Master of Science in Software Engineering

Drexel University offers a Master of Science in Software Engineering (MSSE) degree. This program was created in response to the growing importance of software to the national infrastructure and the rapid rise in demand for professional software engineers.

The MSSE degree is a multidisciplinary University degree sponsored by the College of Engineering and the College of Information Science and Technology. The program, drawing on the strengths of existing Drexel programs in computer science, computer engineering, and information science and technology, provides a curriculum that encompasses behavioral, managerial and technical aspects of software engineering and attempts to synthesize disciplinary paradigms and themes. This program is designed specifically for students interested in a range of application domains.

PROGRAM OF STUDY

All students in the MSSE program take a core curriculum that spans the scope of disciplinary areas relevant to the degree, thereby providing a common foundation for all students in the program. Students also select an area of concentration, or track, which allows them to take a cohesive, more specialized set of courses supporting their individual career interests. These tracks are available: Information Science and Technology, Computer Science, and Engineering.

Students in all tracks are encouraged to participate in Drexel’s Career Integrated Education (CIE) program (please refer to the CIE fact sheet for further information). The MSSE degree can be completed in two years of full-time or three years of part-time study.

ADMISSION REQUIREMENTS

In addition to satisfying the general admission requirements of the University, all applicants to the program are required to satisfy the following entrance requirements:

1. The applicant must have a bachelor's degree from an accredited institution of higher education with an appropriate undergraduate major. Appropriate undergraduate majors include, but are not limited to, computer science, engineering, information systems, management science, and mathematics. Applicants might also have master's degrees in similar fields.
2. All international students must have an acceptable score on the Test of English as a Foreign Language (TOEFL) Exam.

3. Prospective students should possess the following knowledge and/or experience:

   Advanced capability to program in a block structured programming language such as Pascal, C or Ada or an object oriented language such as C++ or Small talk.

   An undergraduate course in systems analysis and design or software engineering.

   An undergraduate course in data structures and algorithms.

   An undergraduate course in discrete mathematics

   A grade of 'B' or better is required in these courses.

4. Evidence of an understanding of the development of the industrial strength software applications. This requirement may be met by having at least two years experience working directly with software system development, or (with permission of an advisor) extensive software intensive course work. Students may also be required to have or develop proficiency in particular technologies, operating environments, or programming languages.

   Students found to be deficient in one or more above areas will be required to take up to three foundation courses (these will not count towards the degree) to prepare them for admission to the MSSE program. These foundation courses, to be determined by the advisor, will provide students with requisite knowledge and skill necessary to begin the master's program.

   The following foundation courses are typically recommended:

   To cover the data structures requirement, students typically take:

   CS260 Data Structures (Fall, Winter, Spring, Summer)

   To cover the discrete mathematics requirement, students typically take one of the two courses:

   CS270 Foundations of Computer Science (Fall, Spring)

   To cover the software engineering requirement, students typically take one of the two courses:

   CS451 Software Engineering (Fall, Spring)

   The MSSE degree is not recommended for students who have never had a course in programming.
Please note that working experience is a requirement for admission to the MSSE. You will need to cover all of the pre-requisite courses. If you apply, you may be admitted conditionally until you satisfy the pre-requisite course requirements at Drexel University (or somewhere else).

You can apply on-line by going to: On-line application

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**ONLINE DEGREE REQUIREMENTS**

Because we are growing the on-line offering of the MSSE degree, we cannot offer as many course options as the on-campus version of the degree. Hence, on-line students will, in the near future, have fewer choices but, nevertheless, be able to complete the 45 credits required to graduate with an MSSE degree. On-line students must take all of the core courses and all of the CS Track Required courses. In addition, they must take two more graduate courses as electives, for a total of 15 courses.

