Department of Engineering Management and Systems Engineering

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Andres Sousa-Poza, Graduate Program Director, Doctoral Programs

General Description

The Engineering Management and Systems Engineering (EMSE) Department at Old Dominion University is dedicated to excellence in teaching and research in critical areas related to the management of complex, technology-intensive organizations and systems. Our award-winning programs are directed at working professionals and traditional full-time students with technical undergraduate degrees. The degrees are available on campus in a traditional classroom setting as well as online. Courses are scheduled in the evenings and they could be attended live on the Norfolk main campus, from the ODU satellite campuses and via distance learning.

The EMSE Department is the recipient of the American Society of Engineering Management’s 1995, 2000, 2002, 2004, 2005, 2007, 2010, and 2014 awards for Excellence in Leadership in Graduate Programs. The Master of Engineering Management (MEM) program at Old Dominion University is also one of the first three programs certified by the American Society for Engineering Management. The program was initially certified in 2003 and has been re-certified in 2007 and 2012.

List of Degrees and Certificates

• Master of Engineering Management
• Master of Science, Engineering – Engineering Management
• Master of Engineering – Systems Engineering
• Doctor of Philosophy, Engineering – Engineering Management and Systems Engineering
• Doctor of Engineering – Engineering Management and Systems Engineering
• Advanced Engineering Certificate in
  • Engineering Management
  • Cyber Systems Security
  • Energy Systems
• Graduate Certificate in
  • Project Management
  • Homeland Security
  • Entrepreneurship and Innovation in Engineering

Master of Engineering Management

Degree Description

The Master of Engineering Management (MEM) provides a foundation and the necessary skills, knowledge, and abilities required to design and manage the technology-based, project-driven enterprise. Fundamentally, the engineering management program focuses on problems, design, and management of projects and complex operations. The program is grounded in solid principles of systems science while exploiting the tools of management science and project management. The Master of Engineering Management emphasizes the concept of technological leadership. Technological leadership’s vision looks to the creation of new products, processes, and services which, in turn, will create new markets or enable domination of existing ones. Core course work in the Master of Engineering Management program concentrate on developing the knowledge and skills required by graduates to provide the project and program leadership and management necessary to develop and manage technology intensive organizational settings. The Department of Engineering Management and Systems Engineering at Old Dominion University is the recipient of the American Society of Engineering Management’s 1995, 2000, 2002, 2004, 2005, 2007, 2010 and 2014 awards for Excellence in Leadership in Graduate Programs. The Master of Engineering Management (MEM) program at Old Dominion University is also one of the first three programs certified by the American Society for Engineering Management. The program was initially certified in 2003 and has been re-certified in 2007 and 2012.

The degree is directed at working professionals and traditional full-time students with technical undergraduate degrees. The degree is available on campus in a live setting as well as online. Courses are scheduled in the evenings and they could be attended from off-campus sites, including the Peninsula Higher Education Center in Hampton and the Virginia Beach Higher Education Center. The complete M.E.M. program is available through Old Dominion University’s distance learning program and through the Commonwealth Graduate Engineering Program. Both programs transmit courses to educational, industrial, and government locations throughout Virginia and via web-based platform.

Admission Requirements

Admission to the master of Engineering Management program is in accordance with Old Dominion University and Frank Batten College of Engineering and Technology requirements for master’s programs as specified in this catalog.

Admission requirements specific to this program include the following:

1. Undergraduate degree from an ABET-accredited program in engineering or engineering technology or from an accredited program in applied science with a GPA of 3.00 (out of 4.00) or better.
2. GRE Exam (GRE requirement may be waived at GPD discretion based on academic preparation and related work experience).
3. Students with an undergraduate GPA between 2.70 and 3.00 on the required undergraduate degrees may be admitted provisionally based on their academic preparation and GRE scores. GRE scores should be in the 60th percentile or higher.
4. A minimum score of 550 on university-level TOEFL scores for all international students when English is not their first language.

Degree Requirements

General Requirements

The master of Engineering Management is in accordance with the general requirements for master’s degrees as specified in this Catalog. All students must have mathematics course work through the level of integral calculus, matrix algebra or differential equations, and ENMA 520 or equivalent calculus-based probability and statistics. Students who have not had a calculus-based probability and statistics course will be required to include ENMA 520, or equivalent, as part of their plan of study. All students are expected to communicate effectively both orally and in written documents, that are correct in grammar, style, and mechanics. Those deemed insufficient may be required to take remedial speech or writing courses. The engineering management curriculum has been designed around six core areas that develop the skill sets identified earlier and prepare graduates to assume positions within technology-based enterprises.

