



BOARD OF REGENTS

**SUMMARY OF ITEM FOR ACTION,
INFORMATION, OR DISCUSSION**

TOPIC: University of Maryland, College Park: Bachelor of Science in Information Science

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: September 22, 2015

SUMMARY: The exponential growth of data generation and storage has created a pressing need for individuals to be educated in how to leverage “big data” to create new opportunities for controlled digital experiments, supporting decision-making and encouraging innovation. The proposed Bachelor of Science in Information Science (BSIS) will have as an initial specialization, “Data Science” which is not offered as an undergraduate specialization at any iSchool or research university in the country.

The Data Science specialization is intended for students who wish to pursue such careers as data analyst, data scientist, or information analyst, thus requiring advanced understanding and skills for managing, manipulating, and mobilizing data to extract insight, create value, and achieve organizational goals in a variety of sectors. Data science electives will focus on commonly used data handling, manipulation and analytic processes, tools, and techniques.

While there are programs in related fields at other Maryland institutions, the proposed BSIS provides an integrated, interdisciplinary STEM program with a balance of theoretical knowledge and practical skills that set it apart from existing programs that are provided through either Schools of Business or Computer Science. The University of Maryland’s iSchool faculty offers unique expertise with its research and graduate programs in Library Science, Information Management, and Human-Computer Interaction, positioning it to create an undergraduate program applicable to a wide range of disciplinary and economic sectors.

Resources for delivering the program will come from a combination of STEM enhancement funding and internal reallocation from the Office of the Provost and from the iSchool, depending on program growth. This program is also planned to be part of a suite of programs to be offered in the new Bioscience and Engineering Education (BSE) building at the Universities at Shady Grove, for which planning is underway and which is scheduled to open by Fall 2018.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funding is necessary. The program will be supported through reallocation.

CHANCELLOR’S RECOMMENDATION: That the Committee on Education Policy and Student Life recommend that the Board of Regents approve the proposal from the University of Maryland, College Park to offer a Bachelor of Science in Information Science.

COMMITTEE RECOMMENDATION: **DATE:** September 22, 2015

BOARD ACTION: **DATE:**

SUBMITTED BY: Joann A. Boughman 301-445-1992 jboughman@usmd.edu

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

- New Instructional Program
- Substantial Expansion/Major Modification
- Cooperative Degree Program
- Within Existing Resources, or
- Requiring New Resources

University of Maryland College Park

Institution Submitting Proposal

Information Science

Title of Proposed Program

Bachelor of Science

Award to be Offered

Fall 2016

Projected Implementation Date

Proposed HEGIS Code

College of Information Studies

Department in which program will be located

11.0401

Proposed CIP Code

Ann Weeks

Department Contact

301-405-2060

Contact Phone Number

acweeks@umd.edu

Contact E-Mail Address

Signature of President or Designee

Date

A. Centrality to the University's Mission;

As the flagship campus of the University System of Maryland and the original 1862 land-grant institution in the State, the University of Maryland, College Park's (UMD) mission is to provide excellent teaching, research and service, nourish a climate of intellectual growth, and provide outstanding instruction in a broad range of academic disciplines and interdisciplinary fields. UMD has as a primary goal to provide knowledge-based programs and services that are responsive to the needs of the citizens across the state and throughout the nation. In response to this call, the College of Information Studies (the iSchool) proposes to offer a Bachelor of Science in Information Science (BSIS). Information Science has emerged as an interdisciplinary field of study that explores major issues at the confluence of information, technology, and people. As data collection and analysis expands across all sectors, an information rich society requires skilled professionals able to help develop and use new information methods and technologies in diverse settings.

The BSIS is a STEM program that prepares students to design, develop, and use information and technology to understand, assess, create and manage systems to meet the needs of people, organizations and society in a variety of contexts. While programs in the related field of information systems exist in the region, they are housed primarily within Schools of Business or computer science and engineering programs, and serve more specific business and technical audiences. The University of Maryland's iSchool faculty offers unique expertise with its research and graduate programs in Library Science, Information Management, and Human-Computer Interaction, positioning it to create an undergraduate program applicable to a wide range of disciplinary and economic sectors. By providing an integrated, interdisciplinary STEM educational experience with a balance of theoretical knowledge and practical skills, the BSIS will create new opportunities for students interested in applied technology fields who currently are not served by the existing programmatic offerings in computer science, engineering, social sciences, the liberal arts, and humanities.

