houses several instructional and research laboratories, a virtual reality theater, and a four-walled C.A.V.E. (Cave Automatic Virtual Environment). A significant resource to the department is the Virginia Modeling, Analysis and Simulation Center located adjacent to the University's Tri-Cities Higher Education Center in Suffolk, Virginia. VMASC occupies a two-story 60,000 square foot building designed to support state-of-the-art research in modeling, simulation and visualization. Some of the center's facilities are used in the department's educational programs; in addition, VMASC researchers teach courses and mentor students in the department's academic programs.

This handbook is designed to assist students enrolled in the masters, Ph.D. or D.Eng. programs. The information in the handbook complements the ODU catalog by providing specific details about the four Modeling and Simulation programs (Master of Engineering, Master of Science, Ph.D. and D.Eng.). It also contains information for those pursuing the graduate certificate in modeling and simulation engineering.

Old Dominion University was the first to offer the Ph.D. in modeling and simulation in 2000. We are also the first to establish an academic department and to offer an undergraduate engineering program in modeling and simulation. We welcome you to our program and look forward to working with you in the exciting discipline of modeling and simulation.

Ultimately, your success in the graduate program rests with you. Your active participation in seminars and professional activities, and your contribution to the field via your research, will significantly impact your personal growth and development as well as add to the overall body of knowledge in the discipline.

Sincerely,

Yuzhong Shen, Ph.D.                                  Rick McKenzie, Ph.D.
Graduate Program Director                             Chair
MSVE Department                                        MSVE Department
yshen@odu.edu                                         rdmckenz@odu.edu
MSVE Department Administration

Yuzhong Shen, Ph.D.
Associate Professor and Graduate Program Director
(yshen@odu.edu)

The graduate program director serves as the overall manager of the graduate program. He helps with program marketing and recruitment, overseeing admissions decisions, determines financial aid offers to candidates, establishes program capacity, manages enrollment, advises students, coordinates thesis and dissertation schedules, handles student requests for exemptions and waivers, certifying students for graduation, and coordinates the administration of the diagnostic and candidacy exams.

Trey Mayo
Academic Advisor and Program Manager
(rmayo@odu.edu)

The academic advisor and program manager assists the graduate program director in his duties. He serves as the front-line advisor and student services coordinator for day-to-day interactions with the MSVE department by assisting with program marketing and recruitment, coordinating applications to the program, maintaining student files and forms, advising and orientating new students, handling course registration and scheduling matters, and assisting students with conducting business with other offices throughout the University.

Vonda Norman
Fiscal Technician
(vnorman@odu.edu)

The fiscal technician is responsible for managing the day-to-day finances for the MSVE department. She oversees the payroll process for students receiving graduate assistantships, and also coordinates purchases on behalf of the department. The fiscal technician also helps with assisting students with conducting business with other offices throughout the University.

Jayne Massey
Administrative Assistant
(jmassey@odu.edu)

The administrative assistant is responsible for the front office operations of the MSVE department. She oversees the general needs for day-to-day operations in the front office, and assisting students and guests with conducting business with other offices throughout the University.

Rick McKenzie, Ph.D.
Professor and Department Chair
(rdmckenz@odu.edu)

The chair is an administrative officer of the university, and the chief executive officer of a department. The chair has primary responsibility for the development of quality programs in instruction, research, and professional service within the department.
MSVE Department Directory

Main Contact Information
Department of Modeling, Simulation and Visualization Engineering       Phone: (757) 683-3720
1300 E.V. Williams Engineering and Computational Sciences Building      Fax: (757) 683-3200
4700 Elkhorn Avenue                                                      Web: www.odu.edu/msve
Norfolk, VA 23529

Department Directory
Key to Office Abbreviations
ECSB=Engineering and Computational Sciences Building         KAUF=Kaufman Hall
PHEC=Peninsula Higher Education Center                        VMASC=Virginia Modeling, Analysis and
Simulation Center

Faculty

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<th>Name</th>
<th>E-mail</th>
<th>Office Location</th>
<th>Phone Number</th>
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<tbody>
<tr>
<td>Rick McKenzie, PhD Professor and Chair</td>
<td><a href="mailto:rdmckenz@odu.edu">rdmckenz@odu.edu</a></td>
<td>ECSB 1307</td>
<td>(757) 683-5590</td>
</tr>
<tr>
<td></td>
<td><strong>Research Interests:</strong> Medical modeling and simulation, human behavior representation, and simulation architectures often focusing on aspects of scientific visualization and virtual reality.</td>
<td></td>
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<tr>
<td>Yuzhong Shen, PhD Associate Professor and Graduate Program Director</td>
<td><a href="mailto:yshen@odu.edu">yshen@odu.edu</a></td>
<td>ECSB 1113</td>
<td>(757) 683-6366</td>
</tr>
<tr>
<td></td>
<td><strong>Research Interests:</strong> Game-based learning; visualization and computer graphics; modeling and simulation; and, signal and image processing.</td>
<td></td>
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<tr>
<td>Jim Leathrum, PhD Chief Departmental Advisor</td>
<td><a href="mailto:jleathru@odu.edu">jleathru@odu.edu</a></td>
<td>ECSB 1303</td>
<td>(757) 683-3741</td>
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<tr>
<td></td>
<td><strong>Research Interests:</strong> Parallel and distributed simulation, hardware and software simulation architectures, and applications of discrete event simulation to multi-modal transportation systems.</td>
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<tr>
<td>Michel Audette, PhD Assistant Professor</td>
<td><a href="mailto:maudette@odu.edu">maudette@odu.edu</a></td>
<td>ECSB 1300</td>
<td>(757) 683-6940</td>
</tr>
<tr>
<td></td>
<td><strong>Research Interests:</strong> Medical applications in M&amp;S including imaging and surgery.</td>
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<tr>
<td>Bharat Madan, PhD Professor</td>
<td><a href="mailto:bmadan@odu.edu">bmadan@odu.edu</a></td>
<td>ECSB 1115</td>
<td>(757) 683-6163</td>
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<tr>
<td></td>
<td><strong>Research Interests:</strong> Network and cyber security applications.</td>
<td></td>
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<tr>
<td>Roland R. Mielke, PhD University Professor</td>
<td><a href="mailto:rmielke@odu.edu">rmielke@odu.edu</a></td>
<td>ECSB 1301</td>
<td>(757) 683-4570</td>
</tr>
<tr>
<td></td>
<td><strong>Research Interests:</strong> Systems theory, mathematical modeling, modeling and simulation education, application of continuous simulation in electrical engineering, and applications of discrete event simulation in transportation and enterprise decision support.</td>
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## Faculty with Joint Appointment