Curricular Requirements

All students admitted to the MEM program must earn a grade of “C” or better in all courses required for the degree and in all Engineering Management prerequisite courses. A student may be removed from the program if he/she receives 2 (two) grades of “C” or lower. The master of engineering management requires 31 credit hours of course work (10 three-credit courses plus one one-credit caspstone course). The program requires 6 core courses and four electives. At least three-fifths (3/5) of course work must be at the 600 or 700 level for the M.S. degrees. The electives may be selected from the ENMA courses (and/or from courses in other departments with the approval of the Graduate Program Director). All electives must
be at the graduate level. The following table delineates the specific course requirements for this program.

### M.E.M. Courses:

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Core</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENMA 600</td>
<td>Cost Estimating and Financial Analysis</td>
<td>15</td>
</tr>
<tr>
<td>ENMA 601</td>
<td>Analysis of Organizational Systems</td>
<td>15</td>
</tr>
<tr>
<td>ENMA 603</td>
<td>Operations Research</td>
<td>15</td>
</tr>
<tr>
<td>ENMA 604</td>
<td>Project Management</td>
<td>15</td>
</tr>
<tr>
<td>ENMA 614</td>
<td>Quality Systems Design</td>
<td>15</td>
</tr>
</tbody>
</table>

Select one of the following: 3

| ENMA 640 | Integrated Systems Engineering I | 12 |
| ENMA 715 | Systems Analysis | 12 |
| ENMA 724 | Risk Analysis | 12 |

Electives ** 12

Capstone 1

ENMA 605 Program Capstone (required final semester) 31

* Students must select twelve credit hours of elective coursework for the M.E.M. The electives may be selected from the available ENMA courses (and/or from courses in other departments with the approval of the Graduate Program Director). All electives must be at the graduate level. Exceptions to these requirements must be approved by the Graduate Program Director.

### Requirements for Graduation

In addition to completing all the required courses, all graduate students must complete the Collaborative Institutional Training Initiative (CITI) basic course. The basic course includes the following modules: Misconduct (falsification, fabrication, and plagiarism); Data acquisition, management, sharing and ownership; Mentor/trainee relationships; Publication practice and responsible authorship; Peer review; Conflicts of interest; and Collaborative research. The RCR modules must be completed prior to completion of 12 semester hours. Students who fail to complete this requirement will have a registration hold placed on their records.

### Master of Science, Engineering – Engineering Management

#### Degree Description

The Master of Science in Engineering Management (MSEM) provides a foundation and the necessary skills, knowledge, and abilities required to design and manage the technology-based, project-driven enterprise. The Master of Science (M.S.) program requires thesis research, and the student is expected to identify an advisor and work with him/her starting from the first semester. Fundamentally, the engineering management program focuses on problems, design, and management of projects and complex operations. The program is grounded in solid principles of systems science while exploiting the tools of management science and project management. The course work is designed to produce graduates capable of addressing issues related to the design, operation, analysis, and transformation of complex problems. Core course work in the Master of Engineering Management program concentrate on developing the knowledge and skills required by graduates to provide the project and program leadership and management necessary for an organization to develop and manage technologies.

The degree is directed at working professionals and traditional full-time students. The degree is available on campus in a live setting as well as online. Courses are scheduled in the evenings and they could be attended from off-campus sites, including the Peninsula Higher Education Center in Hampton and the Virginia Beach Higher Education Center. The complete M.E.M. program is available through Old Dominion University’s distance learning program and through the Commonwealth Graduate Engineering Program. Both programs transmit courses to educational, industrial, and government locations throughout Virginia and via web-based platform.

#### Admission Requirements

Admission to the Master of Science in Engineering Management program is in accordance with Old Dominion University and Frank Batten College of Engineering and Technology requirements for master’s programs as specified in this catalog.

Admission requirements specific to this program include the following:

1. Undergraduate degree from an ABET-accredited program in engineering or engineering technology or from an accredited program in applied science with a GPA of 3.00 (out of 4.00) or better.
2. GRE Exam (GRE requirement may be waived at GPD discretion based on academic preparation and related work experience).
3. Students with an undergraduate GPA between 2.70 and 3.00 on the required undergraduate degrees may be admitted provisionally based on their academic preparation and GRE scores. GRE score should be in the 60th percentile or higher.
4. A minimum score of 550 on university-level TOEFL scores for all international students when English is not their first language.