In addition to students admitted to UMD College Park as freshmen, the BSIS program will be of interest to community college and other transfer students with backgrounds in General Studies, Computer Science, Information Systems and similar fields. The initial curriculum will focus on Data Science as a specialty area, with additional specialty areas to be considered in the future as enrollments in the program become established and resources are available.

B. Critical and Compelling Statewide Need;

The market for sophisticated information professionals continues to grow dramatically and, like many STEM fields, Information Science as a discipline is also undergoing rapid growth. Employment for graduates with the skills and experiences provided by the BSIS program is expected to continue to increase much faster than the average for all occupations. This increase is due primarily to the rapid growth among computer-related occupations and the need for high-level leadership. The 2012 Occupational Outlook Handbook of the Bureau of Labor Statistics reports that demand will be highest for graduates with advanced technical knowledge coupled with strong administrative and communication skills¹. Graduates of the proposed BSIS program will be employable in a variety of information science positions in non-profit, for-profit, government, and entrepreneurial settings and will be well-prepared to undertake advanced graduate studies in their field of choice.

¹ Bureau of Labor Statistics Occupational Outlook Handbook: <http://www.bls.gov/ooh/>

C. Market Supply and Demand;

In response to market demand for skilled professionals able to address issues at the confluence of information, technology, and people, iSchools around the world provide a mix of graduate and undergraduate offerings. As shown in Table 1 below, undergraduate programs are available for students at the majority of iSchools in the U.S. and are even more prevalent in iSchools with top-ranked graduate programs (<http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-library-information-science-programs>) such as the University of Maryland College Park. Appendix B shows that over half (15 of the 27 U.S. iSchools) offer bachelor of science programs and Table 2 shows robust demand for information science graduates around the College Park, MD area.

	U.S. iSchools n=27	Top Ranked U.S. iSchools n=13	iSchools Worldwide n=65
Undergraduate programs	70.4%	76.9%	64.6%
Graduate programs only	29.6%	23.1%	35.4%

Table 1. Prevalence of undergraduate offerings at iSchools.

On July 29, 2015, a search of two online employment databases representing private and federal government sectors (Monster and for USAJobs) found many job opportunities for graduates within 60 miles of College Park, MD – the location of the UMD campus. The keywords used in the search process and the resulting hits are reported below in Table 2. (Exact keywords in quotes were used.)

Search terms	Monster (private sector)	USAJobs (federal government)
“Information Science”	480	267
“Data analysis”	1,000+	338
“Data mining”	611	10
“Data scientist”	240	24
“Data specialist”	68	244
“Information analysis”	47	494
Total	2,446+	1377

Table 2. Data- and information-oriented job opportunities within 50 miles of College Park, Maryland for BSIS graduates.

There is also a healthy job market for “big data-savvy...professionals at all levels.”² As digital data generation and storage have undergone exponential growth, there is a pressing need for individuals able to leverage big data to create new opportunities by increasing organizational transparency, instrumenting controlled digital experiments, tailoring offerings to population segments, supporting human decision-making, and encouraging innovation. McKinsey Global Institute reports that, “By 2018 the United States alone faces a shortage of 140,000 to 190,000

² Dillow, C. (2013). Big employment boom. Fortune, 09/04/2013. Available at: <http://tech.fortune.cnn.com/2013/09/04/big-data-employment-boom/>

people with analytical expertise and 1.5 million managers and analysts with the skills to understand and make decisions based on the analysis of big data.³” The Bureau of Labor Statistics recognizes big data as a major growth area and reports that big data work is happening across several of its current occupational and industry classes.

A number of academic institutions in the United States offer undergraduate majors, minors, or concentrations in data science, a field that has been called, “the competitive advantage of the future.”⁴ However, George Mason University in Fairfax, Virginia, is the only institution in the region that offers a B.S. in Computational and Data Science and places much more emphasis on mathematical modeling and less on information science issues and contextual application than the BSIS proposed here. Currently, no iSchool in the U.S. with an undergraduate program in information science offers a specialization in data science, nor do any other universities with a classification of Very High Research Activity Research Universities (formerly, ‘R1’) from the Carnegie Foundation for the Advancement of Teaching.