**THE CORE**

(CS 575) Software Design (Spring)
(CS 576) Dependable Software Systems (Summer)
(CS 544) Computer Networks (Winter)
(INFO 627) Requirements of Engineering and Management (Winter)
(INFO 638) Software Project Management (Spring)
(INFO 631) Information Technology Integration (Winter)

**CS TRACK REQUIRED**

(CS 520) Computer Science Foundations (Fall)
(CS 571) Programming Tools and Environments (Winter)
(CS 521) Data Structures and Algorithms I (Fall)
(CS 522) Data Structures and Algorithms II (Winter)
(CS 525) Theory of Computation (Spring)
(CS 550) Programming Languages (Spring)
(CS 530) Developing User Interfaces (Fall)

**CS TRACK ELECTIVES**

Students can take any other two CS or INFO online (or on-campus) graduate course except for INFO 605 and INFO 530.
ON CAMPUS DEGREE REQUIREMENTS

The MSSE degree requirements vary depending on the tracks. Every student takes the required six core courses (18 credits). The remaining courses are from the track courses.

THE CORE

Core courses cover topics that are essential for the practicing software engineer. All MSSE students take the following six required core courses.

(CS 575) Software Design, (Fall)

(CS 576) Dependable Software Systems (Winter)

(ECE-C 500) Fundamentals of Computer Hardware (Spring)

(ECE-C 600) Fundamentals of Computer Networks (Winter)

Students may take ECE-C 631 Computer Networks I in the Fall instead of ECE-C 600. However, it is not advisable to do so because ECE-C 631 is designed for MS in Computer Engineering students.

(INFO 627) Requirements of Engineering and Management (Fall, Winter, Spring, Summer).

MSSE students do not need to take any pre-requisites before they can take this course. Please send e-mail to laura@cs.drexel.edu in order to register for this class.

(INFO 638) Software Project Management (Fall, Winter, Spring, Summer) Summer).

MSSE students do not need to take any pre-requisites before they can take this course. Please send e-mail to laura@cs.drexel.edu in order to register for this class.

THE TRACKS

The following are descriptions of each track. Students in each track will follow the policies determined by the respective college.

Computer Science

The computer science track welcomes students who are interested in a variety of technical topics pertaining to the development of software systems such as databases, networks, operating systems, graphics and animation systems, compilers, expert systems, and systems for scientific computing. Students will use languages and apply techniques to specify, design, implement, test, and maintain software systems.
Students in the computer science track take 9 courses in addition to the 6 core courses. Of the 9 courses, 4 courses must be from one of the six concentrations. The other 5 courses are electives that may be fulfilled by any course offered for the MSSE degree except INFO605 and INFO530. Students in their final 3 quarters of study that have a 3.5 GPA or better may take a 9-credit project instead of 3 elective courses. To register for a project, the student must select a project advisor, a member of the CS faculty, who is willing to supervise them. The project is a large-scale software development effort in which students specify, design, implement, and test a significant software system.

CIE will also be available for up to six credits. However, the CIE option requires students to take six credits more than for the non-CIE option. Failure to register for CIE credits may impact an international student's visa.

**CONCENTRATION COURSES:**

**Computing Systems Concentration**
(CS 543) Operating Systems (Fall)
(CS 643) Advanced Operating Systems (Summer)
(CS 645) Network Security (Not offered in 2005-06)
(CS 675) Software Reverse Engineering (Fall)
(CS 544) Computer Networks (Winter)
(CS 741) Computer Networks II (Spring)
(CS 540) High Performance Computing
(CS 679) Parallel Programming
(CS 500) Database Theory (Summer)

**Programming Languages Concentration**
(CS 525) Theory of Computation (Fall)
(CS 552) Programming Languages (Winter)
(CS 551) Compiler Construction I (not offered in 2005-06)
(CS 552) Compiler Construction II (not offered in 2005-06)
(CS 680) Program Generation and Optimization (not offered in 2005-06)
(CS 675) Software Reverse Engineering (Fall)
(CS 679) Parallel Programming

**User Interface Software Concentration**
(CS 530) Developing User Interfaces (Winter)
(CS 630) Cognitive Systems (Spring)
(PSY 612) Psychology of Human Computer Interaction Design (Spring)
(CS 536) Computer Graphics (Winter)
(CS 636) Advanced Computer Graphics (Spring)
(CS 680) Game Design and Implementation (Fall)

**Artificial Intelligence Concentration**
(CS 510) Artificial Intelligence (Fall)
(CS 610) Advanced Artificial Intelligence (Winter)
(CS 680) Knowledge-Based Agents (Spring)
(CS 770) Topics in Artificial Intelligence (offerings vary in schedule)