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<th>Name</th>
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<tr>
<td>N. Rao Changaty, PhD</td>
<td><a href="mailto:rchangant@odu.edu">rchangant@odu.edu</a></td>
<td>ECSB 2323</td>
<td>(757) 683-3897</td>
</tr>
<tr>
<td>Joint Appointed Professor with Mathematics</td>
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<td></td>
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<tr>
<td>Duc T. Nguyen, PhD</td>
<td><a href="mailto:dnguyen@odu.edu">dnguyen@odu.edu</a></td>
<td>ECSB 1300</td>
<td>(757) 683-3761</td>
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### Research Interests:
- Large deviations, generalized linear models, estimating equations
- Linear/Non-linear constraint optimization numerical algorithms and software; Cluster Parallel MATLAB Computing for large-scale, real time computer simulation; Finite Element Analysis/Solution for PDE general field problems; Efficient algorithms for large-scale Shortest Paths in "transportation networks"; Computational (Engineering) Mechanics; Efficient algorithms/software for solving large-scale "simultaneous linear/non-linear equations", and "general eigen-value" problems

## Adjunct Faculty

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<th>Name</th>
<th>E-mail</th>
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<tr>
<td>Catherine M. Berry, PhD</td>
<td>[<a href="mailto:cmbanks@odu.edu">cmbanks@odu.edu</a>](mailto: <a href="mailto:cmbanks@odu.edu">cmbanks@odu.edu</a>)</td>
<td>VMASC</td>
<td>(757) 686-6224</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Andrew J. Collins, PhD</td>
<td><a href="mailto:ajcollin@odu.edu">ajcollin@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 638-4437</td>
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<td>C. Donald Combs, PhD</td>
<td><a href="mailto:combscd@evms.edu">combscd@evms.edu</a></td>
<td>EVMS</td>
<td>(757) 446-6090</td>
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<tr>
<td>Saikou Y. Diallo, PhD</td>
<td><a href="mailto:sdiallo@odu.edu">sdiallo@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 638-6320</td>
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<tr>
<td>Rafael Diaz, PhD</td>
<td><a href="mailto:rdiaz@odu.edu">rdiaz@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 686-6233</td>
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<tr>
<td>Barry Ezell, PhD</td>
<td><a href="mailto:bezell@odu.edu">bezell@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 638-4439</td>
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### Research Interests:
- Interoperability of simulations; composability of models.
- Operations research, operations management, production and healthcare and public health systems, dependence modeling for stochastic simulation, and simulation-based optimization methods
- All-hazards Risk and Decision Analysis; Operations Research Systems Analysis; Probabilistic Risk Assessment; Capabilities-Based Assessment; Group Facilitation; Insurgency and Terrorism M&S
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<th>Name</th>
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<tr>
<td>Johnny Garcia, PhD</td>
<td><a href="mailto:Johnny.garcia@simisinc.com">Johnny.garcia@simisinc.com</a></td>
<td>Off-Campus</td>
<td>N/A</td>
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<tr>
<td><strong>Research Interests:</strong></td>
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<tr>
<td>Combat Modeling</td>
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<tr>
<td>Jose Padilla, PhD</td>
<td><a href="mailto:jpadilla@odu.edu">jpadilla@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 686-6200</td>
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<tr>
<td><strong>Research Interests:</strong></td>
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<tr>
<td>Human, social, cultural, and behavior modeling; epistemology of modeling and simulation; systems engineering and engineering management.</td>
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<tr>
<td>Yiannis Papelis, PhD</td>
<td><a href="mailto:ypapelis@odu.edu">ypapelis@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 638-6560</td>
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<tr>
<td><strong>Research Interests:</strong></td>
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<tr>
<td>Robotics and autonomous systems; semi-autonomous agents; virtual environments and immersive games; and, discrete event and continuous simulations.</td>
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<tr>
<td>Mike Robinson, PhD</td>
<td><a href="mailto:rmrobin@odu.edu">rmrobin@odu.edu</a></td>
<td>VMASC</td>
<td>(757) 638-7010</td>
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<tr>
<td><strong>Research Interests:</strong></td>
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<tr>
<td>Transportation modeling; evacuation modeling; and, decision making.</td>
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<tr>
<td>Andreas Tolk, PhD</td>
<td><a href="mailto:atolk@odu.edu">atolk@odu.edu</a></td>
<td>Off-Campus</td>
<td>N/A</td>
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<td><strong>Research Interests:</strong></td>
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<tr>
<td>Model-based systems engineering, which includes research on modeling and simulation interoperability challenges, in particular in the context of complex systems and system of systems.</td>
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<tr>
<td>Eric Weisel, PhD</td>
<td><a href="mailto:eweisel@odu.edu">eweisel@odu.edu</a></td>
<td>KAUF 129A</td>
<td>(757) 683-6062</td>
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<tr>
<td><strong>Research Interests:</strong></td>
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<tr>
<td>Operations research; applied statistics, including design of experiments; advanced mathematics; modeling and simulation; and, nuclear engineering.</td>
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**Academic Advisor and Program Manager**

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<th>Name</th>
<th>Email</th>
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**Fiscal Technician**

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<th>Name</th>
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<td>Vonda Norman</td>
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<td>ECSB 1308</td>
<td>(757) 683-3033</td>
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**Administrative Assistant**

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<th>Name</th>
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<tr>
<td>Jayne Massey</td>
<td><a href="mailto:jmassey@odu.edu">jmassey@odu.edu</a></td>
<td>ECSB 1300</td>
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Current as of 7/11/2016
Graduate Degree Programs Overview

The Modeling and Simulation (M&S) Graduate Program at Old Dominion University is administered through the MSVE Department and offers programs of study leading to the degrees Master of Science (MS) in M&S, Master of Engineering (ME) in M&S, Doctor of Engineering (DEng) degree in M&S, and Doctor of Philosophy (PhD) in M&S. The Graduate Program also is supported by research scientists and facilities of the Virginia Modeling, Analysis and Simulation Center (VMASC), Old Dominion University’s internationally recognized research center focused on modeling, simulation and visualization. The ME and DEng programs are directed primarily at part-time students employed full-time in the M&S industry who are seeking a more solid foundation in the discipline and/or preparing for technical leadership positions. The MS and PhD programs are directed primarily at full-time students who are preparing for a career in advanced M&S research and/or academic positions.

The Master’s Program is designed for students having bachelor’s degrees in Engineering, Science or Mathematics, although students from other educational backgrounds may apply with appropriate leveling courses. The curriculum is designed around a set of courses that includes an introduction to M&S, model engineering, analysis for M&S, and M&S visualization. The M&S graduate leveling and core courses ensure a well-rounded treatment of fundamental concepts within the M&S discipline. Most courses are offered in the evenings in a distance learning format – synchronously live through two-way television or video conferencing software and asynchronously via the internet. Students utilize the Blackboard Academic Suite which provides on-line lectures, homework submissions, examinations, discussion boards, wikis, video/audio collaboration sessions and grading. Students having access to reliable high speed internet service can connect and participate in engaging discussion and distributed asynchronous learning with the instructor and other students.

