

COMPUTER SYSTEMS ENGINEERING

Computer Systems Engineering is an interdisciplinary program between the Computer Science Department and the Electrical Engineering Department. It is a School of Engineering major that leads to a Bachelor of Science in Engineering degree. The program is targeted for undergraduates with an interest in implementation and application of computers and computer-based systems. Through course work and laboratory experiences, students obtain a strong foundation in the basics of both Computer Science and Electrical Engineering. From there, students specialize in either Digital Systems, Networking, or Robotics and Mechatronics. A senior project caps the program and provides a special hands-on experience.

UNDERGRADUATE RESEARCH OPPORTUNITIES

In addition to the honors program in CS (discussed later in this handbook), there are many opportunities for undergraduates to get involved in research. Here is a partial list:

CURIS (Undergraduate Research in Computer Science)

Each summer undergraduates work with CS faculty through the summer research college. Interested students apply for positions during the winter quarter; CURIS decisions are made and offers sent out before spring quarter begins. These positions are fully-funded and provide invaluable experience in cutting-edge research. All CS and CSE students are notified via email of CURIS opportunities and the application process.

Research Opportunities for Computer Science Undergraduates

At the beginning of each academic year CS faculty are asked to provide a list of ongoing research projects that are appropriate for undergraduate involvement. Descriptions of the projects are listed at <http://curis.stanford.edu/research.html> (don't let the 'curis' fool you; this is not the web site for the summer CURIS program).

Research Tour/Lunch Series

Each year the CS department offers research lab tours and luncheons specifically geared toward undergraduates. These tours allow students to experience first-hand what goes on in a lab, and the luncheons provide an opportunity for students to discuss interests with research faculty. Past tours included the AI Robotics Lab, the IRoom and the Graphics Lab.

Research Seminars and Talks

At various times throughout the year, the CS department hosts talks and presentations on various research and technology topics. In addition to these one-time events, there are regularly scheduled seminars which are open to undergraduates. Many of these seminars are available as 1 unit, 500-level courses, but enrollment is not required for attendance.

Pursuing a Research-Oriented Undergraduate Program:

Freshman and Sophomore Year

Students interested in pursuing research should plan to finish the CS core (CS 103, 106, 107, and 108) by the end of the sophomore year. Those with extra room may find these courses useful:

If you're considering...

Possible AI courses
Possible graphics courses
Possible theory courses

...take these freshman/sophomore year

MS&E 120 or Stat 116
Math 51 or Math 103
MS&E 120 or Stat 116; CS 154

Students are encouraged to apply for CURIS summer research positions but should be aware they may not yet have the necessary background to explore a research area in depth.

Junior Year

During the junior year students considering research can take one of the following sequences:

Field of Interest	Fall	Winter	Spring
Artificial Intelligence	221*	Any 22x	Coursework
Databases	145	245	suggested by
Graphics	248**	448	CURIS advisor
Human-Computer Interaction	147	247	
Systems	140	244A	
Theory	157 and 161*	256 or 259	

* Students should take Stat 116 or MS&E 120 before taking CS 161 or 221.

** Students should take Math 51 or Math 103 before taking CS 248.

Students doing summer research through CURIS should expect to take a course or two spring quarter to prepare them for their research project.

Senior Year

Students may choose to take CS 294 if they do not have a specific project in mind but wish to contribute to active research.

Note: The above are meant to be taken only as suggestions. If you have questions, contact the CS course advisor at advisor@cs.stanford.edu.

