SPECIAL REPORT

OF THE

ACADEMIC PRIORITIES,
PROGRAM AND BUDGET and
ACADEMIC MATTERS COUNCILS

concerning

CREATION OF A BS PROGRAM IN INFORMATICS IN THE
COLLEGE OF INFORMATION AND COMPUTER SCIENCES
(#4100)

Presented at the
777th Regular Meeting of the Faculty Senate
April 12, 2018

COUNCIL MEMBERSHIP

ACADEMIC PRIORITIES COUNCIL

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ACADEMIC PRIORITIES COUNCIL

At its meeting on March 22, 2018 the Academic Priorities Council enthusiastically voted to recommend approval of the new Degree Program in Informatics proposed by the College of Information and Computer Sciences. Although some work remains in arranging electives in the School of Management, the APC viewed this as not an obstacle to the Faculty Senate moving forward with the approval process.

PROGRAM AND BUDGET COUNCIL

The informatics curriculum enables students to explore and integrate computing with their other disciplinary interests. We would expect this to attract students with an interest in disciplines with a strong “human” element - medicine, life sciences, social sciences, environmental and sustainability programs, etc., that increasingly require a high level of sophistication in computing.

Creating an informatics major is a key step towards achieving a broader mission within CICS.

The informatics curriculum was developed and offered through the Bachelor’s Degree with Individual Concentration (BDIC) program at the university for the past four years. Two concentrations in Informatics have been experimentally offered: a digital media concentration and a data science concentration. The current BDIC students with the data science concentration will be transitioned into the newly-created informatics major. The current BDIC students with a digital media concentration will be given the choice of either transferring into the data science concentration of the newly-created major, or completing their current BDIC program with the digital media concentration. No new students will be recruited into the BDIC informatics program once the informatics major is created.

The proposed informatics program with its data science concentration addresses the educational priority of extending data science education to the broadest range of undergraduate students, beyond the traditional CS student population.

Letters of support from other units on campus such as Mathematics & Statistics, Journalism, Biostatistics & Epidemiology, Isenberg School of Management, Bachelor’s degree with individual concentration (BDIC), and the Center for Data Science are included.

The submitted budget shows fringe benefits at 2.2%. This is something that likely needs adjustment but does not affect approval.

Previous questions & comments:
We ask that you review information submitted and respond to items below:

- Where are the new students coming from?
Are students in provided counts currently enrolled at UMass?
If from this campus, who/what departments lose revenue?
- Since we do not, currently function in RCM – what is the revenue model? This information should include a detailed and accurate budget indicating current resource levels, proposed new resources required and the revenue stream that will support the expenditures. Please include details on start-up costs and funding.
- Do various departments listed as offering ‘Concentration’ courses guarantee seats for projected Informatics students? (EX. Journalism, OIM, Public Health, Statistics, English, Art, etc.)
- Is there a need for resources?
- Please provide letters of resources/investment commitment from current Provost, CICS Dean.
- Please provide letters of support and commitment (or MOU) from collaborating departments.

The previous questions having been answered and expressed concerns satisfied, the Program and Budget Council voted at its meeting on March 22, 2018 to recommend approval of this proposal.

ACADEMIC MATTERS COUNCIL

The Academic Matters Council recommends approval of this proposal.
Please describe your proposal

UMass New Academic Program - Submission Template

Proposed Degree(s) Title: B.S. in Informatics

Proposed CIP Code: (provided by campus OIR)

Date of Board of Trustees Vote: (leave blank; AASAIR will fill in)

Date Letter of Intent submitted to Commissioner (leave blank; AASAIR will fill in)

A. Alignment with Institution Mission Priorities

How does the proposed program align with the institution’s mission priorities?

Alignment with College.

The College of Information and Computer Sciences (CICS) was created in April 2015, in part to offer new programs that broaden the computing mission across the university. Creating an informatics major is a key step towards achieving our broader mission. Our undergraduate-level informatics effort is synergistic with our goal of creating a complete undergraduate and graduate program in information science and social computing. It is also aligned with our strategic initiative to create a School of Information (iSchool) within our college, our proposed informatics program being a first step towards an iSchool.

The informatics program is also synergistic with the Center for Data Science (CDS) within CICS. CDS is a leading internationally-known interdisciplinary hub for data science education, research, and industry collaboration. The proposed informatics program with its data science concentration addresses the highest educational priority of CDS of extending data science education to the broadest range of undergraduate students, beyond the traditional CS student population.

Alignment with the University.

The April 2014 report of the university’s Joint Task Force on Strategic Oversight (JTFSO) Subcommittee on Research and Graduate Education identifies six key focus areas as being in the intersection between our campus strengths and State/Regional/National priorities. The proposed informatics program is uniquely positioned to address two of those six focus areas. Our proposed informatics program offers one initial concentration: data science. The data science concentration aligns with the JTFSO focus area of “data science, computing and analytics, and computational social science (CSS)” and is closely tied to the newly-created multimillion-dollar Center for Data Science (CDS) within the college. A second focus area identified by JTFSO is “equity and inclusion” that is also greatly helped by informatics as it attracts a greater diversity of students with a greater variety of perspectives and skills. In addition to the data science concentration, we envision more informatics concentrations that we will propose in the future.

B. Alignment with System Priorities
1. Will this proposed program address a regional/local/state workforce shortage? Explain.

Informatics is at the core of ICT (Information and Communication Technologies) that affects almost every aspect of modern life. Massachusetts – an international leader in the “Innovation Economy” – is highly dependent on a skilled workforce in ICT. According to the U.S. Department of Labor, in the period from 2002 to 2012, ICT jobs grew nationally by 36%, while total jobs grew only 2%. In Massachusetts, ICT jobs grew even faster at 40% during the same period, while total employment grew less than 1%\(^1\).

2. For undergraduate programs only - With what, if any, other institutions have articulation agreements been arranged for this program? (attach agreements)

Letters of support from other units on campus such as Mathematics & Statistics, Journalism, Biostatistics & Epidemiology, Isenberg School of Management, Bachelor’s degree with individual concentration (BDIC), and the Center for Data Science are included.

3. How will the proposed new academic program broaden participation and completion at the institution by underrepresented and underserved groups?

The need for an informatics major is manifest within our current student body in Computer Science (CS). Many non-CS majors get their first taste of computing with our introductory course (COMPSCI 121) that they take to learn an important skill, to fulfill a general education requirement, or to meet a technical requirement of the Information Technology (IT) Minor, only to discover that they want to learn more computing. Informatics meets an important curricular need for these students by providing an alternate pathway into computing, a need not fulfilled by our existing BS/BA program in Computer Science, the BS degree in Computer Systems Engineering, the Information Systems offering in ISOM, or the IT minor. Of our current 108 informatics majors, only 10% were previously CS majors. The rest came from the CICS exploratory track (25%), natural sciences (26%), SBS (10%), HFA (12%), engineering (5.5%), and SPHHS (5.5%).

The informatics curriculum enables students to explore and integrate computing with their other disciplinary interests. We would expect this to attract students with an interest in disciplines with a strong “human” element - medicine, life sciences, social sciences, environmental and sustainability programs, etc., that increasingly require a high level of sophistication in computing. Experience with interdisciplinary computing programs at other universities shows that they contribute to broadening the computing discipline to include and retain a more diverse student body. While the numbers of women and persons of color have increased with the dramatic growth in CS enrollment, the percentages have remained relatively constant, e.g., women represent less than 12% of the CS major. In contrast, even with our limited BDIC offering in informatics, we are seeing a marked increase in diversity among our 108 majors, with women (37%) and ALANA (42.5%).

C. Overview of Proposed Program

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\(^1\) Technology Workforce Analysis, Massachusetts Board of Higher Education, Spring 2014 (https://goo.gl/7Ip5vG).
1. Context. Describe the program’s development, as well as its proposed administrative and operational organizational structure.

To demonstrate viability and assess student demand for the proposed Informatics program, we have developed and offered the informatics curriculum through the Bachelor’s Degree with Individual Concentration (BDIC) program at the university for the past four years. In the BDIC program we experimentally offered two concentrations: a digital media concentration and a data science concentration. The demand for the data science concentration has been particularly significant with 96 out of the 108 majors in that concentration. The remaining 11 students are in the digital media concentration, of whom 5 will graduate this year (AY 17-18). Given the great success of the informatics BDIC offering with the data science concentration, our proposed informatics major will start by offering that concentration. The latent demand for informatics is particularly notable as our initial success was achieved with little to no external publicity for the BDIC informatics program.

The day-to-day operations of the program are performed by a core set of faculties who form the informatics program committee, led by a program director. The program committee is responsible for student recruitment, admissions, advising, and publicity for the informatics major. In addition, the program committee is responsible for the informatics curriculum, including vetting new electives for the informatics major. Centralizing these functions within the program committee provides operational efficiency. As we expand the program, we expect the informatics program committee to include informatics-affiliated faculty across campus, as well as some staff support.

2. Description. What is the intent/purpose of the program? What knowledge and skills will students acquire? For what careers will graduates be prepared?

Almost every industry sector depends on information and communication technology (ICT) and hires applications and systems designers, architects, developers, programmers, and analysts, managers, administrators and user support specialists. The technology sectors that develop and deploy telecommunications, software, enterprise and web services, storage technologies, data centers, mobility and wireless, etc. are well-served by our computer science and computer engineering programs. Large and small organizations and businesses requiring database, network and system administrators, sales representatives or user support specialists can turn to computer and management information systems or information technology associate, bachelor’s and graduate programs for talent. However, there are growing industry sectors that are increasingly dependent on sophisticated ICT applications, such as education, healthcare, energy, finance, insurance, tourism and travel, pharmaceuticals, medical devices, etc. These sectors require domain expertise outside of computing yet rely on foundational knowledge of computing. Our informatics program educates the student who is interested in applying computing principles to other domains,

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2 The current BDIC students with the data science concentration will be transitioned into the newly-created informatics major. The current BDIC students with a digital media concentration will be given the choice of either transferring into the data science concentration of the newly-created major, or completing their current BDIC program with the digital media concentration. No new students will be recruited into the BDIC informatics program once the informatics major is created.
thus fulfilling a need that is currently underserved from an educational standpoint, both within our university and across our state and nation.

The informatics program teaches the knowledge and skills needed to effectively use computing to solve important problems in other domains. Such skills include technical knowledge of hardware, software, and programming. In addition, students learn key societal issues that surround computing such as ethics, security and privacy. Further, the concentration courses and electives allow the student to gain knowledge in their domain of interest.

A student in the currently-proposed data science concentration learns how to process, visualize, and derive insights from large amounts of data. The need for processing “big data” exists in nearly every industry segment, including government, health care, insurance, biotech, and pharmaceutical. Informatics students can play the role of a data analyst, business analyst, or data scientist in these industry segments.

3. Curriculum, Requirements.
Attach curriculum outline (Templates) and course descriptions (use provided template).
Provide a complete description of the curriculum. Describe procedures and arrangements for independent work, internship or clinical placement arrangements, if applicable. Describe role and membership of external advisory committee, if any.

Our proposed curriculum balances the need for a strong foundation in computing with the requirement for domain expertise in a different discipline. Students achieve domain expertise by choosing a concentration. While we expect to broaden our set of concentrations to include areas such as health informatics in the future, we initially focus on data science where we see immediate opportunities.

Data Science Concentration: A critical challenge for humanity in the 21st century is the explosion of data in every field of endeavor imaginable: web pages, social networks, online reviews, blog postings, press releases, news articles, online government documents, and sensor data. We are in a unique position to offer a cutting-edge Informatics concentration in data science due to our newly-created Center for Data Science, our significant strengths in affiliated areas such as data mining and machine learning, and our cluster initiative in Computational Social Science that spans Computer Science, Political Science, Sociology, and Statistics.