The MS program is available only as a thesis option. In addition to the leveling and core classes, students must complete thesis research and elective courses intended to support the thesis research. The thesis research is designed to provide a research apprenticeship in which the candidate conducts guided research in an area of M&S. While most of the course work is available via televised instruction and asynchronous web delivery, students are expected to be present on campus to work with their supervising faculty during the completion of their thesis research.

The ME program is available only as a non-thesis option and provides a strong foundation addressing the M&S Body of Knowledge. Elective courses allow the student to investigate advanced M&S fundamentals or applications of M&S in various domains. The ME program can be completed entirely on-line; thereby, making it available to an active international simulation industry. All course materials are distributed and collected electronically.

The Ph.D. in Modeling and Simulation program focuses on developing the necessary skills and knowledge to enable the graduate to conduct and evaluate independent, original research in an area of modeling and simulation. The goal of the program is to prepare students for careers in teaching and research at academic institutions, as well as the conduct or leadership of research and development in public and private organizations.
The D. Eng. in Modeling and Simulation program focuses on developing the advanced skills and knowledge to enable the graduate to conduct and lead advanced technical projects in an engineering environment. It affords engineering practitioners the opportunity to achieve advanced graduate education beyond the master’s degree. Industry experience is expected of applicants in this program.

The Graduate Certificate in Modeling and Simulation Engineering is designed for those who meet the admission requirements of the modeling and simulation master’s program and who wish to broaden their knowledge of modeling and simulation related principles and practices without pursuing a graduate degree. This is a 12 credit hour non-degree program offered by the Department of Modeling Simulation and Visualization Engineering. The certificate program is open to both degree-seeking and non-degree-seeking graduate students. Courses taken for the certificate program may later be applied to the master's degree in modeling and simulation.

**Time Limits and Residency Requirements to Complete the Degree**

**Master’s Degrees**
The master’s degree can vary in the amount of time it takes to complete the program. Typically, a year and a half to two years of full-time study are needed to complete the course work and thesis (if applicable). Part-time enrollment can take significantly longer depending on the student’s progress.

Master’s students must complete their degree program within a six-year period.

**Doctoral Degrees**
Doctoral students will vary in the amount of time it takes to complete their program. Typically, one to two years of coursework, followed by one to two years of dissertation research (roughly three and a half to four years total) will be needed to complete the degree as a full-time student. After the Candidacy Examination, all doctoral students are required to register each semester until graduation for at least one credit hour for continuance registration. Part-time enrollment will take significantly longer to complete the degree program.

Doctoral students must complete their degree within eight calendar years from the date of beginning their initial course following admission to the doctoral program.

**Admission to the Graduate Programs**
Students wishing to apply to a graduate degree program in modeling and simulation will need to meet the following requirements outlined below. The application materials are collected by Graduate Admissions and sent to the MSVE Department for evaluation when the application file is complete. Completed applications are reviewed by the Department's Graduate Program Committee that makes the admission decision. Admission decisions are made continuously as applications are received and evaluated. Application decisions are conveyed to applicants through the Office of Graduate Admissions. The admission process, once all application documents have been received, usually requires several weeks. Once an applicant has been accepted to the program, the applicant's point of contact with the university becomes the department's graduate program director. International students apply for our degree program through the Office of International Admissions.
Master’s Degrees
The Master’s Degree in Modeling and Simulation is designed for students having bachelor’s degrees in Engineering, Science or Mathematics, although students from other educational backgrounds may apply with appropriate leveling courses. Prerequisites for admission include: mathematics – two courses in differential and integral calculus and one course in calculus-based probability and statistics; and computer programming – algorithmic problem solving using a high-level object-oriented programming language (C++ or JAVA).

A minimum GPA of 2.80 overall and a minimum GPA of 3.0 in the undergraduate major are required. Students with notable deficiencies may be considered for provisional admission and will be required to complete prerequisite course requirements in addition to the graduate degree requirements. Job experience and training may be considered in evaluating prerequisite requirements.

Applicants should submit the following materials to the Old Dominion University Office of Graduate Admissions (or International Admissions if an international applicant):

1. A completed graduate application form
2. A resume
3. A statement of academic goals and objectives (to be used as a writing sample)
4. Official transcripts from all colleges and universities previously attended sent directly from the institution
5. Recent Graduate Record Examination (GRE) scores from the general test (no specialty tests are required) – For the ME program only, the GRE is waived if the student has an undergraduate GPA of 2.80 or higher
6. Two letters of recommendation from previous university instructors or employment supervisors
7. TOEFL exam for international applicants (see International Admissions website for more details)

During the first year in the Master of Science-M&S program, students are required to select a thesis advisor. This faculty member will provide guidance and oversight for the student’s thesis research. The graduate program director is available to assist students in selecting a thesis advisor.

Doctoral Degrees
Admission to the Ph.D. in M&S program is made in accordance with Old Dominion University and Batten College of Engineering and Technology requirements for doctoral programs as specified in the Graduate Catalog. Specific requirements for the modeling and simulation degree include the following:

1. Completion of a master’s degree in an appropriate and closely related field is expected.
2. A minimum GPA in graduate course work of 3.50 (out of 4.0) is required of most students. A student with a GPA greater than 3.25 and with evidence of a high level of professional capability in the field of modeling and simulation may be eligible for admission to the program upon submission of a petition to the graduate program director.
3. Recent scores (typically, not more than five years old) on the Graduate Record Examination’s (GRE) verbal, quantitative, and analytical writing sections must be submitted by all applicants.
4. Three letters of recommendation (typically at least two of which are from faculty in the highest degree program completed when the application is within five years of graduation from that degree program) are required.
5. The applicant must submit a statement of purpose, goals, and objectives related to the program (to be used as a writing sample).
6. The applicant must also submit a resume.

Admission to the D. Eng. Program with a concentration in modeling and simulation is made in accordance with Old Dominion University and Batten College of Engineering and Technology requirements for doctoral programs as specified in the Graduate Catalog. Specific admission requirements are identical to the admission requirements for the Doctor of Philosophy program in modeling and simulation.

Applicants for the D.Eng. program are expected to have the following foundation knowledge:

2. Computer programming fundamentals including an object-oriented programming language such as C++ or JAVA, algorithmic problem solving, and data structures.
3. Knowledge of the content of the foundation courses required in the Modeling and Simulation Master’s Program.