REQUIREMENTS

Course	Title	Units	Quarter	Year
Mathematics (23 units minimum)				
MATH 41	Calculus	5	A	Fr
MATH 42	Calculus	5	AW	Fr
MATH 51	Linear Alg and Differential Calculus of Several Variables	5	AWS	Fr
MATH 52 or 53	Integral Calc of Several Variables/ Linear Algebra	5	AWS	So
STAT 116 or MS&E 120 or CME 106	Theory of Probability Probabilistic Analysis Introduction to Probability and Statistics for Engineers	3-5	AS A W	So/Jr So/Jr So/Jr
Science (12 units minimum)				
PHYSICS 41	Mechanics	4	W	Fr
PHYSICS 43	Electricity and Magnetism	4	S	Fr
PHYSICS 45	Light and Heat	4	A	Fr/So
Engineering Fundamentals (13 units minimum)				
ENGR 40	Introductory Electronics	5	AS	So
CS 106X or CS 106A and CS 106B	Programming Methodology and Abstractions (Acc) Programming Methodology Programming Abstractions	5	AW AWS WS	Fr/So Fr/So Fr/So
Elective	(see Fig. 3-4 for list of approved Engr Funds courses)	3-5		So/Jr
Technology in Society (One course, 3-5 units)				
<i>See Figure 3-3 for list of SoE approved courses.</i>				
Writing in the Major (One course)				
<i>CS191W, CS194, CS201 and CS294W fulfill the "Writing in the Major" requirement.</i>				
Core (32 units minimum)				
CS 103X or CS 103A and CS 103B	Discrete Structures (Accelerated) Discrete Mathematics for Computer Science Discrete Structures	4-6	W AW WS	Fr/So Fr/So Fr/So
CS 107	Programming Paradigms	5	AS	So
CS 108	Object-Oriented Systems Design	4	AW	So
EE 108A	Digital Systems I	4	AW	So/Jr
EE 108B	Digital Systems II	4	AW	So/Jr
Senior Project	CS 191, 191W, 194, 294 or 294W (see note 1)	3		Sr

Plus two of the following (see note 2):				
EE 101A	Circuits I	4	W	So/Jr
EE 101B	Circuits II	4	AS	So/Jr
EE 102A	Signals and Systems I	4	W	So/Jr
EE 102B	Signals and Systems II	4	S	So/Jr

CHOOSE ONE OF THE FOLLOWING THREE SPECIALIZATIONS:

Digital Systems Specialization (20 units minimum)				
CS 140 or CS 143	Operating Systems Compilers	4	AW AW	Jr/Sr Jr/Sr
EE 109	Digital Systems Design Lab	4	S	So/Jr
EE 271	VLSI Systems	3	A	Jr/Sr
Plus three to four of the following (see note 3)				
CS 140 or 143	(if not counted above)	4	AW/AW	Jr/Sr
CS 240E	Embedded Wireless Systems	3	W	Jr/Sr
CS 244A	Introduction to Networking	4	W	Jr/Sr
CS 244E	Low-Power Wireless Networking	3	S	Jr/Sr
EE 273	Digital Systems Engineering	3	Not given 2006/07	Jr/Sr
EE 275	Logic Design	3	Not given 2006/07	Jr/Sr
EE 282	Computer Architecture	3	S	Jr/Sr

Networking Specialization (20 units minimum)				
CS 140	Operating Systems	4	AW	Jr/Sr
CS 244A	Introduction to Networking	4	W	Jr/Sr
Plus four to five of the following (see note 3)				
CS 240	Advanced Topics in Operating Systems	3	AS	Jr/Sr
CS 240E	Embedded Wireless Systems	3	W	Jr/Sr
CS 240X	Advanced Operating Systems II	3	W	Jr/Sr
CS 244B	Distributed Systems	3	W	Jr/Sr
CS 244E	Low-Power Wireless Networking	3	S	Jr/Sr
CS 249	OOP from a Modeling and Simulation Perspective	3-5	A	Jr/Sr
EE 179	Introduction to Communication	3	W	Jr/Sr
EE 276	Introduction to Wireless Personal Communications	3	S	Jr/Sr