Curriculum structure.
We distill the foundation of informatics into seven core courses that span three broad areas: two introductory courses on “big ideas” and mathematical foundations, two courses on human factors and societal aspects, and three courses on problem solving and programming (see Table 1 below). One of the cores also satisfies the integrative experience (IE) requirement of the university. In total, the seven required core courses account for 23 credits. On completing the core courses, students can choose between multiple concentrations that facilitate acquisition of domain-specific knowledge, each concentration requiring four additional courses chosen from a pre-approved list of courses. The concentration courses account for 12 credits. Finally, the program requires four electives to be chosen from a pre-approved list of electives. The elective courses account for 12 additional credits.
Table 1: The informatics program consists of a technical core, concentration-specific courses, and electives. The four starred courses were developed for Informatics, while the rest leverage existing courses.

<table>
<thead>
<tr>
<th>Cores (23 credit hours)</th>
<th>Data Science Concentration Courses (12 credit hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• INFO 101: Introduction to Informatics*</td>
<td>• INFO 397F: Introduction to Data Science*</td>
</tr>
<tr>
<td>• INFO 150: A Mathematical Foundation of Informatics*</td>
<td>• COMPSCI 345: Practice and Applications of Data Management</td>
</tr>
<tr>
<td>• COMPSCI 121: Introduction to Problem Solving with Computers</td>
<td>• Statistics (one of STATISTIC 240; OIM 240; PSYCH 240; SOCIOL 212; or RES-ECON 212)</td>
</tr>
<tr>
<td>• COMPSCI 190D: Using Data Structures</td>
<td></td>
</tr>
<tr>
<td>• INFO 203: A Networked World*</td>
<td>Choose one from below</td>
</tr>
<tr>
<td>• COMPSCI 325: Introduction to Human Computer Interaction</td>
<td>• Upper-level statistics (one of STATISTIC 501, STATISTIC 515, STATISTIC 516)</td>
</tr>
<tr>
<td>• COMPSCI 326: Web Programming (IE Requirement)</td>
<td>• JOURNAL 397DJ: Data Driven Storytelling</td>
</tr>
<tr>
<td></td>
<td>• OIM 350: Business Intelligence and Analytics</td>
</tr>
<tr>
<td></td>
<td>• PUBHLTH 490ST: Telling Stories with Data: Statistics, Modeling, and Visualization</td>
</tr>
</tbody>
</table>

The concentration courses and electives enable the student to acquire expertise in his/her chosen application domain, such as social sciences, arts, business, life sciences, physical sciences, and engineering. See Table 1 above and the attached curriculum outline document and course syllabi for a detailed listing of core, concentration, and elective courses. Letters of support from other academic units that offer some of the concentration courses, such as Mathematics & Statistics, Journalism, Biostatistics & Epidemiology, Isenberg School of Management, are also attached.

Finally, we have a residency requirement where two of the four concentration courses and four of the six electives that satisfy the informatics major requirements must be taken at UMass Amherst.

4. Students. For first year and transfer students, outline requirements for admission and graduation, expected time from admission to graduation, projected degree completion rates, and transferability of program participants’ credits to other institutions. Describe the proposed program’s alignment to students emerging from the K-12 system. How will the program be connected to public secondary education in the region? Are there dual enrollment or early college opportunities being planned for the proposed program?

College of Information and Computer Sciences Informatics admissions for the B.S. degree will be handled by the University Admissions office. Students already admitted to the university in another major will be eligible to declare Informatics once they have earned a grade of C or better in both INFO 150 and COMPSCI 121.
The projected degree completion rate will be comparable or better than other majors at UMass Amherst. This conclusion is supported by the preliminary data for graduation rates of Informatics majors through BDIC:

- Average time to completion for non-transfer students is about 4 years.
- 7 students graduated during AY 2016-2017. Of those, time to completion ranged between 3 to 4.5 years, dated from when students first entered the university.
- 20 students are set to graduate in AY 2017-2018, all of whom entered the university in AY 2013-2014 or AY 2014-2015, resulting in a maximum time to completion of 5 years.
- As of this writing, only one student who has been formally accepted as a BDIC Informatics major has left the major; none have failed to graduate when expected.

Because Informatics is being run as an incubated program in BDIC, students cannot enter the university as Informatics majors through the traditional admissions process; they must switch to the BDIC major once already enrolled in a major at the university. For this reason, data regarding admission directly to the major is not available.

There are two key alignments with the K-12 system in our region; Advanced Placement courses in Computer Science A and Computer Science Principles both offer high school students the opportunity to earn AP credit for COMPSCI 121 and INFO 101, respectively. The Computer Science Principles AP exam is new, and AP courses in Computer Science Principles are being offered at 12 high schools across the state. In addition, through MassTransfer we accept equivalencies for COMPSCI 121, and in some cases, COMPSCI 190D from community colleges statewide. Transfer students are advised individually by college and program advisors to ensure that their transition to UMass Amherst is smooth.

5. Feasibility. Complete the Faculty Form that follows item C-7. Attach vitae for current faculty using vita form.

Describe faculty, staffing, library and information technologies, facility (including lab and equipment), fiscal and or other resources required to implement the proposed program. Distinguish between resources needed and on-hand. Display positions to be filled with qualifications.

We modeled the resources required for creating a BS degree in informatics on the two programs that we currently operate within CICS: the BDIC Informatics program and the BS Computer Science program. Creating a BS in informatics with our current BDIC informatics enrollment of 108 majors can be supported with current resources, with no significant additional investments. However, to satisfy the demands of the student body and the workforce, we targeted a growth of 50 new students each year, yielding 200-300 informatics majors in steady state. To support this growth and to position informatics for the future, we budgeted 3 faculty hires, 1 tenure-track and two instructors, amounting to three hires in the first three years. We also factored in additional TA and administrative support for the informatics program. Our budget analysis indicates that informatics program is fully sustainable and self-funding from the very first year with revenues exceeding the expenditures. Please see the attached budget for additional details.

The Provost office has committed strategic investment BASE funds to develop an iSchool program, with the Informatics BS degree being our first step toward supporting the
undergraduate degree programs in applied and human-focused computing. The included Provost support letter documents the commitment.

6. Licensure and Accreditation. Is this program intended to prepare students for licensure? If yes, name licensure organization and licensing exam. Project student passing rates. What professional or specialized accreditation will be pursued for the program? Project accreditation timelines.

This program does not prepare students for licensure.

7. Program Effectiveness Goals, Objectives, and Assessment.

**Complete the Program Goals Table.** *(Please note that this section is intended to focus on overall effectiveness, not student learning, which is addressed elsewhere.)*

Linked to each goal should be measurable objectives – such as job placement rates, faculty additions, facility or programmatic enhancements, etc. – timetable, and, if applicable, strategies for achieving them.

**PROGRAM GOALS**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Measurable Objective</th>
<th>Strategy for Achievement</th>
<th>Timetable</th>
</tr>
</thead>
</table>
| Meet student recruitment target  | 50 new students in each of the first four years    | Advertise to local K-12 schools, active recruitment from exploratory track (ET) placement across campus, recruit transfers from community colleges, establish a presence in open house events on campus. | 50 – AY18-19  
50 – AY19-20  
50 – AY20-21  
50 – AY21-22 |
| Meet faculty recruitment target  | 3 new hires in the first 3 years                   | Use existing CICS recruitment process for high-quality recruitment                        | 1 Lecturer – AY18-19  
1 Tenure Track – AY19-20  
1 Lecturer – AY20-21. |
| Successful career placement for students | Job placement rates assessed via annual survey. | Use CICS career services, industrial affiliates program, and CICS-hosted career fairs. Use existing university-level services for internships and Co-ops. | Started the process in Fall 2017. |
Describe program assessment strategies that will be used to ensure continuing quality, relevance and effectiveness. Include plans for program review including timetable, use of assessment outcomes, etc.

We will track time-to-completion, graduation rates, placement rates, and inclusiveness related metrics on an ongoing basis and make corrections as needed.

**Faculty Form**

**Summary of Faculty who will teach in the proposed program.**

Please list full-time faculty first, alphabetically by last name. Add additional rows as necessary. The following is a sample list of faculties who have recently taught the core informatics courses. We expect the assignment of faculty to courses to vary over time.

<table>
<thead>
<tr>
<th>Name of faculty member (Name, Degree and Field, Title)</th>
<th>Tenured Y/N</th>
<th>Courses Taught Put (C) to indicate core course. Put (OL) next to any course currently taught online.</th>
<th># of sections</th>
<th>Division or College of Employment</th>
<th>Full- or Part-time in Program</th>
<th>Full- or part-time in other department or program (Please specify)</th>
<th>Sites where individual will teach program courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson, Gordon PhD, Computer Science Teaching Faculty</td>
<td>N</td>
<td>• COMPSCI 121: Problem Solving with Computers (C)</td>
<td>(1)</td>
<td>College of Information and Computer Sciences</td>
<td>Part-Time for Informatics</td>
<td>Full-Time in CICS</td>
<td>Main Campus</td>
</tr>
<tr>
<td>Barrington, David A. Mix PhD, Computer Science Professor</td>
<td>Y</td>
<td>• INFO 150: A Mathematical Foundation for Informatics (C)</td>
<td>(1)</td>
<td>College of Information and Computer Sciences</td>
<td>Part-Time for Informatics</td>
<td>Full-time in CICS</td>
<td>Main Campus</td>
</tr>
<tr>
<td>Hudlicka, Eva PhD, CS Part-time Lecturer</td>
<td>N</td>
<td>• COMPSCI 325: Human Computer Interaction (C)</td>
<td>(1)</td>
<td>College of Information and Computer Sciences</td>
<td>Part-Time for Informatics</td>
<td>Part-Time in CICS</td>
<td>Main Campus</td>
</tr>
<tr>
<td>Liberatore, Marc D. PhD, Computer Science Teaching Faculty</td>
<td>N</td>
<td>• COMPSCI 190D: Using Data Structures (C)</td>
<td>(1)</td>
<td>College of Information and Computer Sciences</td>
<td>Part-Time for Informatics</td>
<td>Full-Time in CICS</td>
<td>Main Campus</td>
</tr>
<tr>
<td>Liberatore, Marc PhD, CS Teaching Faculty</td>
<td>N</td>
<td>• INFO 203: Networked World (C)</td>
<td>(1)</td>
<td>College of Information and Computer Sciences</td>
<td>Part-Time for Informatics</td>
<td>Full-Time in CICS</td>
<td>Main Campus</td>
</tr>
</tbody>
</table>
### INFORMATICS PROGRAM ENROLLMENT PROJECTION

<table>
<thead>
<tr>
<th></th>
<th># of Students Year 1</th>
<th># of Students Year 2</th>
<th># of Students Year 3</th>
<th># of Students Year 4*</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Full Time</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Continuing Full Time</td>
<td>90</td>
<td>110</td>
<td>130</td>
<td>150</td>
</tr>
<tr>
<td>New Part Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuing Part Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>140</td>
<td>160</td>
<td>180</td>
<td>200</td>
</tr>
</tbody>
</table>

(Assumption: Of the 108 continuing students currently in the BDIC informatics program, we assume 90 transfer into the informatics major, accounting for graduations in 2018. Of these students, we assume 30 graduate in Year 1, 30 graduate in Year 2, and 30 graduate in Year 3. We assume new students admitted directly into the major graduate in four years.)

