



ARTICULATION AGREEMENT

between the computer science curricula at

Massachusetts Bay Community College

Dept. of Computer Science

and

University of Massachusetts Lowell

College of Arts & Sciences

Dept. of Computer Science

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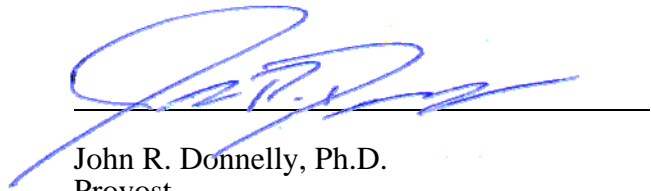


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Purpose

This agreement is intended to smooth the path for students transferring from the Massachusetts Bay Community College (MassBay) Dept. of Computer Science to the University of Massachusetts Lowell (UMass Lowell) Dept. of Computer Science. It is not intended to override any rules, regulations, or admissions criteria of either institution. It is intended solely to clarify the intersections between the two curricula so that MassBay students can adequately prepare themselves to enter the four-year Bachelor of Science (B.S.) in Computer Science program at UMass Lowell and complete that program successfully.

This articulation agreement applies specifically to students who earn an Associate in Science (A.S.) degree in Computer Science from MassBay CC. Students who wish to transfer to UMass Lowell before completing all the requirements for an A.S. degree will be evaluated on a case-by-case basis.

Understanding the UMass Lowell Undergraduate Computer Science Curriculum

The Computer Science (CS) curriculum at UMass Lowell has a “systems,” as opposed to an “applications,” orientation. The curriculum strives to give students a solid theoretical foundation in the underlying software concepts that allow computers to do what they do and the reasons why those concepts are important. The curriculum does not focus on specific applications or computer languages. Applications are presented and discussed when they can clarify underlying concepts and serve as examples of practical implementations of those concepts. Computer languages are chosen for particular assignments, but the implementation language is far less important than the concepts taught by that assignment. In fact, while the concepts covered in a course remain quite constant from one semester to another, the language used for assignments may change at the discretion of the professor.

The overarching philosophy of the UMass Lowell undergraduate CS curriculum is that languages, applications, and techniques change very rapidly in our field, and that students are best served by focusing on the underlying concepts that will be relevant long into the future, regardless of the language chosen to implement them or the application in which they are employed. For example, the UMass Lowell faculty feels that it is important to understand the basic structure of linked lists at the pointer level, not just how they can be manipulated using an Application Programmer Interface (API). Such basic structures are the same in all languages, while their APIs may differ significantly. If students understand a construct’s basic structure, they can use it in any language with any API, even those not yet invented.

In keeping with this philosophy, the first two CS courses at UMass Lowell – which cover basic computer concepts and elementary data structures – are taught using straight C on Linux systems. At many other colleges and universities, including MassBay CC, these courses are taught using Java or C++ on Windows or Macintosh systems. Object-oriented programming is not formally introduced into the UMass Lowell undergraduate CS curriculum until the third required CS course, which is typically taken in the first semester of a student’s sophomore year. Modern program design techniques and tools such as object-oriented analysis and design

(OOAD), programming patterns, and the Unified Modeling Language (UML) are delayed until the fourth course.

There have been endless discussions in the CS community about the desirability of “objects first” vs. “procedures first” curricula. Like most such arguments, there are advantages and disadvantages to both. One may be more suitable for some students, while the other may be more suitable for others. The issue is not which is better, but simply that the two are different.

It is important for transfer students and their advisors to realize this difference so that students can fully prepare themselves to make a smooth transition from one curriculum to the other. As noted in the previous section, the best way for MassBay CS students to prepare themselves to transfer to UMass Lowell CS is to complete all the requirements for an Associate in Science (A.S.) in Computer Science degree from MassBay CC. Most importantly, to get credit for Computing I through Computing III (91.101, 91.102, and 91.201) at UMass Lowell, MassBay students must complete *all four* of the following courses at MassBay CC and achieve a grade of at least 2.7 in each course.

