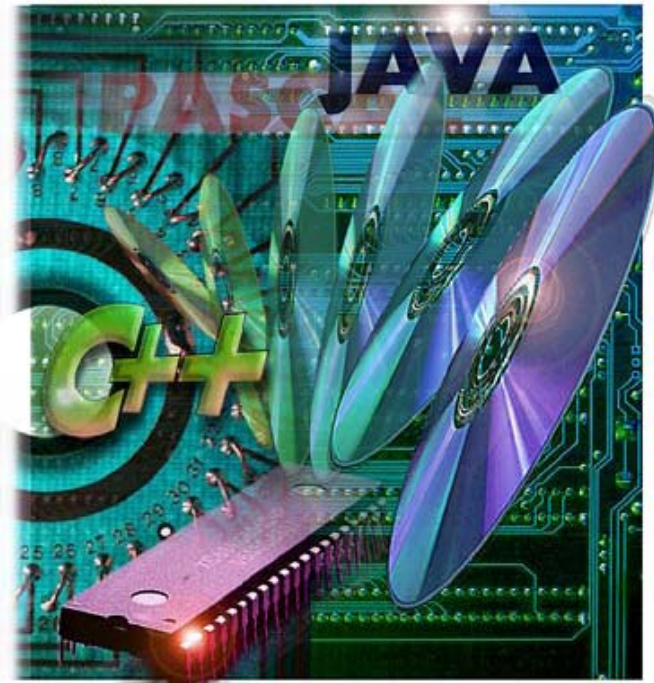


Clarkson University



Department of Computer Science

Student Handbook
(Class of 2010 and beyond)
September 2008

**Student Handbook
Computer Science
Class of 2010 and beyond**

September 2008

This handbook has been prepared for advising purposes. It contains detailed requirements and advice for students majoring in Computer Science. A checklist of requirements, as well as an on-line version of this handbook, can be found on the Computer Science web site at <http://www.clarkson.edu/cs>.

Note that the Clarkson Catalog (as amended), the Clarkson Regulations and the current edition of Courses remain the official references.

Students majoring in Software Engineering should consult the on-line Software Engineering handbook that can be found at <http://www.clarkson.edu/ece/handbook>.

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New in This Edition of the Handbook

Here is a summary of the main changes since the previous edition of this handbook (March 2008):

- General option, new curriculum: COMM440 was added to the list of courses in CS or related disciplines.
- Software Design and Development option: the list of Business electives has been expanded.
- IT option:
 - ◊ IS312 is no longer required.
 - ◊ IS400 is no longer an alternative to COMM341.
 - ◊ COMM341 counts as a Knowledge Area IA course.
 - ◊ CS457 is recommended as a CS elective.



Overview of the CS Major

The Computer Science major is organized into four options, as described below. The General option is the most flexible. It allows students to design an individualized program of study. The other three options prepare students for specific career paths.

The **General** option allows students to tailor their program of study to a wide variety of professional and personal goals. With the general option, students may explore a wide range of topics in computer science and related disciplines. They can also combine portions of some of the other options. The General option is also the easiest for pursuing a second major in another discipline.

The **Software Design and Development** option prepares students for careers in the software engineering field. These are careers that involve the specification, design, implementation, testing and maintenance of computer software.

The **Information Technology** option prepares students for careers in the planning and management of information technology infrastructure. Such careers include the administration of computer systems, computer networks and database systems, as well as the design and implementation of web sites.

The **Research** option prepares students for careers in research and development in either academia or industry. Such careers typically require a graduate degree and the Research option is the best way to prepare for graduate studies in computer science.



Is following an option like completing a minor? Students completing the Software Design and Development, Information Technology, and Research options automatically earn minors in Software Engineering, Information Technology, and Mathematics, respectively. However, the requirements of these options go significantly beyond the requirements of the minors alone. Note that you still need to officially enroll in the minor by submitting the appropriate form to the Department office.