1. **Need for graduates.** What is the local/regional/state labor market outlook for graduates of the proposed program? What occupations are students being prepared for after graduation? Name the common entry-level job titles. Are there enough economic opportunities in these fields to support the scale of program you intend to build? At present, how many students graduate with this credential in the region you serve compared to the number of relevant job postings? Which local employers are hiring the most entry-level people in these fields? Use real time labor market information for the proposed program. How will you give students experience with the information...
There are growing industry sectors that are increasingly dependent on sophisticated ICT applications, such as education, healthcare, energy, finance, insurance, tourism and travel, pharmaceuticals, medical devices, etc. These sectors require domain expertise outside of computing yet rely on foundational knowledge of computing. Our informatics program educates the student who is interested in applying computing principles to other domains, thus fulfilling a need that is currently underserved from an educational standpoint, both within our university and across our state and nation.

According to the U.S. Department of Labor, in the period from 2002 and 2012, ICT jobs grew nationally by 36%, while total jobs grew only 2%\(^3\). In Massachusetts, ICT jobs grew even faster at 40% during the same period, while total employment grew less than 1%. For many leaders in the tech sector in Massachusetts, even this faster growth of ICT jobs is not fast enough. In 2010, the Mass Technology Leadership Council (MASSTLC) challenged its members to create 100,000 new ICT jobs in Massachusetts by 2020, stating that it would yield $8.8 billion in incremental tech wages, listing “big data” in its list of priorities\(^4\). The BLS conservatively projects 31% growth in information and computer technology jobs from 2010 through 2020\(^5\).

Some common entry-level jobs for informatics students are as follows. An informatics student with a data science concentration will be employable as a data analyst, business analyst, data scientist, quantitative analysts, market analyst, etc.

2. Student Demand / Target Market. What is the student market for the proposed program? Discuss demographics, location, proposed market share, etc. Provide data, e.g., survey results, etc., that form the basis for enrollment projections.

Our experience with the BDIC Informatics program, albeit small, provides useful information about the latent demand for Informatics within our current student body. Without overt advertising beyond an initial distribution of flyers to advising offices and a presence at the annual Majors Fair, the number of BDIC Informatics majors has grown exponentially. Concerted effort to launch the program collaboratively with BDIC began in Fall 2014 with the initial offering of COMPSCI 190 DM and COMPSCI 190IN; those courses now have the permanent designations of INFO 150 and INFO 101. Flyers about Informatics were sent to the undeclared advising center, and web pages were created describing the program in that same semester. By the end of Fall 2016, there were 70 students pursuing informatics. Currently, there are 108 BDIC informatics majors. The chart below illustrates the increasing yield from both the INFO 101 course and from other sources:

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As the chart above indicates, Informatics is poised to be a steadily growing major. Considering that the bulk of our students come from outside CICS, the CICS ET, and Engineering, it is reasonable to expect a broad level of student demand for the major that will continue to hit established enrollment targets.

3. Duplication. Identify existing public and private programs/institutions in the region or state that offer the same or similar programs. Discuss size / enrollment trends for these programs.

Other programs on campus.

The current BS/CS degree is an intensive program with significant computer science, mathematics and science requirements that is difficult to begin after a student’s first year. The BS/CSE is a similarly demanding program focused at the device, hardware, and telecommunications level. While the Computer Science BA degree is more flexible and allows a concentration in another discipline, the depth and focus of the computing requirements make it a program more suitable for future systems designers, architects, developers, programmers, and software engineers. The Computer Science minor does allow a student to gain an in-depth grounding in computer science but does not deal with the broader issues of computing in society. The IT minor was designed to be and remains an interdisciplinary “IT across the curriculum” program whose goals compliment the Informatics program goals. The IT minor provides computer skills and competency and primarily serves communication, journalism, and ISOM majors – disciplines that are increasingly ICT dependent. As the IT program becomes more fully integrated within the College, the relationship and possible synergies with the Informatics major will be explored.

Related programs within the state and the region.

Within the UMass system, the BS in information technology (IT) at the Lowell and Boston campuses train skilled professionals who can manage and administer networks, databases, and other complex IT systems. Our informatics program is significantly differentiated from these programs by its focus on using computing principles in disciplines that range from the sciences to the humanities. Within our geographical region, WPI offers a comprehensive curriculum in Interactive Media and Game Development, but it is more narrowly focused on gaming. There are also several programs in our region in health, clinical, or bio informatics that are more narrowly focused, less computing-oriented, and largely offered as a specialization at the graduate level (e.g., Harvard, MIT, Brown, BU, Yale). Perhaps the most closely related programs in our vicinity are the BS in Informatics at SUNY Albany and the BS in information science at Northeastern and Cornell. Further, across the nation, there are several informatics programs that are starting to build momentum, such as those in Indiana University, University of Washington, University of Michigan, and Arizona State. While these

<table>
<thead>
<tr>
<th>Semester</th>
<th>Enrollment in INFO 101</th>
<th>Yield from INFO 101</th>
<th>Yield from other sources, including ET Tracks</th>
<th>Total Informatics Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 14</td>
<td>12</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Spring 15</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>10</td>
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<tr>
<td>Fall 15</td>
<td>22</td>
<td>4</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Spring 16</td>
<td>0</td>
<td>0</td>
<td>16</td>
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</tr>
<tr>
<td>Fall 16</td>
<td>36</td>
<td>11</td>
<td>17</td>
<td>70</td>
</tr>
</tbody>
</table>
programs validate our assumptions on the importance of informatics, we believe that our proposed informatics program is unique and distinctive and addresses a key curricular need within our university system and region. Further, our proposed program provides the first public school option for the study of informatics within the state.

4. Competitive advantage. Apart from the obvious pricing advantage of public institutions, what will distinguish the proposed program in the academic marketplace?

The Informatics program will be part of CICS that is recognized as one of the top venues in the world for computing research and education. We expect that we can build on our strong international reputation in computer science and our current relationship with other units on campus to attract strong local, national, and international students and to attract high-quality faculty in Informatics.

Another distinct competitive advantage of our Informatics program is our close relationship with the Center for Data Science (CDS)\(^6\) that is part of our college. Informatics students with a concentration in data science can leverage the rich research opportunities available through CDS. Further, Informatics students can leverage CDS’s Industrial Affiliates program to obtain internships and jobs through events such as the Data Science Career Fair that is organized each October. The data science symposia and seminar series organized by CDS would also help broaden the education of Informatics students. Further, the informatics program with its data science concentration is the most important educational priority of CDS. Please see the attached support letter from CDS for more information.

Finally, a key competitive strength of our proposed program is the highly-diverse student body on our university campus. Informatics education by its very nature is enriched by students bringing in different domain expertise, skill sets, and life experiences into the computing endeavor. The strength of diversity of the student body is already clearly visible in our current BDIC Informatics program. Of our current 108 informatics majors, only 10% were previously CS majors. The rest came from the CICS exploratory track (25%), natural sciences (26%), SBS (10%), HFA (12%), engineering (5.5%), SPHHS (5.5%), etc. Further, we are seeing a marked increase in diversity among our 108 majors, with 37% women and 42.5% ALANA.

5. Marketing Plan. Describe the institution's marketing plan, including time lines, for the proposed program?

The marketing plan for Informatics includes all the university-wide and CICS-led efforts already in place for the computer science major. In addition, there are three areas of specifically targeted efforts, enabling us to reach out to high schools, community college students, and current UMass students. These efforts are supported by the work of two peer advisors, positions that will continue even after we create the informatics major.

I. Marketing to High Schools - As a University accepting credit for AP CS Principles (CSP), the name of our university and program are listed and advertised by The College Board, along with our AP transfer credit policy. Because AP CSP was designed to appeal to a broader high school student audience, we expect that its offering in area high schools will attract an entirely new population of students who

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\(^6\) Center for Data Science, College of Information and Computer Science, UMass, Amherst (https://ds.cs.umass.edu).
are interested in studying Informatics rather than Computer Science. Notably, AP CSP attracted a diverse population of 50,000 high school students in its first offering in 2016-17, making it the largest launch of any AP course in college board history! Our informatics program is well-positioned to recruit from this diverse student body by extending the interdisciplinary approach to computing education to the college level.

II. Marketing to Community Colleges – Through participation in events such as Community College Day, Informatics can make more visible the pathways already established for students looking to transfer their years of study toward a four-year degree at UMass. Concerted outreach to department chairs in relevant departments of participating community colleges will increase awareness of Informatics as a potential major of interest for their students.

III. Marketing to Current UMass students, particularly those in ET Tracks- Through public information sessions in both fall and spring, an enthusiastic presence at the annual Majors fair, and advertised open office hours with our peer advisors, we expect to continue to attract students who are still looking for a major.

E. Budget Projection

a. Budget Narrative. Explain assumptions underlying expense and income projections, e.g., instructor status, enrollment projections, field and clinical resources, etc. Describe additional cost/revenue impacts within the broader departmental/institutional budget.

Revenue:

We assume that 90 of the 108 students from the existing informatics track within BDIC will transfer into the BS Informatics program, accounting for graduations in 2018. Further, we assume that we add 50 new students each of the year from 2018 to 2022. In steady state, we plan to maintain the major at about 200 students for the level of expenditures projected in our budget.

To better estimate the fraction of in-state versus out-of-state students, we used our current enrollment of BDIC Informatics students where roughly 20% are out-of-state. The overall percentage of out-of-state students in the university is also in a similar range. To estimate revenue per student, we used the established tuition rate of $15,030 per year for an in-state student and $33,096 per year for an out-of-state student. The tuition rate was inflated at a rate of 4% per year.

Expenditure:

To support the growth of the Informatics major, we plan to hire one tenure-track (TT) Associate Professor and two Lecturers. We expect the TT hire to be well-established in their field and capable of providing significant leadership in matters of curriculum and hiring in their concentration. To carry the course load of adding 50 new students per year, we budgeted the hiring of two Lecturers, one in the first year and one in the third year. Faculty salaries are assumed at $125K for Associate, and $80K for Lecturer. Startup-costs are $15K for Lecturers in the first year and $300K for Associate spread over 3 years.

Administrative staff consists of an undergraduate program manager budgeted with a yearly salary of $41,500K starting in year two. In the first year, the program will be provided with partial administrative support from a staff member supporting the computer science
undergraduate program. CICS will also continue to hire undergraduate peer advisors with a budget of $5K per year. Operating expenses are assumed to be 4% of budget - no detailed breakdown by expense category is possible at this point. TAs are based on the number of courses offered and grow from 4 to 6 TAs in the first three years as the Informatics enrollments increase. Marketing costs will be around $10K in each of the first two years to develop materials and then $5K per year to refresh and realign those materials and channels. Facilities and lab setup are one-time costs that are not included in the budget. COLA is assumed to be 3% and expenditures are inflated accordingly in successive years.

**Commitments**

The Provost's Office has committed funding for three new faculty lines over three years, with two of those being teaching faculty (Lecturers). They also are committing base budget funds to hire an undergraduate program manager. Any remaining costs incurred to establish and grow the program to 200 students will come from the College of Information and Computer Sciences.

**Summary:**

While the informatics program can continue to operate at the current BDIC enrollment of 108 students with no significant infusion of resources, our budget analysis indicates that the proposed growth of 50 new students per year can easily be supported with revenues exceeding expenditures in every year of the budget.
**b. Program Budget.**

Budget categories include facilities, library, faculty, staff, field/clinical experiences, revenues from grants, tuition or other sources, etc. Reallocated funds should specify reallocations from existing campus resources to support the proposed program, including funds reallocated from discontinued or downsized programs. Indicate one-time/start-up costs and revenues.