1. CS 120 Programming I
2. CS 200 Programming II
3. CS 208 Data Structures
4. CS 212 Systems Programming with C

Most other MassBay courses will transfer to UMass Lowell one-to-one. Please see the course equivalency list under “Specific Course Equivalencies” for specific pairings.

General Terms of This Agreement

1. MassBay students who earn an A.S. in Computer Science and achieve a GPA of 2.5 or higher are guaranteed admission to the B.S. in C.S. program at UMass Lowell.
2. MassBay students may typically transfer up to 60 credits to be applied to the B.S. in C.S. program at UMass Lowell. Additional credits may be presented for acceptance, but at least 60 credits must be earned at UMass Lowell to earn a B.S. in C.S.
3. In general, course credits earned at MassBay may only be transferred to UMass Lowell at the 100 (freshman) and 200 (sophomore) levels. Some exceptions to this policy may be granted in cases where course equivalencies are clearly established.
4. Transfer of course credits that satisfy General Education (GenEd) and other university requirements is governed by the MassTransfer Policy. Students and academic advisors are encouraged to familiarize themselves with the details of that policy, which can be found at:

<http://www.mass.edu/library/ctagappC.asp>

5. This Articulation Agreement is approved for MassTransfer benefits including the acceptance of credits as stated in the MassTransfer Policy and the 33% discount on tuition.

Specific MassBay / UMass Lowell CS Program Course Equivalencies

The table below lists the typical set of courses taken by MassBay CS majors and indicates the credit that will be given at UMass Lowell for each course.

MassBay			UMass Lowell		
Course No.	Course Title	Credits	Course No.	Course Title	Credits
CS 120 + CS 200 + CS 208 + CS 212	Programming I + Programming II + Data Structures + Systems Programming with C	16	91.101 + 91.102 + 91.201	Computing I + Computing II + Computing III (as a block)	12
CS 205	Intro to Computation	4	91.299	CS Elective	3
CS 214	Computer Architecture and Assembly	4	91.203	Computer Organization and Assembly Language	4
CS 225	Software Design	3	91.204	Computing IV	3
CT 100	Critical Thinking	2	45.202	Intro Logic & Critical Reasoning (AH GenEd)	3
EN 101	Freshman English I	3	42.101	College Writing I	3
EN 102	Freshman English II	3	42.102	College Writing II	3
MA 210	Intro to Linear Algebra	4	92.221	Linear Algebra I	3
MA 200	Calculus I	4	92.131	Calculus I	4
MA 201	Calculus II	4	92.132	Calculus II	4
PY 103	Engineering Physics I	4	95.141/ 96.144	Physics I + Lab	4
PY 104	Engineering Physics II	4	95.144/ 96.144	Physics II + Lab	4
aa nnn	Program Elective	4	nn.nnn	Tech Elective	3
aa nnn	Social Science Elective	3	nn.nnn	Social Science (SS) GenEd	3
aa nnn	Humanities Elective	3	nn.nnn	Arts & Humanities (AH) GenEd	3
aa nnn	Humanities or Social Science Elective	3	nn.nnn	SS or AH GenEd	3

Computer Science Curriculum for Students Entering In or After September 2008

Version 2.8, updated March 25, 2009

Suggested course sequence for students entering UMass Lowell in or after September 2008.
Please see the definitions and notes on course categories and sequences on the next page.

Freshman Fall - total: 14 credits	Freshman Spring - total: 14 credits
91.101 - Computing I (4 credits)	91.102 - Computing II (4)
92.131 - Calculus I (4)	92.132 - Calculus II (4)
42.101 - College Writing I (3)	42.102 - College Writing II (3)
Slot 1 - Gen Ed Course (3)	Slot 2 - Gen Ed Course (3)

Sophomore Fall - total: 17 credits	Sophomore Spring - total: 16 credits
91.201 - Computing III (4)	91.204 - Computing IV (3)
91.203 - Comp. Org. & Assembly Lang. (4)	92.386 - Probability and Statistics I (3)
92.321 - Discrete Structures I (3)	92.322 - Discrete Structures II (3)
16.265 - Logic Design (3)	42.220 - Gen Ed: Oral & Writ. Comm. for CS (3)
Slot 3 - Natural Science Elective (3)	Slot 4 - Natural Science Elective with lab (4)

