SPECIAL REPORT

of the

ACADEMIC MATTERS COUNCIL

concerning

ESTABLISHMENT OF A CONTINUATION REGUIREMENT IN THE UNDERGRADUATE COMPUTER SCIENCE DEGREE PROGRAMS (B.A. AND B.S.) (#5909)

Presented at the
787TH Regular Meeting of the Faculty Senate
April 25, 2019

COUNCIL MEMBERSHIP

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COUNCIL RECOMMENDATION

The Academic Matters Council recommends approval of this proposal.

Overall Description

This proposal is to create a continuation requirement for the Undergraduate Computer Science degrees (BS/BA) applicable to either primary/secondary majors. The requirement proposed here will apply only to incoming first-year students, and not to internal or external transfer students.

MOTION 26-19 **That the Faculty Senate approve establishment of continuation requirements for the B.A and B.S. Programs in Computer Science, as presented in Sen. Doc. 19-072**

A Continuation Requirement for the BS/BA in Computer Science

This proposal is to create a continuation requirement for the Undergraduate Computer Science degrees (BS/BA) applicable to either primary/secondary majors. The requirement proposed here will apply only to incoming first-year students, and not to internal or external transfer students; it follows the UMass Faculty Senate policy (Senate Doc. No. 12-041) for such proposals.

Major

The proposal is to add a continuation requirement to the Bachelors Degrees (both B.S. and B.A.) in Computer Science.

Degree Requirements

The degree requirements for the B.S. in Computer Science are outlined here:
https://www.cics.umass.edu/content/revised-bs-requirements-effective-september-2016

The degree requirements for the B.A. in Computer Science are outlined here:
https://www.cics.umass.edu/ugrad-education/details-ba-requirements

The full ARR requirements for these degree programs are included in an appendix.

Proposed Standards

The requirement proposed here will apply only to incoming first-year students, and not to internal or external transfer students. It is intended to apply to all majors who fit this description, both primary and secondary.

Internal transfer students, that is, students who have already matriculated at UMass and are seeking entry to the CS degree program, must complete an application process that includes course and minimum grade requirements that already serve the goals of this requirement. (see: https://www.cics.umass.edu/ugrad-education/major-change-cs)
External transfer students have generally already completed the requirements below; in future applications for a continuation requirement, we may include a different set of criteria for these students.

The proposed criteria for incoming first-year students is below.

Students in the Computer Science major must fulfill the following criteria to remain in the major:

1. A grade of C or better in each of the following courses (if taken at UMass Amherst), or posted credit (AP, high-school/college dual-enrollment transfer, or the like) on their UMass Amherst transcript for each of:
    a. COMPSCI 121
    b. COMPSCI 187
    c. MATH 131
    d. MATH 132
2. Credit for these courses and the required grades must be achieved by the end of the student's fourth full-time semester as a Computer Science major.

A semester counts against the four semester limit if the student is enrolled in at least 12 credits at the end of the add/drop period for that semester, with one exception: If a student withdraws from all courses for a semester, then that semester does not count against the limit.

Students who do not meet the above criteria will be removed from the Computer Science major and will work with advisors in the CICS Undergraduate Dean's office to transfer into another major.

Proposed Term

We propose a term of three years for this requirement, the maximum permissible.

Rationale and Analysis

Please see the numerical analysis prepared by Krisztina Filep and staff at the Office of Institutional Research in F18, attached in an separate file. It contains a historical analysis of the five cohorts of entering first-year Computer Science majors, starting in AY 2010. The first four have had five years (10 semesters) to graduate; the last has had four years, but is included to provide as much recent data as possible.

The key observation in this analysis is that a single C- in any of the four courses listed above is a very strong indicator that a student is not trending toward success in Computer Science. About 88% of such students fail to complete their CS degree at UMass in five years, and about 70% fail to complete a degree program at UMass at all. Placing these students into a more appropriate program of study is in the interest of both the student and the University.

Like all majors, Computer Science has always had a small fraction of students who do not complete the degree in a timely fashion. But as enrollments have grown, the number of students

who need to repeat courses, and who either fail to graduate or take a very long time to meet graduation requirements has grown. The growth of this group in particular places a significant burden on the College's advising and teaching resources.

The key points that justify this proposed continuation requirement are as follows:

1. Enrollments in CS are increasing rapidly, and the number of students who are not progressing in the major in a timely fashion is also increasing.
2. The four introductory courses proposed for the continuation requirement are prerequisites for advanced work in Computer Science.
3. Earning a single C- or below in any one of the four courses listed above is an accurate predictor that a student is very unlikely to graduate with their degree in CS within five years of matriculation.
4. Requiring students to have completed each of these courses with a C or better in four semesters generally means they have not earned more than two grades of C- or below (one in the Computer Science courses, one in the Math courses).
5. Setting this requirement creates a framework to promote advising and major-change discussions with students early enough to make a difference for at-risk students.

