

## Accelerated Bachelor of Science/Master of Science in Computer Science Dual Degree Program

### Definitions

The discussion below uses the following definitions:

*BS/MS program:* The complete accelerated Bachelor of Science/Master of Science in Computer science Dual Degree Program, at the completion of which a student receives both a BS in Computer Science and an MS in Computer Science. A student enrolled in this program takes 12 credits less in order to receive both degrees than the number of credits required when obtaining the degrees separately.

*BS/MS year:* This is normally the student's senior year. During the BS/MS year, the student who is accepted into the program enrolls in 12 credits of graduate Computer Science courses, as specified below.

*MS/BS year:* This is the student's "+1" year. During this year, the student completes the requirements for the graduate degree, as well as any other necessary requirements for the BS.

### Procedures Overview

Procedures for applying and fulfilling the requirements of the BS/MS are listed below:

Step	Date	Procedure
1.	Student's junior year, preferably when he/she has completed 60-75 credits and no later than March 1 of the junior year.	Student applies to the Department of Computer Science for accelerated BS/MS dual degree program. See below for procedures.
2.	Upon acceptance into the BS/MS program	Graduate program advisor and student fill out a Change of Program form.
3.	Spring of junior year	Student goes physically to the Graduate School office to register for fall classes of BS/MS year. <i>This must be done every semester from now on!</i>
4.	When student has completed requirements for undergraduate degree	Transition Form completed by student and signed by graduate advisor before being turned into the Graduate School office. <i>This represents an official enrollment into MS/BS program.</i>
5.	When student has met obligations of both BS and MS	Student applies for graduation for both degrees.

**Program Details**

This program allows highly motivated students to begin taking graduate courses in their senior year, accelerating their graduate studies while still at the undergraduate level and while paying undergraduate tuition and fees. The program is also known as the accelerated BS/MS or the 4+1 degree because it allows interested and qualified students to complete the department's bachelors and masters degrees in five years rather than the normal six.

**Requirements for Application**

To apply to the program, student must have:

- Be enrolled in the B.S. Computer Science Degree Program.
- Have completed at least 24 credits of undergraduate Computer Science courses with an average Computer Science GPA of at least 3.5.
- Obtain a letter of recommendation from a faculty member in the Rowan Computer Science Department.

**Application**

Admission to the program will be based on the student meeting the above-listed criteria and an application packet. This application packet, which will include the letter of recommendation and a BS/MS in Computer Science application form, must be submitted to the Graduate Program Advisor of the Computer Science Department. This application packet can be obtained from the Computer Science Department.

**Admission**

Final admission decisions will be made by a three-member Admissions Committee chaired by the Graduate Computer Science Program Advisor.

**Satisfactory Progress towards Graduation**

In order to graduate from the BS/MS Computer Science program all students must meet the following three requirements:

1. Completion of all the requirements for the BS CS with the following options:
  - a. Up to 6 semester hours of graduate CS courses taken by the student in his/her fourth year as a senior (BS/MS year of program) may count as undergraduate CS restricted elective credits towards the BS in CS.
  - b. Up to 6 semester hours of graduate CS courses taken by the student in his/her fourth year as a senior (BS/MS year of program) may count as free elective credits towards the BS in CS.
2. Completion of all requirements for the MSCS.
3. Full-time status:
  - a. Maintain full-time status each semester as an undergraduate student (minimum enrollment of 12 semester hours) during his/her BS/MS year of the Program