When do I need to choose an option? The sample schedules in this handbook all have the same first five semesters and start diverging in the sixth semester. So you should normally choose an option no later than the fall semester of your junior year, before selecting courses for the spring. You can, of course, choose earlier. You may also be able to choose later, depending on your choice of courses. Your advisor can help you plan. Once you have chosen an option, you should notify your advisor and the Department office (Cindy Smith, cindy@clarkson.edu). You can also submit the minor enrollment form at the same time (see above).

Does my CS option appear on my transcript? No. But if you fulfill the requirements of one of the last three options, you will receive a certificate from the Department, provided the Department office is notified of your choice before your graduation.

Should I put my CS option on my resume? Yes. It is a good idea to mention your CS option when applying for jobs or graduate school. For example, “Major: Computer Science, IT option.”



General Advice

As you plan your program of study, keep in mind the following special programs and general advice.

Co-op Program. Doing a co-op usually means working for a company during a summer and the following or preceding academic semester. This allows you to gain valuable experience and get a foot in the door of a company. You also see first-hand how your education relates to the real world. The best time to go on co-op is probably around the summer between your junior and senior years. You should start planning as early as your sophomore year. Visit the Career Center web pages or pass by their office for more information.

Study Abroad. A semester of study abroad exposes you to another educational system and culture. It's an excellent way to gain important skills for an increasingly globalized world. Clarkson has agreements with universities in Australia, England, Mexico and several other countries in Europe and Asia. Visit the Career Center web pages or pass by their office for more information.

Cross Registration. The four local colleges have a cross registration program for transferring credit. For example, SUNY Potsdam offers courses in foreign languages, fine arts and education that are not available at Clarkson. Contact SAS for more information.

Computer Science Labs. You are encouraged to get involved in one of the student-centered department labs or in the University's student chapter of the Association for Computing Machinery (ACM), one of the main computer science professional organizations. The labs are the Clarkson Open Source Institute,



the Internet Teaching Lab and the Virtual Reality Lab. Brief descriptions of the labs and ACM student chapter are included towards the end of this handbook.

Free Electives. All options of the Computer Science major include 25 to 31 credits of free electives. You are strongly encouraged to use these electives in a meaningful way. Some of these electives can be used to take additional courses in computer science. However, in recent years, close to 90% of CS graduates used some of their free electives to earn either a minor or a second major. You are encouraged to follow their example: the knowledge and perspective gained through the study of a second discipline is a valuable addition to your major.

This second discipline can be closely related to computer science or it can be a discipline in which you have a strong personal or professional interest. Some of the most common possibilities are discussed later in this handbook.

Earning an official minor or second major has the advantage of being recognized on your transcript. But you can also build your own minor: pick two or three courses in another discipline and add any required prerequisites. Discuss your plans with your advisor.

One-Year M.B.A. Another good use of free electives is to prepare for a one-year Master of Business Administration. Visit the School of Business web pages or office for details.



General Requirements

University Requirements:

1. Students must complete at least 120 credit hours and achieve a cumulative QPA of at least 2.0.
2. Students must also achieve a cumulative QPA of at least 2.0 in their major. The list of courses that constitute the major is maintained by SAS. The current list for the CS major is MA211 and all CS courses excluding any directed study, undergraduate research, and clinic courses (CS407, 408, 411, 412, 441, 442, 497 and 498).
3. Starting with the class of 2010, all students must satisfy the requirements of the Clarkson Common Experience. The Clarkson Common Experience is described in the Clarkson Catalog and lists of courses that fulfill some of its requirements can be found on the SAS web pages.
4. FY100 First-Year Seminar is required for all students entering as first-year students.

Restrictions:

1. Up to 12 credit hours of advanced (300 and 400-level) course work in aerospace studies or military science can be counted as free electives. AS and MS courses at the 100 and 200 levels cannot be counted towards graduation requirements.
2. The following courses cannot be counted towards graduation requirements: MA031, 041, 042, 051, 061, 101, 104, 180, 181, STAT282, SC131. At most one of CS142 and EE363 can be counted. At most two of the following three courses can be counted: CS241, EE264, EE360. Starting Fall 2008, at most one of CS242 and EE408 can be counted.