We expect this requirement to promote more substantive advising conversations with our students about strategies for achieving the grades required for academic success, and thus increase the likelihood that students in the major will meet these performance criteria. The College recently hired a second full-time professional advisor, a full-time Director of Academic Advising and Student Success, and plans to continue expanding our advising resources in AY 18–19. This expansion will include the addition of up to three new full-time professional advisors dedicated entirely to our CS program.

The proposed requirement provides a strong incentive for students to seek help from CICS faculty and advisors, and for those advisors to offer guidance to students whose performance is not predictive of timely completion of the major requirements (or of timely graduation at all). Our hope is that it will motivate students who are at risk of being discontinued from the major to get help and develop good study skills early on. The proposed requirement (and students' knowledge of it) disincentivizes multiple course repeats as a method of surmounting difficulties. CICS advisors can assist such students in deciding on a course of action that may include utilizing the University Repeat Course Policy or seeking a more appropriate major early in their undergraduate careers, increasing the likelihood that these students will achieve academic success in a timely manner.

To reiterate: The overall goal of this proposed requirement is for higher rates of retention and academic success to result for these students, as they will receive useful advising and/or transfer to a more appropriate degree program earlier in their academic career.

Students who are traditionally underrepresented in STEM may have difficulty succeeding in our major compared to their peers. CICS has several initiatives in place, some general, some specific, to engage our students. These initiatives include small first year seminars and early alerts in our introductory courses. These initiatives, along with others being developed by the College's two Directors of Diversity and undergraduate dean's office, will help ensure this continuation requirement will not inadvertently and unreasonably reduce the numbers of female, underrepresented minority, first-generation college, and/or low-income students who pursue (and succeed in) Computer Science. **We intend to carefully monitor the demographics of students affected by this policy, and to suspend the requirement should it disproportionately affect these groups.**

Finally, it is worth nothing that the purpose of this requirement is not to manage enrollment. CICS works closely with the Admissions Office to manage the size of our incoming class and is a closed major; we do not need a continuation policy to control enrollment. Rather, this requirement is to help ensure that students have a reasonable path to graduation in an appropriate degree program, and that they do not continue to take seats in courses and consume advising resources once it becomes clear they are unlikely to complete the related major.

			COMPSCI 121				COMPSCI 187				MATH 131				MATH 132				Total repeats generated	
Entering Year	Total	Grade below C in at least 1 course	Grade C or higher	Grade below C	Did not take	*Repeated*	Grade C or higher	Grade below C	Did not take	*Repeated*	Grade C or higher	Grade below C	Did not take	*Repeated*	Grade C or higher	Grade below C	Did not take	*Repeated*	Based on low grade only	Including W
Fall 2010	66	12	41	5	20	7	49	4	13	5	36	4	26	0	42	5	19	3	15	23
Fall 2011	93	23	59	10	24	9	60	6	27	12	42	6	45	6	52	9	32	19	49	53
Fall 2012	150	24	102	8	40	11	116	5	29	8	65	10	75	5	95	6	49	16	40	62
Fall 2013	146	32	88	5	53	7	106	14	26	9	59	11	76	3	86	18	42	8	27	38
Fall 2014	194	37	121	4	69	6	147	19	28	14	71	6	117	4	108	19	67	21	45	73

Course result is based on course taken in the first four semesters. Some students may have taken the course outside that time frame - those grades are not reflected here.

Grade C or higher, Grade below C and Did not take sum to the total students in the cohort.

Repeated: students who took the course more than once in the first four semesters. In almost all cases the students took the course twice in that time window, except 3 students who started in Fall 2011 took MATH 132 3 times.

Students who received a grade below C in at least one of the four courses

		Graduated in 5 yrs		Graduated total		Still Enrolled		Withdrawn/
Entering Year	Total	CompSci	Other	CompSci	Other	CompSci	Other	Dismissed
Fall 2010	12	3	4	3	4	0	0	5
Fall 2011	23	5	5	5	5	1	0	12
Fall 2012	24	4	9	4	10	1	1	8
Fall 2013	32	1	12	1	12	0	1	18
Fall 2014	37	2	9	2	9	4	7	15

For the Fall 2014 cohort, graduated in 5 years only includes 4 years of data.

Graduated total includes all students who graduated, regardless of time to degree.