Applicants should submit the following materials to the Old Dominion University Office of Graduate Admissions (or International Admissions if an international applicant):

1. A completed graduate application form
2. A resume and statement of academic goals and objectives
3. Transcripts from all colleges and universities previously attended
4. Recent Graduate Record Examination (GRE) scores from the verbal, quantitative and analytical writing tests
5. Three letters of recommendation preferably two letters from university instructors from the master’s program and one letter from a work supervisor

Typically, a student pursuing the D.Eng. will have his/her employer support participation in his/her final project.

Financial Aid
Students who enroll in the M&S program full-time are eligible to apply for financial assistance. The most common form of financial assistance for M&S students is the Graduate Research Assistantship (GRA) or Graduate Teaching Assistantship (GTA) and associated tuition waiver. Other special assistantships and fellowships may be available; interested students should discuss their financial aid requirements with the graduate program director at the time of application to the program. Only limited financial assistance is available to ME students.
GRAs may be appointed by the GPD directly or by the supervising faculty and are only available to M.S. or Ph.D. students. GTAs are appointed by the Graduate Program Director and are available to Master of Science and Master of Engineering students. A graduate research assistantship normally consists of 10 to 20 hours per week of assigned duties conducted in support of an ongoing research project. Duties for GRAs may include conducting background research and literature reviews, conducting experiments and analyzing the resulting data, assisting with the conceptual investigation of a research topic and assisting in writing research reports and documentation. Frequently, the student's thesis research is a by-product of this activity. GTA tasks include classroom duties such as grading and/or instructing a lab class. A full-time appointment typically carries a semester stipend along with additional funds during the summer term. Appointments are normally made for one term at a time and generally are renewed if the student’s performance is good, academic progress towards degree completion is satisfactory, and funding sources supporting the assistantship continue to be available.

GA appointments normally are accompanied by a partial tuition waiver for master’s and 100% of tuition for PhD students. The amount of the tuition waiver usually is limited to some specified maximum number of credits each term.

Students interested in GRA or GTA appointments should discuss this opportunity with the graduate program director during the application process. They also are encouraged to explore GRA opportunities with faculty with whom they share research interests. The number of available GRA awards is limited and the awards are made on a competitive basis.

The MSVE Department does not provide financial assistance to part-time students or students who are employed outside the department.

**Responsible Conduct of Research (RCR) Training**

RCR training is required for all graduate students in the Batten College of Engineering and Technology (BCET) effective Fall 2010. Only those students who started their graduate program prior to Fall 2010 are not subject to this requirement. However, all students are encouraged to complete the training. Students must complete the RCR training within 12 credit hours of enrolling in their graduate program.

Directions on how to enroll in and complete this training are available on the MSVE Department’s website. Upon completion of the RCR program, students must provide the certificate from the website confirming that they have completed this training program to the MSVE Academic Services Coordinator.

Please note: Failure to complete this program within the first 12 credit hours will result in a hold placed on the student’s account. This hold will prevent further registration until the student has completed the training.

**Student Advising**

**Program of Study**

Prior to enrollment in any term, a student must submit a plan of study to the department for review and approval. The purpose of the program of study is to ensure that the student organizes a coherent,
individualized plan for the course work and research activities. The program of study is to be consistent with the requirements for the degree as described in the catalog and must be approved by the graduate program director. The successful completion of the program of study, along with the collateral reading, research, practica, etc., will enable the student to demonstrate the high level of professional competence required of all graduate students in their respective fields. Registration blocks will be removed for up to one academic year if a student’s plan is considered appropriate to warrant such a removal. A Plan of Study may change depending upon student performance and research direction selected.

**Master’s Students**

Master of Engineering students are advised by both the Graduate Program Director and the Academic Advisor and Program Manager of the MSVE Department. Master of Science students are advised by their research advisor, who is the primary advisor, along with the Graduate Program Director who monitors the program of study until degree completion. The graduate program director in consultation with the student, will assign a graduate advisor who must be certified for graduate instruction. An annual evaluation may include student’s performance in courses, assistantships (teaching, research), the development and re-evaluation of his/her plan of study, guidance in selecting projects and mentors, preparation and scheduling of qualifying/comprehensive or equivalent exams, time management, and obtaining employment or further education. The advisor’s annual evaluation and recommendation will be shared with the student and the graduate program director.

**Doctoral Students**

The graduate program director, in consultation with the student, will assign a program advisor or guidance committee. The advisor of the guidance committee is the chair of the committee. Among the advisor’s guidance committee’s responsibilities are a review of student’s performance in courses, research, and comprehensive or equivalent exams. This review may result in changes in the student’s plan of study. A diagnostic exam is part of the requirements for a doctoral degree. The results of the diagnostic may impact a student’s future plan of study in the program.
Master of Engineering Degree – 2013-2014 Catalog Year and forward

The Master of Engineering program requires completion of 10 three-credit courses; four core courses and six elective courses are required to complete the degree program.

Core ME Courses (12 hours)

- MSIM 741 – Principles of Visualization – 3 credits
- MSIM 551 – Analysis for Modeling and Simulation – 3 credits
  - or MSIM 751 – Advanced Analysis for Modeling and Simulation – 3 credits
- Advanced Modeling Course (see list below) – 3 credits
- Advanced Simulation Course (see list below) – 3 credits

Advanced Modeling Course Examples (3 credits)

- MSIM 607 Machine Learning I
- MSIM 660 System Architecture and Modeling
- MSIM 702 Methods of Rational Decision Making
- MSIM 730 Simulation Formalisms
- MSIM 772 Modeling Global Events
- MSIM 774 Transportation Network Equilibrium
- Other courses with graduate program director’s approval.

Advanced Simulation Course Examples (3 credits)

- MSIM 711 Finite Element Analysis
- MSIM 722 Cluster Parallel Computing
- MSIM 725 Principles of Combat Modeling and Simulation
- MSIM 742 Visualization II (Synthetic Environments effective Fall 2014)
- MSIM 776 Simulation Modeling in Transportation Networks
- Other courses with graduate program director’s approval.

Students must take six electives, 3 credit hours each, in addition to the core courses. Several electives are available covering topics such as system dynamics, social networks, graduate level statistics, and combat modeling. Other courses must be approved by the graduate program director.

Certain students will need to take pre-requisite leveling courses that will count towards the six elective course requirement. These courses are: MSIM 510; MSIM 541; MSIM 602; and, MSIM 603.