Lists of Restricted Electives:

Some of the requirements of the CS major are electives that must be chosen from specified lists of courses. These lists are reviewed and updated periodically. This handbook contains the current version of these lists. Check with your advisor or with the Department office for the most up-to-date lists.



The Computer Science Major

All students must take the courses below as well as the courses specified by one of the options shown on the following pages.

Note: The requirements of the Computer Science major, as described in the following pages, include a number of CS and free electives. Some of these must be chosen to meet certain Common Experience requirements. Additional details will be available in later editions of this handbook.

COMMON TO ALL OPTIONS

Computer Science

CS141 Introduction to Computer Science I
CS142 Introduction to Computer Science II
CS241 Computer Organization
CS242 Advanced Programming Concepts
CS341 Programming Languages
CS344 Algorithms and Data Structures
CS345 Automata Theory and Formal Languages
CS350 Software Design and Development
CS444 Operating Systems

Mathematics

MA131 Calculus I
MA132 Calculus II
MA211 Foundations
MA339 Applied Linear Algebra (or MA239 Elementary Linear Algebra)
STAT383 Applied Statistics I (or MA381 Probability)



COMMON TO ALL OPTIONS (continued)

Science

A two-course sequence in physics or chemistry

(PH131–132, PH141–142 or CM131–132)

At least 4 credits of PH, BY, CM or Science Foundation courses.

Common Experience

FY100 First-Year Seminar

UNIV190 The Clarkson Seminar

Five courses covering six Knowledge Areas (at least one of these courses must be a University Course that covers two areas)

Courses that carry a total of six communication points (at least two of these points must be earned in courses in the major at the 300 level or higher)

(Note: A single course can fulfill more than one Common Experience requirement as well as a requirement of the major.)



GENERAL OPTION

- Two of
 - CS445 Compiler Construction
 - CS455 Computer Networks
 - CS460 Database Systems
- One from a list of advanced CS courses
(400 or higher.)
- Two from a list of advanced courses in CS or related disciplines
(CS400 or higher, EE368, 466, IS312, 314, COMM440,
442 or 444.)
- Free electives (31 credits)

SOFTWARE DESIGN AND DEVELOPMENT OPTION

- CS458 Formal Methods for Program Verification
- CS459 Human-Computer Interaction
- CS460 Database Systems
- EE368 Software Engineering
- One of
 - CS445 Compiler Construction
 - CS455 Computer Networks
- One from a list of advanced CS courses
(400 or higher.)
- One from a list of business courses
(Any MK, OM or OS. HP200 allowed for students in
the Honors Program.)
- Free electives (25 credits)



INFORMATION TECHNOLOGY OPTION

CS455 Computer Networks
CS460 Database Systems
CS462 Software Development for the Web (or one of COMM440
PHP/My SQL Interactive Design or COMM442 Advanced
World Wide Web Interface Design)
IS314 Database Administration
COMM341 Introduction to Web Design (IA) (or IS400
Development of Business Applications on the Internet, if
taken before Fall 2008)
COMM444 Unix Web System Administration
One from a list of advanced CS courses
(400 or higher. Recommended: CS457)
Free electives (28 credits)

RESEARCH OPTION

CS445 Compiler Construction
CS447 Computer Algorithms
One of
 CS455 Computer Networks
 CS460 Database Systems
Two from a list of advanced CS courses
(400 or higher.)
6 credits of thesis or undergraduate research, or two graduate
courses numbered 600 or higher. (See the next page for
more details.)
Free electives (25 credits)



Thesis Requirement

(Research option only)

To satisfy the requirements of the Research option, students must engage in a research project worth at least 6 credit hours and normally spanning two academic semesters. A research proposal must be submitted and approved during the first semester. A thesis based on the research must be submitted and approved by the end of the second semester. Approvals are required from the students' research supervisor and the Computer Science Undergraduate Committee.

It is the students' responsibility to find a research supervisor. Every effort will be made to accommodate all qualified students, but the Department cannot guarantee that an interested research supervisor will be available.