B.A. in Computer Science - with changes effective Sept 2019 (previously approved by FacSenate)
2/14/19

Not Satisfied: In addition to University and College requirements, you must complete the following Plan requirements. (rg5534)

Description

- GPA: 2.000 required, 0.000 actual

CmpSci 391F cannot count toward major requirements

No courses taken on a pass/fail basis may be applied to BA-CS requirements

1. Take CmpSci 121

Not Satisfied: 1. Take CmpSci 121. (r11995,ln20)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 121	Intro Problem Solving W/Comp	4.00			

View All | First 1 of 1 Last

1. Take CmpSci 187.

Not Satisfied: 1. Take CmpSci 187. (r11995,ln40)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 187	Programming w/Data Structures	4.00			

View All | First 1 of 1 Last

2. Take Junior Year Writing.

Not Satisfied: 2. Take Junior Year Writing. (r11995,ln60)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 305	Social Issues in Computing	3.00			

COMP SCI 305	Social Issues in Computing	3.00

View All | First 1 of 1 Last

3. Take five Computer Science electives numbered 300 or higher

Not Satisfied: 3. Take five Computer Science electives numbered 300 or higher, not including 305. Courses numbered x90-x99 can only be applied to this requirement with approval of the Undergraduate Program Director. Courses taken outside the Computer Science Department may be used by petition. (r11995,ln70)

Description

- Courses: 5 required, 0 taken, 5 needed

4. Take Math 131.

Not Satisfied: 4. Take Math 131. (r11995,ln80)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 131	Calculus I	4.00			
MATH 131H	Calculus I Honors	4.00			

View All | First 1-2 of 2 Last

5. Take Math 132.

Not Satisfied: 5. Take Math 132. (r11995,ln90)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 132	Calculus II	4.00			
MATH 132H	Honors Calculus II	4.00			

View All | First 1-2 of 2 Last

6. Take one of the following math courses.

Not Satisfied: 6. Take one of the following math courses. (r11995,ln100)

Group box

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 233	Multivariate Calculus	3.00			
MATH 235	Intro Linear Algebra	3.00			
MATH 296ISH	Hnr Indstu In Math	3.00-6.00			

MATH 300	Fund Concpts Of Math	4.00
MATH 331	Ord Dif Eq/Sci Eng	3.00
MATH 391T	S- Intro/K-12 Math Teaching	2.00
MATH 396ISH	Hnrs Indstu In Math	3.00-6.00
MATH 397F	ST-Mathematics of Finance	3.00
MATH 411	Intro to Abstract Algebra I	3.00
MATH 412	Intro to Abstract Algebra II	3.00
MATH 421	Complex Variables	3.00
MATH 425	Advanced Calculus	3.00
MATH 437	Actuarial Financial Math	3.00
MATH 455	Intro to Discrete Structures	3.00
MATH 456	Mathematical Modeling	3.00
MATH 461	Affine and Projective Geometry	3.00
MATH 462	Geometry II	3.00
MATH 471	Theory Of Numbers	3.00
MATH 475	History of Mathematics	3.00
MATH 491P	S- Problem Seminar	1.00
MATH 496ISH	Hnr Indstu In Math	3.00-6.00
MATH 503	Cmp Con Mth Sec Tchr	3.00
MATH 511	Abstract Algebra I	3.00
MATH 513	Combinatorics	3.00
MATH 523	Int Mod Analysis I	3.00
MATH 524	Intro to Modern Analysis II	3.00
MATH 532	Topics/Ord Diff Eqs	3.00
MATH 534	Intro Partial Dif Eq	3.00
MATH 536	Actuarial Probability	3.00
MATH 545	Lin Alg Appl Math	3.00
MATH 551	Int Scientfc Comput	3.00
MATH 552	Appl Scientfc Comput	3.00
MATH 563	Differential Geom	3.00
MATH 571	Intro/MathematicalCryptography	3.00
MATH 591CF	S-Cybersecurity Lecture Series	1.00
MATH 597T	ST-MathmKnwldge for Teaching I	3.00
MATH 611	Algebra I	3.00
MATH 612	Algebra II	3.00
MATH 621	Complex Analysis	3.00
MATH 623	ThFnctn-Real Vrbl I	3.00
MATH 624	Real Analysis II	3.00
MATH 645	Diff EqDynmc Sys I	3.00
MATH 651	Int Numrcl Analys I	3.00
MATH 652	Int Numrcl Anlys II	3.00
MATH 671	Intr-Gnrl Topology I	3.00
MATH 672	Algebraic Topology	3.00
MATH 697AM	ST-Appl Math & Math Modeling	3.00
MATH 697AM	ST-Foundatns/AnalysisMachLrng	3.00
MATH 697CM	ST-Combinatorial Optimization	3.00
MATH 697CP	ST- Convex Polytopes	3.00
MATH 697CV	ST-Calc of Var & Opt Cntrl Thy	3.00
MATH 697FA	ST-Fast Algms Parallel Proc	3.00
MATH 697LA	ST-Intro to LIE Algebra	3.00
MATH 697MS	ST-Multiscale Methods	3.00
MATH 697NA	ST-Numerical Algorithms	3.00
MATH 697S	ST-Stoch Modeling & Stat Comp	3.00
MATH 697SC	ST-Comp Methods Stochastic Sys	3.00
MATH 697WA	ST-NonlinWaves & Appl/Continua	3.00
RES-ECON 211	Intro Stats for Life Sciences	4.00