Robotics and Mechatronics Specialization (19 units minimum)				
CS 205	Mathematical Methods for Robotics, Vision and Graphics	3	A	So/Jr
CS 223A	Introduction to Robotics	3	W	Jr/Sr
ME 210 or EE 118	Introduction to Mechatronics	4	W	So/Jr
ENGR 105	Feedback Control Design	3	W	So/Jr
Plus two to three of the following (see note 3)				
CS 223B	Introduction to Computer Vision	3	W	Jr/Sr
CS 225A	Experimental Robotics	3	S	Jr/Sr
CS 225B	Robot Programming Laboratory	4	A	Jr/Sr
ENGR 205	Introduction to Control Design Techniques	3	A	Jr/Sr
ENGR 206	Control System Design	4	S	Jr/Sr
ENGR 207A	Modern Control Design I	3	W	Jr/Sr
ENGR 207B	Modern Control Design II	3	S	Jr/Sr

Notes:

1. CS191 and 191W independent study projects require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CSE program advisor (Robert Plummer or Patrick Young). A form bearing these

signatures, along with a brief description of the project, should be filed with the department representative in Gates 182 the quarter before work on the project is begun.

2. Students pursuing the **Robotics and Mechatronics** or **Networking** specializations must take EE 102A and 102B.
3. Students opting to take CS 103X instead of CS 103A and B must complete the higher number of courses.

INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: COMPUTER SYSTEMS ENGINEERING

1. Find an Advisor

For details see <http://csmajor.stanford.edu/ChoosingAdvisor.shtml>

Find a CS professor or lecturer who verbally agrees to be your advisor. See

<http://csmajor/FacultyList.php> for a list of faculty members. You should meet with him or

her in person, either in office hours or by appointment. Write your advisor's name here.

I have spoken

to

--

and he/she has agreed to
be my advisor.

2. Collect Folder and Declare on Axess

Track down your freshman advisor and get your academic folder from him or her. If you cannot reach your freshman advisor, we will create a new academic folder for you.

q I have my academic folder.

Print out a copy of your unofficial transcript from Axess (Academics → View Unofficial Transcript). *Please don't staple it.*

q My folder includes an unofficial transcript from this quarter.

While you're on Axess, be sure to declare there. (Academics → Declare a Major/Minor). CSE majors select "Engineering", as your major and CSE as your field of study (subplan).

q I have declared on Axess.

3. Basic Information

Full name	First	Middle	Last		
Name you go by:		Birth date:	Month:	Day:	Year:
SUID #		E-mail _____@stanford.edu			
Major	<input type="checkbox"/> CS <input type="checkbox"/> CSE	Expected graduation	<input type="checkbox"/> 2010 <input type="checkbox"/> 2009 <input type="checkbox"/> 2008 <input type="checkbox"/> 2007 <input type="checkbox"/> Other:		
Date you came to see the Course Advisor:					

4. See the Course Advisor in Gates 160

Bring this form to the Course Advisor's office hours in **Gates 160**. The current quarter's office hours are posted at <http://csmajor.stanford.edu/WhoToSee.shtml>.

NOTE: There are no office hours during finals week, break, or summer quarter. It may take up to two weeks for a declaration to go through, so please plan accordingly! Juniors should do this before winter quarter.

Stanford University ♦ School of Engineering
Computer Systems Engineering – Digital Systems Specialization
2006-2007 Sample Program Sheet

Final version of completed and signed program sheet due to the department no later than one month prior to the last quarter of senior year.

Name: _____
 Local Address: _____

SU ID: _____
 Local Phone: _____
 Email: _____
 Date B.S. expected: _____

Mathematics and Science Requirement

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
<i>Mathematics (23 units minimum)</i>							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
MATH	51	Calculus	5				
MATH	52 or 53	Calculus	5				
STAT	116	Probability (or MS&E 120 or CME 106)	3 to 5				
<i>Mathematics Unit Total</i>				<i>(23 units minimum)</i>			
<i>Science (12 units minimum)</i>							
PHYSICS	41	Mechanics	4				
PHYSICS	43	Electricity and Magnetism	4				
PHYSICS	45	Light and Heat	4				
<i>Science Unit Total</i>				<i>(12 units minimum)</i>			
<i>Mathematics and Science Unit Total</i>				<i>(35 units minimum)</i>			

Technology in Society Requirement (1 course required; see UGHB Fig. 3-3 for SoE approved list)