**Scientific Computation Concentration**
(CS 540) High Performance Computing (not offered in 2005-06)
(CS 567) Applied Symbolic Computation (Fall)
(CS 668) Computer Algebra I (Winter)
(CS 669) Computer Algebra II (Spring)
(CS 679) Parallel Programming (not offered in 2005-06)
(CS 680) Numerical Methods I (not offered in 2005-06)
(CS 680) Numerical Methods II (not offered in 2005-06)

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**Information Science and Technology**
This track supports students interested in applying software engineering to information systems problems in commercial organizations and other settings. The track’s principle focus is the process by which user and system requirements are converted into cost-effective, maintainable software systems. This focus is complemented by a concern for defining, creating, understanding, and evaluating the full range of software life cycle products. The track places particular emphasis on systems values, such as the human computer interface, front-end user requirements analysis, modeling and validation, and the use of off-the-shelf tools and components to assist in software processes.

**Engineering Track**
Students in the engineering track will pursue techniques to model engineering problems and offer software solutions. The courses in this track will emphasize problems facing electrical, mechanical, environmental, chemical and other engineering industries. Systems modeling and simulation techniques will be used to solve these problems.

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**FACULTY AND RESEARCH AREAS**
David Breen, Ph.D. (Rensselaer Polytechnic Institute), Assistant Professor
Geometric modeling, computer graphics, scientific visualization, medical imaging, simulation

Yuanfang Cai, Ph.D. (University of Virginia), Assistant Professor
Formal software design modeling and analysis, software economics, software evolution and modularity.

Bruce W. Char, Ph.D. (University of California, Berkeley), Professor
Symbolic mathematical computation, algorithms and systems for computer algebra, problem solving environments, parallel and distributed computation.

Rachel Greenstadt, Ph.D. (Harvard University), Assistant Professor
Electronic privacy, privacy properties of distributed constraint optimization algorithms, privacy and security models for multi-agent systems, economic aspects of electronic privacy and information security.

Jeremy R. Johnson, Ph.D. (Ohio State University), Professor and Chair of the Department of Computer Science
Computer algebra, design and analysis of algorithms, symbolic computation systems.

Werner Krandick, Ph.D. (Ohio State University), Associate Professor
Symbolic computation, computer arithmetic, distributed computation.

Frank Lee, Ph.D. (Carnegie-Mellon University), Assistant Professor

Spiros Mancoridis, Ph.D. (University of Toronto), Professor and Director of Software Engineering
Software architecture, reverse engineering, software visualization, software security, code analysis, software engineering education.

Ko Nishino, Ph.D. (University of Tokyo), Assistant Professor
Computer vision, computer graphics, analysis and synthesis of visual appearance.

Jeffrey L. Popyack, Ph.D. (University of Virginia), Associate Professor
Operations research, stochastic optimization, computational methods for Markov decision processes, artificial intelligence, computer science education.

William Regli, Ph.D. (University of Maryland at College Park), Professor
Artificial intelligence, engineering design, geometric modeling, engineering informatics.

Dario Salvucci, Ph.D. (Carnegie-Mellon University), Associate Professor
Human-computer interaction, cognitive modeling, driving and driver distraction.
Ali Shokoufondeh, Ph.D. (Rutgers University), Associate Professor
Combinatorial optimization, theory of algorithms, graph theory, computer vision.

Guiseppe Valetto, Ph.D. (Columbia University), Assistant Professor
Software Engineering, autonomic computing, mining software repositories.

FOR MORE INFORMATION
If you have questions about the Master of Science in Software Engineering degree, please feel free to contact any of the members of the standing committee which oversees the program. Here are the contacts for the three tracks:

Computer Science Track Professor Spiros Mancoridis
(215)895-6824
E-mail: spiros AT drexel . edu
http://www.cs.drexel.edu/~spiros

Information Science and Technology Track Dr. Michael Atwood
(215) 895-6272
E-mail: michael.atwood@ischool.drexel.edu
http://www.ischool.drexel.edu/faculty/matwood/

Engineering Track Dr. Leonid Hrebien
(215)895-6632
E-mail: Ihrubien@ece.drexel.edu

To apply to this program, please reference its major code on the application: 688 - Master of Science in Software Engineering

PUBLICATIONS
Frequently Asked Questions

**Question:** I just got admitted into the MSSE program and I have been instructed to contact my advisor, who should I meet with?