RES-ECON 212	Intro Stats/Soc Sci	4.00
STATISTC 240	Intro To Statistics	3.00
STATISTC 501	Meth Applied Stats	3.00
STATISTC 515	Statistics I	3.00

Find | View 10 | First 1-63 of 63 Last

7. Take a 4-course concentration approved by the Undergraduate Program Director

Not Satisfied: 7. Take four courses numbered 200 or higher approved by the Undergraduate Program Director as forming a focused study in another discipline with relevance to the theory or practice of computer science. (r11995,ln110)

Description

- Courses: 4 required, 0 taken, 4 needed

8. Elective Residency Requirement

Not Satisfied: 8. At least three of the five Computer Science electives must be taken at UMass/Amherst. (r11995,ln120)

Description

- Courses: 3 required, 0 taken, 3 needed

9. Elective & Concentration Residency Requirement

Not Satisfied: 9. At least five of the nine courses consisting of the five Computer Science electives and the four-course Outside-Concentration must be taken at UMass/Amherst. (r11995,ln130)

Description

- Courses: 5 required, 0 taken, 5 needed

Take 3 of the following 4 courses

Not Satisfied: Take 3 of the following 4 courses. [CmpSci 291SP and 291SR count as one course.] (r11996)

1. Take CmpSci 230.

Not Satisfied: 1. Take CmpSci 230. (r11996,ln10)

Description

- Units: 4.00 required, 0.00 taken, 4.00 needed
- Courses: 1 required, 0 taken, 1 needed

2. Take CmpSci 220.

Not Satisfied: 2. Take CmpSci 220. (r11996,ln20)

Description

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 220	Programming Methodology	4.00			

View All | First 1 of 1 Last

3. Take CmpSci 240.

Not Satisfied: 3. Take CmpSci 240. (r11996,ln30)
Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 240	Reasoning Under Uncertainty	4.00			

View All | First 1 of 1 Last

4. Take CmpSci 250

Not Satisfied: 4. Take CmpSci 250. (r11996,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 250	Introduction To Computation	4.00			

View All | First 1 of 1 Last

CS: Additional Courses

**Additional Computer Science Courses (r10253)
CS: Electives

Courses Not used for Degree/Major/Minor Requirements(r10254)

B.S. in Computer Science
2/14/19

Not Satisfied: V. In addition to the GenEd, Diversity and College requirements, you must complete the following Major requirements. (rg5528)
Description

- GPA: 2.000 required, 0.000 actual

CS: Requirements

Not Satisfied: A. Computer Science Requirements. (r11314)
No Pass/Fail courses count toward major requirements

1. Take CompSci 121

Not Satisfied: 1. Take CompSci 121. (r11314,ln20)
Description

- Courses: 1 required, 0 taken, 1 needed

2. Take CompSci 187

Not Satisfied: 2. Take CompSci 187. (r11314,ln30)
Description

- Courses: 1 required, 0 taken, 1 needed

3. Take CompSci 220

Not Satisfied: 3. Take CompSci 220. (r11314,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

4. Take CompSci 230

Not Satisfied: 4. Take CompSci 230. (r11314,ln50)
Description

- Courses: 1 required, 0 taken, 1 needed

5. Take CompSci 240

Not Satisfied: 5. Take CompSci 240. (r11314,ln60)
Description

- Courses: 1 required, 0 taken, 1 needed

6. Take CompSci 250

Not Satisfied: 6. Take CompSci 250. (r11314,ln70)
Description

- Courses: 1 required, 0 taken, 1 needed

7. Take Junior Year Writing: CompSci 305

Not Satisfied: 7. Take Junior Year Writing: CompSci 305, at UMass/Amherst. (r11314,ln80)
Description