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Engineering Fundamentals (13 units minimum)

CS	106	Programming Methodology & Abstractions (A and B, or X)	5				
ENGR	40	Introductory Electronics	5				
		Elective (see note 1)					
<i>Engineering Fundamentals Total</i>				<i>(13 units minimum)</i>			

NOTES

- * This form is available as an Excel file at <http://ughb.stanford.edu/>. The printed form must be signed by the departmental representative. Changes must be initialed in ink.
 - * All courses listed on this form must be taken for a letter grade if offered by the instructor.
 - * Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Computer Systems Engineering Core and Depth (combined) is 2.0.
 - * Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's office. Transfer credits in Computer Systems Engineering Core and Depth must be approved by the Computer Science undergraduate program representative. Transfer credit information and petitions are available at <http://ughb.stanford.edu/transfer.html>.
 - * All courses listed on this form must only be included under one category. Delete courses not taken.
- (1) One course required, 3 to 5 units. See Engineering Fundamentals list, Fig. 3-4 in UGHB.

program sheet continues on page 2

Computer Systems Engineering Program Sheet (continued)

Computer Systems Engineering (55 units minimum)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Core (32 units minimum)							
CS	103	Discrete Structures (X, or A and B)	4 or 6				
CS	107	Programming Paradigms	5				
CS	108	Object-Oriented Systems Design	4				
EE	108A	Digital Systems I	4				
EE	108B	Digital Systems II	4				
Senior Project		CS191, 191W, 194, 294 or 294W (see notes 2, 3)	3				
Plus two of the following							
EE	101A	Circuits I	4				
EE	101B	Circuits II	4				
EE	102A	Signals and Systems I	4				
EE	102B	Signals and Systems II	4				
<i>Computer Systems Engineering Core Total</i>				<i>(32 units minimum)</i>			
Depth (20 units minimum) Be advised, no course may be listed twice on the sheet. No double-counting.							
CS	140 or 143	Operating Systems or Compilers	4				
EE	109	Digital Systems Design Lab	4				
EE	271	VLSI Systems	3				
Plus three to four of the following (see note 4; delete courses not taken)							
CS	140 or 143	<i>(if not counted above)</i>	4				
CS	240E	Embedded Wireless Systems	3				
CS	244A	Introduction to Networking	4				
CS	244E	Low-Power Wireless Networking	3				
EE	273	Digital Systems Engineering	3				
EE	275	Logic Design	3				
EE	282	Computer Architecture	3				
<i>Computer Systems Engineering Depth Total</i>				<i>(20 units minimum)</i>			

Computer Systems Engineering Core + Depth Total *(55 units minimum)*

Program Approvals

Advisor

Printed Name: _____

Date: _____

Signature: _____

Departmental

Printed Name: _____

Date: _____

Signature: _____

School of Engineering

Printed Name: _____

Date: _____

Signature: _____

NOTES (continued from page 1)

- (2) The WIM requirement for Freshmen and Transfer students entering Fall 96 or later may be met by taking CS 201 as a Technology in Society course or through the Senior Project course (191W, 194, or 294W only).
- (3) Independent study projects (CS 191 or 191W) require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CSE program advisor (Robert Plummer or Patrick Young). A signed approval form, along with a brief description of the proposed project, should be filed with the department representative in Gates 182 the quarter before work on the project is begun.
- (4) Students opting to take CS 103X instead of CS 103A and B must complete four of these courses.

Stanford University ♦ School of Engineering
Computer Systems Engineering – Networking Specialization
2006-2007 Sample Program Sheet

Final version of completed and signed program sheet due to the department no later than one month prior to the last quarter of senior year.