Alternatively, students can fulfill the thesis requirement by earning grades of C or better in two CS graduate courses numbered 600 or higher. This requires a GPA of at least 3.5 and permission of the Department chair.



CS Electives

Here is a list of undergraduate CS courses that can be taken as electives in the various options.

- CS443 Parallel Programming
- CS445 Compiler Construction
- CS446 Computer Graphics and Geometry
- CS447 Computer Algorithms
- CS449 Computational Learning
- CS451 Artificial Intelligence
- CS452 Computer Graphics
- CS453 Mainframe Computing
- CS455 Computer Networks
- CS456 Cryptography
- CS457 Computer and Network Security
- CS458 Formal Methods for Program Verification
- CS459 Human-Computer Interaction
- CS460 Database Systems
- CS461 Virtual Environments: Principles and Applications
- CS462 Software Development for the Web
- CS463 Wireless Networks
- CS464 Computer Game Development (pending approval)

Undergraduate students can also take graduate courses. Courses at the 500 level require a GPA of at least 3.0 and courses at the 600 level require a GPA of at least 3.5. In both cases, you also need approval of your advisor and of the course instructor.

Courses at the 500 level are normally cross-listed with 400-level courses. Courses at the 600 level are research-oriented. Here is a list of the current 600-level courses:

- CS642 Computational Complexity
- CS643 Parallel Computation



- CS644 Current Issues in Operating Systems Research
- CS653 Automated Reasoning
- CS654 Current Issues in Computer Networks Research
- CS656 Advanced Topics in Cryptography
- CS657 Advanced Topics in Computer Security
- CS658 Current Issues in Program Analysis and Verification
Research
- CS659 Systems Biology

Students interested in research can enroll in CS497-498. This requires permission of a research supervisor.

It is also possible to study topics not covered in regular courses by arranging a directed study course (CS407, 408, 411, 412). This requires permission of a faculty supervisor.

Students can also receive credit for projects carried out in the Open Source Institute (COSI) and the Internet Teaching Lab (ITL) through the courses MP*51 and MP*52, respectively. This requires permission of a faculty advisor.



Sample Schedules

The following are sample schedules for all the options of the CS curriculum. The schedules are set up so that the first five semesters are identical in all options. This allows students to delay the choice of an option until the fall semester of their junior year.

The common first five semesters are shown below. The last three semesters for each of the options are shown in the following pages.

These are only sample schedules. Many variations are possible.

COMMON TO ALL OPTIONS

First Year					
CS141	Intro to CS I	4	CS142	Intro to CS II	3
MA131	Calc I	3	MA132	Calc II	3
	Sci sequence	4		Sci sequence	4
UNIV 190	Clarkson Seminar	3		KA Elective	3
FY100	First-Year Seminar	1		Free Elective	3
		15			16
Sophomore Year					
CS242	Adv. Prog. Concepts	3	CS241	Computer Organization	3
MA211	Foundations	3	CS344	Data Struct. and Alg.	3
	Science	3	MA339	Linear Algebra	3
	KA/UC	3		Science	3
	Free Elective	3		KA/UC	3
		15			15
Junior Year					
CS341	Prog. Languages	3			
CS345	Automata Theory	3			
CS350	Softw. Des. Dev.	3			
	KA/UC	3			
	Free Elective	3			
		15			



GENERAL OPTION

CS444	Operating Systems	3
	CS Elective	3
STAT383	Applied Statistics	3
	KA/UC	3
	Free Elective	3
		15

Senior Year					
	CS Elective	3		CS Elective	3
	CS Elective	3		CS Elective	3
	Free Elective	3		Free Elective	3
	Free Elective	3		Free Elective	3
	Free Elective	3		Free Elective	2
		15			14

SOFTWARE DESIGN AND DEVELOPMENT OPTION

CS444	Operating Systems	3
EE368	Software Engineering	3
	CS Elective	3
STAT383	Applied Statistics	3
	KA/UC	3
		15