D. Reasonableness of Program Duplication, if any;

While other colleges and universities in the state and the region offer bachelor’s degrees in information systems, the program proposed here would be unique. Appendix A lists bachelor’s programs in Information Science/Studies (CIP 11.0401) in the University System of Maryland. The BSIS curriculum is grounded in a perspective that equally emphasizes information, technology, and people, and integrates significant design and development components. Other local programs are offered in departments and schools with either a more business or a more technical focus. Schools of Business target managerial decision making to meet the needs of businesses, providing limited focus on information, interaction, and system design and development. The for-profit industry focus of Schools of Business also limits the applicability of these information systems degrees to the information issues of non-profits, governments, society and individuals and to the needs arising from “market failures.” Programs located in Computer Science departments focus on automating the algorithmic processes that underlie information acquisition and handling at scale. Programs in departments of Computer Science, Engineering, Information Technology, and Professional Studies develop graduates with strong technical skills, but put less emphasis on leveraging the affordances and constraints inherent in the social and organizational context of application domains.

Three programs in USM that fall into the 11.0401 CIP are housed in schools or departments other than business or computer science, but are distinct from the proposed BSIS. One of these programs is the B.S. in Information Systems offered by the University of Maryland Baltimore County in its College of Engineering and Information Technology. The curriculum of this program includes courses usually found in programs offered through Schools of Business such as microeconomics, macroeconomics, principles of accounting, the practice of management, and

³ Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., & Hung Byers, A. (2011) Big Data: The Next Frontier for Innovation, Competition and Productivity, McKinsey Global Institute.

¹McKinsey&Company (May 2011). Available at:

http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/Big_data_The_next_frontier_for_innovation

⁴ Booz Allen Hamilton. 2013. *The Field Guide to Data Science*. Available at:

<http://www.boozallen.com/media/file/The-Field-Guide-to-Data-Science.pdf>

statistics for business and economics. The University of Maryland University College (UMUC) offers two programs that fall into the 11.0401 CIP, both of which are offered in their Information Technology and Computer Science Program. The articulated program outcomes and curriculum of the B.S. in Information Systems Management offered by UMUC are most similar to those in Business Schools, while the B.S. in Computer Networks and Security also offered at UMUC most closely resembles the curriculum in applied Computer Science.

E. Relevance to the Implementation and Maintenance of High-Demand programs at HBIs;

Each of Maryland's Historically Black Institutions (HBIs) (Bowie State University, Coppin State University, and Morgan State University) offers undergraduate programs with an emphasis on the business environment that have some overlap with the proposed BSIS. However, these programs focus on aspects of information systems, technology, and processes that differ significantly from the BSIS proposed by the iSchool. Bowie State University offers a Bachelor of Science in Business Information Systems, and Coppin State offers a Bachelor of Science concentration in Management Information Systems. Both of these programs are offered by business schools and the coursework integrates the study of management information systems with topics in business, accounting, and economics. Coverage of information science topics outside industry settings is limited.

Morgan State University offers a Bachelor of Science in Information Systems through its Business School, which prepares students for managerial decision-making and careers in corporate and business environments, or for graduate programs that require a business background. The proposed BSIS stands apart from these degree programs in its designation as a STEM program and in its mission to prepare students for careers with a significant design and development component in sectors beyond business, including government and non-profit organizations.

F. Relevance to the support of the uniqueness and institutional identities and missions of HBIs;

See section above

G. Adequacy of the Proposed Curriculum Design;

The Academic requirements for the degree are listed in Appendix C.

Learning Outcomes

Learning outcomes will be assessed for each course in the curriculum through appropriate metrics. Program level learning outcomes and the assessment process may be found in Section M.

- Demonstrate an ability to select, critically evaluate, and apply relevant areas of information science scholarship.
- Produce an original analysis or other scholarly work that reflects a body of knowledge relevant to information science.
- Describe and evaluate the principles of information organization and systems.
- Demonstrate and evaluate the principles of information behavior and user needs.
- Demonstrate the principles, methods and types of leadership and team development within organizations.
- Demonstrate the principles and techniques of database design.