- b. Maintain full-time status each semester as a graduate student (minimum enrollment of 9 semester hours of graduate Computer Science courses) during his/her MS/BS year of the Program.
  - c. A student who fails to maintain full-time status during any semester of the Program (except the semester in which the student expects to complete the Program) will be dropped from the Program at the end of that semester. Moreover, any student who has not completed requirement 1 above will be re-admitted back into the B.S. Computer Science Degree Program subject to the requirements of that program.
  - d. Students with extenuating circumstances may request an exception to requirements (a)-(c) above by obtaining written approval of the Graduate Computer Science Program Advisor, Computer Science Department Chairperson, and any other approvals that are required under university policy.
4. Satisfactory progress:
- a. Completion of at least 2 graduate Computer Science courses by the end of the BS/MS year of the Program.
  - b. Earn at least a grade of B in all graduate courses taken during the BS/MS year of the Program.
  - c. Completion of the Program by the end of the third year of the Program.
  - d. Any student who fails to maintain satisfactory progress as described in parts (a)-(c) above may be dropped from the Program. If the student has not already earned the B.S. Computer Science Degree at this point, then he/she will be re-admitted back into the B.S. Computer Science Degree Program subject to the requirements of that program.
  - e. Students with extenuating circumstances may request an exception to this requirement by obtaining written approval of the Graduate Computer Science Program Advisor, Computer Science Department Chairperson, and any other approvals that are required under university policy.
  - f. At any time while the student is in the accelerated program he/she may opt to revert to the BS program. He/she will be awarded the BS computer science degree if all the requirements for that degree are met.

### **Graduation**

After completion of all requirements listed in 1- 4 under *Satisfactory Progress towards Graduation*, students must apply to receive simultaneously a Bachelor of Science in Computer Science and a Master of Science in Computer Science. These are awarded as separate diplomas.

### **Tuition Costs**

Students enrolled in the BS/MS year of the program will pay undergraduate tuition and fees for all courses—whether the courses are undergraduate or graduate—until they are

accepted into the MS/BS year. Upon transition into the MS/BS year, students will pay graduate tuition and fees for all courses, and all graduate requirements apply. Under no circumstances are students allowed to take more than 12 graduate credits while they are enrolled into BS/MS program as undergraduate students.

### **Structure of Program**

The BS/MSCS Dual Degree is structured so that students first complete requirements for the B.S. CS Degree Program, but begin to take graduate courses required for the MSCS Degree Program in the fall semester of their senior year. In particular, the number of graduate CS courses that each student should enroll in each semester is listed in the table below:

<b>Semester of BS/MSCS</b>	<b>Number of graduate CS courses student should enroll in</b>
1 <sup>st</sup> (Fall – Senior Year)	2
2 <sup>nd</sup> (Spring – Senior Year)	2
3 <sup>rd</sup> (Fall – Graduate Year)	3
4 <sup>th</sup> (Spring – Graduate Year)	3

### **Identification of courses with brief description and credit hours for each:**

#### **B.S. Computer Science Degree Program**

For students matriculating September 2008 or later

A total of 120-123 semester hours is required for this degree, depending on the General Education courses chosen.

*General Education courses and Rowan Experience courses must total at least 42 semester hours (s.h).*

#### **I. General Education**

The General Education requirements are automatically met by students transferring in from a New Jersey county college with an associate's degree.

##### **A. Communications - 6 s.h.**

College Composition I and II (COMP 01.111, COMP 01.112) are required.

##### **B. Science and Mathematics – 7 s.h.**

Note: The science and mathematics courses listed in the “Required Courses” section below may be applied toward this requirement.

##### **C. Social and Behavioral Sciences - 6 s.h.**

Note: The course Computers and Society (INTR 01.265 or 01.266) may be applied toward this requirement.

##### **D. History, Humanities, and Language – 6 s.h.**

### **E. Non-Program Electives – 6 s.h.**

Courses must be selected from the Communications, Artistic/Creative Experience, History/Humanities/Language or Social/Behavioral Sciences banks of the general education guide.

## **II. Rowan Experience**

The Rowan Experience must include at least one course in each of the following categories:

- Arts and Creative Expression
- Literature
- Multicultural/Global
- Public Speaking
- Rowan Seminar (required only for students entering with freshman status)
- Writing Intensive

General education courses and required major courses may be applied toward the Rowan Experience requirement.

## **III. Free Electives – 0 to 16 s.h.**

The student who applies *Calculus I*, the lab science courses, and *Computers and Society* toward the General Education requirement will have 16 s.h. of free electives. These may be any courses offered by Rowan University, or they may be transferred in from another school.

### **Major Requirements - 81 s.h.**

Prerequisites are shown in brackets [like this].