**Answer:** If you are in the CS Track, your advisor is Spiros Mancoridis. You should download the MSSE Plan of Study form (for non-online MSSE students) at: [http://www.cs.drexel.edu/~spiros/msse/SE-Checklist.xls](http://www.cs.drexel.edu/~spiros/msse/SE-Checklist.xls), or (for on-line MSSE students) at: [http://www.cs.drexel.edu/~spiros/msse/SE-Online-Checklist.xls](http://www.cs.drexel.edu/~spiros/msse/SE-Online-Checklist.xls), or fill out the form, and send it to [laura@cs.drexel.edu](mailto:laura@cs.drexel.edu) for approval.

**Question:** Do I need to take the GRE (Graduate Record Exam)?

**Answer:** Yes, only if you want to be enrolled as a full-time student. Part time students do not need to take the GRE. Applicants interested in graduate assistantships must submit GRE scores since these awards are based on academic merit.

**Question:** Do I need to take the TOEFL (Test of English as a Foreign Language)?

**Answer:** Yes, only if you are an international student.

**Question:** What is the difference between the MS in Software Engineering (Computer Science Track) and the MS in Computer Science degrees?

**Answer:** The MS in SE is an excellent degree to prepare students for jobs in the Information Technology industry as software developers. It is an applied degree with more emphasis on practice than theory. The MS in CS is a traditional degree that prepares students for advanced degrees in CS, such as a Ph.D. but is also a good degree for preparing students for jobs in the IT industry.

The MS in SE has a 9 credit project requirement, the MS in CS does not. The MS in CS has a thesis option, however, which the MS in SE does not. In the MS in SE students take courses from 3 colleges (Engineering, Information Systems, and Arts and Sciences - CS). MS in CS students take courses from the Computer Science department for the most part.

**Question:** Is financial aid available to MSSE students?

**Answer:** Financial aid is available to full-time students only. The aid comes in the form of either a Teaching Assistantship (TA) or a Research Assistantship (RA). To apply for a TA contact Dr. Johnson (jjohnson@cs.drexel.edu). Students can discuss RAs by meeting with faculty that have sponsored research projects. Students usually get RAs after taking a few classes at Drexel University. Often, Professors that have sponsored research projects award RAs to students that have demonstrated promise in one or more classes taught by the Professor.
**Question:** Why can't I register for any of the INFO courses online?

**Answer:** Just send e-mail to laura@cs.drexel.edu and she’ll assist in registering you for the course.

**Question:** Can I get credit toward my MSSE degree if I have successfully completed the Lockheed-Martin TDC curriculum?

**Answer:** Drexel University has a special agreement with Lockheed-Martin for MSSE students of all tracks. Specifically, if a student has completed the TDC curriculum offered at Lockheed-Martin the student can get credit for 2 courses (6 credits) towards an MSSE degree. However, the student must register for (and hence pay for) an independent study course (worth 6 credits) that is created by the MSSE advisor at the student's request. The advisor will give the student the same letter grade as was award in the TDC curriculum (evidence of the grade must be provided by Lockheed-Martin).

**Question:** Is there an on-line Drexel University catalog entry for the MSSE?

**Answer:** Spiros Mancoridis' MSSE website is the most up-to-date source. However, you may want to consult the Drexel University catalog as well at: http://www.drexel.edu/catalog/masters/sweng.htm.

**Question:** Is there an on-line Drexel University course description catalog for the MSCS and MSSE courses?

**Answer:** http://coreapp1.drexel.edu/webcourses/CourseListing.asp?SubjCode=CS&Levl=GR&univ=DREX.

**Question:** Is there an on-line resource at Drexel University to help me plan my courses and plan of study?

**Answer:** http://coreapp1.drexel.edu/webtms.

**Question:** As an international student, can I work off-campus with an F-1 visa?

**Answer:** Yes, via the OPT (Optional Practical Training) program http://www.drexel.edu/isss/OPT.html

**Question:** What happened to the Database concentration?

**Answer:** It has been phased out. If you started the MSSE before 2004 you may declare the Database Track by taking INFO 605 Database Management I, INFO 606 Database Management II, INFO 607 Applied Information and Database Technology, INFO 612 Knowledge Base Systems.