Master of Engineering Online Program

The MSVE department also offers an ME online degree in Modeling and Simulation via the Blackboard Academic Suite which provides students with a richer overall experience that provides online lectures, homework submissions, examinations, discussion boards, wikis, video/audio collaboration sessions and grading. Students having access to reliable high speed internet service can connect and participate in engaging discussion and distributed asynchronous learning with the instructor and other students. All course materials are distributed and collected electronically. Students located in the Hampton Roads region may utilize live courses to fulfill course requirements.
Master of Science Degree – 2012-2013 Catalog Year

Degree Requirements – Master of Science
The Master of Science program requires 12 hours of course credit in modeling and simulation foundation courses. These foundation courses include:

- MSIM 741 – Principles of Visualization – 3 credits
- MSIM 551 – Analysis for Modeling and Simulation – 3 credits
  - or MSIM 751 – Advanced Analysis for Modeling and Simulation – 3 credits
- Advanced Modeling Course (see list below) – 3 credits
- Advanced Simulation Course (see list below) – 3 credits

Advanced Modeling Course Examples (3 credits)

- MSIM 607 Machine Learning I
- MSIM 660 System Architecture and Modeling
- MSIM 702 Methods of Rational Decision Making
- MSIM 730 Simulation Formalisms
- MSIM 772 Modeling Global Events
- MSIM 774 Transportation Network Equilibrium
- Other courses with graduate program director's approval.

Advanced Simulation Course Examples (3 credits)

- MSIM 711 Finite Element Analysis
- MSIM 722 Cluster Parallel Computing
- MSIM 725 Principles of Combat Modeling and Simulation
- MSIM 742 Visualization II (Synthetic Environments effective Fall 2014)
- MSIM 776 Simulation Modeling in Transportation Networks
- Other courses with graduate program director's approval.

The remaining course credits (12 credits) are elective course credits. These courses are selected to achieve one or more program objectives or themes and must be approved by the student's advisor and/or graduate program director. The program concludes with 6 credit hours of thesis credit (MSIM 699) and a thesis defense.

Certain students will need to take pre-requisite leveling courses that will count towards the 12 credit hour elective course requirement. These courses are: MSIM 510; MSIM 541; MSIM 602; and, MSIM 603.

Thesis Requirement – Master of Science
The thesis requirement is satisfied by completing successfully 6 credits of MSIM 699: Thesis Research, certification from the thesis committee that their thesis document is complete and satisfactory, and passing the public presentation and defense of their thesis research. MS-M&S students are encouraged to work with their faculty thesis advisor to produce a publication based upon their thesis research before graduation.
NOTE: The graduate forms referenced in the topics below are available via the web at: http://www.odu.edu/graduatestudies and by clicking on “Forms.” The MSVE Department can also provide you with a copy of these forms upon request.

Forming a Committee
The student and research advisor will form a committee for his/her master’s thesis. The committee usually consists of a minimum of three faculty members with the student’s advisor serving as the chair of the committee. Once the committee has been formed, the student will complete Graduate Form M1 (Appointment of Master’s Thesis Committee). This form must have the signatures of the members of the committee before the form is turned in to the department. Should a member of the committee change, the student must file a new Graduate Form M1.

Composing the Thesis
The Office of Graduate Studies has compiled a *Guide for Preparation of Theses and Dissertations* which is available on its website at: http://www.odu.edu/content/dam/odu/offices/graduate-studies/thesis-dissertation/docs/thesis_dissertation_guide.pdf This guide can help students with general composition and formatting questions concerning their thesis. Other specific formatting guidelines are dictated by the Batten College of Engineering and Technology’s Dean’s Office.

Defending the Thesis
When the student and the research advisor are ready to present his/her work to his/her thesis committee, the student will conduct a public thesis defense. This usually takes place during the final semester of study about two months before graduation. Student will submit a title and abstract to the department announcing the date of the defense at least one week prior. Upon successful defense of the thesis, the committee will make recommendations on revisions needed for the thesis. The student will also have his/her thesis chair complete and sign Graduate Form M2 (Result of Master’s Examination or Requirement). The Oral Thesis Defense Examination column will be marked as “Passed” and signed by the chair of the committee (the student’s advisor) and the committee members before being submitted to the department. The MSVE Department will then forward the form on to the Office of the University Registrar. At this point, the student will begin the revision process on the thesis.

Thesis Revisions and Delivery
The student will complete the revisions recommended by the committee and present it to the GPD of the MSVE Department no later than the dates outlined below. The GPD will review the thesis and make additional edits as deemed fit. The GPD will return those edits to the student for further revision.

After the GPD’s review of the thesis and revisions by the student, the student, via the MSVE Department, will forward the revised thesis to the Office of the Dean in the Batten College of Engineering and Technology no later than the dates outlined below. A professional editor will review the thesis and provide one last round of edits as deemed fit. The student will receive the edited thesis from the Dean’s Office and make the necessary revisions. The student will have his/her Advisor and GPD sign the “Certification of Completeness of Thesis/Dissertation for Final Review by Dept. G.P.D. & Advisor” form available at: http://www.odu.edu/content/dam/odu/col-dept/msve/docs/gpdadvisorapproval.docx. The student will then take the revised copy, the signed approval form, and the signed Graduate Form M3 (Master’s Thesis Acceptance and Processing) to the Dean’s Office for signature. The student will then prepare the final copies for delivery to the Registrar’s Office. Additionally, the student must also secure the original signatures on the title page of each of the final copies.
The student should consult the Office of Graduate Studies’ *Guide to Theses and Dissertations* (specifically pp. 4-6) for information on the type of paper that should be used for the final copies. A minimum of five copies must be submitted to the Registrar’s Office for binding and processing with Graduate Form M3 and Graduate Form M4 (Master’s Thesis Delivery). The MSVE Department is not involved with Graduate Form M4.

**Thesis Submission Deadlines**
Thesis submissions deadlines are posted and updated throughout the academic year on the MSVE Department website at http://www.odu.edu/msve.
Doctor of Engineering Degree (D.Eng.)
The D.Eng. in Modeling and Simulation program focuses on developing the advanced skills and knowledge to enable the graduate to conduct and lead advanced technical projects in an engineering environment. It affords engineering practitioners the opportunity to achieve advanced graduate education beyond the master’s degree.

Degree Requirements – 2013-2014 Catalog Year and forward
The D. Eng. in modeling and simulation is offered in accordance with the D. Eng. degree requirements as specified for the Batten College of Engineering and Technology in this catalog. Specific program of study requirements for the concentration in modeling and simulation include the following.

Completion of a minimum of 18 credits of core professional courses; a minimum of 18 credits of core and elective technical courses; and a minimum of 12 credits of applied doctoral project.