#### **A. Required Courses – 69 s.h.**

01.130]	MATH 03.160	Discrete Structures [MATH 01.122 or MATH	3 s.h
	MATH 01.130	Calculus I [MATH 01.122 or equivalent experience]	4 s.h.
	MATH 01.131	Calculus II [MATH 01.130]	4 s.h.
3 s.h.	MATH 01.210	Linear Algebra [MATH 01.131 and MATH 03.160]	3 s.h.
	STAT 02.290	Probability & Statistical Inference for Computing Systems [MATH 01.131, MATH 03.160, and (CS 04.113 or CS 04.112)] each with a grade of C- or better.	3 s.h.

- CS 04.113 Introduction to Object-Oriented Programming [MATH 01.122 or MATH 01.123 or MATH 01.131] 4 s.h
- CS 04.114 Object-Oriented Programming and Data Abstraction [CS 04.113 or (CS 04.103 and CS 04.112)] 4 s.h.
- CS 04.222 Data Structures and Algorithms [CS 04.114 (C- or better) and MATH 03.160] 4 s.h.
- CS 04.315 Programming Languages [CS 04.222 and CS 06.205]
- CS 06.205 Computer Organization [(CS 04.113 and MATH 03.160) or (CS 04.103 and MATH 03.160)] 3 s.h.
- CS 07.210 Foundations of Computer Science [C- or better in MATH 01.130, and any one of the following: CS 01.102, CS 04.103, CS 01.104, CS 04.113] 3 s.h.
- CS 07.321 Software Engineering I (CS 04.222 or CS 04.225) and (COMP 01.112 or ENGR 01.201) and (CMS 04.205 or ENGR 01.202) 3 s.h.
- CS 06.310 Principles of Digital Computers [Co-requisite CS 06.311  
Prerequisites: CS 06.205] 3 s.h.
- CS 06.311 Digital Computer Laboratory [Corequisites: CS 06.310  
Prerequisites: CS 06.205 ] 1 s.h.
- CS 07.340 Design and Analysis of Algorithms [CS 04.222 and CS 07.210] 3 s.h.
- CS 04.390 Operating Systems [CS 04.222 and CS 06.205] 3 s.h.
- CS 04.400 Computer Science Senior Project [CS 04.315 and CS 07.340] 3 s.h.
- INTR 01.265 or INTR 01.266 Computers and Society [CMS 04.205]  
One of the following two-course lab science sequences:  
BIOL 01.100,101 Biology I, II (4 s.h. each) (transferred only)
- BIOL 01.104 BIOL 1: Diversity, Evolutions & Adaption  
BIOL 01.106 BIOL 2: Concepts in Genetics (4 s.h. each)
- PHYS 02.200, 201 (Calc required) (4s.h. each) (transferred only)
- PHYS 02.200,201 Intro Mechanics, Intro Electricity & Magnetism (4 s.h. each)
- CHEM 06.100,101 Chemistry I, II (4 s.h. each)
- One additional lab science course chosen from the previous list

**B. Restricted Electives - 12 s.h.**

- CS 01.395 Topics in Computer Science [permission of instructor]
- CS 04.305 Web Programming [CS 01.205 and CS 04.222]
- CS 04.325 Programming in Ada [CS 04.222]
- CS 04.327 Power Java [CS 04.222]
- CS 04.380 Object Oriented Design [CS 07.340]