- Demonstrate the principles, evaluation, and implementation of local and wide-area computer networking, including issues of security and ethics.
- Demonstrate the ability to use statistical analysis to make decisions in an information science context.
- Demonstrate understanding and implementation of computer applications using object-oriented techniques, including program design and testing.
- Apply and evaluate principles of user interface design.
- Demonstrate the design and implementation of a system analysis project from inception to completion in a team setting.

Data Science Specialization Learning Outcomes

- Analyze a systemic problem that may impair the sustainable operation of an organization, and develop strategies to solve the problem by making use of modeling and simulation.
- Demonstrate the principles, evaluation, and implementation of a variety of systems and techniques for information organization and representation.
- Demonstrate the principles and techniques for analyzing and evaluating big data sets through clustering, classification, and regression techniques.
- Demonstrate the knowledge and techniques for developing dynamic, database-driven web sites, including acquiring, installing, and running web servers, database servers, and connectivity applications.
- Demonstrate and implement the principles of the visualization of information, including the effects of human perception, the aesthetics of information design, and the mechanics of visual display.

H. Articulation with Community Colleges;

Appendix D contains potential articulations with three degree programs at Montgomery College, which is an example pathway for students who could choose to enter the BSIS program upon completing an associate degree at a community college. Articulation agreements with area community colleges will be considered depending on student interest in and the rate of growth of the BSIS program.

I. Adequacy of Faculty Resources;

All courses in the program will be taught by regular, full-time College Park faculty or part-time faculty who have been approved for teaching by the Appointment, Promotion, and Tenure (APT) Committee of the iSchool. Regular, full-time College Park faculty will teach a high proportion of the courses and the majority of the tenured and tenure/track faculty will participate in creation of courses and delivery of the program. Approximately half of the current faculty will play a significant role in the development of the curriculum and expect to teach courses at the undergraduate, as well as the graduate level. Information about the credentials of these faculty members may be found in Appendix E. The iSchool's web site (<http://ischool.umd.edu/fac-staff>) provides information about all faculty members in the College.

The program will be managed by the Director of Undergraduate Programs, who will be appointed by the Dean for a three-year term and may be reappointed. The Program Director, in

collaboration with the Associate Deans, the Academic Administrators, and members of the faculty, will provide intellectual leadership for the BSIS. The Program Director will chair the administrative committee that is responsible for determining the academic and pedagogic strategies, setting and reviewing policies for student recruitment and for the courses that make up the program.

J. Adequacy of Library Resources;

The University Library System's existing collection of journals and other resources is sufficient to support this certificate.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources;

Existing facilities and instructional resources will be used to deliver this program.

L. Adequacy of financial resources;

We anticipate an initial offering on the College Park campus. We do not anticipate that this program will result in an overall increase in enrollment at College Park, but that enrollment would represent a shift from other degree programs. As a result, no new tuition revenue is assumed. Resources for delivering the program will come from a combination of STEM enhancement funding and internal reallocation from the Office of the Provost and from the iSchool, depending on program growth. This program is also planned to be part of a suite of programs to be offered in the new Bioscience and Engineering Education (BSE) building at the Universities at Shady Grove, for which planning is underway and which is scheduled to open by Fall 2018. Resources for the new academic programs at Shady Grove have not yet been identified. The resources and expenditures tables in this proposal reflect delivery only on the College Park campus.

M. Adequacy of Program evaluation;

The program-level learning outcomes are listed below.

At the completion of this program, students will be able to:

1. Demonstrate an understanding of information design and management: the interrelationships among information consumers or creators, information content, and the conduits through which information flows.
2. Apply basic principles to the design, development and management of information to meet the needs of diverse users.
3. Assess the impact of existing or emerging technologies on information practices and the flow of information.
4. Employ state-of-the-art tools and techniques to create, manage, and analyze information.
5. Demonstrate an understanding of critical issues including the security, privacy, authenticity, and integrity of information.