The program of study for the Modeling and Simulation program is developed with the approval of the graduate program director and the student’s advisor. The program shall include a minimum of 18 credits of professional course work and 18 credits of technical core course work beyond the master’s degree distributed as follows:

The required core professional courses are as follows:

- ENGN 604: Project Management
- ENGN 611: Financial Engineering
- ENGN 612: Engineering Corporate Management
- ENGN 811: Methodologies for Advanced Engineering Projects
- ENGN 812: Engineering Leadership
- ENGN 813: Engineering Ethics

The required advanced technical core courses are as follows:

- Advanced Simulation Course from the list below
- MSIM 830: Simulation Foundations
- MSIM 842: Visualization II (Synthetic Environments effective Fall 2014)
- MSIM 851: Advanced Analysis for Modeling and Simulation
- Approved Technical Elective I
- Approved Technical Elective 2
  The approved technical elective courses usually are selected to provide background knowledge required for the applied doctoral project undertaking. At least three-fifths of the doctoral level courses must be at the 800-level.

Advanced Simulation Course Examples (3 credits)

- MSIM 811 Finite Element Analysis
- MSIM 822 Cluster Parallel Computing
- MSIM 825 Principles of Combat Modeling and Simulation
- MSIM 876 Simulation Modeling in Transportation Networks
- Other courses with graduate program director’s approval.
The sequence of milestones to complete the D. Eng. degree is as follows.

- Completion of master's level coursework need as part of the background prerequisites for the program;
- Successful completion of a written Diagnostic Examination covering the program background prerequisites; this exam must be passed before completion of 9 credits of doctoral course work;
- Completion of the doctoral level professional core courses and advanced technical core courses;
- Successful completion of a written and oral Qualifying Examination designed to assess the student's preparation for advanced project work; this exam usually is taken during or just following the semester in which the doctoral course work is completed;
- Successful presentation of a written and oral doctoral project proposal; and,
- Successful presentation and public defense of the completed applied doctoral project; the project should be worthy of publication in a peer-reviewed scholarly journal.

Tracking and oversight of the student's progress in the program is the responsibility of the student's faculty project advisor, the student's guidance committee, and the department's graduate program director.

All degree requirements must be completed within an eight-year time period beginning at the time of first registration in the program.

No more than three credits from course work satisfying foundation knowledge requirements may be included in the program of study for technical elective credit. At least three-fifths of the non-project coursework must be at the 800-level.

Certain students entering the program will be required to complete additional pre-requisite leveling courses. These courses are: MSIM 510; MSIM 541; MSIM 551; MSIM 602; and, MSIM 603.

**Final Project Guidelines – Doctor of Engineering**

The applied doctoral project must successfully demonstrate the student's mastery of the subject area and his/her ability to apply advanced technical knowledge to identify, formulate, and solve novel and complex engineering problems. The project must address a complex but practical problem currently faced by the public, industry, or government, and it must provide a solution that satisfy all the technical, social, political, economic, safety, sustainability and environmental requirements and/or constraints.

The doctoral project committee will have at least three Old Dominion University faculty members certified for graduate instruction; two faculty members must be from the major department. The committee must also have at least one person external to the department with knowledge of the project subject area.
Doctor of Philosophy Degree (Ph.D.)
The Ph.D. in Modeling and Simulation program focuses on developing the necessary skills and knowledge to enable the graduate to conduct and evaluate independent, original research in an area of modeling and simulation. The goal of the program is to prepare students for careers in teaching and research at academic institutions, as well as the conduct or leadership of research and development in public and private organizations.

Degree Requirements – Doctor of Philosophy – 2013-2014 Catalog Year and forward
The Ph.D. in modeling and simulation is offered in accordance with the general requirements for doctoral degrees as specified in the Requirements for Graduate Degrees Section of this Catalog. Specific program of study requirements for the concentration in modeling and simulation include the following:

Completion of a minimum of 24 credits of course work beyond the master’s degree; and a minimum of 24 credits of dissertation research.

The program of study for the Modeling and Simulation program is developed with the approval of the graduate program director and the student’s advisor. The program shall include a minimum of 24 credit hours of course work beyond the master’s degree distributed as follows.

- Advanced Simulation Course from the list below
- MSIM 830: Simulation Foundations
- MSIM 842: Visualization II (Synthetic Environments effective Fall 2014)
- MSIM 851: Advanced Analysis for Modeling and Simulation

Advanced Simulation Course Examples (3 credits)

- MSIM 811 Finite Element Analysis
- MSIM 822 Cluster Parallel Computing
- MSIM 825 Principles of Combat Modeling and Simulation
- MSIM 876 Simulation Modeling in Transportation Networks
- Other courses with graduate program director’s approval.

The 12 credits of approved technical elective courses usually are selected to provide background knowledge required for the dissertation research. These courses must be approved in advance by the student’s research advisor, the guidance committee, and the department's graduate program director. When appropriate, electives courses from other academic colleges and departments may be selected. At least three-fifths of the doctoral level courses must be at the 800-level.

Certain students entering the program will be required to complete additional pre-requisite leveling courses. These courses are: MSIM 510; MSIM 541; MSIM 551; MSIM 602; and, MSIM 603.

The sequence of milestones to complete the Ph.D. in modeling and simulation is as follows.

- Completion of master’s level course work need as part of the background prerequisites for the program;
• Successful completion of a written Diagnostic Examination covering the program background prerequisites; this exam must be passed before completion of 9 credits of doctoral course work;
• Completion of the doctoral level technical core courses and approved elective courses;
• Successful completion of a written and oral Qualifying Examination designed to assess the student's preparation for advanced research work; this exam usually is taken during or just following the semester in which the doctoral course work is completed;
• Successful presentation of a written and oral dissertation proposal; and,
• Successful presentation and public defense of the completed dissertation research; the research work should be worthy of publication in a peer-reviewed scholarly journal.

Tracking and oversight of the student's progress in the program is the responsibility of the student's faculty research advisor, the student's guidance committee, and the department's graduate program director.

All degree requirements must be completed within an eight year time period beginning at the time of first registration in the program.

Definition of ABD and a Candidate – Doctor of Philosophy
A student is defined as a “candidate” by the Batten College of Engineering and Technology when he/she has:

1. Successfully completed all coursework;
2. Passed the candidacy exam (student is now “ABD”); and
3. Passed the dissertation proposal.

Dissertation Requirements – Doctor of Philosophy
The dissertation requirement is satisfied by completing successfully a minimum of 24 credits of MSIM 899: Dissertation Research, certification from the dissertation committee that their thesis document is complete and satisfactory, and passing the public presentation and defense of their thesis research. PhD-M&S students are encouraged to work with their faculty thesis advisor to produce a publication based upon their thesis research.

NOTE: The graduate forms referenced in the topics below are available via the web at: [http://www.odu.edu/graduatestudies](http://www.odu.edu/graduatestudies) and by clicking on “Forms.” The MSVE Department can also provide you with a copy of these forms upon request.