- Courses: 1 required, 0 taken, 1 needed

Upper Level Requirements

8. Take CompSci 311

Not Satisfied: 8. Take CompSci 311. (11314,ln90)
Description

- Courses: 1 required, 0 taken, 1 needed

9. Take three additional CompSci electives numbered 400 or higher

Not Satisfied: 9. Take three additional CompSci electives numbered 400 or higher (at least 9 credits). UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln100)

Description

- Units: 9.00 required, 0.00 taken, 9.00 needed
- Courses: 3 required, 0 taken, 3 needed

10. Take three additional CompSci electives numbered 300 or higher

Not Satisfied: 10. Take three additional CompSci electives numbered 300 or higher (at least 9 credits), not including CompSci 305. May include the CompSci course used to satisfy the IE requirement for a primary CS major. UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln110)

Description

- Units: 9.00 required, 0.00 taken, 9.00 needed
- Courses: 3 required, 0 taken, 3 needed

11a. Take one additional CompSci elective numbered 300 or higher OR

Not Satisfied: 11a. Take one additional CompSci elective numbered 300 or higher (at least 3 credits), not including CompSci 305. May include the CompSci course used to satisfy the IE requirement for a primary CS major. UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln130)

Description

- Units: 3.00 required, 0.00 taken, 3.00 needed
- Courses: 1 required, 0 taken, 1 needed

11b. Take one of the following electives outside Computer Science

Not Satisfied: 11b. Take one of the following electives outside Computer Science. (r11314,ln135)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
EC-ENG 353	Computer Syst Lab I	3.00			
EC-ENG 547	Security Engineering	3.00			
EC-ENG 668	Computr Architecture	3.00			
EC-ENG 668X	Computr Architecture	3.00			
LINGUIST 401	Introduction to Syntax	3.00			
LINGUIST 401H	Intro To Syntax, Hons	3.00			
MATH 411	Intro to Abstract Algebra I	3.00			
MATH 545	Lin Alg Appl Math	3.00			
MATH 551	Int Scientfc Comput	3.00			
MATH 552	Appl Scientfc Comput	3.00			

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12. Residency Requirement

Not Satisfied: 12. Residency Requirement: At least five of the eight upper-level courses must be taken at UMass/Amherst. (r11314,ln140)

Description

- Courses: 5 required, 0 taken, 5 needed

CS: Math Requirements

Not Satisfied: B. Math Requirements
No grade in major of Pass/Fail

1. Take Math 131

Not Satisfied: 1. Take Math 131. (r12102,ln20)

Description

- Courses: 1 required, 0 taken, 1 needed

2. Take Math 132

Not Satisfied: 2. Take Math 132. (r12102,ln30)
Description

- Courses: 1 required, 0 taken, 1 needed

3. Take Math 235

Not Satisfied: 3. Take Math 235. (r12102,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

4. Take Math 233 or Statistc 515

Not Satisfied: 4. Take Math 233 or Statistc 515. (r12012,ln50)
Description

- Courses: 1 required, 0 taken, 1 needed

CS: Science Requirement

Not Satisfied: C. Science Requirement: Take two of the following approved science courses with a laboratory component. (r11313)

Chem 111 or 121

Not Satisfied: Chem 111 or 121 (r11313,ln10)
Description

- Courses: 1 required, 0 taken, 1 needed

Chem 112 or 122

Not Satisfied: Chem 112 or 122 (r11313,ln20)
Description

- Courses: 1 required, 0 taken, 1 needed

Geology 101

Not Satisfied: Geology 101 (4 unit course). [Geology 101 (3 unit lecture) plus Geology 131 (1 unit lab), or Geology 103 plus 131, or Geology 105 plus 131 can also satisfy this requirement. Contact upd@cs.umass.edu to request an ARR adjustment] (r11313,ln30)
Description

- Units: 4.00 required, 0.00 taken, 4.00 needed
- Courses: 1 required, 0 taken, 1 needed

Physics 151 or 181 (4 units)

Not Satisfied: Physics 151 or 181 (4 units) (r11313,ln70)
Description

- Units: 4.00 required, 0.00 taken, 4.00 needed

Physics 152 or 182 (4 units)

Not Satisfied: Physics 152 or 182 (4 units) (r11313,ln80)
Description

- Units: 4.00 required, 0.00 taken, 4.00 needed

CS: Additional Courses

**Additional Computer Science Courses (r10253)

CS: Electives

Courses Not used for Degree/Major/Minor Requirements(r10254)

Second Major in Computer Science (BA) - with changes effective Sept 2019 (previously approved by FacSenate)
2/14/19

Not Satisfied: In addition to University and College requirements, you must complete the following Plan requirements. (rg5574)
Description