#### Degree Requirements

##### General Requirements

The Master of Science in Engineering Management (MSEM) is in accordance with the general requirements for master’s degrees as specified in this Catalog. Students are required to identify an advisor as part of the program requirements. All students are expected to communicate effectively both orally and in written documents, that are correct in grammar, style, and mechanics. Those deemed insufficient may be required to take remedial speech or writing courses. All students must have mathematics course work through the level of integral calculus, matrix algebra or differential equations, and ENMA 520 or equivalent calculus-based probability and statistics. Students who have not had a calculus-based probability and statistics course will be required to include ENMA 520, or equivalent, as part of their plan of study.

##### Curricular Requirements

All students admitted to Engineering program must earn a grade of “C” or better in all courses required for the degree and in all Engineering Management prerequisite courses. A student may be removed from the program if he/she receives 2 (two) grades of “C” or lower. The master of engineering management requires 30 credit hours of course work (8 three-credit courses plus 2 three-credit thesis research courses). At least three-fifths (3/5) of course work must be at the 600 or 700 level for the M.S. degrees.

The following table delineates the specific course requirements for this program.

### M.S. Courses:

<table>
<thead>
<tr>
<th>Prerequisite</th>
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<th>18</th>
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<td>Quality Systems Design</td>
<td>18</td>
</tr>
<tr>
<td>ENMA 715</td>
<td>Systems Analysis</td>
<td>18</td>
</tr>
<tr>
<td>ENMA 721</td>
<td>Foundations of Research</td>
<td>18</td>
</tr>
</tbody>
</table>

Electives ** 6

Thesis Research *** 6

Total Hours 30

* All students must have mathematics course work through the level of integral calculus; matrix algebra or differential equations; and a course in calculus-based statistics (ENMA 420/ENMA 520 or equivalent).
Admission requirements specific to this program include the following:

1. Undergraduate degree from an ABET-accredited program in engineering or engineering technology or from an accredited program in applied science with a GPA of 3.00 (out of 4.00) or better.
2. GRE Exam (GRE requirement may be waived at GPD discretion based on academic preparation and related work experience)
3. Students with an undergraduate GPA between 2.70 and 3.00 on the required undergraduate degrees may be admitted provisionally based on their academic preparation and GRE scores. GRE score should be in the 60th percentile or higher.
4. A minimum score of 550 on university-level TOEFL scores for all international students when English is not their first language.

** ENMA 711 or ENMA 721 may be an elective required by the thesis advisor. At least three-fifths (3/5) of course work must be at the 600 or 700 level for the M.E.M. and M.S. degrees.

Students must select twelve credit hours of elective coursework for the M.E.M. and six credit hours of elective course work for the M.S. degree. The electives may be selected from the ENMA courses (and/or from courses in other departments with the approval of the Graduate Program Director). All electives must be at the graduate level.

*** M.S. students take six credits of thesis research, which must be spread over a minimum of two semesters.

Exceptions to these requirements must be approved by the Graduate Program Director.

Requirements for Graduation

In addition to completing all the required courses, all graduate students must complete the Collaborative Institutional Training Initiative (CITI) basic course. The basic course includes the following modules: Misconduct (falsification, fabrication, and plagiarism); Data acquisition, management, sharing and ownership; Mentor/trainee relationships; Publication practice and responsible authorship; Peer review; Conflicts of interest; and Collaborative research. The RCR modules must be completed prior to completion of 12 semester hours. Students who fail to complete this requirement will have a registration hold placed on their records. Master of Science students must also pass a final examination front of a thesis committee approved by the graduate program director.

Master of Engineering – Systems Engineering

Degree Description

The Master of Engineering – Systems Engineering provides an interdisciplinary approach to support the realization, deployment, and maintenance of successful system solutions to complex problems. ODU's Systems Engineering Master's program builds upon your technical background as an engineer. It is designed to provide in-depth, real-world practitioner expertise in engineering complex system solutions. In addition, this rigorous educational experience will help develop your skills in effectively addressing complex problems for both government and commercial organizations. Students in the program are introduced to core competencies for systems engineering, complex systems, modeling, systems analysis, complex problem solving needed for successful delivery of system solutions.

