

Accelerated Undergraduate/Graduate (BS/MS) Dual Degree Program in Computational Mathematics (BS) and Computer Science (MS)

The BS degree in Computational Mathematics requires 120 semester hours and the MS degree in Computer Science requires 30 semester hours. Undergraduate Computational Mathematics majors who enter the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program are **permitted to double count up to 6 semester hours of overlapping courses**. Students working toward a BS degree in Computational Mathematics will: (1) be well prepared in Mathematics; (2) possess introductory programming skills as well as a theoretical foundation in computing due to the fact that they are required to take four undergraduate Computer Science courses as part of the BS degree; and (3) will have additional opportunities to expand their knowledge in computing because the BS degree requires students to select at least two additional Computer Science courses to satisfy BS degree Program Electives. The 6 semester hours of overlapping courses come from taking graduate level Computer Science courses which fulfill graduate program requirements and which are also used to satisfy credit hour requirements for the BS degree. Specifically, we recommend two graduate-level Computer Science courses (of up to 6 semester hours) be chosen to fulfill Free Electives required for the BS degree in Computational Mathematics. Other than the 6 semester hours of courses that students may double count toward their BS degree in Computational Mathematics and the MS degree in Computer Science, students complete all other BS degree requirements.

Undergraduate students with the proper prerequisites are permitted and encouraged to take graduate-level Computer Science courses. Students enrolled in the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program must complete *all* of their degree requirements for the BS degree in Computational Mathematics before being permitted to register for either thesis or project in the MS degree in Computer Science.

Undergraduate students who apply to RIT in Computational Mathematics are accepted initially into the BS degree program. Students interested in the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program request entry into this program using a Change of Program form. **We encourage students to wait until at least the end of their second year at RIT before making this request.** Students should consult their academic advisor prior to officially filing the form. The Associate Graduate Program Coordinator in Computer Science currently handles all matters related to the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program, and with consultation *if needed* with appropriate individuals in Computational Mathematics, determines whether or not a student is admitted to this dual degree program.

We will not define all possible combinations of Computer Science courses and program paths that might be used for a BS in Computational Mathematics/MS in Computer Science combination, although we illustrate one possible scenario below. Rather, we will advise students and guide them in putting together appropriate collections of courses that help them meet their goals once they are admitted to the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program.

The following pages have been taken directly from the document filed with New York State that proposed the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program under semesters. These pages have been *updated* to reflect several modest curriculum changes that have taken place since that time. Table 1a and the notes that follow it depict the BS degree for a student planning to complete the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program. Table 1b (case 1) and the notes that follow it depict the MS degree with a thesis option for a student planning to complete the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program. Again, it should be stressed that these tables only demonstrate the feasibility of completing the accelerated BS in Computational Mathematics/MS in Computer Science dual degree program in one additional year beyond the BS degree.

Table 1a: Undergraduate Program Schedule (BS degree in Computational Mathematics)

| Term: FALL 1 | | | | | | Term: SPRING 1 | | | | | |
|--|----|------|------|-----|---|---|----|-----|------|------|---|
| Course Number & Title | CR | LA S | Ma j | New | Prerequisite(s) | Course Number & Title | CR | LAS | Ma j | Ne w | Prerequisite(s) |
| COS-MATH-181 Project-Based Calculus I (LAS 7A) | 4 | 4 | | | Math Placement Exam score | COS-MATH-182 Project-Based Calculus II (LAS 7B) | 4 | 4 | | | C- or better in (MATH 181 or MATH 173 or 1016 282) or (MATH 171 and MATH 180) or equivalent courses |
| COS-MATH-199 Math and Statistics Seminar WI | 1 | | 1 | | | CSCI 142 Computer Science II | 4 | 4 | | | CSCI 141 with grade of C- or better |
| Foundation Elective (LASF 1) | 3 | 3 | | | | GE Lab Science 1 (LAS 5) | 4 | 4 | | | |
| Artistic Perspective (LAS 1) | 3 | 3 | | | | ENGL 150 First-Year Writing (LASF 2) | 3 | 3 | | | |
| CSCI 141 Computer Science I | 4 | 4 | | | None | | | | | | |
| ACSC 010 Year One | 0 | | | | New institute first year requirement launched with start of semesters | Wellness Activity 1 | 0 | | | | |
| Term credit total: | 15 | 14 | 1 | | | Term credit total: | 15 | 15 | 0 | | |
| Term: FALL 2 | | | | | | Term: SPRING 2 | | | | | |
| Course Number & Title | CR | LA S | Ma j | New | Prerequisite(s) | Course Number & Title | CR | LAS | Ma j | Ne w | Prerequisite(s) |
| COS-MATH-221 Multivariable and Vector Calculus | 4 | | 4 | | MATH-182 | COS-MATH-231 Differential Equations | 3 | | 3 | | MATH-182 |
| COS-MATH-251 Probability and Statistics I | 3 | | 3 | | MATH 182 or MATH 172 or MATH 182A or 1016 282 or equivalent courses | COS-MATH-241 Linear Algebra | 3 | | 3 | | MATH 190 or MATH 200 or MATH 219 or MATH 220 or MATH 221 or MATH 221H or equivalent courses |
| GE Lab Science 2 (LAS 6) | 4 | 4 | | | Lab Science I | CSCI 262 Introduction to Computer Science Theory or CSCI 263 Honors Introduction to Computer Science Theory | 3 | | 3 | | CSCI 141 and MATH 190 (MATH 200 is an acceptable equivalent) |
| CSCI 243 The Mechanics of Programming | 3 | | 3 | | CSCI 142 with grade of "C-" or better or CSCI 140 with grade of "C-" or better or CSCI 242 with grade of "C-" or better | Ethical Perspective (LAS 2) | 3 | 3 | | | |
| COS-MATH-200 | 3 | 3 | | | MATH-182 | Global | 3 | 3 | | | |