- GPA: 2.000 required, 0.000 actual

CmpSci 391F cannot count toward major requirements

No courses taken on a pass/fail basis may be applied to BA-CS requirements

1. Take CmpSci 121

Not Satisfied: 1. Take CmpSci 121. (r11995,ln20)
Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 121	Intro Problem Solving W/Comp	4.00			

View All | First 1 of 1 Last

1. Take CmpSci 187.

Not Satisfied: 1. Take CmpSci 187. (r11995,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 187	Programming w/Data Structures	4.00			

View All | First 1 of 1 Last

2. Take Junior Year Writing.

Not Satisfied: 2. Take Junior Year Writing. (r11995,ln60)
Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 305	Social Issues in Computing	3.00			

View All | First 1 of 1 Last

3. Take five Computer Science electives numbered 300 or higher

Not Satisfied: 3. Take five Computer Science electives numbered 300 or higher, not including 305. Courses numbered x90-x99 can only be applied to this requirement with approval of the Undergraduate Program Director. Courses taken outside the Computer Science Department may be used by petition. (r11995,ln70)

Description

- Courses: 5 required, 0 taken, 5 needed

4. Take Math 131.

Not Satisfied: 4. Take Math 131. (r11995,ln80)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 131	Calculus I	4.00			
MATH 131H	Calculus I Honors	4.00			

View All | First 1-2 of 2 Last

5. Take Math 132.

Not Satisfied: 5. Take Math 132. (r11995,ln90)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 132	Calculus II	4.00			
MATH 132H	Honors Calculus II	4.00			

View All | First 1-2 of 2 Last

6. Take one of the following math courses.

Not Satisfied: 6. Take one of the following math courses. (r11995,ln100)

Group box

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
MATH 233	Multivariate Calculus	3.00			
MATH 235	Intro Linear Algebra	3.00			
MATH 296ISH	Hnr Indstu In Math	3.00-6.00			
MATH 300	Fund Concpts Of Math	4.00			
MATH 331	Ord Dif Eq/Sci Eng	3.00			
MATH 391T	S- Intro/K-12 Math Teaching	2.00			
MATH 396ISH	Hnrs Indstu In Math	3.00-6.00			
MATH 397F	ST-Mathematics of Finance	3.00			
MATH 411	Intro to Abstract Algebra I	3.00			
MATH 412	Intro to Abstract Algebra II	3.00			
MATH 421	Complex Variables	3.00			
MATH 425	Advanced Calculus	3.00			
MATH 437	Actuarial Financial Math	3.00			
MATH 455	Intro to Discrete Structures	3.00			
MATH 456	Mathematical Modeling	3.00			
MATH 461	Affine and Projective Geometry	3.00			
MATH 462	Geometry II	3.00			
MATH 471	Theory Of Numbers	3.00			
MATH 475	History of Mathematics	3.00			
MATH 491P	S- Problem Seminar	1.00			
MATH 496ISH	Hnr Indstu In Math	3.00-6.00			
MATH 503	Cmp Con Mth Sec Tchr	3.00			
MATH 511	Abstract Algebra I	3.00			
MATH 513	Combinatorics	3.00			
MATH 523	Int Mod Analysis I	3.00			
MATH 524	Intro to Modern Analysis II	3.00			
MATH 532	Topics/Ord Diff Eqs	3.00			
MATH 534	Intro Partial Dif Eq	3.00			
MATH 536	Actuarial Probability	3.00			
MATH 545	Lin Alg Appl Math	3.00			
MATH 551	Int Scientfc Comput	3.00			
MATH 552	Appl Scientfc Comput	3.00			
MATH 563	Differential Geom	3.00			
MATH 571	Intro/MathematicalCryptography	3.00			
MATH 591CF	S-Cybersecurity Lecture Series	1.00			
MATH 597T	ST-MathmKnwldge for Teaching I	3.00			
MATH 611	Algebra I	3.00			
MATH 612	Algebra II	3.00			
MATH 621	Complex Analysis	3.00			
MATH 623	ThFnctn-Real Vrbl I	3.00			
MATH 624	Real Analysis II	3.00			
MATH 645	Diff EqDynmc Sys I	3.00			
MATH 651	Int Numrcl Analys I	3.00			
MATH 652	Int Numrcl Anlys II	3.00			
MATH 671	Intr-Gnrl Topology I	3.00			
MATH 672	Algebraic Topology	3.00			
MATH 697AM	ST-Appl Math & Math Modeling	3.00			