**Question:** Can I transfer credits from another University or Department at Drexel to count toward fulfilling my MSSE degree requirements?

**Answer:** It is a university-wide rule that you can transfer up to 15 quarter credits' worth of graduate courses to Drexel's program, at a conversion rate of 4.5 quarter credits = 3 semester
credits. This means that you can transfer three 3 semester credit courses for 13.5 quarter credits (roughly 4 Drexel courses), or four 3 semester credit courses for 15 quarter credits (it would be more except for the 15 quarter credit ceiling). Here are some qualifications to this: a) The courses you want to transfer need to be approved by Dr. Mancoridis as satisfying some portion of the MSSE degree requirements. He should explain to you the specific degree requirements being satisfied by the courses being transferred. For example, there might not be any way to make a graduate French literature course taken at Villanova satisfy any portion of the MSSE degree requirements which all have to do with courses relevant to that software engineering. Thus you would not be able to transfer those course credits into that program. Another example would be if you got graduate credits for introductory C++ programming somewhere. We would not allow transfer of those credits into the MS CS because intro programming is not a graduate level topic here in computer science. Dr. Mancoridis would be making the call about whether such a course could be counted for the MSSE, though. b) Course credits may not be used for a Drexel graduate program if they have already been used to satisfy the requirements of another degree. For example, if you took graduate courses at Villanova but you used those credits towards satisfying the requirements for your bachelor's degree, then you cannot count them again for a Drexel MSSE.

**Question:** Can I take ANY IST or CS course to count as an MSSE elective?

**Answer:** NO, INFO 530 and INFO 605 as well as CS520 and CS571 cannot be taken for credit. However, if you are a provisional student and it is required that you take this

**Question:** Can I take do a dual degree involving the MSSE?

**Answer:** Yes, can transfer 15 credits from the other degree to the MSSE. You will then have to take the 6 core MSSE courses and 4 more courses from one of the MSSE areas of concentration. The 5 elective MSSE requirement will be waived because you will have completed your courses from the other degree.

**Question:** Do I need to submit a Plan of Study?

**Answer:** YES All new grad students should submit their plan of study by the end of the Fall term. Advanced grad students who have already submitted a plan, but have made changes to it, should send it [laura@cs.drexel.edu](mailto:laura@cs.drexel.edu) an updated plan as well. The Office of Graduate Studies is now monitoring this process, and has put in place a new policy stating that all students who have not submitted their plan by the 4th week of winter term will be ineligible for TA/RAships and Provost's Fellowships. The departmental deadline is the 7th week of the student's first term, so if you haven't submitted your plan already, please get it to Leeann Crows as soon as possible.

**Question:** What is the Drexel policy on full-time/part-time status?

**Answer:** Graduate students are considered to be full time when they register for nine or more
credits each quarter for any three quarters in an academic year. All other graduate students are considered part-time. **International students on F-1 or J-1 visas should normally be registered full-time to meet their visa requirements; please contact International Student and Scholars Services for clarification.**

Graduate Quarter Registration Enrollment Classifications:

Less than half-time status: 0.0 to 4.49 credits

Half-time status: 4.5 to 5.99 credits

Three-quarter-time status: 6 to 8.99 credits

Full-time status: 9 or more credits

For purposes of Federal Student Loan Deferment, all graduate students must be classified as enrolled for half-time status (4.5 to 5.99 credits). If you have questions about how your registration affects your financial aid, please contact the appropriate Financial Aid Office.

**Question:** What kind of career opportunities are afforded to MSSE graduates?  
**Answer:** Graduate of the MSSE-SE usually get jobs as Software Engineers in industries such as Insurance, Defense, Finance, Pharmaceuticals, etc. They are typically responsible for the analysis, design, coding, and testing of software that automates these industries. The average industry salary is $80,500. Software Engineer was voted the Best Job by Money Magazine ([http://money.cnn.com/magazines/moneymag/bestjobs/index.html](http://money.cnn.com/magazines/moneymag/bestjobs/index.html)).