Admission Requirements

Admission to the Master in Systems Engineering program is in accordance with Old Dominion University and Frank Batten College of Engineering and Technology requirements for master’s programs as specified in this catalog.

Admission requirements specific to this program include the following:

1. Undergraduate degree from an ABET-accredited program in engineering or engineering technology or from an accredited program in applied science with a GPA of 3.00 (out of 4.00) or better.
2. GRE Exam (GRE requirement may be waived at GPD discretion based on academic preparation and related work experience)
3. Students with an undergraduate GPA between 2.70 and 3.00 on the required undergraduate degrees may be admitted provisionally based on their academic preparation and GRE scores. GRE score should be in the 60th percentile or higher.
4. A minimum score of 550 on university-level TOEFL scores for all international students when English is not their first language.

Degree Requirements

General Requirements

The Master of Engineering with a concentration on Systems Engineering is in accordance with the general requirements for master’s degrees as specified in this Catalog. In addition, all students must have mathematics course work through the level of integral calculus, matrix algebra or differential equations, and ENMA 520 or equivalent calculus-based probability and statistics. Students who have not had a calculus-based probability and statistics course will be required to include ENMA 520, or equivalent, as part of their plan of study as an additional requirement. All students are expected to communicate effectively both orally and in written documents, that are correct in grammar, style, and mechanics. Those deemed insufficient may be required to take remedial speech or writing courses.

Curricular Requirements

All students admitted to Engineering program must earn a grade of “C” or better in all courses required for the degree and in all Engineering Management prerequisite courses. A student may be removed from the program if he/she receives 2 (two) grades of “C” or lower. Specific requirements for the Master in Engineering with a concentration in systems engineering include the following: The M.E. with a concentration in systems engineering requires 31 graduate credit hours of course work (10 courses plus a one-credit capstone course) for the. At least three-fifths (3/5) of course work must be at the 600 or 700 level for the M.S. degrees. The capstone course should be taken within the last two semesters of study. The following table delineates the specific course requirements for this program.

Prerequisite/Corequisite *

Core 18

ENMA 602 Systems Engineering Management
ENMA 640 Integrated Systems Engineering I
ENMA 641 Requirements Management, Verification and Validation
ENMA 660 Systems Architecture and Modeling
ENMA 715 Systems Analysis
ENMA 771 Risk and Vulnerability Management of Complex Interdependent Systems

Capstone ** 1

ENMA 605 or ENMA 690 Program Capstone or Preparation Seminar for Systems Engineering Certification

Electives *** 12

Select four of the following:

ENMA 702 Methods for Rational Decision Making
ENMA 703 Optimization Methods
ENMA 710 Modeling and Analysis of Systems
ENMA 712 Multi-Criteria Decision Analysis and Decision Support Systems
ENMA 716 Complex-Criteria Decision Analysis and Decision Support Systems
ENMA 717 Cost Engineering
ENMA 723 Enterprise and Complex System Dynamics
ENMA 750 System of Systems Engineering
ENMA 751 Complexity, Engineering and Management
ENMA 763 Robust Engineering Design

Total Hours 31

* All students must have mathematics course work through the level of integral calculus, matrix algebra or differential equations, and ENMA 520 or equivalent calculus-based probability and statistics. Students who have not had a calculus-based probability and statistics course will be required to include ENMA 520, or equivalent, as part of their plan of study.

** Required for the Master of Engineering in systems engineering, is to be taken near the final semester of study.

Old Dominion University
**Requirements for Graduation**

In addition to completing all the required courses, all graduate students must complete the Collaborative Institutional Training Initiative (CITI) basic course. The basic course includes the following modules: Misconduct (falsification, fabrication, and plagiarism); Data acquisition, management, sharing and ownership; Mentor/trainee relationships; Publication practice and responsible authorship; Peer review; Conflicts of interest; and Collaborative research. The RCR modules must be completed prior to completion of 12 semester hours. Students who fail to complete this requirement will have a registration hold placed on their records.

**Doctor of Philosophy, Engineering – Engineering Management and Systems Engineering**

**Degree Description**

The Doctor of Philosophy (Ph.D.) focuses on developing the necessary skills to perform and evaluate rigorous research. Graduates are prepared for careers in teaching and research at academic institutions as well as in other public and private organizations characterized by innovation and technological leadership. The program blends highly theoretical with more applied or pragmatic research. The fields of research supported by the program are defined by the diverse specializations of the department faculty. Students in the Ph.D. program work closely with faculty to develop world-class expertise in their chosen fields of research. Advising faculty expect doctoral students to become collaborators, supporting the faculty's research agenda, and contributing towards their research goals.