Forming a Committee
The student will form a committee for his/her dissertation at the beginning of the dissertation research process. The committee usually consists of four faculty members with the student’s advisor serving as the chair of the committee. Once the committee has been formed, the student will complete Graduate Form D2 (Appointment of Doctoral Dissertation Committee). This form must have the signatures of the student’s advisor (the chair of the committee), the members of the committee, the student’s own signature, the signature of the MSVE graduate program director, the MSVE department chair, and the BCET Dean’s Office. The form is turned in to the department and retained in the student’s file. Should a
member of the committee change, the student must submit a new Graduate Form D2 with all of the aforementioned signatures, and the signature of the MSVE department chair, to the department.

External committee members (i.e., individuals who are not necessarily affiliated with Old Dominion University) are permitted to serve on a committee provided that their credentials have been reviewed and approved by the MSVE Department. An external committee member may not serve as the chair of the dissertation committee.

**Dissertation Proposal**

Once the Dissertation Committee has been formed and the Candidacy Examination passed, the student must present a proposal for a dissertation to the Dissertation Committee Chairman (the Advisor). This formal dissertation proposal shall include an outline of the proposed research subject, methods to be employed, and research objectives. The student must defend this proposal to and obtain approval from the Dissertation Committee and submit it through the MSVE GPD on Graduate Form D3. The result will be recorded on the Dissertation Prospectus line and will be forwarded by the MSVE Department to the Registrar’s Office. A copy will be retained in the student’s department file.

**Composing the Dissertation**

The Office of Graduate Studies has compiled a *Guide for Preparation of Theses and Dissertations* which is available on its website at: [http://www.odu.edu/content/dam/odu/offices/graduate-studies/thesis-dissertation/docs/thesis_dissertation_guide.pdf](http://www.odu.edu/content/dam/odu/offices/graduate-studies/thesis-dissertation/docs/thesis_dissertation_guide.pdf) This guide can help students with general composition and formatting questions concerning their dissertation.

**Defending the Dissertation**

When the student and the research advisor are ready to present his/her work to his/her dissertation committee, the student will conduct a public dissertation defense. This usually takes place during the final semester of study usually no later than two months before graduation. Upon successful defense of the dissertation, the committee will make recommendations on revisions needed for the dissertation. The student will also have his/her chair complete and sign Graduate Form D3 (Result of Doctoral Examination or Requirement). The Oral Dissertation Defense Examination column will be marked as “Passed” and signed by the chair of the committee (the student’s advisor). The rest of the committee will also sign Graduate Form D3, and present it to the GPD for his/her signature. The MSVE Department will then forward the form on to the Office of the University Registrar. At this point, the student will begin the revision process on the dissertation.

**Dissertation Revisions and Delivery**

The student will complete the revisions recommended by the committee and present it to the GPD of the MSVE Department no later than the dates outlined below. The GPD will review the dissertation and make additional edits as deemed fit. The GPD will return those edits to the student for further revision.

After the GPD’s review of the dissertation and revisions by the student, the student, via the MSVE Department, will forward the dissertation to the Office of the Dean in the Batten College of Engineering and Technology no later than the dates outlined below. A professional editor will review the dissertation and provide one last round of edits as deemed fit. The student will receive the dissertation
from the Dean’s Office and make the necessary revisions. The student will have his/her Advisor and GPD sign the “Certification of Completeness of Thesis/Dissertation for Final Review by Dept. G.P.D. & Advisor” form available at: http://www.odu.edu/content/dam/odu/col-dept/msve/docs/gpdadvisorapproval.docx. The student will then take the revised copy, the signed approval form, and the signed Graduate Form D5 (Doctoral Dissertation Acceptance and Processing) to the Dean’s Office for signature. The student will then prepare the final copies for delivery to the Registrar’s Office. Additionally, the student must also secure the original signatures on the title page of each of the final copies.

The student should consult the Office of Graduate Studies’ Guide to Theses and Dissertations (specifically pp. 4-6) for information on the type of paper that should be used for the final copies. A minimum of five copies must be submitted to the Registrar’s Office for binding and processing with Graduate Form D5 and Graduate Form D6 (Doctoral Dissertation Delivery). The MSVE Department is not involved with Graduate Form D6.

**Dissertation Submission Deadlines**

Dissertation submission deadlines are posted and updated throughout the academic year on the MSVE Department website at: http://www.odu.edu/msve

**Enrollment during the Dissertation Process**

Ph.D. students are required to be registered for at least one dissertation credit during the entire time it takes to complete and submit your dissertation.
Examinations

Diagnostic Exam
Students are expected to successfully complete and pass a written Diagnostic Examination covering the program background prerequisites before the completion of 9 credits of doctoral course work.

The exam will be administered by the Graduate Program Committee two times a year at scheduled dates and times. These exams will be conducted during October and March. No exams will be offered at any other times.

The M&S faculty will grade the examination and the Graduate Program Committee will evaluate the results of the examination. Based on the results of the examination, specific courses might be required to address inadequacies or weaknesses.

The exam has seven questions. Students select and answer six (of the seven) questions to complete the exam. The questions will come from these technical groups:

- Mathematics—differential / integral calculus; ordinary differential equations; and linear algebra
- Calculus-based probability and statistics
- Discrete Event Simulation
- Modeling
- Computer Science (data structures, object oriented computer language, C++ and/or JAVA)
- Analysis
- Visualization

The exam is three hours in duration and it is closed book / closed notes and calculators are not permitted.

The results of the examination will be reported using Graduate Form D3 (Result of Doctoral Examination or Requirement). In the event the student does not pass this examination it may be repeated once at the next scheduled offering. Failure to pass the examination on the second trial will result in termination from the D.Eng. program.

D. Eng. Qualifying Exam
Before or during the last semester of coursework the student must arrange to take the D.Eng. Candidacy Examination through his / her Advisor. In order to be eligible to take this examination the student must have achieved a cumulative GPA of at least 3.00. This examination may be taken in the final semester of coursework and no later than three months after completion of all course work contained in the student's Formal Study Plan.

The Candidacy Examination consists of a written and an oral section and the student must pass both sections. All parts of the Candidacy Examination are normally completed within two weeks. The written examination will be given first.
The written examination typically consists of a review of key papers and/or issues in the student's general research area. The research advisor will provide these papers. The student should be able to explain how these papers (and any other papers entered into the written response) are applicable to his / her research. Upon completion of the written portion, the student will submit his / her written portion directly to the Final Project Director, who, in turn, will share the student’s response with the members of the Guidance Committee.

The oral examination consists of a student presentation of his / her written examination to the Guidance Committee, defending the understanding of the work done and answering any questions in the general subject area that the committee feels necessary to evaluate the student's abilities in performing independent research. Typically, the student presents his / her responses to the papers for 30-40 minutes, followed by a discussion period.