| | | | | | |
|---|----|------|------|--------------------------|--|
| Discrete Mathematics and Introduction to Proofs | | | | | |
| Wellness Activity 2 | 0 | | | | |
| Term credit total: | 17 | 7 | 10 | | |
| Term: FALL 3 | | | | | |
| Course Number & Title | CR | LA S | Ma j | New | Prerequisite(s) |
| COS-MATH-431 Real Variables I | 3 | | 3 | | MATH-200, MATH-221 |
| COS-MATH-341 Advanced Linear Algebra | 3 | | 3 | | MATH-241 |
| SWEN 261 Introduction to Software Engineering | 3 | | 3 | | CSCI 142 or CSCI 242 or CSCI 140 or 4003 243 |
| Program Elective 1 | 3 | | 3 | | |
| Social Perspective (LAS 4) | 3 | 3 | | | |
| | | | | | |
| Term credit total: | 15 | 3 | 12 | | |
| Term: FALL 4 | | | | | |
| Course Number & Title | CR | LA S | Ma j | New | Prerequisite(s) |
| COS-MATH-421 Mathematical Modeling WI | 3 | | 3 | | MATH-221, MATH-251, and MATH-341 |
| Program Elective 4 | 3 | | 3 | | |
| LAS Immersion 2 | 3 | 3 | | | |
| COS-MATH-411 Numerical Analysis | 3 | | 3 | | MATH-231, MATH-241 |
| Free Elective 1 (CSCI 665 Foundations of Algorithms (BS in Computational Mathematics/MS in Computer Science Overlapping Course)) | 3 | | | | ((CSCI 603 or CSCI 602) and (CSCI 605 or CSCI 604) and (CSCI 661 or CSCI 660)) with grades of B or better. Prerequisite may also be satisfied by successful completion of (CSCI 243 or 4003 334) and (CSCI 262 or CSCI 263). |
| Term credit total: | 15 | 3 | 9 | (*) Student also takes 3 | |

| | | | | | |
|--|----|-----|------|------------------------|--|
| Perspective (LAS 3) | | | | | |
| | | | | | |
| Term credit total: | 15 | 6 | 9 | | |
| Term: SPRING 3 | | | | | |
| Course Number & Title | CR | LAS | Ma j | Ne w | Prerequisite(s) |
| COS-MATH-441 Abstract Algebra I | 3 | | 3 | | MATH-200, MATH-241 |
| Program Elective 2 | 3 | | 3 | | |
| Program Elective 3 | 3 | | 3 | | |
| LAS Immersion 1 | 3 | 3 | | | |
| GE Elective 1 | 3 | 3 | | | |
| COS-MATH-399 Math/Stat Job Seminar | 0 | | | | |
| Term credit total: | 15 | 6 | 9 | | |
| Term: SPRING 4 | | | | | |
| Course Number & Title | CR | LAS | Ma j | Ne w | Prerequisite(s) |
| Program Elective 5 | 3 | | 3 | | |
| Program Elective 6 | 3 | | 3 | | |
| Free Elective 2 (CSCI 664 Computational Complexity (BS in Computational Mathematics/MS in Computer Science Overlapping Course)) | 1 | | | | (CSCI 661 or CSCI 262 or CSCI 263) and (CSCI 665 or CSCI 261 or CSCI 264) or equivalent courses. |
| LAS Immersion 3 | 3 | 3 | | | |
| GE Elective 2 | 3 | 3 | | | |
| Term credit total: | 13 | 6 | 6 | (*) Student also takes | |

| | | | | | | | |
|--|---------------------|--|----------------------------|--------------------------------|---|--|--|
| | *) | | credits of free electives. | |) | | 1 credit of free electives (see note 1). |
| | Credits: 120 | Liberal Arts & Sciences: 60 | Major: 56 | Elective & Other: 4 | | | |