CS 04.391 Concurrent Programming [CS 04390]  
 CS 04.392 System Programming and Operating System Internals  
 [CS 04.390 and CS 01.205]  
 CS 04.394 Distributed Systems [(CS 06.205 and CS 04.222) or (ECE 09.242  
 and CS 04.255)]  
 CS 04.401 Compiler Design [CS 07.210 and CS 04.315]  
 CS 04.430 Database Systems: Theory and Programming [CS 07.340]  
 CS 06.410 Data Communications and Networking [CS 07.340 and STAT  
 02.290]  
 CS 06.412 Advanced Computer Architecture [CS 06.310]  
 CS 06.415 Wireless Networks, Protocols and Applications [CS 06.410]  
 CS 06.416 TCP/IP and Internet Protocols and Technologies [CS 06.410]  
 CS 06.420 Embedded Systems Programming [(CS 04.390 and CS 06.310 and  
 CS 06.311) or (CS 04.390 and ECE 09.241 and ECE 09.242)]  
 CS 07.310 Robotics (CS 04.113 and CS 04.222 and Math 01. 210) or (CS  
 04.103 and CS 04. 225 and ENGR 01.202 and MATH 01.236)  
 CS 07.320 Software Engineering Laboratory [concurrent enrollment in CS  
 07.321 Software Engineering I  
 CS 07.322 Software Engineering II [CS 07.321]  
 CS 07.350 Computer Cryptography [CS 07.210]  
 CS 07.360 Introduction to Computer Graphics [(MATH 01. 210 or MATH  
 01.235) and CS 07.340]  
 CS 07.370 Introduction to Information Visualization [MATH 01.210 or  
 MATH 01.236]  
 CS 07.380 Introduction to Computer Animation [(MATH 01.210 or MATH  
 01.236) and PHYS 02.200]  
 CS 07.422 Theory of Computing [CS 04.222 and MATH 01.131 and CS  
 07.210]  
 CS 07.470 Theory and Applications of Pattern Recognition  
 CS 07.450 Artificial Intelligence [MATH 03.160, and CS 04.222 and CS  
 07.210]  
 CS 07.460 Computer Vision [CS 04.113 and MATH 01.210 and STAT  
 02.290]  
 CS 99.300 Computer Field Experience [permission of instructor](note: only 3  
 credits for CFE can be applied towards the restricted electives)

**Note:** 1) A grade of C- or better is required for graduation in Calculus I, Discrete Structures, Introduction to Object Oriented Programming, Object Oriented Programming/Data Abstraction, Computer Organization and Data Structures. This policy applies whether these courses are taken locally or transferred.

2) A 2.5 grade point average in the required and restricted elective courses together with College Composition I,(not including Calc I, Comp & Soc, or the lab sciences) whether they are taken locally or transferred, is required for graduation (A = 4; B = 3; C = 2; D = 1; F = 0; "+" = +0.3; "-" = -0.3).

## MS Computer Science Degree Program

The MS in Computer Science is a 30 credit-hour program with an optional thesis track. All students must complete a 12-credit core of required courses. Students in the thesis track must take 12 additional credits of restricted electives and the 6-credit thesis sequence. Students choosing the non-thesis track must take 18 additional credits of restricted electives, 6 credits of which must be classified as project intensive.

The 12-credit core must be selected from the following list:

- CS 07.522 Advanced Theory of Computing (3 s.h.)
- CS 07.540 Advanced Design and Analysis of Algorithms (3 s.h.)
- CS 04.548 Programming Languages: Theory, Implementation and Application (3 s.h.)
- CS 07.523 Advanced Software Engineering (3 s.h.)
- CS 04.560 Design and Implementation of Operating Systems (3 s.h.)
- CS 06.520 Topics in Computer Architecture (3 s.h.)
- CS 06.510 Computer Networks (3 s.h.)
- CS 04.530 Advanced Database Systems: Theory and Programming (3 s.h.)

Available electives include the following existing Rowan University graduate level courses:

- CS 04.564 Compiler Design Theory (3 s.h.)
- CS 04.565 System Programming (3 s.h.)
- CS 04.570 Advanced Object Oriented Design (3 s.h.)
- CS 06.505 Wireless Networks and Systems (3 s.h.)
- CS 06.510 Computer Networks (3 s.h.)
- CS 06.515 Embedded Systems Programming (3 s.h.)
- CS 06.520 Topics in Computer Architecture (3 s.h.)
- CS.07.545 Advanced Robotics (3 s.h.)
- CS 07.550 Concepts in Artificial Intelligence (3 s.h.)
- CS 07.555 Natural Language Processing (3 s.h.)
- CS 07.556 Machine Learning (3 s.h.)
- CS 07.560 Computer Graphics (3 s.h.)
- CS 07.565 Computer Vision (3 s.h.)
- CS 07.570 Introduction to Visualization (3 s.h.)
- CS 07.575 Advanced TCP/IP and Internet Protocols and Technologies (3 s.h.)
- CS 07.580 Computer Animation (3 s.h.)
- CS 07.595 Advanced Topics in Computer Science (3 s.h.)