The iSchool is developing a set of metrics that will be used to monitor, evaluate, and continually improve the quality of the BSIS program. The metrics are based on our shared vision of high standards for the entire learning experience at the iSchool and include standards for the courses and activities, faculty effectiveness, and administrative and technical support services for students. Faculty and content designers will use these metrics to guide the development and any necessary revisions of each course.

The assessment strategies will include direct measures of student learning, such as evaluation of students' performance in capstone experiences by supervisors and instructors based upon stated program objectives; the evaluation of students' portfolios; internal and external reviews of senior projects; and performance on examinations given in foundational core and specialization courses. Indirect measures will include job placement data; surveys of graduates and employers; exit interviews; observations of students' performance in classes; and satisfaction surveys.

The degree to which the BSIS is meeting its goals will be assessed by a process that is consistent with that outlined in the UMD Undergraduate Program Learning Outcomes Assessment Plan. The Undergraduate Program Committee will direct the assessment process. Assessments will be conducted annually in the spring semester, beginning in the first year of the program. The assessment report to the Provost each fall will include the results of the assessment and recommendations for program improvement that are based on these results.

Program review will be carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (<http://www.president.umd.edu/policies/2014-i-600a.html>). Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment (<https://www.irpa.umd.edu/Assessment/LOA.html>). The iSchool faculty are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (<http://www.president.umd.edu/policies/2014-ii-120a.html>).

N. Consistency with Minority Student Achievement goals;

The iSchool is dedicated to supporting gender and ethnic diversity as well as those working for organizations that support and advocate for underrepresented groups. Over half of our graduate students are female and approximately 10 percent are from diverse ethnic backgrounds -- traditionally underrepresented in STEM fields. Currently, the iSchool sponsors the iDiversity Student Group (<http://idiversity.umd.edu/>), which is dedicated to promoting awareness of diversity, inclusivity, and accessibility within the information professions. This group is open to all interested students, including undergraduates. And current diversity and inclusion efforts within the iSchool include a robust specialization in the Master of Library Science program. All of the undergraduates will be able to utilize the iSchool's existing resources. Courses will include content important in understanding diversity issues including serving underrepresented groups and institutions, meeting unique needs for diversity promotion, and developing capacity in all sizes and types of organizations including for-profit, charitable, governmental and cultural heritage institutions.

O. Relationship to Low Productivity Programs;

N/A

Estimated Resources and Expenditures

Resources	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	\$658,082	\$744,849	\$765,995	\$787,775	\$916,608
2. Tuition/Fee Revenue (c+g below)	\$0	\$0	\$0	\$0	\$0
a. #FT Students	50	100	150	200	200
b. Annual Tuition/Fee Rate	\$13,439	\$13,842	\$14,257	\$14,685	\$15,126
c. Annual FT Revenue (a x b)	\$0	\$0	\$0	\$0	\$0
d. # PT Students	0	0	0	0	0
e. Credit Hour Rate	\$340	\$350	\$361	\$372	\$383
f. Annual Credit Hours	14	14	14	14	14
g. Total Part Time Revenue (d x e x f)	\$0	\$0	\$0	\$0	\$0
3. Grants, Contracts, & Other External	\$0	\$0	\$0	\$0	\$0
4. Other Sources	\$0	\$0	\$0	\$0	\$0
TOTAL (Add 1 - 4)	\$658,082	\$744,849	\$765,995	\$787,775	\$916,608