Cr: credits **LAS:** liberal arts & sciences **Maj:** major requirement **New:** new course **Prerequisite(s):** list prerequisite(s) for the noted courses

NOTES:

- (1) By selecting two graduate level Computer Science courses as free electives in year 4, students increase the total credits earned toward their BS degree from 120 to 122, but also increase the likelihood of completing their MS degree with one additional year. If they select undergraduate courses instead, they may need more time than two additional semesters in which to complete their remaining MS degree requirements.
- (2) The BS degree in Computational Mathematics requires students to complete six program electives, with at least three program electives selected from Mathematics and at least two program electives chosen from Computer Science. The choices for program electives in Mathematics must include either COS-MATH-351 Graph Theory or COS-MATH-412 Numerical Linear Algebra.

These program electives provide students in the BS in Computational Mathematics/MS in Computer Science dual degree program additional opportunities to select Computer Science courses that make it feasible for them to complete the MS portion of the degree program in a reasonable amount of time.

Table 1b: Graduate Program Schedule (MS degree in Computer Science) (case 1)

NOTE: The following is an example for a student who completes the BS in Computational Mathematics/MS in Computer Science program by choosing the research path and the Theory cluster.

| Term: Fall 5 | | | | Term: Spring 5 | | | |
|--|---------|---|--|--|---------|-----|--|
| Course Number & Title | Credits | New | Prerequisite(s) | Course Number & Title | Credits | New | Prerequisite(s) |
| CSCI 761 Topics in Advanced Algorithms | 3 | | CSCI-261 or CSCI-264 or CSCI-665 or equivalent course. | CSCI 762 Advanced Cryptography | 3 | | CSCI-662 or CSCI-462 or equivalent course. |
| CSCI 799 Computer Science Graduate Independent Study | 3 | | Permission of instructor and department | CSCI 630 Foundations of Intelligent Systems | 3 | | Completion of (CSCI-603 or CSCI-602) and (CSCI-605 or CSCI-604) and (CSCI-661 or CSCI-660) with grades of B or better. Prerequisite may also be satisfied by successful completion of (CSCI-243 or 4003-334) and (CSCI-262 or CSCI-263). |
| CSCI 799 Computer Science Graduate Independent Study | 3 | | Permission of instructor and department | CSCI 790 Computer Science MS Thesis | 6 | | Permission of thesis committee and graduate program coordinator |
| CSCI 662 Foundations of Cryptography | 3 | | Completion of (CSCI-603 or CSCI-602) and (CSCI-605 or CSCI-604) and (CSCI-661 or CSCI-660) with grades of B or better. Prerequisite may also be satisfied by successful completion of (CSCI-243 or 4003-334) and (CSCI-262 or CSCI-263). | | | | |
| Term credit total: | 12 | | | Term credit total: | 12 | | |
| Term: | | | | Term: | | | |
| Program Totals: | | Credits: 30 (= 6 overlapping credits from graduate courses applied to BS degree + 24 credits needed to complete the MS degree) | | For Master's programs, identify the required comprehensive, culminating element(s) (e.g., thesis), including course number if applicable: Computer Science MS Thesis (CSCI 790) | | | |

NOTES:

- (1) For this example, the student uses CSCI 662, 664, and 761 to satisfy the MS degree requirement that three courses are chosen from one cluster (in this case, the Theory cluster). CSCI 664 is one of the two courses that are overlapping between the BS and MS degree programs.
- (2) CSCI 665 Foundations of Algorithms is the second overlapping course between the BS and MS degree programs.
- (3) Students enrolled in the BS in Computational Mathematics/MS in Computer Science program will be allowed to enroll in graduate level Computer Science courses during term 'fall 5' even if they have not yet completed all of their degree requirements for the BS degree. Students, however, must complete all of their degree requirements for the BS degree before being permitted to register for CSCI 790 Computer

Science MS Thesis (and the same would apply to those students who elect to complete CSCI 788 Computer Science MS Project).