COMPUTER SCIENCE (MS)

The Master of Science in Computer Science provides a broad background in the practical and theoretical foundations of Computer Science appropriate for those interested in research or in advanced career opportunities. Other related programs in the Computer Science Department are the M.S. in Information Technology (https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/computer-science/information-technology-ms/) and the M.S. in Software Engineering (https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/computer-science/software-engineering-ms/).

The M.S. in Computer Science offers the following areas of specialization:

- No Concentration (Default)
- Artificial Intelligence
- Cybersecurity
- Computer Systems
- Thesis Track

Curriculum

The Master of Science in Computer Science requires a total of 30cr hours (typically 10 courses). To achieve depth and breadth, Computer Science students must complete the following to obtain the required 30 credits to graduate:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 417</td>
<td>Social and Ethical Issues in Computing ¹</td>
<td>3</td>
</tr>
<tr>
<td>COMP 460</td>
<td>Algorithms &amp; Complexity ¹</td>
<td>3</td>
</tr>
</tbody>
</table>

Track/Major Requirements 12

No Concentration (Default)

Major Requirements

- COMP 413 Intermediate Object-Oriented Development
- Select three of the following:
  - COMP 410 Operating Systems
  - COMP 433 Web Services Programming
  - COMP 436 Markup Languages
  - COMP 439 Distributed Systems
  - COMP 442 Server-Side Software Development
  - COMP 443 Computer Networks
  - COMP 453 Database Programming
  - COMP 464 High-Performance Computing
  - COMP 471 Theory of Programming Languages
  - COMP 473 Advanced Object Oriented Programming
  - COMP 474 Software Engineering

Artificial Intelligence

Major Requirements

- COMP 479 Machine Learning
- Select one of the following:
  - COMP 429 Natural Language Processing
  - COMP 487 Deep Learning
  - COMP 488 Computer Science Topics
- Select two of the following:
  - COMP 406 Data Mining

Cybersecurity

Major Requirements

- COMP 401 Computer Security
- Select three of the following:
  - COMP 431 Cryptography
  - COMP 440 Computer Forensics Investigations
  - COMP 445 Internet of Things Device and Application Security
  - COMP 447 Intrusion Detection and Computer Forensics
  - COMP 448 Network Security
  - COMP 449 Wireless Networking and Security
  - COMP 452 Introduction to Computer Vulnerabilities
  - COMP 488 Computer Science Topics

Computer Systems

Major Requirements

- COMP 410 Operating Systems
- Select three of the following:
  - COMP 405 Database Administration
  - COMP 413 Intermediate Object-Oriented Development
  - COMP 439 Distributed Systems
  - COMP 443 Computer Networks
  - COMP 451 Enterprise Networking
  - COMP 462 Advanced Computer Architecture
  - COMP 464 High-Performance Computing
  - COMP 472 Compiler Construction

General Elective Courses 12

Total Hours 30

¹ Either required course above can be substituted with another graduate course under the discretion of Graduate Program Director if students had their equivalent in their undergraduate program.

Prerequisite/Preparation Courses

All of these courses must be taken if you do not have a four-year undergraduate degree in a related field, and will not be counted towards the MS degree requirements.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>COMP 400A</td>
<td>Object-Oriented Programming</td>
<td>3</td>
</tr>
<tr>
<td>COMP 400B</td>
<td>Data Structures I</td>
<td>3</td>
</tr>
<tr>
<td>COMP 400C</td>
<td>Data Structures II</td>
<td>3</td>
</tr>
<tr>
<td>COMP 400D</td>
<td>Computing Tools and Techniques</td>
<td>1</td>
</tr>
<tr>
<td>COMP 400E</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
</tbody>
</table>

For students who have taken Computer Science coursework at Loyola: many 400-level courses in the department are cross-listed with 300-level analogues (e.g. COMP 443 Computer Networks and COMP 343 Computer Networks). Students who enter the MS program after taking a Loyola course in this category must choose to take 400-level courses that are not cross-listed with any 300-level courses taken earlier, unless granted specific permission by the Graduate Program Director.
may not use an introductory course to satisfy a foundation or elective requirement.

Preparatory courses do not count towards the 30 required credit hours of non-preparatory courses.