### EXPENDITURE ESTIMATES

<table>
<thead>
<tr>
<th></th>
<th>Year 1 (AY18-19)</th>
<th>Year 2 (AY 19-20)</th>
<th>Year 3 (AY 20-21)</th>
<th>Year 4 (AY21-22)</th>
<th>Year 5 (AY22-23)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel Services</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td>$80,000</td>
<td>$0</td>
<td>$211,150</td>
<td>$302,357</td>
<td>$311,427</td>
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<td>Administrators</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Support Staff</td>
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<td>$18,500</td>
<td>$44,027</td>
<td>$48,110</td>
<td>$54,148</td>
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<tr>
<td>Others</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Fringe Benefits 2.2%</td>
<td>$1,760</td>
<td>$0</td>
<td>$5,614</td>
<td>$7,710</td>
<td>$8,043</td>
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<tr>
<td><strong>Total Personnel</strong></td>
<td>$81,760</td>
<td>$18,500</td>
<td>$260,791</td>
<td>$358,177</td>
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<td><strong>Operating Expenses</strong></td>
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<tr>
<td>Supplies</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Library Resources</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
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<td>Marketing/Promotional Expenses</td>
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<td>$10,000</td>
<td>$5,000</td>
<td>$5,000</td>
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<td>Laboratory Expenses</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>General Administrative Overhead 4%</td>
<td>$4,010</td>
<td>$0</td>
<td>$10,632</td>
<td>$14,527</td>
<td>$15,145</td>
</tr>
<tr>
<td>Other (specify) - Faculty startup</td>
<td>$15,000</td>
<td>$0</td>
<td>$75,000</td>
<td>$165,000</td>
<td>$75,000</td>
</tr>
<tr>
<td><strong>Total Operating Expenses</strong></td>
<td>$29,010</td>
<td>$0</td>
<td>$95,632</td>
<td>$184,527</td>
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<tr>
<td><strong>Net Student Assistance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Assistantships</td>
<td>$97,412</td>
<td>$0</td>
<td>$125,417</td>
<td>$174,685</td>
<td>$159,666</td>
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<tr>
<td>Fellowships</td>
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<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Stipends/Scholarships</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total Student Assistance</strong></td>
<td>$97,412</td>
<td>$0</td>
<td>$125,417</td>
<td>$174,685</td>
<td>$159,666</td>
</tr>
<tr>
<td>Capital</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Year 5</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Facilities / Campus recharges</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Equipment</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Other</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>Total Capital</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

| Total Expenditures          | $208,182 | $18,500 | $481,840 | $5,000 | $717,389 | $5,000 | $628,429 | $5,000 | $577,316 | $5,000 |

**BUDGET SUMMARY OF NEW PROGRAM ONLY**

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total of newly generated revenue for the university</strong></td>
<td>$989,258</td>
<td>$2,057,340</td>
<td>$3,209,451</td>
<td>$4,450,439</td>
<td>$5,785,571</td>
</tr>
<tr>
<td><strong>Total of additional resources required for program</strong></td>
<td>$208,182</td>
<td>$481,840</td>
<td>$717,389</td>
<td>$628,429</td>
<td>$577,316</td>
</tr>
<tr>
<td><strong>Excess/ (Deficiency) for the university</strong></td>
<td>$781,076</td>
<td>$1,575,500</td>
<td>$2,492,062</td>
<td>$3,822,010</td>
<td>$5,208,254</td>
</tr>
<tr>
<td><strong>Total resources committed by the Provost's Office</strong></td>
<td>$95,000</td>
<td>$330,177</td>
<td>$515,466</td>
<td>$440,575</td>
<td>$383,542</td>
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<td><strong>Total resources committed by CICS</strong></td>
<td>$113,182</td>
<td>$151,663</td>
<td>$201,922</td>
<td>$187,854</td>
<td>$193,774</td>
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<td><strong>Total resources committed</strong></td>
<td>$208,182</td>
<td>$481,840</td>
<td>$717,389</td>
<td>$628,429</td>
<td>$577,316</td>
</tr>
</tbody>
</table>

---

**Justification of Financial Projections:**

Revenue: Assumed a 4% increase in tuition each year from current 2017-2018 rates. The 90 students coming from existing programs are now part of BDIC. These students are not all in their first year, as assumed in the revenue model.

Expenditures: Current faculty salaries assumed at $125K for Associate and $80K for Lecturer. Administrative staff consists of an undergraduate program manager. Added 3% COLA each year. Current support staff responsibilities will be transferred to new staff once hired, with continued funding for student workers coming from CICS. Operating expenses are assumed to be 4% of budget - no detailed breakdown by expense category is possible at this point. TAs are based on number of courses offered. Startup-costs are $15K for Lecturers in the first year and $300K for Associate spread over 3 years. Marketing costs will be higher in early years to development materials, then those materials and channels will need to be refreshed annually. Facilities, space and lab setup are one-time costs that are *not* considered. Any additional resources for the program that are not covered by the Provost's Office, will be covered by CICS.
# Undergraduate Program Curriculum Outline

## Major Required (Core) Courses (Total courses required = 7)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>INFO 101</td>
<td>Introduction to Informatics</td>
<td>3</td>
</tr>
<tr>
<td>INFO 150</td>
<td>A Mathematical Foundation for Informatics</td>
<td>3</td>
</tr>
<tr>
<td>COMPSCI 121</td>
<td>Introduction to Problem Solving with Computers</td>
<td>4</td>
</tr>
<tr>
<td>COMPSCI 190D</td>
<td>Using Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>INFO 203</td>
<td>A Networked World</td>
<td>3</td>
</tr>
<tr>
<td>COMPSCI 325</td>
<td>Introduction to Human Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>COMPSCI 326</td>
<td>Web Programming (IE)</td>
<td>3</td>
</tr>
</tbody>
</table>

**SubTotal # Core Credits Required** 23

## Concentration Course Choices (Total courses required = 4)

Choose all three courses in list A. Choose one course from list B

### List A: Data Science (choose 3 courses)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 240</td>
<td>Intro to Statistics (Also accept OIM 240 Business Data Analysis; PSYCH 240 Statistics in Psychology; SOCIOL 212 Elem Statistics; or RES-ECON 212 Intro Stats/SocSci)</td>
</tr>
<tr>
<td>COMPSCI 345</td>
<td>Practice and Applications of Data Management</td>
</tr>
<tr>
<td>INFO 397F</td>
<td>Introduction to Data Science</td>
</tr>
</tbody>
</table>

### List B: Data Science (choose 1 course)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 501</td>
<td>Meth Applied Stats (Also accept STAT 515 (requires MATH 233) or STAT 516 (requires STATISTC 515))</td>
</tr>
<tr>
<td>PUBHLTH 490ST</td>
<td>Telling Stories with Data: Statistics, Modeling, and Visualization</td>
</tr>
<tr>
<td>JOURNAL 397DJ</td>
<td>Data Driven Storytelling</td>
</tr>
<tr>
<td>OIM 350</td>
<td>Business Intelligence and Analytics</td>
</tr>
</tbody>
</table>

**SubTotal # Concentration Credits Required** 12

## Other/Elective Course Choices (Total courses required = 6)

(subject to course availability)

*Any course from list B that is not used as a concentration course can be used as an elective*

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 501</td>
<td>Meth Applied Stats (Also accept STAT 515 (requires MATH 233) or STAT 516 (requires STATISTC 515))</td>
</tr>
<tr>
<td>PUBHLTH 490ST</td>
<td>Telling Stories with Data: Statistics, Modeling, and Visualization</td>
</tr>
<tr>
<td>JOURNAL 397DJ</td>
<td>Data Driven Storytelling</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>OIM 350</td>
<td>Business Intelligence and Analytics</td>
</tr>
<tr>
<td>MARKETING 413</td>
<td>Social Media and Marketing Analytics</td>
</tr>
<tr>
<td>COMPSCI 328</td>
<td>Mobile Health Sensing and Analytics</td>
</tr>
<tr>
<td>300 or 400-level course (Must be approved by advisor)</td>
<td>Operations and Information Management</td>
</tr>
<tr>
<td>300-level or above course (Must be approved by advisor)</td>
<td>Public Health</td>
</tr>
<tr>
<td>500-level or above course (Must be approved by advisor)</td>
<td>Statistics</td>
</tr>
<tr>
<td>300-level or above course (Must be approved by advisor)</td>
<td>College of SBS</td>
</tr>
<tr>
<td>English 379, 380, 391C, 381 or 382</td>
<td>Course in professional writing</td>
</tr>
<tr>
<td>OIM 454</td>
<td>Advanced Business Analytics</td>
</tr>
<tr>
<td>MARKETING 301</td>
<td>Fundamentals of Marketing</td>
</tr>
<tr>
<td>MARKETING 455</td>
<td>Internet Marketing</td>
</tr>
<tr>
<td>SCH-MGMT 397B</td>
<td>Internet Technology for e-Business</td>
</tr>
<tr>
<td>SUSTCOMM 297L</td>
<td>Visual Communication Design Skills and Principles</td>
</tr>
</tbody>
</table>

**SubTotal # Elective Credits Required** 18

### Distribution of General Education Requirements

**Attach List of General Education Offerings (Course Numbers, Titles, and Credits)**

<table>
<thead>
<tr>
<th>Requirement</th>
<th># of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Social World Electives</td>
<td>16</td>
</tr>
<tr>
<td>One course (AL/AT), one course (HS), one course (SB), and one course (AL, AT, SB, I, or SI)</td>
<td></td>
</tr>
<tr>
<td>Social and Cultural Diversity</td>
<td></td>
</tr>
<tr>
<td>One course focusing on UNITED STATES diversity (U, ALU, ATU, HSU, IU, or SBU) and one course focusing on GLOBAL diversity (G, ALG, ATG, HSG, IG, or SBG)</td>
<td>8-11</td>
</tr>
<tr>
<td>Biological &amp; Physical World</td>
<td></td>
</tr>
<tr>
<td>One course (BS) and one course (PS);</td>
<td></td>
</tr>
<tr>
<td>Basic Mathematics</td>
<td></td>
</tr>
<tr>
<td>One course (R1) or a passing score on the Tier 1 Math Exemption Exam</td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>6</td>
</tr>
<tr>
<td>ENGLWRIT 112 and COMPSCI 305</td>
<td></td>
</tr>
</tbody>
</table>

**Sub Total General Education Credits** 30-33
Curriculum Summary

| Total number of courses required for the degree | 26 |
| Total credit hours required for degree         | 120 |

**Prerequisite or Other Additional Requirements:**
An overall GPA 2.0 is required for courses that count towards the major. No class counted for the major may be taken pass/fail. All electives must be majors-level courses. Seminar courses (x91) and independent studies (x96) at the 300-level (or above) are reviewed for elective credit via the independent study approval process. Informatics majors wanting to add another major may not seek both majors within CICS; Informatics majors must complete a total of 60 credits from the colleges of CNS and CICS.

**Junior-Year Writing (JYW) Requirement:** COMPSCI 305 or other CICS approved, university-certified JYW course required to satisfy the JYW requirement.

**Residency Requirement.** Two of the four concentration courses and four of the six electives that satisfy the informatics major requirements must be taken at UMass Amherst.

Notes:
- R2 Math requirement satisfied by COMPSCI 121
- Integrative Experience Requirement satisfied by COMPSCI 326
- The social and cultural diversity courses are included in the social world requirements.
Course Summary

Course number: Public Health 490ST

Number of Credits: 3

Course Name: Telling Stories with Data: Statistics, Modeling, and Data Visualization

Online: No

Course Description: The aim of this course is to provide students with the skills necessary to tell interesting and useful stories in real-world encounters with data. Specifically, they will develop the statistical and programming expertise necessary to analyze datasets with complex relationships between variables. Students will gain hands-on experience summarizing, visualizing, modeling, and analyzing data. Students will learn how to build statistical models that can be used to describe and evaluate multidimensional relationships that exist in the real world. Specific methods covered will include linear, logistic, and Poisson regression. This course will introduce students to the R statistical computing language and by the end of the course will require substantial independent programming. To the extent possible, the course will draw on real datasets from biological and biomedical applications. This course is designed for students who are looking for a second course in applied statistics/biostatistics (e.g. beyond BIOSTATS 391B or STAT 240), or an accelerated introduction to statistics and modern statistical computing.