**Admission Requirements**

Admission to the Ph.D. program is competitive. The admission process is designed to select applicants that have a strong alignment between their own research interests and an area of specialization of one of the faculty. The best qualified applicant or applicants for an area of specialization are then selected. The number of students admitted into any faculty's area of specialization is dependent on the faculty's projected ability to advise additional doctoral students. The selected is based on the applicants' academic history, maturity in the development of research capabilities, and proficiency in specialized skills demanded by the research area.

In addition to general University admission requirements, which include English language proficiency for international students, applicants must have: (1) A master's degree or equivalent with a grade point average of 3.50 in an appropriate field from an accredited institution of higher education. In exceptional cases students may be admitted directly into the Ph.D. program after completion of their bachelor degree. Details of the direct Bachelor-to-Ph.D. program can be found on the college pages of this catalog. (2) Applicants must have an undergraduate degree from an ABET-accredited program in engineering or engineering technology, or from an accredited program in applied science. Applicants must have completed their undergraduate degrees with a GPA of 3.00 (out of 4.00) or better. Each applicant is required to submit the following documentation when initially applying: (1) Transcripts from all institutions that the applicant has attended. (2) Graduate Record Examination general aptitude scores. (3) A curriculum vitae that highlights professional and research related activities. And, (4) an essay of 500 words or less describing personal and academic goals, professional objectives, preparation for graduate study, and how the chosen program will help the applicant achieve these goals and objectives. The essay should clearly state the specific area in which the applicant intends to specialize.

Applicants whose interests can be supported by a faculty's specialization and demonstrate adequate preparation to meet the demands of doctoral studies will be contacted by the Graduate Program Director. The GPD may request additional information that will assist in the selection process. Additional information may include, but is not restricted to: Publications, samples of research reports, and documents or materials that support proficiency claims of specialized skills. If warranted, the GPD will organize an interview of the applicant by faculty that have specializations in areas that may overlap with the applicant's intended area of research.

Admission is contingent on having the support of a faculty that is willing to commit to acting as an advisor should the applicant be admitted.

Students lacking adequate academic preparation may be required to complete coursework in addition to the graduate admission requirements. Students may be admitted to the Ph.D. program deficient in these leveling courses, but as part of their plan of study, the student must take and successfully complete these courses at the earliest possible opportunity. All students must have mathematics course work through the level of integral calculus; matrix algebra or differential equations; and a course in calculus-based statistics (ENMA 420 or ENMA 520 equivalent). As part of master's-level coursework, all students must have completed the following engineering management leveling courses or their equivalent: ENMA 600, ENMA 603, and ENMA 604.

**Degree Requirements**

**General Requirements**

The Ph.D. program is intended to develop scholarship and research capabilities in the student. Graduates will be experts within their chosen field, highly skilled researchers, critical thinkers, and competent communicators and debaters. Graduates will demonstrate this in a variety of ways that will include, but is not limited to, their performance in: coursework, written and oral examinations, closed and public debates and defenses, and contribution to their field's body of knowledge. The development and assessment of such expertise and scholarship takes place under the guidance, advising, and mentorship of a faculty that is an expert in the field, and appropriate guidance, dissertation and examination committees.

**Curricular Requirements**

Curriculum requirements in engineering management are in accordance with the general requirements for Ph.D. degrees as specified in the Requirements for Graduate Degrees section of this catalog. The Ph.D. program is governed by a Plan of Study that is established by the student in conjunction with his/her advisor and guidance committee within the first nine credit hours of coursework and will follow the established course requirements (below) unless a substitution to one or more courses is agreed upon between the advisor and student and approved by the Graduate Program Director. The plan of study is designed to prepare the student to undertake scholarly research in the particular field and specialization of their dissertation. The coursework selected will provide the student with (1) the requisite foundational knowledge of the selected field, and (2) the necessary research skills. A high degree of flexibility is provided to customize the plan of study, taking into account the diversity in the fields of study, the multidisciplinary nature and variety of research that is undertaken, as well as the different levels of preparation that individual students have.

At least three-fifths (3/5) of formal coursework must be at the 800 level for all doctoral programs.

