
Program Learning Outcomes for the MCSE Degree

Upon completing the MCSE degree, students will be able to:

1. Acquire broad, advanced knowledge in modern computational techniques.
2. Possess skills to identify, formulate, and solve advance technical problems related to one of the three focus areas.
3. Communicate technical ideas effectively.

Requirements for the MCSE Degree

The MCSE degree is a non-thesis master's degree. For general university requirements, please see Non-Thesis Master's Degrees (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-non-thesis-masters-degrees). For additional requirements, regulations, and procedures for all graduate programs, please see All Graduate Students (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees). Students pursuing the MCSE degree must complete:

- A minimum of 30 credit hours to satisfy degree requirements.
- A minimum of 30 credit hours of graduate-level study (coursework at the 500-level or above).
- A minimum of 24 credit hours must be taken at Rice University.
- A minimum residency enrollment of one fall or spring semester of part-time graduate study at Rice University.
- A minimum overall GPA of 2.67.
- A minimum GPA of 2.67 in required coursework.

The Master in Computational Science and Engineering (MCSE) degree in the School of Engineering is a non-thesis degree program designed to provide training and expertise in computational science and engineering and in data analytics. The MCSE degree program is intended for students interested in technical and managerial positions such as computational scientist, computational engineering, and data analyst. The program offers students opportunities to specialize in areas such as high-performance computing, data analytics, data science, machine learning, software engineering, and distributed systems.

The departments of Computational and Applied Mathematics, Computer Science, Electrical and Computer Engineering, and Statistics jointly offer the MCSE degree program. Based on preferences indicated in their applications, MCSE students are admitted to one of the following four home departments:

- Computational and Applied Mathematics (CAAM),
- Computer Science (COMP),
- Electrical and Computer Engineering (ELEC), or
- Statistics (STAT).

The courses listed below satisfy the requirements for this degree program. In certain instances, courses not on this official list may be substituted upon approval of the program's academic advisor, or where applicable, the department or program's Director of Graduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the department or program's Official Certifier (https://registrar.rice.edu/facstaff/degreeworks/officialcertifier).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the MCSE Degree</td>
<td>30</td>
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Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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Core Requirements

Select 1 course from 3 of the following 4 groups: 9-11

Group 1 (CAAM) 1

- CAAM 519 COMPUTATIONAL SCIENCE I
- CAAM 520 COMPUTATIONAL SCIENCE II
- CAAM 536 / CEVE 555 NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS
- CAAM 550 NUMERICAL ANALYSIS I
- CAAM 553 ADVANCED NUMERICAL ANALYSIS I
- CAAM 564 NUMERICAL OPTIMIZATION
- CAAM 571 LINEAR AND INTEGER PROGRAMMING

Group 2 (COMP) 2

Select 1 course from the following:

- COMP 504 GRADUATE OBJECT-ORIENTED PROGRAMMING AND DESIGN
- COMP 506 COMPILER CONSTRUCTION FOR GRADUATE STUDENTS
- COMP 520 / ELEC 520 DISTRIBUTED SYSTEMS
- COMP 521 / ELEC 552 OPERATING SYSTEMS AND CONCURRENT PROGRAMMING
- COMP 522 MULTI-CORE COMPUTING
- COMP 529 / ELEC 529 ADVANCED COMPUTER NETWORKS
- COMP 530 DATABASE SYSTEM IMPLEMENTATION
- COMP 533 INTRODUCTION TO DATABASE SYSTEMS
- COMP 540 STATISTICAL MACHINE LEARNING
- COMP 541 INTRODUCTION TO COMPUTER SECURITY
- COMP 542 LARGE-SCALE MACHINE LEARNING
- COMP 557 / ELEC 557 ARTIFICIAL INTELLIGENCE
- COMP 582 / ELEC 512 GRADUATE DESIGN AND ANALYSIS OF ALGORITHMS

Group 3 (ELEC) 3

Select 1 course from the following:

- ELEC 513 / COMP 513 COMPLEXITY IN MODERN SYSTEMS
- ELEC 525 / COMP 525 VIRTUALIZATION AND CLOUD RESOURCE MANAGEMENT

Group 4 (CAAM or COMP or ELEC)

Select 1 course from the following:

- CAAM 519 / COMP 504 / ELEC 513 COMPLEXITY IN MODERN SYSTEMS
- CAAM 520 / COMP 506 / ELEC 513 COMPLEXITY IN MODERN SYSTEMS
- CAAM 536 / COMP 520 / ELEC 529 ADVANCED COMPUTER NETWORKS
- CAAM 550 / COMP 557 / ELEC 557 ARTIFICIAL INTELLIGENCE
- CAAM 553 / COMP 582 / ELEC 512 GRADUATE DESIGN AND ANALYSIS OF ALGORITHMS
- CAAM 564 / COMP 530 / ELEC 530 DATABASE SYSTEM IMPLEMENTATION
- CAAM 571 / COMP 533 / ELEC 533 INTRODUCTION TO DATABASE SYSTEMS
Select up to 6 credit hours from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ELEC 526 / COMP 526</td>
<td>HIGH PERFORMANCE COMPUTER ARCHITECTURE</td>
</tr>
<tr>
<td>ELEC 531</td>
<td>STATISTICAL SIGNAL PROCESSING</td>
</tr>
<tr>
<td>ELEC 533 / CAAM 583 / STAT 583</td>
<td>INTRODUCTION TO RANDOM PROCESSES AND APPLICATIONS</td>
</tr>
<tr>
<td>ELEC 546 / COMP 546</td>
<td>INTRODUCTION TO COMPUTER VISION</td>
</tr>
<tr>
<td>ELEC 547</td>
<td>COMPUTER VISION</td>
</tr>
<tr>
<td>ELEC 549</td>
<td>COMPUTATIONAL PHOTOGRAPHY</td>
</tr>
<tr>
<td>ELEC 553</td>
<td>MOBILE AND EMBEDDED SYSTEM DESIGN AND APPLICATION</td>
</tr>
<tr>
<td>ELEC 554 / COMP 554</td>
<td>COMPUTER SYSTEMS ARCHITECTURE</td>
</tr>
<tr>
<td>ELEC 558</td>
<td>DIGITAL SIGNAL PROCESSING</td>
</tr>
<tr>
<td>ELEC 575</td>
<td>LEARNING FROM SENSOR DATA</td>
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<tr>
<td>ELEC 576 / COMP 576</td>
<td>A PRACTICAL INTRODUCTION TO DEEP MACHINE LEARNING</td>
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Group 4 (STAT) 4

Select 1 course from the following:

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>STAT 502 / COMP 502 / ELEC 502</td>
<td>NEURAL MACHINE LEARNING I</td>
</tr>
<tr>
<td>STAT 518</td>
<td>PROBABILITY</td>
</tr>
<tr>
<td>STAT 519</td>
<td>STATISTICAL INFERENCES</td>
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<tr>
<td>STAT 541</td>
<td>MULTIVARIATE ANALYSIS</td>
</tr>
<tr>
<td>STAT 602 / COMP 602 / ELEC 602</td>
<td>NEURAL MACHINE LEARNING AND DATA MINING II</td>
</tr>
<tr>
<td>STAT 605</td>
<td>R FOR DATA SCIENCE</td>
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<tr>
<td>STAT 613</td>
<td>STATISTICAL MACHINE LEARNING</td>
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<td>STAT 615</td>
<td>REGRESSION AND LINEAR MODELS</td>
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<td>STAT 616</td>
<td>ADVANCED STATISTICAL METHODS</td>
</tr>
<tr>
<td>STAT 648</td>
<td>GRAPHICAL MODELS AND NETWORKS</td>
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Elective Requirements