Objectives/Learning Outcomes/ Course Expectations

- Understand and critique statistical model equations as representations of a given real-world setting,
- Independently formulate, fit, and interpret statistical models to weigh evidence for/against hypotheses about associations between variables,
- Diagnose the appropriateness or “goodness-of-fit” of a given model,
- Independently write code in R, the language of modern statistical computing,
- Create powerful data visualizations that reveal features of data or fitted models,
- Write concise, professional, and reproducible statistical analysis reports using knitr and RMarkdown.

Pre-requisites: BIOSTAT 391B, STAT 111, STAT 240, STAT 501, ResEcon 212, PSYCH 240

Relationship of course to program context and effectiveness:

This course serves as an elective in the data science track of the informatics program. It provides students with greater experience communicating the results of their quantitative analysis, a skill set they acquired in the core course Introduction to Data Science Info (397F). This course provides students with experience applying data science to the public health domain. The course emphasizes and reinforces professional abilities and skills.

Grading:

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Course Summary

Course number: INFO 101
Number of Credits: 3

Course Name: Introduction to Informatics
Online: No

Course Description:
An introduction to the main concepts of Informatics. There are several "Big Ideas" in computing, including but not limited to abstraction, data and information, algorithms, programming, and analysis of both computational problems and computational artifacts. This class provides an introduction to those ideas and considers some of the ways that those computing principles might be used to solve real world problems. Computer-based assignments are an integral part of this course but no programming knowledge or prior programming experience is expected or required. Not for CS majors.

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

- convert to and from binary
- map a standard home network
- design and execute a simple program that incorporates abstraction, logical decisions, and knowledge of order of operations
- describe basic issues related to privacy, security and encryption
- explain the basic role of a browser and name server in accessing an URL
- create a simple algorithm
- explain the role of efficiency in searching and sorting
- use pseudocode and flowcharts as planning tools
- define and explain the common types of memory storage
- explain representation of colors and how they relate to RGB values
- explain the relationship between image file sizes and image quality
- define the basic terminology of databases and datatypes
- write simple SQL statements that retrieve and sort specific pieces of data
- explain some of the basic challenges resulting from very large data sets

Pre-requisites: None

Relationship of course to program context and effectiveness:
This course serves as the primary introductory course to the major of informatics. It also acts as a recruitment course as it is designed based on the AP Computer Science Principles framework, enabling high school students with credit for the AP-CS Principles exam to receive credit for this course. Because this course provides a broad introduction to the major concepts of computing, it also serves as an important foundation for later courses in the curriculum by establishing conventions in coding, flowcharting, and logical reasoning.

Grading add rows if necessary

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Course Summary

Course number: INFO 150        Number of Credits: 3

Course Name: A Mathematical Foundation for Informatics  Online: No

Course Description:
Mathematical techniques useful in the study of computing and information processing. The mathematical method of definition and proof. Sets, functions, and relations. Combinatorics, probability and probabilistic reasoning. Graphs and trees as models of data and of computational processes. Prerequisite: R1 math skills recommended. Not intended for Computer Science majors - students interested in a majors-level treatment of this material should see COMPSCI 240 and 250, or MATH 455.

Objectives/Learning Outcomes/ Course Expectations:
Upon successful completion of the course, students should be able to:
• take a new puzzle or game and analyze it, precisely specifying the rules and options
• use truth tables to determine whether a propositional expression is a tautology, or whether one such expression implies another
• translate statements from propositional or predicate logic to and from English
• prove simple statements in number theory using proof by cases and the Division Theorem
• prove simple numerical facts by induction on the positive integers
• understand and translate statements about sets and set operations
• use the sum and product rules to count finite sets
• solve instances of the four basic counting problems (with or without replacement, with or without order)
• compute probabilities in situations with finite event spaces
• compute probabilities occurring in games with cards or dice
• compute expected values in situations with finite event spaces
• add and multiply matrices of integers or of real numbers
• use matrix multiplication to analyze the behavior of a Markov process
• use matrix multiplication to detect or count paths of a given length in a graph
• use graphs to model the states of a puzzle or game

Pre-requisites: None

Relationship of course to program context and effectiveness:
This course provides students with foundational mathematical knowledge necessary for success in subsequent required courses informatics. Its learning objectives articulate to both 200-level and 300-level informatics and computer science courses, and it goes beyond general education requirements by tailoring the mathematical training students receive to an informatics-specific learning context. Gain experience with the rigorous analytical thinking required for success in the programming courses.

Grading

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Course Summary

Course number: COMPSCI 121  
Number of Credits: 4

Course Name: Introduction to Problem Solving with Computers  
Online: No

Course Description:
This course provides an introduction to problem solving and computer programming using the Java programming language. The course teaches how problems can be solved computationally using the object-oriented approach that underlies Java. Concepts and techniques covered include data types, expressions, objects, methods, top-down program design, program testing and debugging, state representation, interactive programs, data abstraction, conditionals, iteration, interfaces, inheritance, arrays, graphics, and GUIs. No previous programming experience is required.

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

• Write Java programs at an intermediate level.
• Write comprehensive test cases for code.
• Employ an Object-Oriented approach to organization of code.
• Use an array data structure to store, access, and manipulate data.
• Use iterative and conditional constructs to solve problems.
• Be able to trace the execution path of an algorithm.
• Gain proficiency using a development tool including a debugger.
• Use pseudocode and flowcharts as planning tools
• Define and explain the concept of data types and data representation.
• Explain the use of inheritance and composition in Object-Oriented code.
• Define and explain the concept of an interface as an API.
• Define and explain the concept of reference and variable binding.

Pre-requisites: R1.

Relationship of course to program context and effectiveness:
This course serves as the primary introductory course in programming in the informatics program. It provides crucial background knowledge and skill that are required in several tracks in the informatics program, such as data science and multimedia. It reinforces and expands upon the skills acquired in Info 101 such as coding, flowcharting, and logical reasoning.

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Course Summary

Course number: COMPSCI 190D  Number of Credits: 4
Course Name: Using Data Structures  Online: No

Course Description:
COMPSCI 190D introduces foundational abstract data types and algorithms. The main focus is on the use of data structures in designing and developing programs to solve problems in a variety of domains. Specific topics include lists, sets, maps, graphs, stacks, queues, searching, and sorting. There will be weekly programming assignments, programming and written exercises in discussion sections, regular quizzes, and a cumulative final exam.

Prerequisite: COMPSCI 121.

Objectives/Learning Outcomes/ Course Expectations

• Demonstrate understanding of pragmatic ADTs and their use in Java (generic Lists, Sets, and Maps); use them to solve a variety of non-trivial problems.
• Demonstrate understanding of the implementation details of simple array-backed and linked data structures (stacks, queues, and singly-linked lists).
• Learn simple set theory (informally defined aspects of mathematical sets). Understand sets as collections of unique objects and know the basic set operations.
• Begin to develop concepts leading to O() notation. Be able to roughly identify constant-time and linear- or quadratic-time algorithms.
• Understand simple graph theory. Know that undirected graphs are a set of vertices and edges, some graphs have additional constraints/structure (notably trees and their nomenclature) and that graphs can be used to model problems.
• Understand and be able to implement simple n^2 sorting algorithms (insertion, bubble, selection).
• Understand the binary search algorithm.
• Understand and implement breadth-first search (abstractly, and as applied to a well-defined problem or two).
• Understand and implement simple recursion (translating a for loop into its recursive counterpart, for example).
• Demonstrate competence using a modern IDE (Eclipse) for programming, debugging, and project completion
• Understand use of unit testing as aid to software development.

Upon successful completion of this course, students should be able to:

Be able to write computer programs of an intermediate size and complexity using programming best practices and applying the use of appropriate data structures to optimize time and space efficiency.

Relationship of course to program context and effectiveness:

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Course Summary

Course number: INFO 203  
Number of Credits: 3  
Course Name: A Networked World  
Online: No

Course Description:

The course will cover the technical foundations and use of today's communication networks, particularly the internet. It will also address key social, policy, economic, and legal aspects of these networks, their use (and abuse) and their regulation. This course covers computer science topics, but all material will be presented in a way that is accessible to an educated audience with or without a strong technical background.

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

• understand protocols for web servers and browsers
• explain internet routing and communication
• calculate transmission times for a network architecture
• write a critique of proposed changes to internet privacy laws
• understand tradeoffs in internet governance policies
• participate in discussions of economic and legal issues regarding the internet

Pre-requisites: None

Relationship of course to program context and effectiveness:

This course introduces crucial technical and social issues with the functioning of the internet, Bitcoin, and other important networking technologies in our world. Students are introduced to the interplay of technical and policy issues, which will be key to their ability to work with the intersection of technology, business, and social life. The course is also very highly regarded by students and will get students excited to participate in the informatics program.

Grading

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Course Summary

Course number: COMPSCI 325  Number of Credits: 3
Course Name: Introduction to Human Computer Interaction Online: No

Course Description:
In this course, we examine the important problems in Usability, Human Computer Interaction, User Interfaces and Human Centered Computing. We will examine elements of HCI history, human information processing capabilities, HCI design, user interface prototyping methods and new applications and directions in HCI, including affective HCI. This is not a course on how to make better dialog boxes, but rather a much more thorough exploration of how humans interact with computers and how to evaluate the effectiveness of HCI designs. Some elementary programming, or the use of UI prototyping tools, will be required, but students without prior programming experience should feel right at home in this class. The course is available to any undergraduate student and is not limited to computer scientists. IT-minor students are especially encouraged to participate. The course emphasizes group projects and students will be required to work in teams. There is one midterm exam, numerous class presentations of on-going project work, and a final demo and presentation of the major class project.

Objectives/Learning Outcomes/ Course Expectations
Upon successful completion of this course, students should be able to:
- Know Human-Computer Interaction history.
- Utilize information organization and visualization.
- Understand human cognitive and perceptual capabilities and limitations; Human error.
- Understanding the design process and designing for error.
- Be aware of the importance of emotions in HCI and design.
- Understand the concept of user models and human-centered computing.
- Utilize storyboarding and Rapid prototyping.
- Be able to perform requirements analysis for HCI and UX.
- Understand and apply user modeling and adaptive HCI.
- Apply design principles for HCI (UI, UX).
- Perform usability evaluation.
- Understand graphical design: elements and principles.
- Know affective HCI and future trends in UI and UX.

Prerequisites: At least junior year standing.

Relationship of course to program context and effectiveness:
This course serves as one of the core courses in the informatics program. It is designed to provide a solid background in the main topics and techniques in human-computer interface design. Because the course spends significant time examining and explaining how to design effective interfaces, this course is integral for informatics students who will be expected to bring an awareness of both clients and users. Knowing how to assess design challenges and implement design-based solutions for a wide range of applications is necessary for students hoping to work in a global industry.

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Course Summary

Course number: COMPSCI 326
Number of Credits: 3
Course Name: Web Programming
Online: No

Course Description:

The World Wide Web was proposed originally as a collection of static documents inter-connected by hyperlinks. Today, the web has grown into a rich platform, built on a variety of protocols, standards, and programming languages, that aims to replace many of the services traditionally provided by a desktop operating system. Topics will include: producing dynamic content using a server-based language, content serving databases and XML documents, session state management, multi-tier web-based architectures, web security, and core technologies including HTTP, HTML5, CSS, JavaScript, and SQL will be emphasized. This course will also study concepts and technologies including AJAX, social networking, mashups, JavaScript libraries (e.g., jQuery), and web security. This course is hands-on and project-based; students will construct a substantial dynamic web application based on the concepts, technologies, and techniques presented during lecture.