Expenditures	Year 1	Year 2	Year 3	Year 4	Year 5
1.F.T. Faculty (b+c below)	\$332,500	\$410,970	\$423,299	\$435,998	\$449,078
a. #FTE	2.5	3.0	3.0	3.0	3.0
b. Total Salary	\$250,000	\$309,000	\$318,270	\$327,818	\$337,653
c. Total Benefits	\$82,500	\$101,970	\$105,029	\$108,180	\$111,425
2. P.T. Faculty (b+c below)	\$0	\$0	\$0	\$0	\$0
3.Admin. Staff (b+c below)	\$246,582	\$253,979	\$261,599	\$269,447	\$277,530
a. #FTE	2.0	2.0	2.0	2.0	2.0
b. Total Salary	\$185,400	\$190,962	\$196,691	\$202,592	\$208,669
c. Total Benefits	\$61,182	\$63,017	\$64,908	\$66,855	\$68,861
4.Total Support Staff (b+c below)	\$39,000	\$39,900	\$41,097	\$42,330	\$43,600
a. #FTE	0.5	0.5	0.5	0.5	0.5
b. Total Salary	\$30,000	\$30,000	\$30,900	\$31,827	\$32,782
c. Total Benefits	\$9,000	\$9,900	\$10,197	\$10,503	\$10,818
5. Total Graduate TA (b+c+d below)	\$53,200	\$109,592	\$106,400	\$106,400	\$106,400
a. #FTE	2.0	4.0	4.0	4.0	4.0
b. TA stipend	\$40,000	\$82,400	\$80,000	\$80,000	\$80,000
c. Benefits	\$13,200	\$27,192	\$26,400	\$26,400	\$26,400
d. GA Tuition Remission	\$24,800	\$49,600	\$49,600	\$49,600	\$49,600
6. Equipment	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000
7. Library	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
8. Other Expenses: Operational Expenses	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
TOTAL (108)	\$658,082	\$744,849	\$765,995	\$787,775	\$916,608

APPENDIX A
BACHELOR'S PROGRAMS IN INFORMATION SCIENCE IN THE VICINITY OF UMCP

Institution	Program name & URL	Offering College or Department
George Mason University	B.S. in Computational and Data Sciences http://spacs.gmu.edu/category/academics/undergraduate-programs/bs-computational-data-sciences/	School of Physics, Astronomy, and Computational Sciences
George Washington University	Bachelor's Degree Completion Program in Integrated Information Science and Technology http://cps.gwu.edu/bachelors-completion	College of Professional Studies
Howard University	Information Systems http://sbweb1.bschool.howard.edu/current-students/departments/information-systems-supply-chain-management-department/	School of Business, Dept. of Information Systems and Supply Chain Management
Loyola University of Maryland	B.B.A. in Information Systems http://www.loyola.edu/sellinger/academics/undergraduate/majors-minors.aspx	School of Business
Morgan State University	B.S. in Information Systems http://www.morgan.edu/departments/information_science_and_systems/degreesprograms/undergraduate.html	School of Business and Management, Dept. of Information Science & Systems
Mount St. Mary's University	Bachelor's in Information Systems http://www.msmary.edu/School_of_business/undergraduate-programs/information-systems/	Offered jointly by School of Business and Math & Computer Science Department
Salisbury University	Bachelor's in Information Systems http://www.salisbury.edu/InfoSys/	School of Business, Department of Information and Decision Sciences
Towson University	B.S. in Information Systems http://www.towson.edu/cosc/undergraduate.asp	Department of Computer and Information Sciences
University of Baltimore	B.S. in Information Systems and Technology Management http://www.ubalt.edu/merrick/undergraduate-programs/information-systems-and-technology-management.cfm	School of Business, Dept. of Information Systems and Decision Science
University of Maryland College Park	B.S. in Information Systems	School of Business

University of Maryland University College	http://www.umuc.edu/academic-programs/bachelors-degrees/computer-information-science-major.cfm	Information Technology & Computer Science
University of Maryland, Baltimore County	B.S. in Information Systems http://informationsystems.umbc.edu/home/undergraduate-programs/undergraduate-degree-programs/bachelor-of-science-in-information-systems/	College of Engineering and Information Technology, Dept. of Information Systems

APPENDIX B

U.S. ISCHOOLS WITH BACHELOR OF SCIENCE PROGRAMS

(Programs in top-rated institutions shown in bold)