Junior Fall - total: 15 credits	Junior Spring - total: 15 credits
91.304 - Foundations of CS (3)	91.301 - Organization of Prog. Languages (3)
91.305 - Computer Architecture (3)	91.308 - Intro. to Operating Systems (3)
Slot 5 - Natural Science Elective (3)	Slot 8 - Natural Science Elective (3)
Slot 6 - Gen Ed: CS Ethics Course (3)	Slot 9 - Gen Ed: Diversity Course (3)
Slot 7 - General (Free) Elective (3)	Slot 10 - General (Free) Elective (3)

Senior Fall - total: 15 credits	Senior Spring - total: 15 credits
91.xxx - Project Course - Part 1 (3)	91.xxx - Project Course - Part 2 (3)
91.404 - Analysis of Algorithms (3)	91.xxx - Computer Science Elective (3)
Slot 11 - Technical Elective (3)	Slot 14 - Technical Elective - (3)
Slot 12 - Non-Technical General Elective (3)	Slot 15 - General (Free) Elective (3)
Slot 13 - Gen Ed Course (3)	Slot 16 - General (Free) Elective (3)

Definitions and Notes

Please see http://teaching.cs.uml.edu/~heines/curriculum/ugrad/course_grid_2008.shtml for live links from this text.

Gen Ed Courses

- CS students must complete six courses (18 credits) of courses that satisfy the [University General Education Requirements](#).
- Three of these must be approved as Arts and Humanities (AH) courses and three must be approved as Social Sciences (SS) courses.
- 42.220 Oral & Written Communication for Computer Science is required and counts as one of the three required AH Gen Eds.
- One of these must satisfy the [CS Ethics Requirement](#).
- One must satisfy the [University Diversity Requirement](#).
- Specific courses may be recommended for different CS Tracks.
- See the [University General Education Program](#) website for more detailed information.

Natural Science Electives

- CS students must complete 12 credits of natural science courses.
- These are courses offered by one of the four natural science departments in the College of Arts & Sciences:
 - Biological Sciences
 - Chemistry
 - Environmental, Earth, and Atmospheric Sciences
 - Physics and Applied Physics
- Courses that fulfill this requirement must be classified as required or elective courses for the majors in those departments.
- This requirement may be satisfied by completing three 3-credit courses that do *not* include labs plus one 4-credit course that *does* include a lab (totaling 13 credits), or three 4-credit courses that *do* include labs (totaling 12 credits).
 - Thus, at least one natural science course must include a lab.
- An additional constraint is that the total number of credits applied to this requirement plus the number of credits earned in Math (92.xxx) courses must total at least 30.
- Specific courses may be recommended for different CS Tracks.
- See the [CS Dept. Policy on Natural Science Electives](#) for more detailed information.

Technical Electives

- CS students must complete 6 credits of technical electives.
- These are courses offered by the College of Arts & Sciences (Sciences Division) or the College of Engineering.
- Courses that fulfill this requirement must be classified as required or elective courses for the majors in those departments.
- Specific courses may be recommended for different CS Tracks.

Non-Technical Elective

- CS students must complete 3 credits of a non-technical elective.
- These are courses offered by the College of Arts & Sciences (Fine Arts, Humanities & Social Sciences Division), Graduate School of Education, School of Health & Environment, or College of Management that have a specific non-technical focus.

- Specific courses may be recommended for different CS Tracks.

General (Free) Elective

- CS students must complete 9 credits of almost any course offered by the University.
- Courses taken to fulfill this requirement must not be below the level of any required course.
- Specific courses may be recommended for different CS Tracks.
- See the [CS Dept. Policy on General Electives](#) for more detailed information.

Slots

- Courses listed in “slots” may generally be taken in any order, within the confines of specified course prerequisites.
- Some CS Tracks may put constraints on the ordering of these electives.
- Faculty advisors recommend that two-course sequences (such as Chemistry I and II) be taken in successive semesters rather than taking part 1 and then waiting one or more semesters to take part 2.