MATH 697AM	ST-Foundatns/AnalysisMachLrng	3.00
MATH 697CM	ST-Combinatorial Optimization	3.00
MATH 697CP	ST- Convex Polytopes	3.00
MATH 697CV	ST-Calc of Var & Opt Cntrl Thy	3.00
MATH 697FA	ST-Fast Algms Parallel Proc	3.00
MATH 697LA	ST-Intro to LIE Algebra	3.00
MATH 697MS	ST-Multiscale Methods	3.00
MATH 697NA	ST-Numerical Algorithms	3.00
MATH 697S	ST-Stoch Modeling & Stat Comp	3.00
MATH 697SC	ST-Comp Methods Stochastic Sys	3.00
MATH 697WA	ST-NonlinWaves & Appl/Continua	3.00
RES-ECON 211	Intro Stats for Life Sciences	4.00
RES-ECON 212	Intro Stats/Soc Sci	4.00
STATISTC 240	Intro To Statistics	3.00
STATISTC 501	Meth Applied Stats	3.00
STATISTC 515	Statistics I	3.00

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7. Take a 4-course concentration approved by the Undergraduate Program Director

Not Satisfied: 7. Take four courses numbered 200 or higher approved by the Undergraduate Program Director as forming a focused study in another discipline with relevance to the theory or practice of computer science. (r11995,ln110)

Description

- Courses: 4 required, 0 taken, 4 needed

8. Elective Residency Requirement

Not Satisfied: 8. At least three of the five Computer Science electives must be taken at UMass/Amherst. (r11995,ln120)

Description

- Courses: 3 required, 0 taken, 3 needed

9. Elective & Concentration Residency Requirement

Not Satisfied: 9. At least five of the nine courses consisting of the five Computer Science electives and the four-course Outside-Concentration must be taken at UMass/Amherst. (r11995,ln130)

Description

- Courses: 5 required, 0 taken, 5 needed

Take 3 of the following 4 courses

Not Satisfied: Take 3 of the following 4 courses. [CmpSci 291SP and 291SR count as one course.] (r11996)

1. Take CmpSci 230.

Not Satisfied: 1. Take CmpSci 230. (r11996,ln10)

Description

- Units: 4.00 required, 0.00 taken, 4.00 needed
- Courses: 1 required, 0 taken, 1 needed

2. Take CmpSci 220.

Not Satisfied: 2. Take CmpSci 220. (r11996,ln20)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 220	Programming Methodology	4.00			

View All | First 1 of 1 Last

3. Take CmpSci 240.

Not Satisfied: 3. Take CmpSci 240. (r11996,ln30)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 240	Reasoning Under Uncertainty	4.00			

View All | First 1 of 1 Last

4. Take CmpSci 250

Not Satisfied: 4. Take CmpSci 250. (r11996,ln40)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
COMPSCI 250	Introduction To Computation	4.00			

View All | First 1 of 1 Last

CS: Additional Courses

**Additional Computer Science Courses (r10253)

CS: Electives

Courses Not used for Degree/Major/Minor Requirements(r10254)

Second major in Computer Science
2/14/19

Not Satisfied: You must complete the following requirements for a second major in Computer Science. (rg5562)

Description

- GPA: 2.000 required, 0.000 actual

CS: Requirements

Not Satisfied: A. Computer Science Requirements. (r11314)
No Pass/Fail courses count toward major requirements

1. Take CompSci 121

Not Satisfied: 1. Take CompSci 121. (r11314,ln20)
Description

- Courses: 1 required, 0 taken, 1 needed

2. Take CompSci 187

Not Satisfied: 2. Take CompSci 187. (r11314,ln30)
Description

- Courses: 1 required, 0 taken, 1 needed

3. Take CompSci 220

Not Satisfied: 3. Take CompSci 220. (r11314,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

4. Take CompSci 230

Not Satisfied: 4. Take CompSci 230. (r11314,ln50)
Description

Description

- Courses: 1 required, 0 taken, 1 needed

5. Take CompSci 240

Not Satisfied: 5. Take CompSci 240. (r11314,ln60)
Description

- Courses: 1 required, 0 taken, 1 needed

6. Take CompSci 250

Not Satisfied: 6. Take CompSci 250. (r11314,ln70)
Description

- Courses: 1 required, 0 taken, 1 needed

7. Take Junior Year Writing: CompSci 305

Not Satisfied: 7. Take Junior Year Writing: CompSci 305, at UMass/Amherst. (r11314,ln80)
Description

- Courses: 1 required, 0 taken, 1 needed

Upper Level Requirements

8. Take CompSci 311

Not Satisfied: 8. Take CompSci 311. (11314,ln90)
Description

- Courses: 1 required, 0 taken, 1 needed

9. Take three additional CompSci electives numbered 400 or higher

Not Satisfied: 9. Take three additional CompSci electives numbered 400 or higher (at least 9 credits). UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln100)