Name: _____
 Local Address: _____

SU ID: _____
 Local Phone: _____
 Email: _____
 Date B.S. expected: _____

Mathematics and Science Requirement

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
<i>Mathematics (23 units minimum)</i>							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
MATH	51	Calculus	5				
MATH	52 or 53	Calculus	5				
STAT	116	Probability (or MS&E 120 or CME 106)	3 to 5				
<i>Mathematics Unit Total</i>				<i>(23 units minimum)</i>			
<i>Science (12 units minimum)</i>							
PHYSICS	41	Mechanics	4				
PHYSICS	43	Electricity and Magnetism	4				
PHYSICS	45	Light and Heat	4				
<i>Science Unit Total</i>				<i>(12 units minimum)</i>			
<i>Mathematics and Science Unit Total</i>				<i>(35 units minimum)</i>			

Technology in Society Requirement (1 course required; see UGHB Fig. 3-3 for approved list)

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Engineering Fundamentals (13 units minimum)

CS	106	Programming Methodology & Abstractions (A and B, or X)	5				
ENGR	40	Introductory Electronics	5				
		Elective (see note 1)					
<i>Engineering Fundamentals Total</i>				<i>(13 units minimum)</i>			

NOTES

- * This form is available as an Excel file at <http://ughb.stanford.edu/>. The printed form must be signed by the departmental representative. Changes must be initialed in ink.
 - * All courses listed on this form must be taken for a letter grade if offered by the instructor.
 - * Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Computer Systems Engineering Core and Depth (combined) is 2.0.
 - * Transfer and AP credits in Math, Science, Fundamentals, & TIS must be approved by the SoE Dean's office. Transfer credits in Computer Systems Engineering Core and Depth must be approved by the Computer Science undergraduate program representative. Transfer credit information and petitions are available at <http://ughb.stanford.edu/transfer.html>.
 - * All courses listed on this form must only be included under one category. Delete courses not taken.
- (1) One course required, 3 to 5 units. See Engineering Fundamentals list in UGHB, Fig. 3-4.

program sheet continues on page 2

Computer Systems Engineering Program Sheet (continued)

Computer Systems Engineering (54 units minimum)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
<i>Core (32 units minimum)</i>							
CS	103	Discrete Structures (X, or A and B)	4 or 6				
CS	107	Programming Paradigms	5				
CS	108	Object-Oriented Systems Design	4				
EE	102A	Signals and Systems I	4				
EE	102B	Signals and Systems II	4				
EE	108A	Digital Systems I	4				
EE	108B	Digital Systems II	4				
Senior Project		CS191, 191W, 194, 294 or 294W (see notes 2, 3)	3				
<i>Computer Systems Engineering Core Total</i>				<i>(32 units minimum)</i>			
<i>Depth (20 units minimum) Be advised, no course may be listed twice on the sheet. No double-counting.</i>							
CS	140	Operating Systems	4				
CS	244A	Introduction to Networking	4				
<i>Plus four to five of the following (see note 4; delete courses not taken)</i>							
CS	240	Advanced Topics in Operating Systems	3				
CS	240E	Embedded Wireless Systems	3				
CS	240X	Advanced Operating Systems II	3				
CS	244B	Distributed Systems	3				
CS	244E	Low-Power Wireless Networking	3				
CS	249	OOP from a Modeling and Simulation Perspective	3				
EE	179	Introduction to Communication	3				
EE	276	Introduction to Wireless Personal Communications	3				
<i>Computer Systems Engineering Depth Total</i>				<i>(20 units minimum)</i>			

Computer Systems Engineering Core + Depth Total *(54 units minimum)*

Program Approvals

Advisor

Printed Name: _____
Signature: _____

Date: _____

Departmental

Printed Name: _____
Signature: _____

Date: _____

School of Engineering

Printed Name: _____
Signature: _____

Date: _____

NOTES (continued from page 1)

- (2) The WIM requirement for Freshmen and Transfer students entering Fall 96 or later may be met by taking CS 201 as a Technology in Society course or through the Senior Project course (191W, 194, or 294W only).
- (3) Independent study projects (CS 191 or 191W) require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CSE program advisor (Robert Plummer or Patrick Young). A signed approval form, along with a brief description of the proposed project, should be filed with the department representative in Gates 182 the quarter before work on the project is begun.
- (4) Students opting to take CS 103X instead of CS 103A and B must complete five of these courses.