Communication, Leadership, Management and Ethics 5

Select up to 6 credit hours from the following: 6

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>ENGI 510</td>
<td>TECHNICAL AND MANAGERIAL COMMUNICATIONS</td>
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<tr>
<td>ENGI 515</td>
<td>LEADING TEAMS AND INNOVATION</td>
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<tr>
<td>ENGI 528 / CEVE 528</td>
<td>ENGINEERING ECONOMICS</td>
</tr>
<tr>
<td>ENGI 529 / CEVE 529</td>
<td>ETHICS AND ENGINEERING LEADERSHIP</td>
</tr>
<tr>
<td>ENGI 542</td>
<td>COMMUNICATION FOR ENGINEERS: BUILDING A PRACTICAL TOOLBOX</td>
</tr>
<tr>
<td>ENGI 545 / LEAD 545</td>
<td>STRATEGIC THINKING FOR COMPLEX PROBLEM SOLVING</td>
</tr>
<tr>
<td>ENGI 610 / NSCI 610</td>
<td>MANAGEMENT FOR SCIENCE AND ENGINEERING</td>
</tr>
<tr>
<td>ENGI 614</td>
<td>LEARNING HOW TO INNOVATE?</td>
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<tr>
<td>ENGI 615</td>
<td>LEADERSHIP COACHING FOR ENGINEERS</td>
</tr>
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Additional Electives

Select additional courses from departmental CAAM, COMP, ELEC, or STAT course offerings at the 500-level or above to reach 30 total credit hours.

Footnotes and Additional Information

1 A student whose home department is COMP, ELEC, or STAT has the option of satisfying Group 1 requirements by completing exactly one course from the following: CAAM 453, CAAM 454, or CAAM 471.
2 A student whose home department is CAAM, ELEC, or STAT has the option of satisfying Group 2 requirements by completing exactly one course from the following: COMP 322 / ELEC 323, or COMP 430.
3 A student whose home department is CAAM, COMP, or STAT has the option of satisfying Group 3 requirements by completing exactly one course from the following: ELEC 425 / COMP 425.
4 A student whose home department is CAAM, COMP, or ELEC has the option of satisfying Group 4 requirements by completing exactly one course from the following: STAT 310 / ECON 307, STAT 405, or STAT 410.
5 Other courses may satisfy the Communication, Leadership, Management, and Ethics group requirement. See advisor for more details.
6 Credit hours earned for ENGI 530 Engineering Practicum may not be applied toward MCSE degree requirements.

Policies for the MCSE Degree

Departments of Computational and Applied Mathematics, Computer Science, Electrical and Computer Engineering, and Statistics Graduate Program Handbook

The General Announcements (GA) is the official Rice curriculum. As an additional resource for students, the departments of Computational and Applied Mathematics, Computer Science, Electrical and Computer Engineering, and Statistics, which jointly offer the MCSE degree program, publish a graduate program handbook, which can be found here: https://gradhandbooks.rice.edu/2018_19/Computer_Science_Graduate_Handbook.pdf

Application Information

Students must have completed a BA or BS degree in an engineering or science discipline, with training in engineering mathematics, statistical foundations, and programming methodology to be admitted to the program.

- Fall admission deadline —February 1
- To apply to the program go to MSCE application (https://mcsegradapps.rice.edu)
- For additional information about the program contact mcse@rice.edu
- Enrollments and degrees awarded for degree programs in the Engineering School are available at: https://engineering.rice.edu/about/enrollment-degrees-awarded

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (ga.rice.edu/graduate-students/academic-policies-procedures/regulations-procedures-all-degrees/#transfer). Some departments and programs have additional restrictions on transfer credit. Students...
are encouraged to meet with their academic program's advisor when considering transfer credit possibilities.

**Additional Information**
For additional information, please see the Computational Science and Engineering website: [https://engrprofmasters.rice.edu/](https://engrprofmasters.rice.edu/)

**Opportunities for the MCSE Degree**

**Fifth-Year Master's Degree Option for Rice Undergraduate Students**

Rice students have an option to pursue the Master of Computational Science and Engineering (MCSE) degree by adding an additional fifth year to their four undergraduate years of science and engineering studies.

Advanced Rice undergraduate students in good academic standing may apply to the MCSE degree program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may then start taking some required courses of the master’s degree program. A plan of study will need to be approved by the student’s undergraduate advisor and the MCSE program director.

As part of this option and opportunity, Rice undergraduate students:

- must complete the requirements for a bachelor's degree and the master's degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).
- should be aware there could be financial aid implications if the conversion of undergraduate coursework to that of graduate level reduces their earned undergraduate credit for any semester below that of full-time status (12 credit hours).
- more information on this Undergraduate - Graduate Concurrent Enrollment opportunity, including specific information on the registration process can be found here [ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment](ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment).

**Additional Information**
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