**Subject Area Specialization**

**Subject Area Electives (minimum) 9+**

**Research Skills**

**Foundations of Research 3**

**Research Skills Electives (minimum) 6+**

**Total Coursework Required (minimum) 24**

**Dissertation Research 24**

**Total Hours (minimum) 48**

* Up to 6 dissertation research hours may be replaced by coursework with the approval of the advisor and GPD.
Requirements for Graduation

In addition to any University and College requirements presented in this catalog, the Ph.D. program in engineering management requires:

1. Satisfactory completion of a minimum of 48 credit hours of postmaster’s degree credit or equivalent level of performance course work. This shall include a minimum of 24 credit hours of coursework that complies with the student’s plan of study, and a minimum of 18 credit hours of dissertation research hours.
2. Passing a written and oral candidacy examination at the completion of formal course work.
3. The completion of research representing independent original research and its formal documentation as a dissertation.
4. The successful defense of a written dissertation proposal.
5. The successful public defense of the dissertation before an audience, which includes an appropriately selected committee of faculty knowledgeable in the field of the research.

Continuance Requirements

Students may be separated for failure to comply with any policies, procedures or requirements that pertain to this Ph.D. program or student behavior. In addition to the requirements for graduation, separation from the program may be warranted for the following reasons, among others:

Coursework:

1. All students admitted to Engineering Management and Systems Engineering programs must earn a grade of “C” or better in all courses required for the degree and in all Engineering Management prerequisite courses. A student may be separated from the program if he/she receives a grade lower than a “C”. Additionally, a student may be separated from the program if he/she receives 2 (two) grades lower than a “B”.

Adherence to programmatic expectations:

1. Students are expected to complete their coursework according to an agreed upon plan of study. Failure to adhere to the plan of study may result in separation from the program.
2. Students are expected to make timely progress on their coursework and research. Persistent failure to meet deadlines and milestones, or other indicators that demonstrate progress, as assessed and documented by the guidance or advisory committee may lead to separation from the program.
3. Students are expected to remain within the specialization area of their advisor and committee members. Students that deviate outside of the agreed upon research area will be notified of this deviation. The student may lose the support of their advisor and committee if the deviation persists. A student will be given a limited period of time (generally one semester) to acquire an advisor that is capable of supporting their new research direction. Separation from the program will result if the student cannot obtain a new advisor, whether this is due to the lack of a specialization in the new field, or if a faculty with a suitable specialization cannot take on additional advising responsibilities.
4. Similarly, if a student is left without an advisor for any other reason (e.g. departure of a faculty advisor from the program), it is contingent on the student to obtain a new advisor in a timely manner. This may require flexibility and willingness by the student to adjust their area of specialization. The department will assist the student and take their particular situation into consideration when the loss of an advisor is due to factors outside of the student’s control. Separation from the program will, however, result if no advisor is obtained after a limited period of time (generally one semester).

Quality of Research

1. A student that persistently submits work of low quality whether it be in documented or in oral form, may be required to submit for special reviews by the committee. Records taken by the advisor, and the guidance or advisory committees, which document the quality problems and present remedial actions where appropriate will be used to help ascertain whether the problems can reasonably be expected to be resolved, or if separation from the program is warranted.

Ethical Behavior

1. Any student partaking or demonstrating behaviors that might be considered to go against the policies and conditions expected for responsible conduct in research, Old Dominion University expected codes of conduct, or ethical considerations that might be specific to an area of research, may result in separation from the program.

Doctor of Engineering – Engineering Management and Systems Engineering

Degree Description

The Department offers a Doctor of Engineering (D.Eng.) program with concentration in Engineering Management and Systems Engineering in accordance with the D.Eng. program requirements specified for the Batten College of Engineering and Technology in this catalog. Additional information on the admission procedure and criteria can be found at http://eng.odu.edu/enma/academics/dengapply.shtml.

Graduate Certificates

The Department of Engineering Management and Systems Engineering administers or participates in a variety of graduate certificates. These include graduate certificates, or advanced engineering certificates with concentrations in:

- Advanced Engineering Certificate in
  - Engineering Management
  - Cyber Systems Security
  - Energy Systems
- Graduate Certificate in
  - Project Management
  - Homeland Security
  - Entrepreneurship and Innovation in Engineering

Please refer to Frank Batten College of Engineering and Technology (http://catalog.odu.edu/graduate/frankbattencollegeofengineeringandtechnology) for more information.