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

- Learn the nature of the web.
- Understand the structure of the Internet and Web.
- Study the general notion of protocols.
- Explore the TCP/IP protocol and understand its use in the web.
- Understand and apply the HyperText Transfer Protocol (HTTP).
- Study and apply the HyperText Markup Language (HTML).
- Explore the Document Object Model (DOM).
- Understand and apply asynchronous and event-based programming.
- Study and apply the basics of Cascading Style Sheets (CSS).
- Learn and understand the fundamentals of the JavaScript Programming Language.
- Explore and apply the client/server model.
- Understand stateless versus stateful protocols.
- Understand connectionless versus connection-oriented protocols.
- Explore server-side JavaScript programming.
- Explore client-side JavaScript programming.
- Understand and apply the Model-View-Controller (MVC) pattern.
- Understand server-side routes.
- Understand and apply session state.
- Investigate and apply document-oriented databases.
- Learn and apply data-interchange languages (JSON/XML).
- Understand and apply RESTful APIs.
- Learn and apply a CSS framework.
- Learn and apply a browser-based framework.
- Learn and apply a server-side language.

Pre-requisites: COMPSCI 190D or equivalent, and junior-year status.

Relationship of course to program context and effectiveness:

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Course Summary

Course number: COMPSCI 345  
Number of Credits: 3

Course Name: Practice and Applications of Data Management  
Online: No

Course Description:

Computing has become data-driven, and databases are now at the heart of commercial applications. The purpose of this course is to provide a comprehensive introduction to the use of data management systems within the context of various applications. Some of the covered topics include application-driven database design, schema refinement, implementation of basic transactions, data on the web, and data visualization. The class will alternate between lecture and practice, and the students will experience the covered topics through a semester-long collaborative mini-project. This course counts as a CS Elective toward the COMPSCI major (BA/BS). Students who have taken COMPSCI 445 are not eligible to take this course.

Prerequisite: COMPSCI 190D or COMPSCI 187 or its equivalent (such as ECE 242).

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

- Understand and apply the Relational Data Model.
- Attain basic proficiency with SQL (including aggregates, nested queries, views)
- Understand schema design and E/R Diagrams
- Understand how to work with and model semi-structured data: XML and JSON
- Apply database performance tuning (index selection, plan inspection).
- Use effective data visualization techniques.
- Understand basic transactions.
- Understand and apply concurrency control techniques.
- Understand main concepts of Parallel Databases.
- Understand the major issues of database access control and security.

Relationship of course to program context and effectiveness:

This course is one of the core courses in the data science concentration in the informatics program. It is designed to provide a solid background in an essential area of data science- databases. This course is important because it provides students with practical, real-world tools for assembling, arranging, analyzing, and extracting information from data. This course provides foundational knowledge of SQL which is a starting point for some of the upper level electives. This course is useful for students expecting to work with data in any kind of industry environment.

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Course Summary

Course number: STAT 501  Number of Credits: 3
Course Name: Methods of Applied Statistics  Online: No

Course Description:

An applied statistics course for graduate students and upper level undergraduates with no previous background in statistics who will need statistics in their further studies and their work. The focus is on understanding and using statistical methods in research and applications. Topics include: descriptive statistics, probability theory, random variables, random sampling, estimation and hypothesis testing, basic concepts in the design of experiments and analysis of variance, linear regression, contingency tables. The course has a large data-analytic component using MINITAB.

Objectives/Learning Outcomes/ Course Expectations

Students will learn how to use exploratory data analysis methods for statistical data, how to design experiments with respect to statistical issues, and understand the meaning of inference methods and when to apply them.

Pre-requisites: High school algebra; junior standing or higher

Relationship of course to program context and effectiveness:

This course gives grounding in mathematical statistics and data analysis methods, with attention to their statistical foundations.

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Course Summary

Course number: INFO 397F  Number of Credits: 3

Course Name: Introduction to Data Science  Online: No

Course Description:

The terms “data science” and “big data” appear in the news media and in everyday conversations. Moreover, we are told that we live in the “age of information”, where almost every business venture and scientific research initiative collect a massive amount of data which may contain valuable information. This course is an introduction to the concepts and skills involved with the collection, management, analysis, and presentation of data and the data products that result from the work of data scientists. Students perform analysis on examples of real-world data using the R programming language. Students should have had exposure to basic probability and statistics, a first semester course in a substantial programming language, as well as basic mathematical maturity. Not for CS majors.

Objectives/Learning Outcomes/ Course Expectations

Upon successful completion of this course, students should be able to:

- Write R code to perform basic machine learning analysis on a data set.
- Proficient at manipulating data in various formats.
- Understand the difference between data and information.
- Perform exploratory data analysis using R.
- Fit and evaluate several modeling algorithms to data.
- Select appropriate model parameters.
- Select and produce visualizations of data and results of analysis.
- Be able to identify threats to validity in data analysis.
- Develop critical thinking around data modeling and data collection techniques.
- Understand the importance of domain knowledge in data science.
- Apply the data science process to analyze a collection of data.

Pre-requisites: COMPSCI 121 or equivalent, STATS 240 or equivalent.

Relationship of course to program context and effectiveness:

This course serves as the introductory course to the data science track in the informatics program. It is designed to provide a solid background in the main topics and techniques in the field of data science to prepare students for success in further courses involving data analysis and data science activities. This course also introduces and strengthens vocational skills.

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Course Summary

Course number: STAT 240  
Number of Credits: 3

Course Name: Introduction to Statistics  
Online: No

Course Description:

This is the introductory course in statistics. It fulfills the R2 general education requirement that addresses analytical reasoning. The course also fulfills the Basic Math Skills requirement (R1). Topics covered include descriptive statistics, probability, discrete random variables, the binomial and normal distributions, sampling distributions, simple linear regression, confidence intervals and hypothesis testing.

Objectives/Learning Outcomes/ Course Expectations

Upon completion of this course, students should be able to think critically about data, present graphical and numerical summaries of the data, understand basic probability models, and apply standard statistical inference procedures.

Pre-requisites: High school algebra

Relationship of course to program context and effectiveness:

This course gives grounding in mathematical statistics, a critical foundation of data science and data analytic methods.

Grading

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Course Summary

Course number: JOURNAL 397DJ  Number of Credits:  3
Course Name: Data-Driven Storytelling  Online: No

Course Description:

How can journalists use data to find stories? How can they tell stories through data? This hands-on course provides students with the knowledge and skills necessary to begin gathering, analyzing and visualizing interactive, data-driven stories. Students will work in pairs to tackle questions pertaining to ethical data sourcing, data analysis and making data meaningful for the public. They will also produce their own exciting and thought-provoking digital news story. Prior experience with advanced statistics, web design or computer programming is neither assumed nor necessary, and course content will adapt to the collective skills of the students in the classroom. However, a willingness to experiment, learn new technologies and embrace iteration in a cooperative environment is a must.

Objectives/Learning Outcomes/ Course Expectations

• Generate compelling story ideas that may be addressed through analyses of publicly accessible data.
• Locate sources of public data to report stories.
• Evaluate the strengths and weaknesses of data sources, data sets and analytical strategies.
• Discover errors in data files and "clean" them using computer software.
• Analyze data using descriptive statistical techniques in order to identify patterns, groups, relationships and/or outliers of interest.
• Critique data visualizations and match chart forms and functions.
• Collaboratively create data-driven news stories and visualizations geared at general audiences.

Pre-requisites: Waived for Informatics students (normally JOURNAL 300)

Relationship of course to program context and effectiveness:

This course gives hands-on, small-group experience in designing and building insightful visualizations and stories from data.

Grading

<table>
<thead>
<tr>
<th>Evaluation method</th>
<th>Number</th>
<th>Percentage of final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class participation</td>
<td>–</td>
<td>13%</td>
</tr>
<tr>
<td>Data diaries</td>
<td>12</td>
<td>35%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>12</td>
<td>10%</td>
</tr>
<tr>
<td>Data-driven story critique presentation</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>Final project</td>
<td>1</td>
<td>37%</td>
</tr>
</tbody>
</table>
Course Summary

Course number: OIM 350
Number of Credits: 3

Course Name: Business Intelligence and Analytics
Online: No

Course Description:

This course provides an introduction to Business Intelligence, including the processes, methodologies, infrastructure, and current practices used to transform business data into useful information and support business decision-making. Business Intelligence requires foundation knowledge in data storage and retrieval, thus this course provides content on conceptual data models for both database management systems and data warehouses. Students will learn to extract and manipulate data from these systems. Data mining, visualization, and statistical analysis along with reporting options such as management dashboards and balanced scorecards will be covered. Technologies utilized in the course include SAP Business Warehouse, Excel PivotTables, Business Objects Analysis, SQL, Crystal Reports, Business Objects Dashboard, SPSS, and RapidMiner.

Objectives/Learning Outcomes/ Course Expectations

Students completing this course will understand the following concepts and be able to apply these concepts in various business contexts and through hands-on exercises with leading software applications:

- Online transaction processing (OLTP)
- Online analytical processing (OLAP)
- Relational databases and models
- Structured query language (SQL)
- Data warehouses and data marts
- Dimensional modeling
- Data security and privacy
- Business performance management, including Balanced scorecard, Dashboards, Six Sigma
- Data visualization
- Data mining, including Classification, Cluster analysis, Association Rule Mining, Text and Web mining
- Statistical Analysis
- Report and Dashboard design and development
- Emerging trends in BI

Pre-requisites: None

Relationship of course to program context and effectiveness:

This course gives a broad grounding in business intelligence and analytics, which are major job skills for many informatics graduates. It engages key ideas connecting computational methods and human behavior, a theme of informatics, in the specific application area of business.

Grading

<table>
<thead>
<tr>
<th>Evaluation method</th>
<th>Number</th>
<th>Percentage of final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>Exams</td>
<td>3</td>
<td>75%</td>
</tr>
</tbody>
</table>
Date: December 4, 2017
To: M. J. Peterson, Secretary, Faculty Senate
From: John McCarthy, Provost
Subject: Support for Informatics Undergraduate Degree Program

I write to provide my strong endorsement for the Informatics undergraduate degree proposed by the College of Information and Computer Sciences (CICS) at the University of Massachusetts Amherst. This is precisely the kind of initiative that we had in mind when we created CICS as a separate college.

Computing is a fundamental part of daily life, commerce, and just about every occupation in our modern economy. Informatics focuses on the increasing ubiquity of computing, with applications in a wide and growing range of fields. It allows students to tackle the increasingly complicated social and technical challenges that will confront them professionally. Informatics broadens the computing discipline and supports the Commonwealth’s knowledge-based economy.

To support this new program, we expect to provide base budget funds to fill three new faculty lines over three years, with two of those being teaching faculty (lecturers). These faculty will create new courses and repurpose existing courses to support a total of about 200 majors. We will also commit base budget funds to hire an undergraduate program manager to help administer the program.

I am very excited about the broader opportunities our students will enjoy as they explore and integrate computing with other disciplinary interests. This expansion of our instructional program has the potential for a great impact on human society, and so I warmly endorse this proposal.

John McCarthy
Acting Provost and Senior Vice Chancellor for Academic Affairs
Distinguished Professor

The University of Massachusetts is an Affirmative Action/Equal Opportunity Institution
Date: December 4, 2017
To: Members of the Faculty Senate
From: Laura Haas, Dean, College of Information and Computer Sciences
Subject: Informatics Bachelor’s of Science Degree Program

I strongly support the creation of a Bachelor’s of Science Degree in Informatics.

The emerging discipline of Informatics is rooted in computing and is focused on problems that arise in other disciplines and domains. It also emphasizes the human side of computing, including studying how people interact with computers and each other through computing applications.

Informatics is at the core of ICT (Information and Communication Technologies) that affects almost every aspect of modern life. Massachusetts – an international leader in the "Innovation Economy" – is highly dependent on a skilled workforce in ICT. The Massachusetts Office of Labor and Workforce Development reports that four of the top-10 (including the top-3) fastest-growing occupations in Massachusetts are in ICT. The demand is equally high across New England and nationally. The Informatics degree will enable us to train an increasingly ICT-dependent workforce, provide an alternate pathway into computing, and broaden participation in computing. Experience with interdisciplinary computing programs at other universities shows that they contribute to broadening the computing discipline to include and retain a more diverse student body.