Any core course can be taken as an elective.

In addition, students can choose no more than 6 credits of approved graduate electives from Electrical and Computer Engineering and Mathematics, and in the future from other departments which may offer pertinent graduate level courses.

Students choosing the thesis track must complete:

CS 07.530 Computer Science Thesis I (3 s.h.)  
 CS 07.531 Computer Science Thesis II (3 s.h.)

#### Project Intensive Designation

The course instructor may choose to designate a course as “project intensive.” Project intensive courses contain a significant project that contributes to the students’ final grade. Students choosing the non-thesis option must take at least two project intensive electives. The CS Graduate Program Advisor will ensure that courses are designated as “project intensive” prior to registration periods and that students can register for the required 6 credits within the specified period of the program.

#### **Sequence of course work with description of major and general education requirements.**

The following describes the sequence of courses that a student in the Track would typically take term by term beginning with their 1<sup>st</sup> year as a freshman up through their 5<sup>th</sup> year as a graduate student. Required computer science courses are in **BOLD FACE**.

- ⊗ - Undergraduate CS course
- ⊕ - Graduate CS course
- \* - Required General Education course

#### **Recommended Sequence of Courses**

-----1<sup>st</sup> YEAR (Freshmen)-----

##### **FALL SEMESTER (17 s.h.)**

##### **⊗ Intro to Object Oriented Programming (RS)**

Pre-Calculus\*

College Composition I\*

Discrete Structures\*

Gen Ed

##### **SPRING SEMESTER (17 s.h.)**

##### **⊗ Object Oriented Programming and Data Abstraction**

Calculus I\*

College Composition II\*

Gen Ed

Gen Ed

-----2<sup>nd</sup> YEAR (Sophomore)-----

##### **FALL SEMESTER (14 s.h.)**

##### **⊗ Foundations of Computer Science**

##### **⊗ Data Structures and Algorithms**

Calculus II\*

Free Elective (Computer Lab Techniques recommended)

**SPRING SEMESTER (16 s.h.)**

⊗ **Design & Analysis of Algorithms**

⊗ **Computer Organization**

Linear Algebra\*

Gen Ed (Lab Science Choice)

Public Speaking\*

-----3<sup>rd</sup> YEAR (Junior)-----

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**FALL SEMESTER (16 s.h.)**

⊗ **Programming Languages**

⊗ **Operating Systems**

Computers and Society (WI)\*

Gen Ed (Lab Sequence 1)

Probability and Statistical Inference for Computing Systems\*

**SPRING SEMESTER (17 s.h.)**

⊗ **Principles of Digital Computers and Digital Computer Laboratory**

⊗ **Software Engineering I**

⊗ CS restricted elective

Gen Ed (Lab Sequence 2)

Gen Ed

-----4<sup>th</sup> YEAR (Senior) – YEAR ONE OF PROGRAM-----

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**FALL SEMESTER (12 s.h.)**

⊗ **Senior Project**

⊗ CS restricted elective

⊕ Graduate CS Elective

⊕ Graduate CS Core (as Free Elective)

**SPRING SEMESTER (15 s.h.)**

Gen Ed

Free Elective (if needed to complete 120 credit hours requirement)

Gen Ed

⊕ Graduate CS Elective

⊕ Graduate CS Core (as Free Elective)

-----5<sup>th</sup> YEAR (Graduate Student) – YEAR TWO OF PROGRAM-----

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**FALL SEMESTER (9 s.h.)**

⊕ Graduate CS Core

- ⊕ Graduate CS Elective
- ⊕ Graduate CS Elective (or Graduate Thesis I if Thesis track chosen)

**SPRING SEMESTER (9 s.h.)**

- ⊕ Graduate CS Core
- ⊕ Graduate CS Elective
- ⊕ Graduate CS Elective (or Graduate Thesis II if Thesis track chosen)

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**Courses from other units in the institution.**

This Track requires no additional undergraduate courses and services from other units beyond what they already provide for the B.S. CS Degree Program. However for the graduate electives students can choose no more than 6 credits of approved graduate electives from Electrical and Computer Engineering and Mathematics, and in the future from other departments which may offer pertinent graduate level courses.