A student taking any necessary preparation course is considered to be a full-fledged student of the Graduate School. Preparation courses may be taken in the same semester as other graduate courses, provided the prerequisites for the other graduate courses are met. Students are expected, however, to take all necessary preparation courses early in their career.

A student may place out of an introductory course under any of the following conditions:

- The student has appropriate coursework equivalent to the introductory course.
- The student has appropriate and verified professional experience equivalent to the introductory course.
- The student passes a Graduate Competency Assessment (GCA) in the introductory course area.
- This can be waived with discretion of the GPD.

If a student has had a preparatory course waived, departmental assistance will usually be necessary to allow the student to register for any other course having that preparatory course as a prerequisite.

**Thesis Tracks**

MS in Computer Science students may elect to craft a master's thesis. Course work is strongly recommended over the thesis option, especially for those not planning on a research-oriented career. Many students pursuing the thesis option would be considering a PhD program.

Students wishing to do a thesis should discuss this option as early as possible with the Graduate Program Director. These may involve research in purely theoretical computer science (for example, development or analysis of algorithms), the development of a software package, or instrumentation, measurement, and analysis of existing systems (for example, studying network performance). Because of this wide range, there is no one formal course in research methods. Courses in the electives list contain a significant component of area-specific integrated research methods material. Students interested in writing a thesis are strongly urged to seek advising as early as possible to which electives will be the most appropriate for the student’s proposed area of research.

All PhD students and Master’s students who are writing a thesis must successfully complete UNIV 370 Responsible Conduct in Research and Scholarship or other approved coursework in responsible conduct of research as part of the degree requirements. It is strongly recommended that students complete this two-day training before beginning the dissertation/thesis stage of the program.

1. Identify a faculty advisor and select a tentative topic or area of research. The existing program allows you to take up to 6.0 hours of COMP 490 Independent Project. You will typically begin your research program in such a course, though you may also identify an advisor and select a tentative topic as part of a conventional classroom.
2. Secure permission to pursue the thesis option from the Graduate Program Director. The Graduate Program Director, in consultation with you and your chosen advisor, recommends a thesis committee to the Graduate School. The committee will consist of at least three faculty members; normally the committee director will be the advisor.
3. Once required courses are concluded and a thesis committee is approved, you maintain full-time status by enrolling in the zero-credit-hour COMP 605 Master of Science Study or COMP 595 Thesis Supervision.
4. You will then prepare a formal research proposal, in consultation with your advisor. This proposal must be submitted to your committee for review. Any research involving human subjects will require IRB approval or exemption before the Graduate School approves your proposal. After this step you are now ready to “conduct research” for the project.
5. Upon completion of your thesis, you will be required to formally defend your research. Schedule this with your committee. Your thesis should be in nearly final form. Typically you should give the committee three weeks to read the final draft of the thesis before the defense date. Once approved by your committee, the GPD will submit the ballot for Graduate School approval and the student will submit their thesis for publication in the university eCommons.

**General Electives**

General electives can be any COMP 400 level class, except the preparation courses listed above. The elective course options are common for all programs, differing only in the total number of credits required. There are numerous options for independent study, including a programming project, research, or a service-oriented project. Students may take up to a maximum of 6 credit hours of COMP 490 Independent Project and/or COMP 499 Internship to fulfill electives.

**STEM DESIGNATION**

With a national shortage of professionals trained in STEM-related fields, employers are actively pursuing STEM degree holders. Distinguish yourself in technology with a STEM-designated degree.

Loyola’s master’s degree programs in Computer Science have been granted a STEM designation from the U.S. Department of Homeland Security. The program achieved STEM designation because of its emphasis on teaching students how to solve computer science problems with a suite of quantitative and technological tools.

Under this STEM classification, international students can extend their training in the U.S. by working in their field of study. Students can qualify for a 24-month OPT (Optional Practical Training) Extension, bringing the total OPT time granted to 36 months.

**Graduate & Professional Standards and Regulations**

Students in graduate and professional programs can find their Academic Policies in Graduate and Professional Academic Standards and Regulations (https://catalog.luc.edu/graduate-professional-academic-standards-regulations/) under their school. Any additional University Policies supersede school policies.

**Learning Outcomes**

Students will gain a broad background in the practical and theoretical foundations of Computer Science.
Students in a specific concentration will gain mastery in that area, which students who pursue the thesis option will gain deep expertise in their research area.