Stanford University ♦ School of Engineering
Computer Systems Engineering – Robotics and Mechatronics Specialization
2006-2007 Sample Program Sheet

Final version of completed and signed program sheet due to the department no later than one month prior to the last quarter of senior year.

Name: _____
 Local Address: _____

SU ID: _____
 Local Phone: _____
 Email: _____
 Date B.S. expected: _____

Mathematics and Science Requirement

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
<i>Mathematics (23 units minimum)</i>							
MATH	41	Calculus	5				
MATH	42	Calculus	5				
MATH	51	Calculus	5				
MATH	52 or 53	Calculus	5				
STAT	116	Probability (or MS&E 120 or CME 106)	3 to 5				
<i>Mathematics Unit Total</i>				<i>(23 units minimum)</i>			
<i>Science (12 units minimum)</i>							
PHYSICS	41	Mechanics	4				
PHYSICS	43	Electricity and Magnetism	4				
PHYSICS	45	Light and Heat	4				
<i>Science Unit Total</i>			12	<i>(12 units minimum)</i>			
<i>Mathematics and Science Unit Total</i>				<i>(35 units minimum)</i>			

Technology in Society Requirement (1 course required; see UGHB Fig. 3-3 for approved list)

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Engineering Fundamentals (13 units minimum)

CS	106	Programming Methodology & Abstractions (A and B, or X)	5				
ENGR	40	Introductory Electronics	5				
		Elective (see note 1)					
<i>Engineering Fundamentals Total</i>				<i>(13 units minimum)</i>			

NOTES

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 - * All courses listed on this form must be taken for a letter grade if offered by the instructor.
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program sheet continues on page 2

Computer Systems Engineering Program Sheet (continued)

Computer Systems Engineering (53 units minimum)

Dept	Course	Title	Units	Grade	✓ if Transfer	Transfer/AP Approval	
						Initials	Date
Core (32 units minimum)							
CS	103	Discrete Structures (X, or A and B)	4 or 6				
CS	107	Programming Paradigms	5				
CS	108	Object-Oriented Systems Design	4				
EE	102A	Signals and Systems I	4				
EE	102B	Signals and Systems II	4				
EE	108A	Digital Systems I	4				
EE	108B	Digital Systems II	4				
Senior Project		CS191, 191W, 194, 294 or 294W (see notes 2, 3)	3				
<i>Computer Systems Engineering Core Total</i>				<i>(32 units minimum)</i>			
Depth (19 units minimum) Be advised, no course may be listed twice on the sheet. No double-counting.							
CS	205	Mathematical Methods for Robotics, Vision and Graphics	3				
CS	223A	Introduction to Robotics	3				
ME	210	Introduction to Mechatronics (or EE 118)	4				
ENGR	105	Feedback Control Design	3				
Plus two to three of the following (see note 4; delete courses not taken)							
CS	223B	Introduction to Computer Vision	3				
CS	225A	Experimental Robotics	3				
CS	225B	Robot Programming Laboratory	4				
ENGR	205	Introduction to Control Design Techniques	3				
ENGR	206	Control System Design	4				
ENGR	207A	Modern Control Design I	3				
ENGR	207B	Modern Control Design II	3				
<i>Computer Systems Engineering Depth Total</i>				<i>(19 units minimum)</i>			

Computer Systems Engineering Core + Depth Total *(53 units minimum)*

Program Approvals

Advisor

Printed Name: _____
Signature: _____

Date: _____

Departmental

Printed Name: _____
Signature: _____

Date: _____

School of Engineering

Printed Name: _____
Signature: _____

Date: _____

NOTES (continued from page 1)

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- (3) Independent study projects (CS 191 or 191W) require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CSE program advisor (Robert Plummer or Patrick Young). A signed approval form, along with a brief description of the proposed project, should be filed with the department representative in Gates 182 the quarter before work on the project is begun.
- (4) Students opting to take CS 103X instead of CS 103A and B must complete three of these courses.