Institution	College / Department	Program name & URL	Concentrations, Tracks, and Specializations
Drexel University	College of Computing and Informatics	B.S. in Informatics http://cci.drexel.edu/academics/undergraduate-programs/bs-in-informatics.aspx	
Florida State University	School of Library & Information Studies	B.S. in Information Technology http://slis.fsu.edu/academics/undergrad/	<ul style="list-style-type: none"> • Information Technology (IT), • Information, Communication, and Technology (ICT)
Indiana University	School of Informatics and Computing	B.S. in Informatics http://www.soic.indiana.edu/undergraduate/degrees/bs-informatics/index.shtml	
Michigan State University	Department of Telecommunication, Information Studies, and Media	B.S. in Media and Communication Technology http://tc.msu.edu/undergraduate-majors	<ul style="list-style-type: none"> • Media management and research, • Information and Communication Technologies
Penn State University	College of Information Sciences and Technology	B.S. in Information Sciences and Technology B.S. in Security and Risk Analysis http://ist.psu.edu/future-students/degree-programs	<ul style="list-style-type: none"> • Information systems, • Information technology, • Information context
Syracuse University	School of Information Studies	B.S. in Systems and Information Science http://ischool.syr.edu/future/undergrad/sis.aspx	
University of California at Irvine	Donald Bren School of Information and Computer Sciences, Department of Informatics	B.S. in Informatics http://www.ics.uci.edu/ugrad/degrees/degree_in4matx.php	<ul style="list-style-type: none"> • Software engineering, • Human-Computer Interaction, • Organizations and Information Technology

University of Kentucky (pending approval)	College of Communication and Information	B.S. in Information Communication Technology http://ict.uky.edu	<ul style="list-style-type: none"> • Commercialization • Technology Management
University of Maryland, Baltimore County	Department of Information Systems	B.S. in Information Systems http://informationsystems.umbc.edu/home/undergraduate-programs/undergraduate-degree-programs/bachelor-of-science-in-information-systems/	
University of Michigan	School of Information	B.S. in Information https://www.si.umich.edu/content/bsi	<ul style="list-style-type: none"> • Computational informatics, • Data mining & Information analysis, • Life science informatics, • Social computing
University of North Carolina, Chapel Hill	School of Information and Library Science	B.S. in Information Science http://sils.unc.edu/programs/undergraduate/bsis	<ul style="list-style-type: none"> • Databases, • Geographic information systems, • Human-computer interaction, • Health information systems, • Networks, • Programmer/Analyst, • Web development, • Web design
University of North Texas	College of Information, Department of Library and Information Sciences	B.S. in Information Science http://lis.unt.edu/BSIS	<ul style="list-style-type: none"> • Information science & Knowledge organization, • Project & Knowledge management, • Information management & Health informatics, • Digital content & Information systems
University of Pittsburgh	School of Information Sciences	B.S. in Information Science http://www.ischool.pitt.edu/bsis/	<ul style="list-style-type: none"> • Information systems, • User-centered design, • Networks and security
University of Washington	Information School	B.S. in Informatics http://ischool.uw.edu/academics/informatics	<ul style="list-style-type: none"> • Human-computer interaction, • Information architecture

University of Wisconsin, Milwaukee	School of Information Studies	B.S. in Information Science and Technology http://www4.uwm.edu/sois/ programs/undergraduate/bsi st.cfm	
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APPENDIX C
ACADEMIC REQUIREMENTS
THE BACHELOR OF SCIENCE in INFORMATION SCIENCE PROGRAM

The BSIS program is a STEM academic curriculum. The courses listed here are being developed for review by the Undergraduate Programs Committee, the iSchool PCC, and for proposal to the APAC.

Degree Requirements

With the aid of an academic advisor, the BSIS student devises a course plan to meet the graduation requirements: ten core courses, five major electives, professional writing, and four open electives, for a total of twenty courses (60 credits). At least 45 of the 60 credits must be information studies courses taken from the College of Information Studies.

Core Courses

The following core courses introduce the broad range of disciplines relevant to information science and provide the necessary background and skills for more specialized courses and for employment in the field:

Core (10 Courses = 30 credits)

1. Introduction to Information Science
2. Information Organization
3. Information User Needs and Assessments
4. Teams & Organizations
5. Data Modeling and Manipulation
6. Technologies, Infrastructure and Architecture
7. Statistics for Information Science
8. Object-Oriented Programming
9. User-Centered Research and Design
10. Integrative Capstone (Systems Analysis & Design)

Open Electives (4 courses = 12 credits, can be BSIS, MIM/MLS/HCIM, Domain specific, double major or minor)

Other Courses

In addition, all BSIS students are required to complete five information science electives. Sample topics could include (5 courses = 15 credits):

1. Information for Decision Making/ Organizational Intelligence
2. Data Sources and Manipulation
3. Advanced Data Science
4. Web-Enabled Databases
5. Data Visualization

The remaining courses may be a combination of iSchool courses and undergraduate courses from other departments or other universities.