**Question:** What are the guidelines for the application to the Software Engineering Bachelor's/Master's Dual Degree Program?  
**Answer:** University regulations require application after the completion of 90 credits but before the completion of 120 credits. Applicants must have completed the following core Software Engineering courses with a minimum GPA of 3.25:

SE 101 (Foundations of SE I)

SE 102 (Foundations of SE II)

SE 103 (Foundations of SE III)

SE 210 (Software Specifications and Design I)

SE 211 (Software Specifications and Design II)

SE 310 (Systems Architecture I)
Applicants must have an overall cumulative Grade Point Average of 3.25 or higher. Letters of recommendation from two Software Engineering/Computer Science faculty are required. Students must submit a plan of study. Consult the Graduate Advisor and course schedules for guidance. Acceptance to the program will be decided by the graduate admissions committee with consultation from the undergraduate curriculum committee, and will be based on a combination of the student's GPA and letters of recommendation. Acceptance may be denied if the plan of study is not feasible. For more information, contact the Department of Computer Science.

**Question:** If I take undergraduate courses to improve my background before matriculating into the MSSE will the grades I obtain in these courses count in the calculation of my MSSE GPA?  
**Answer:** Yes. All courses will count towards your GPA regardless of whether they are grad or undergrad. It is university policy: "Grade point average is based on the grade weighted by the credit hours for all courses taken at Drexel University while classified as a graduate student, whether the course is graduate or undergraduate and whether part of a degree program or not."

**Question:** Where should I take undergraduate courses to improve my background before matriculating into the MSSE?  
**Answer:** Applicants who need to take undergraduate courses should either do so as Drexel University Goodwin College students, then reapply to the MSSE program, or take the courses at another institution and reapply to the MSSE program.

**Question:** Do I need to satisfy the pre-requisites to take an INFO course?  
**Answer:** MSSE-CS students can take: (INFO 627) Requirements of Engineering and Management (INFO 638) Software Project Management without taking the pre-requisites. They can also take any IST course except INFO 605 and INFO 530. For ALL IST courses (except INFO 627, 638) students must have the pre-requisites UNLESS the pre-requisites are INFO605 and INFO530. If an IST course has a pre-requisite of INFO605,530 they should be waived for MSSE-CS students.

**Question:** Can you help me apply for graduation? What do I need to do?  
**Answer:** You can apply for graduation using the online form:  
[http://www.drexel.edu/provost/src/application_for_degree.asp](http://www.drexel.edu/provost/src/application_for_degree.asp). Once you have applied, your name will appear on a list received by the department, and we will clear you for graduation.

**Question:** I have been admitted to the MSSE, what should I do now?  
**Answer:** Fill out the plan of study form from this website and e-mail it to Spiros Mancoridis and [laura@cs.drexel.edu](mailto:laura@cs.drexel.edu). There is a schedule of courses by term and department (includes day/time, rooms, and number of students enrolled) available at:  
[http://coreapp1.drexel.edu/webtms/](http://coreapp1.drexel.edu/webtms/). Graduate level courses are those numbered 500 and above; section 900 indicates that they are online courses. To register: Pick up your accounts if
you haven't already at: https://accounts.drexel.edu/start_drexel.asp. You can register yourself for CS courses, though you'll have to email the iSchool advisor for INFO courses (more information is available above on this MSSE website).

**Question:** How do I transfer from one MSSE major to another??
**Answer:** Fill out the Major/Program Transfer form, which is on the Graduate Studies site: http://www.drexel.edu/provost/graduatestudies/forms/Graduate_Major_Program_Transfer_Form.pdf. The graduate advisor of your current major will then sign off as the releasing advisor and you will need to take this form to your new advisor and fill out the rest and walk this over to Graduate Studies.

**Question:** After taking more than a year off from taking classes I am ready to start taking classes again. What should I do?
**Answer:** If you go more than four consecutive terms without taking a class then you are dropped from the program and must reapply. This is very easily fixed, you'll just need to fill out a readmission form on the Graduate Studies website www.drexel.edu/graduatestudies and submit to laura@cs.drexel.edu.