Senior Year					
CS459	Hum.-Comp. Interf.	3	CS458	Program Verification	3
	CS Elective	3	CS460	Database Systems	3
	Business	3		Free Elective	3
	Free Elective	3		Free Elective	3
	Free Elective	3		Free Elective	2
		15			14



INFORMATION TECHNOLOGY OPTION

CS444	Operating Systems	3
CS462	Software Dev for Web	3
COMM 341	Intro to Web Design (IA)	3
STAT383	Applied Statistics	3
	Free Elective	3
		15

Senior Year					
CS455	Computer Networks	3	CS460	Database Systems	3
IS314	Database Admin.	3	COMM 444	Web System Admin.	3
	CS Elective	3		Free Elective	3
	Free Elective	3		Free Elective	3
	Free Elective	3		Free Elective	2
		15			14

RESEARCH OPTION

CS444	Operating Systems	3
CS445	Compiler Construction	3
STAT383	Applied Statistics	3
	CS Elective	3
	KA/UC	3
		15

Senior Year					
CS497	Ugrad Research I	3	CS498	Ugrad Research II	3
CS447	Algorithms	3		CS Elective	3
	CS Elective	3		Free Elective	3
	Free Elective	3		Free Elective	3
	Free Elective	3		Free Elective	2
		15			14



Minors

In recent years, close to 90% of CS graduates earned either a minor or a second major. Roughly 50% earned a minor in Mathematics, 20% earned a minor in Software Engineering, and 10% earned a minor in Information Technology, with some earning more than one. In all, these students earned minors or second majors in a total of 13 different disciplines.

As was mentioned earlier, students completing the Software Design and Development, Information Technology, and Research options automatically earn minors in Software Engineering, Information Technology, and Mathematics, respectively. (Keep in mind that you still need to officially enroll in the minor by submitting the appropriate form to the Department office.)

Below are the three most common minors and how students following the General option of the new curriculum can achieve them.

Mathematics: One additional eligible math or CS course.
Recommended: CS447 or CS456. These courses count as CS electives.

Software Engineering: EE368 and one of OM476, 480 or 485.
EE368 counts as an elective in CS or related disciplines and OM480 is an Economics and Organizations Knowledge Area course.

Information Technology: IS314, CS455, COMM442 and COMM 444. CS455 counts as a CS elective and the COMM courses count as electives in CS or related disciplines.

Other minors are listed in the Catalog, which is available on the University web pages. You should consult with the department offering the minor to verify what the current requirements are. Discuss your plans with your advisor.



Second Majors

In recent years, roughly a quarter of all CS graduates earned a major in a second discipline. Mathematics was by far the most common. Second most common were Management Information Systems (MIS, now ISBP), Psychology, and Computer Engineering. Others were Aeronautical Engineering, Mechanical Engineering, Chemistry, Physics, and Technical Communication (now Communication).

Double majoring is possible in all options but easier in the General option. Double majoring with an engineering major usually requires overloading. Discuss your plans with your advisor and the department of your second major.

A sample schedule for a double major in Computer Science (General option of the new curriculum) and Mathematics (Math option) is given on the next page.



**Sample Schedule for Double Major in
CS (General Option) and Math (Math Option)**

First Year					
CS141	Intro to CS I	4	CS142	Intro to CS II	3
MA131	Calc I	3	MA132	Calc II	3
PH131	Physics I	4	MA200	Modeling & Software	4
UNIV 190	Clarkson Seminar	3	PH132	Physics II	3
FY100	First-Year Seminar	1		Free Elective	3
		15			16
Sophomore Year					
CS242	Adv. Prog. Concepts	3	CS241	Computer Org.	3
MA211	Foundations	3	CS344	Data Struct. and Alg.	3
MA232	Differential Eq.	3	MA231	Calculus III	3
	Science	3	MA339	Appl. Linear Algebra	3
	KA/UC	3		Science	3
		15			15
Junior Year					
CS341	Prog. Languages	3	CS444	Operating Systems	3
CS345	Automata Theory	3	STAT383	Applied Statistics	3
CS350	Softw. Des. Dev.	3		CS Elective	3
MA321	Advanced Calculus I	3		KA/UC	3
	KA/UC	3		Free Elective	3
		15			15
Senior Year					
	MA311 or MA313	3		MA314 or MA322	3
	CS Elective	3		CS Elective	3
	CS Elective	3		CS Elective	3
	KA/UC	3		Liberal Arts	3
	Liberal Arts	3		Free Elective	2
		15			14