The College of Information and Computer Sciences supports the establishment of a broadly interdisciplinary undergraduate program in the area of Informatics, drawing upon its technical strength and integrating with various departments and programs on campus to create a unique program with broad appeal to students both within and outside the commonwealth.

Laura Haas
Dean, College of Information and Computer Sciences
Colleagues,

I am writing you in support of the move of Informatics from a program housed within BDIC to its own major.

BDIC has a long tradition of housing and nurturing interdisciplinary programs to have them stand on their own. In this incubator role, we have launched Legal Studies, Social Though and Political Economy, Computer Science, Public Health, and Women, Gender, and Sexuality Studies.

We are excited have Informatics stand on its own as a major within the College of Information and Computer Sciences (CICS). We recognize that BDIC will lose a significant number of majors, around 90 students.

However, we are proud to have this program ‘graduate.’

Do not hesitate to contact me if you need further information.

Dr. Jonathan R. Wynn
Associate Professor and Undergraduate Program Director of Sociology, and Interim Director of BDIC
University of Massachusetts Amherst
Amherst, MA 01003
December 12, 2017

Prof. James Allan, Chair
College of Information and Computer Sciences
University of Massachusetts
Amherst, MA 01003

Dear Prof. Allan,

I am writing in enthusiastic support for the proposed B.S. degree program in Informatics within the College of Information and Computer Sciences. Informatics is a key offering for our flagship campus as it enables students to explore and integrate computing with their other disciplinary interests. It is also my belief that informatics will play a major role in fulfilling the education needs of our students on our campus as well as have a strong positive impact on the information technology workforce of the Commonwealth and the Nation.

The proposed B.S. in Informatics requires PUBHLTH 490ST “Telling Stories with Data" that is taught in our department. I also understand that 50 new students are projected to enter the B.S. Informatics major each year. This would translate to roughly 30 students in our classes each year. We have already had a number of informatics students in these classes through the BDIC program; we very much look forward to continuing to have them join our classes.

In summary, the proposal to offer a B.S. degree program in Informatics within the College of Information and Computer Sciences has my strong support. And, I look forward working closely with the program to ensure its success.

Sincerely

Susan E. Hankinson, Sc.D.
Professor Epidemiology and Chair
Department of Biostatistics and Epidemiology
cc: Prof. Ramesh K. Sitaraman, Informatics Program Director
February 9, 2018

Prof. Ramesh Sitaraman  
Informatics Program Director  
College of Information and Computer Sciences

February 9, 2018

**SUBJECT:** Center for Data Science support for new Informatics degree program

Prof. Sitaraman,

**The Center for Data Science (CDS) within the College of Information and Computer Sciences (CICS) strongly endorses the proposal for a new B.S. degree program in Informatics, and recommends that the proposal be approved by the Board of Trustees of the University of Massachusetts.**

CDS is UMass Amherst’s leading interdisciplinary hub for data science education, research, and industry collaboration. The nearly 40 CDS-affiliated faculty members in CICS are internationally renowned researchers and educators across many data science specialty areas. Their software runs in Fortune 500 companies; their research is among the most cited in its field; and their graduates have become leaders in business and academia. CDS promotes closer collaboration among the 150+ affiliated faculty across the UMass campus and the regional Five College Consortium, and fosters new educational programs in data science at all degree levels. Powered by its industry affiliates program and numerous industry-engagement events throughout the academic year, CDS builds intellectually strong, mutually beneficial relationships with industrial partners and entrepreneurs.

A core CDS mission is to expand data science education at UMass Amherst across all degree levels. Today, CICS offers a data science concentration as part of its M.S. degree program, a graduate certificate in data science for non-CICS students, and an extensive collection of graduate-level data science courses led by CDS-affiliated faculty. The proposed new Informatics program, with its data science concentration, addresses CDS’s highest educational priority, namely, *to extend data science education to the broadest possible range of undergraduate populations beyond computer science students.* CDS is excited by the opportunity for its faculty to engage non-CS students seeking to learn and apply data science principles and methods within other academic disciplines. Faculty affiliated with CDS have been consulted and have participated fully in developing this proposal.
December 18, 2017

Prof. James Allan, Chair
College of Information and Computer Sciences
University of Massachusetts
Amherst, MA 01003

Dear Prof. Allan,

I am writing to support the proposed B.S. degree program in Informatics within the College of Information and Computer Sciences. An Informatics major would be a strong addition for all UMass students, and would likely provide a positive impact on the information technology workforce of the Commonwealth and the Nation.

The proposed B.S. in Informatics might include required and elective courses that are taught by our department. These include JOURNAL 397DJ (“Data Driven Storytelling”) and JOURNAL 435 (“Web Design for Journalists). We already have informatics students in these courses through the BDIC program, and we will continue to accommodate them in our courses whenever we can.

Should this program be approved, my colleagues and I look forward working with the program to provide a forward-looking curricular sequence for UMass students.

Best regards,

Brian McDermott
Journalism Department Chair
S417 Integrative Learning Center
650 North Pleasant Street
University of Massachusetts Amherst
Amherst, MA 01003
umass.edu/journalism
DATE: December 12, 2017

TO: Faculty Senate

FROM: Linda Shea, Associate Dean for Undergraduate Programs

RE: Memorandum of Understanding for CICS Informatics Major

I am writing with regard to undergraduate students in the proposed CICS Informatics Major who wish to take OIM 350 or OIM 454 as possible electives in this new major. Sections of OIM 350 and OIM 454 are offered in a computer lab with limited capacity and there is high demand for these classes by OIM majors, non-OIM Isenberg students, IT Minors from across campus, BDIC students, and the proposed Informatics major. In past semesters, these classes (and related classes) have accommodated a few undergraduate students pursuing the IT Minor, including BDIC/Informatics students. These students were enrolled when seats were available after serving OIM and other Isenberg majors who need to take these courses to satisfy business degree and minor/certificate requirements.

As in prior semesters, students in the proposed Informatics major will be asked to complete an override form and will be added to these classes when space is available after the registration period has ended and after demands from Isenberg students have been satisfied. Available capacity will then be allocated among IT Minors, BDIC students, and students in the proposed Informatics major who are listed on the override request form. OIM 350 is a prerequisite for OIM 454, and students requesting enrollment in OIM 454 must have already completed OIM 350.

cc: Prof. Ramesh K. Sitaraman, Informatics Program Director
January 19, 2018

Professor James Allan, Chair
College of Information and Computer Sciences
University of Massachusetts
Amherst, MA 01003

Dear James,

I am writing to offer strong support for the proposed B.S. degree program Informatics within the College of Information and Computer Sciences. Informatics is a key offering for our flagship campus, enabling students to explore and integrate computing with their other disciplinary interests.

The proposed B.S. in Informatics has required and elective courses that are taught by our department. These include the introductory statistics course STAT 240, and more advanced statistics courses such as STAT 501, STAT 515, and STAT 516. I understand that 50 new students are projected to enter the B.S. Informatics major each year. This would translate to a total of roughly 50 students per year in the introductory statistics course, with a similar number across the advanced statistics courses each year. We already have informatics students in these courses through the BDIC program and we will continue to accommodate them. Of course, if enrollment increases to the point where it is necessary to add spaces or sections in these courses, we will have discuss how to nd the required resources.

In summary, the proposal to offer a B.S. degree program in Informatics within the College of Information and Computer Sciences has my strong support. The Department of Mathematics and Statistics looks forward working closely with the program to ensure its success.

Sincerely,

George Avrunin
Professor and Acting Department Head

The University of Massachusetts is an Affirmative Action/Equal Opportunity Institution
BIOGRAPHICAL SKETCH

Personal

Name: Gordon C. Anderson
Education: Ph.D. Computer Science, University of Massachusetts Amherst
M.S. Computer Science, University of Massachusetts Amherst
B.S. Computer Science, University of Massachusetts Amherst
B.S. Fine Art, University of Wisconsin, Madison

Positions and Honors

Positions and Employment
2014 - Present  Lecturer, University of Massachusetts Amherst
2012 – 2014  Tenure Track Faculty, Greenfield Community College
2011 – 2012  Adjunct Faculty, Greenfield Community College

Other Experience and Professional Memberships
ATR Certified Art, Therapist, LMHC Licensed Mental Health Counselor in the State of New Hampshire, Certified Bija Ananda Yoga Instructor

Areas of Research:
I am interested in discovering and implementing pedagogical methods that work in large courses. This includes how technology and content design can be used at scale to provide a high-quality learning experience. Another aspect of teaching at scale is how to best evaluate the effectiveness of pedagogy and content design using data from instrumented content.

Scholarship

4 peer-reviewed publications
1 books and chapters
1 presentations and national and international Conferences and Symposia

Selected Peer-reviewed Publications and/or Books and Chapters


Teaching

Selected Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPSCI 121</td>
<td>Intro to Problem Solving with Computers</td>
</tr>
<tr>
<td>COMPSCI 320</td>
<td>Software Engineering</td>
</tr>
<tr>
<td>COMPSCI 529</td>
<td>Software Engineering Project Management</td>
</tr>
<tr>
<td>INFO 397F</td>
<td>Intro to Data Science</td>
</tr>
<tr>
<td>COMPSCI 220</td>
<td>Programming Methodology</td>
</tr>
</tbody>
</table>
BIOGRAPHICAL SKETCH

Personal

Name: David A. Mix Barrington
Education: Ph.D., Mathematics, Massachusetts Institute of Technology
          Certificate of Advanced Study (Part III of Mathematical Tripos, Dept. of Pure Math. and Math. Stats.), Cambridge University, U.K.
          B.A., Mathematics and Physics, Amherst College

Positions and Honors

Positions and Employment

2001-present  Professor, College of Information and Computer Sciences, University of Massachusetts, Amherst
2015-present  Director of Instructional Programs, College of Information and Computer Sciences, University of Massachusetts, Amherst
1998-2001, Spring  Associate Chair for Academic Programs, College of Information and Computer Sciences, University of Massachusetts, Amherst
2017, 2011-2015  Spring  Visiting Professor of Mathematics and Computer Science, Mount Holyoke College
1992-2001  Assistant Professor, College of Information and Computer Sciences, University of Massachusetts, Amherst
Fall 2001  Visiting Professor, School of Computer Science, McGill University
1992-1993  Visiting Associate Professor, Dept. of Computer Science and Engineering, University of Washington, Seattle
1986-1992  Assistant Professor, College of Information and Computer Science, University of Massachusetts, Amherst

Areas of Research: Computational Complexity, Theory of Computation

Scholarship

20 peer-reviewed publications
4 books and chapters
22 presentations and national and international Conferences and Symposia
Selected Peer-reviewed Publications and/or Books and Chapters


Teaching

Selected Courses
CMPSCI 791, 743, 741 Complexity Theory
CMPSCI 611 Advanced Analysis of Algorithms
CMPSCI 575/Math 513 Combinatorics and Graph Theory
CMPSCI 511, 311 Analysis of Algorithms
BIOGRAPHICAL SKETCH

Personal

Name: Eva Hudlicka
Education: Ph.D. Computer Science, University of Massachusetts, Amherst
M.S. Computer Science, The Ohio State University
B.S. Biochemistry, Virginia Tech

Positions and Honors

Positions and Employment
April 1995 - present President and Principal Scientist, Psychometrix Associates, Inc.
2013 - present Visiting Lecturer, College of Information and Computer Sciences, University of Massachusetts-Amherst
Fall 2014, Adjunct Associate Professor, School of Cognitive Science, Hampshire
Spring 2016 College, Amherst, MA
Summer 2005 Adjunct Associate Professor, Dept. of Industrial Engineering, San Jose State University
1995 - 2005 Senior Consulting Scientist, Charles River Analytics, Cambridge, MA
1988 – 1998 Adjunct Associate Professor, Dept. of Computer Science, Worcester Polytechnic Institute
Spring 1986 Instructor, School of Communications and Cognitive Science, Hampshire College, Amherst, MA
Sept 1985 - Visiting Assistant Professor, Dept. of Computer and Information Science,
June 1986 University of Massachusetts-Amherst
March – Aug 1979 Programmer, Institute de Chimie Physique, Ecole Polytechnique Federale, Lausanne, Switzerland

Other Experience and Professional Memberships
2005-2007 Member, Committee on “Organizational Behavior Modeling”; The National Academies / National Research Council, Washington, DC.
2008 – present Member, IEEE Task Force on Player Satisfaction Modeling (http://game.itu.dk/PSM/);
2016 – present Coalition for Technology in Behavioral Science

Areas of Research:

Research areas include modeling both the cognitive processes mediating emotion generation, and the processes mediating the variety of biases that emotions exert on attention, perception and the cognitive processes involved in decision-making. The primary aim of this work is to improve our understanding of the mechanisms that mediate affective biases, and to gain a deeper understanding of human decision-making and behavioral choices, as well as the nature of affective disorders and the mechanisms of action in psychotherapy. Applications of this research exist in affect-adaptive decision-aiding and training systems, serious gaming and affective agents.