Description

- Units: 9.00 required, 0.00 taken, 9.00 needed
- Courses: 3 required, 0 taken, 3 needed

10. Take three additional CompSci electives numbered 300 or higher

Not Satisfied: 10. Take three additional CompSci electives numbered 300 or higher (at least 9 credits), not including CompSci 305. May include the CompSci course used to satisfy the IE requirement for a primary CS major. UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln110)

Description

- Units: 9.00 required, 0.00 taken, 9.00 needed
- Courses: 3 required, 0 taken, 3 needed

11a. Take one additional CompSci elective numbered 300 or higher OR

Not Satisfied: 11a. Take one additional CompSci elective numbered 300 or higher (at least 3 credits), not including CompSci 305. May include the CompSci course used to satisfy the IE requirement for a primary CS major. UPD approval required for any CompSci course with a number ending in '90-99. (r11314,ln130)

Description

- Units: 3.00 required, 0.00 taken, 3.00 needed
- Courses: 1 required, 0 taken, 1 needed

11b. Take one of the following electives outside Computer Science

Not Satisfied: 11b. Take one of the following electives outside Computer Science. (r11314,ln135)

Description

- Courses: 1 required, 0 taken, 1 needed

The following courses may be used to satisfy this requirement:

Course	Description	Units	When	Grade	Status
EC-ENG 353	Computer Syst Lab I	3.00			
EC-ENG 547	Security Engineering	3.00			
EC-ENG 668	Computr Architecture	3.00			
EC-ENG 668X	Computr Architecture	3.00			
LINGUIST 401	Introduction to Syntax	3.00			
LINGUIST 401H	Intro To Syntax, Hons	3.00			
MATH 411	Intro to Abstract Algebra I	3.00			
MATH 545	Lin Alg Appl Math	3.00			
MATH 551	Int Scientfc Comput	3.00			
MATH 552	Appl Scientfc Comput	3.00			

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12. Residency Requirement

Not Satisfied: 12. Residency Requirement: At least five of the eight upper-level courses must be taken at UMass/Amherst. (r11314,ln140)

Description

- Courses: 5 required, 0 taken, 5 needed

CS: Math Requirements

Not Satisfied: B. Math Requirements

No grade in major of Pass/Fail

1. Take Math 131

Not Satisfied: 1. Take Math 131. (r12102,ln20)

Description

- Courses: 1 required, 0 taken, 1 needed

2. Take Math 132

Not Satisfied: 2. Take Math 132. (r12102,ln30)

Description

- Courses: 1 required, 0 taken, 1 needed

3. Take Math 235

Not Satisfied: 3. Take Math 235. (r12102,ln40)
Description

- Courses: 1 required, 0 taken, 1 needed

4. Take Math 233 or Statistc 515

Not Satisfied: 4. Take Math 233 or Statistc 515. (r12012,ln50)
Description

- Courses: 1 required, 0 taken, 1 needed

CS: Science Requirement

Not Satisfied: C. Science Requirement: Take two of the following approved science courses with a laboratory component. (r11313)
Chem 111 or 121

Not Satisfied: Chem 111 or 121 (r11313,ln10)
Description

- Courses: 1 required, 0 taken, 1 needed

Chem 112 or 122

Not Satisfied: Chem 112 or 122 (r11313,ln20)
Description

- Courses: 1 required, 0 taken, 1 needed

Geology 101

Not Satisfied: Geology 101 (4 unit course) [Geology 101 (3 unit lecture) plus Geology 131 (1 unit

Not Satisfied: Geology 101 (4 unit course). [Geology 101 (3 unit lecture) plus Geology 131 (1 unit lab), or Geology 103 plus 131, or Geology 105 plus 131 can also satisfy this requirement. Contact upd@cs.umass.edu to request an ARR adjustment] (r11313,ln30)

Description

- Units: 4.00 required, 0.00 taken, 4.00 needed
- Courses: 1 required, 0 taken, 1 needed

Physics 151 or 181 (4 units)

Not Satisfied: Physics 151 or 181 (4 units) (r11313,ln70)

Description

- Units: 4.00 required, 0.00 taken, 4.00 needed

Physics 152 or 182 (4 units)

Not Satisfied: Physics 152 or 182 (4 units) (r11313,ln80)

Description

- Units: 4.00 required, 0.00 taken, 4.00 needed

CS: Additional Courses

**Additional Computer Science Courses (r10253)