Clarkson Open Source Institute Laboratory (SC 336)

The mission of the Clarkson Open Source Institute (COSI) is to explore and develop the areas in which Open Source Software (OSS) and academia can strengthen each other - in both research and education. The COSI Laboratory serves as a development environment and meeting space for students involved in OSS projects. Students are responsible for administering a variety of server machines running open source software as well as the desktop lab machines, thus gaining real-world experience in administering a Linux facility. COSI students deploy, learn from and develop cutting-edge open source software. COSI students have brought home numerous awards in international open source computing competitions such as the IBM Linux challenge and the Unisys Tuxmaster competition. The lab also provides a Linux-based facility for teaching Computer Science and related courses, and is open for public use during much of the work week. COSI meets each week to review projects and offers tutorials/workshops. The COSI web page is at <http://cosi.clarkson.edu>.

Internet Teaching Laboratory (SC 334)

The Clarkson Internet Teaching Laboratory (ITL) is dedicated to providing students hands-on experience with cutting edge networking hardware and software. Students develop, deploy and improve novel solutions to modern network challenges such as Internet security or network management. Students are responsible for administering a lab of 30 desktop computers that dual-boot Windows and Linux as well as a number of server machines. The lab contains a wide variety of networking equipment for experimentation including four high-end Cisco 7000 routers, five Cisco 2500 router as well as an assortment of switches, hubs and wireless access points. ITL students have brought home numerous awards in international competitions including the Unisys Tuxmaster competition and the VMware Ultimate Appliance Challenge. The ITL meets each week to review projects and offers tutorials/workshops. The ITL's web page is at <http://www.clarkson.edu/projects/itl>.



Virtual Reality Lab (SC 336)

The Virtual Reality Lab is a center for students conducting independent research in virtual environments, computer graphics, and computer games. The most recent project in the VR Lab centers on the application of Virtual Reality technologies to powered wheelchair training, including a suite of games and an intelligent tutoring system designed to help children learn how to operate a power wheelchair. Additional projects include a Personal Driving System (PDS) designed for stroke patients to practice driving skills, and a Breathing Mentor for post-operative breathing exercises for cardiac patients. More information about this and other VRL projects may be found at <http://www.clarkson.edu/~vrlab>. The lab is equipped with computers, a power glove, three head-mounted displays and head trackers, and a haptic driving wheel. Software includes VRML, 3D Studio Max for modeling and Virtools for creating immersive virtual worlds.

ACM Student Chapter

The Clarkson University chapter of the Association for Computing Machinery, founded in 1982, is a student chapter that promotes the free interchange of information among specialists, students, and the public. It does this through various activities such as programming contests, help sessions on various topics like Linux, UNIX, viruses, and programming languages, as well as information tables and demonstrations of advanced software and graphics on advanced computer systems. The chapter also sponsors invited talks on a variety of topics of interest. Recent talks include the following: IBM representatives gave a presentation on Grid Computing, Clarkson alumni Mike deMare spoke about his experiences as a software engineer in the electronic design automation industry, Clarkson alumni Eric Hutchins talked about legal issues in enforcing the GNU general public license. The chapter is currently organizing an IBM mainframe contest.



The Clarkson ACM is, in general, here for students or other members of the Clarkson community to get help from other knowledgeable students on just about any subject which is related to computers, information processing, data exchange, and so on. Our primary focus is to learn something about computers, then extend that knowledge to practical applications, and educate the community about the subject. The chapter's web page is at <http://people.clarkson.edu/clubs/acm/index.php>.