The Guidance Committee will decide whether the student passes the candidacy exam or not. The student has only two opportunities to pass the written portion of the examination. A failed written part must be repeated within six months. The oral part is taken only after passing the written part. The student also has two opportunities to pass the oral section, but a failed oral portion must be retaken within two months of the first attempt. If the written part is passed on the first try, it need not be repeated in the event of failing the oral part. No part of the Candidacy Examination can be passed conditionally.

The successful completion of both the written and oral parts of this examination is required before progress toward a D. Eng. degree can be continued. The Guidance Committee must report the outcome of the Candidacy Examination on Graduate Form D3. The student must submit this form with the advisor and committee signatures.

Ph.D. Candidacy Examination
Before or during the last semester of coursework the student must arrange to take the Ph.D. Candidacy Examination through his / her Advisor. In order to be eligible to take this examination the student must have achieved a GPA of at least 3.00 on all course work completed. This examination must be taken no later than three months after completion of all course work contained in the student’s Plan of Study.

The Candidacy Examination consists of a written and an oral section and the student must pass both sections. All parts of the Candidacy Examination are normally completed within two weeks. The written examination will be given first.

The written examination typically consists of a review of key papers and/or issues in the student's general research area. The Dissertation Director will provide these papers. The student should be able to explain how these papers (and any other papers entered into the written response) are applicable to his / her research. Upon completion of the written portion, the student will submit his / her essay directly to the Dissertation Director, who, in turn, will share the student’s response with the members of the Dissertation Committee.

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The oral examination consists of a student presentation of his / her written examination to the Dissertation Committee, defending the understanding of the work done and answering any questions in the general subject area that the committee feels necessary to evaluate the student's abilities in performing independent research. Typically, the student presents his / her responses to the papers for 30-40 minutes, followed by a discussion period.

Two or more negative votes from the Dissertation Committee on either part constitute a failure for that section of the candidacy examination. The student has only two opportunities to pass the written portion of the examination. A failed written part must be retaken after six months but within one calendar year. The oral part is taken only after passing the written part. The student also has two opportunities to pass the oral section, but a failed oral portion must be retaken within one month of the first attempt. If the written part is passed on the first try, it need not be repeated in the event of failing the oral part. No part of the Candidacy Examination can be passed conditionally.

The successful completion of both the written and oral parts of this examination is required before progress toward a Ph.D. degree can be continued. The Dissertation Committee must report the outcome of the Candidacy Examination on Graduate Form D3. This report will go through the GPD and the Office of the University Registrar.
Applying for Graduation – Master of Engineering, Master of Science, Doctor of Engineering, and Doctor of Philosophy Degrees

Students who plan to graduate with a graduate degree in Modeling and Simulation will need to apply for graduation with the Office of the University Registrar. An application for graduation will need to be filed by the appropriate deadlines listed below (in general, six months prior to graduation):

<table>
<thead>
<tr>
<th>Intended Semester of Graduation</th>
<th>Application Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>May graduation</td>
<td>November 30th</td>
</tr>
<tr>
<td>August graduation</td>
<td>February 28th</td>
</tr>
<tr>
<td>December graduation</td>
<td>June 30th</td>
</tr>
</tbody>
</table>

The application is available online at: [www.odu.edu/registrar](http://www.odu.edu/registrar)

Applications are entered online as quickly as possible, but this can take up to four weeks during peak times. Please check your graduation status in LEO Online (Student Records-->Graduation Status Information) and contact the Registrar’s Office if you don’t see your status changed to "Pending" a month after the deadline date. All students expected to graduate are coded "Pending." (Once the degree is certified, the degree status is changed to “Awarded,” usually within 4 weeks after the official Commencement date.)

Participating in Commencement – Master of Engineering, Master of Science, Doctor of Engineering, and Doctor of Philosophy Degrees

Students who wish to participate in the University’s Commencement Ceremony will also need to fill out a Commencement Participation Form. This form is found at the Commencement Central website at: [http://www.odu.edu/commencement](http://www.odu.edu/commencement). The Commencement Participation Form must be filled out by the appropriate deadline listed on the Commencement website. Attention to this form is important as it will secure guest tickets and allow a student to participate in the University’s May or December Commencement Ceremonies. There is no August ceremony, however, August candidates may participate in either the May or December ceremony depending on their timeline to degree completion.

NOTE: Participation in the University’s Commencement Ceremony does not confirm that a degree has been conferred.
Graduate Certificate in Modeling and Simulation Engineering
The Graduate Certificate in Modeling and Simulation Engineering is designed for those who meet the admissions requirements of the master’s program who wish to broaden their knowledge of modeling and simulation related principles and practices without pursuing a graduate degree. This is a 12 credit hour non-degree program offered by the Department of Modeling Simulation and Visualization Engineering. The proposed graduate certificate program is open to both degree-seeking and non-degree-seeking graduate students. Courses taken for the certificate program may later be applied to the master’s degree in modeling and simulation.

Admission Requirements
Students should have an undergraduate degree from a regionally accredited institution and should have a mathematical background through Calculus, along with calculus based probability and statistics. Students should submit a graduate non-degree application through the Office of Admissions (unless they are currently degree seeking at ODU in which case only the department application and other credentials are needed), and then submit a departmental application with copies of unofficial transcripts from all previous coursework to the MSVE Department. Departmental applications are available online on the MSVE Department’s website – http://www.odu.edu/msve - and should be sent to:

Academic Advisor and Program Manager
MSVE Department
Old Dominion University
1300 Engineering and Computational Sciences Building
Norfolk, VA 23529

Certificate Requirements
The Graduate Certificate in Modeling and Simulation Engineering requires the completion of 12 credit hours at the graduate level. The course requirements are:
Three courses (9 hours) from the following:

- MSIM 601 – Introduction to Modeling and Simulation
- MSIM 602 – Simulation Fundamentals
- MSIM 603 – Simulation Design
- MSIM 510 – Model Engineering
- MSIM 541 – Computer Graphics and Visualization
- MSIM 551 – Analysis for Modeling and Simulation

MSIM ELE – MSIM Elective*

* A graduate level elective approved by the graduate program director. This elective may be an MSIM course or from another discipline outside of modeling and simulation. It is possible that this course may be outside the discipline of modeling and simulation, but approved because it complements the field of M&S and the student’s interests.
Completion of the Graduate Certificate
When students pursuing the Graduate Certificate in Modeling and Simulation Engineering have completed all of the requirements for the certificate, the MSVE Department will notify the Registrar’s Office of the completion of the certificate. The Registrar’s Office will then award the certificate and send it to the student via mail. The student does not need to formally apply for graduation for the certificate. Additionally, the student does not participate in the University’s commencement ceremonies when pursuing the certificate.