This research is conducted within the context of a cognitive-affective agent architecture (MAMID), which implements a generic methodology for modeling the interacting effects of a variety of factors that influence attention, perception and cognitive processes. These behavior moderators include not only emotion but also a range of personality traits and physiological states such as fatigue.

Prior work included: decision-aiding systems, cognitive modeling, visualization and GUI design, knowledge elicitation, and model-based reasoning in expert systems.

Scholarship

60 peer-reviewed publications
19 books and chapters
88 presentations and national and international Conferences and Symposia

International Jnl. of Synthetic Emotions (with Hatice Gunes). Benefits and Limitations of Continuous Representations of Emotions in Affective Computing, 3(1), 2012


**Teaching**

**Selected Courses**
CMPSCI 527 Introduction to Affective Computing (U.Mass.)
CMPSCI 325 Introduction to Human-Computer Interaction (U.Mass.)
Knowledge Acquisition Techniques for Expert Systems (WPI)
Model-Based Reasoning (WPI)
BIOGRAPHICAL SKETCH

Personal

Name: Marc Liberatore
Education:
  Ph.D., Computer Science, University of Massachusetts Amherst, February 2008
  M.S., Computer Science, University of Massachusetts Amherst, May 2003
  B.S. cum laude, Computer Science, University of Massachusetts Amherst, May 2000

Positions and Honors

Positions and Employment
September 2016-present  Lecturer, College of Information and Computer Science, University of Massachusetts Amherst
September 2016-present  Associate Director, Digital Forensics Laboratory, University of Massachusetts Amherst
January 2009- August 2016  Research Scientist and Lecturer, College of Information and Computer Science, University of Massachusetts Amherst
January 2009- August 2016  Associate Director, Center for Forensics and Society, University of Massachusetts Amherst
August 2007- December 2008  Visiting Assistant Professor (Mellon Fellow), Wesleyan University
January 2001- August 2007  Research Assistant, College of Information and Computer Science University of Massachusetts Amherst
June- August 2001  Instructor, College of Information and Computer Science, University of Massachusetts Amherst

Other Experience and Professional Memberships
2004  Research Intern, Intel Research Cambridge

Areas of Research: File and network forensics, anonymity systems, security, and peer-to-peer architectures

Grants

<table>
<thead>
<tr>
<th>Dates</th>
<th>Project Title</th>
<th>Amount</th>
<th>Role</th>
<th>Funder</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/16 – 6/21</td>
<td>CyberCorps Scholarship for Service at the University of Massachusetts Amherst</td>
<td>$4,200,000</td>
<td>CO-PI</td>
<td>National Science Foundation</td>
</tr>
<tr>
<td>12/12-12/13</td>
<td>Research and Development for IINIU</td>
<td>$160,000</td>
<td>CO-PI</td>
<td>Department of Justice</td>
</tr>
</tbody>
</table>
**Scholarship**

- 21 peer-reviewed publications
- 0 books and chapters
- 6 presentations and national and international Conferences and Symposia

**Selected Peer-reviewed Publications and/or Books and Chapters**


**Teaching**

**Selected Courses**

- CMPSCI190D Using Data Structures
- CMPSCI391L/591L Computer Crime Law
- CMPSCI383 Programming with Data Structures
- CMPSCI383 Artificial Intelligence
- CMPSCI290NW A Networked World
BIOGRAPHICAL SKETCH

Personal

Name: Tim Richards
Education: Ph.D. Computer Science, University of Massachusetts Amherst
M.S. Computer Science, University of Massachusetts Amherst
B.A. Computer Science, Clark University

Positions and Honors

Positions and Employment
2011-present Lecturer, College of Information and Computer Science, UMass Amherst
2009-2011 Visiting Assistant Professor, Trinity College
2007-2008 Adjunct Faculty Member, Clark University
2007-2008 Adjunct Faculty Member, Springfield College
2002-2009 Graduate Research Assistant, UMass Amherst
2000-2001 Software Engineer II, Concord Communications
1999-2000 Systems Software Engineer, Digital Equipment Corporation

Other Experience and Professional Memberships
2016-present CICS Undergraduate Program Director
2016-present CICS Commencement Committee
2015-present CICS Lecturer Search Committee
2014-2015 CICS Teaching Track Committee
2014-2015 CICS Scalability Committee
2011-2014 CICS Informatics Committee
2012-2016 CICS Chief Undergraduate Advisor
2011-2012 CICS Honors Program Director
2011-present CICS Undergraduate Program Committee

Honors
2016 Distinguished Teaching Award Nominee, UMass Amherst

Areas of Research: The use of web, database, learning, and information gathering technologies for harnessing collective intelligence and collaboration in large-scale learning applications in small-scale learning environments to promote acquisition of knowledge and skill through the experience, study, success, and failures in the context of large learning groups.

Grants

<table>
<thead>
<tr>
<th>Dates</th>
<th>Project Title</th>
<th>Amount</th>
<th>Role</th>
<th>Funder</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2017</td>
<td>Micro Virtual Machines for Managed Languages</td>
<td>$170,000</td>
<td>CO-PI</td>
<td>National Science Foundation</td>
</tr>
<tr>
<td>2013</td>
<td>Geospatial Programming: Child’s Play</td>
<td>$18,000</td>
<td>CO-PI</td>
<td>Google Unrestricted Award</td>
</tr>
<tr>
<td>2012-2015</td>
<td>Portable Performance for Parallel Managed Languages</td>
<td>$800,000</td>
<td>CO-PI</td>
<td>National Science Foundation</td>
</tr>
</tbody>
</table>
Scholarship

9 peer-reviewed publications
1 books and chapters
2 presentations and national and international Conferences and Symposia

Selected Peer-reviewed Publications and/or Books and Chapters


Paul E. Dickson, Chris Kondrat, W. Richards Adrion, Tim Richards, and Ryan B. Szeto, “Improved Whiteboard Processing for Lecture Capture”, in the 11th International Workshop on Multimedia Technologies for E-Learning (MTEL), San Jose, CA, December 2016.

Ryan Szeto, Rick Adrion, Tung Pham, Tim Richards, Paul Dickson, and Chris Kondrat, “Portable Lecture Capture that Captures the Complete Lecture”, in the 10th IEEE International Workshop on Multimedia Technologies for E-Learning (MTEL), Miami, FL, December 2015.


## Teaching

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>COMPSCI 187</td>
<td>Programming with Data Structures</td>
</tr>
<tr>
<td>COMPSCI 220</td>
<td>Programming Methodology</td>
</tr>
<tr>
<td>COMPSCI 230</td>
<td>Computer Systems Principles</td>
</tr>
<tr>
<td>COMPSCI 326</td>
<td>Web Programming</td>
</tr>
<tr>
<td>COMPSCI 377</td>
<td>Operating Systems</td>
</tr>
</tbody>
</table>
BIOGRAPHICAL SKETCH

Personal

Name: Michelle D. Trim
Education: Ph.D. Michigan Technological University
M.A. Miami University of Ohio
B.A. Purdue University

Positions and Honors

Positions and Employment
2013-present Lecturer, College of Computing and Information Sciences, University of Massachusetts, Amherst
2012-Aug 2013 Assistant Professor and Director of First-Year Writing, English Department, University of New Haven, West Haven, Connecticut
2007-2012 Lecturer in English, English Department, Elon University, Elon, North Carolina. Continuing status earned spring 2011
2004-2007 Visiting Instructor of English, Department of English and Foreign Languages, Lander University, Greenwood, South Carolina
2000-2004 Graduate Teaching Instructor, Humanities Department, Michigan Technological University, Houghton, Michigan
1998-2000 Graduate Teaching Instructor, English Department, Miami University of Ohio, Oxford, Ohio
1998 Teaching assistant, Electrical Engineering Technology, Purdue University, W. Lafayette, Indiana

Other Experience and Professional Memberships
2012 – present Reviewer, Journal of Faculty Development, Dr. Ed Neal, Editor
2001-2003 Editorial Intern, College Composition and Communication (CCC), Dr. Marilyn Cooper, Editor
2010 Consulting and Educational Print and Media Reviews for Pearson Education’s Courseware (LMS)

Honors
2017 Faculty Development Award, University of Massachusetts
2016 Teaching for Inclusiveness, Diversity and Equity Ambassador
2013 Faculty Development Award, University of Massachusetts
2011 College of Arts and Sciences Nominee for University of New Haven Faculty Excellence in Service Award

Areas of Research: Research interests occupy two main areas: technology studies related to computing and human agency, and, writing studies related to critical pedagogy, also considering agency. Current research projects include exploring epistemologies of computing, particularly in terms of how students understand the role of computing in a global social context, and investigating the degree to which audience studies/audience focused writing instruction provides effective avenues for ethics-related education in computer science.
<table>
<thead>
<tr>
<th>Dates</th>
<th>Project Title</th>
<th>Amount</th>
<th>Role</th>
<th>Funder</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>“How do Students Use Feedback” – Center for the Advancement of Teaching and Learning Scholar</td>
<td>$4,000 + 4 course releases</td>
<td>PI</td>
<td>Elon University Center for the Advancement of Teaching and Learning Grant, IRB-approved</td>
</tr>
<tr>
<td>2010</td>
<td>Togetherness in Difference Lecture and Faculty Development Speaking Series</td>
<td>$3,000</td>
<td>CO-PI</td>
<td>Elon College of Arts and Sciences Fund for Excellence</td>
</tr>
<tr>
<td>2010</td>
<td>GST 373: Technology and Human Agency</td>
<td>$600</td>
<td>PI</td>
<td>Center for the Advancement of Teaching and Learning Grant, IRB-approved</td>
</tr>
</tbody>
</table>

### Scholarship
- 7 peer-reviewed publications
- 1 books and chapters
- 15 presentations and national and international Conferences and Symposia

**Selected Peer-reviewed Publications and/or Books and Chapters**


### Teaching

**Selected Courses**

- CMPSCI 305 Social Issues of Computing
- INFO 101 Introduction to Informatics
- GST 339 Technology and Human Agency
- E 225 Technical Writing and Presentation
- HU 2634 Introduction to Computer Applications

**MOTION:** That the Faculty Senate approve the Creation of a BS Degree Program in Informatics in the College of Information and Computer Sciences, as presented in Sen. Doc. No. 18-055.