General Grade Requirements

The Bachelor of Science degree will be awarded to the student who successfully completes a program of 120 undergraduate hours, with a cumulative grade point average of 2.0 on a 4.0 scale for all courses taken for undergraduate credit since matriculation into the program. A student whose cumulative grade point average at any time in the program is lower than 2.0 is automatically placed on academic probation by the College until the problem leading to probationary status has been corrected. Students have one semester to raise their GPA over 2.0.

APPENDIX D: Representative Curriculum Plans and Articulation Paths

BSIS (Choose Your Own Path specialization) Four Year Academic Plan (UMD CP). Bold signifies major prerequisite, bold italics signify major core courses, italics signifies major electives

Year 1	Fall	Spring
	Course credit	Course credit
	ENGL 101 (Academic Writing: AW) 3	Oral Communication (OC) 3
	MATH 115 (MA) 3	STAT 100 (Analytic Reasoning: AR) 3
	PSYC 100 (History/Social Science: HS) 3	History/Social Science (HS) 3
	Humanities (HU) 3	<i>Introduction to Info Science</i> 3
	UNIV 100 1	Open Elective 3
	Open Elective 3	
	Total 16	Total 15
Year 2	Fall	Spring
Major requirements must be completed within first 45 credits. MATH 115 or higher, STAT 100 or higher, PSYC 100 or higher, programming for non-CS majors	Course credit	Course credit
	Natural Science Lab (NL) 4	Natural Science (NS) 3
	Programming for Non-CS Majors 3	Scholarship in Practice – non major (SP) 3
	Understanding Plural Societies (UP) 3	Cultural Competence (CC) 3
	Scholarship in Practice (SP) 3	Humanities (HU) 3
	Open Elective 3	Open Elective 3
	Total 16	Total 15
Year 3	Fall	Spring
	Course credit	Course credit
	Professional Writing (PW) 3	<i>Teams & Organizations</i> 3
	<i>Object-Oriented Programming</i> 3	<i>Data Modeling and Manipulation</i> 3
	<i>Information Organization</i> 3	<i>HCI/UX/UI Design</i> 3
	<i>Statistics for Information Science</i> 3	<i>Information User Needs & Assessment</i> 3
	Open Elective 3	<i>Major elective</i> 3
	Total 15	Total 15
Year 4	Fall	Spring
	Course credit	Course credit
	<i>Technologies, Infrastructure, and Architecture</i> 3	<i>Integrative Capstone</i> 3
	<i>Major elective</i> 3	<i>Major elective</i> 3
	<i>Major elective</i> 3	Open Elective 3
	<i>Major elective</i> 3	Open Elective 3
	Open Elective 3	Open Elective 1
	Total 15	Total 13

Notes: All students must complete two Distributive Studies courses that will also count for the I-Series requirement. * Students may also fulfill Understanding Plural Society and Cultural Competence with courses from Distributive Studies.

BSIS (Data Science specialization) Four Year Academic Plan (UMD CP)

Year 1	Fall	Spring
	Course credit	Course credit
	ENGL 101 (Academic Writing: AW) 3	Oral Communication (OC) 3
	MATH 115 (MA) 3	STAT 100 (Analytic Reasoning: AR) 3
	PSYC 100 (History/Social Science: HS) 3	History/Social Science (HS) 3
	Humanities (HU) 3	<i>Introduction to Info Science</i> 3
	UNIV 100 1	Open Elective 3
	Open Elective 3	
	Total 16	Total 15
Year 2	Fall	Spring
Major requirements must be completed within first 45 credits.	Course credit	Course credit
MATH 115 or higher, STAT 100 or higher, PSYC 100 or higher, programming for non-CS majors	Natural Science Lab (NL) 4	Natural Science (NS) 3
	Programming for Non-CS Majors 3	Scholarship in Practice – non major (SP) 3
	Understanding Plural Societies (UP) 3	Cultural Competence (CC) 3
	Scholarship in Practice (SP) 3	Humanities (HU) 3
	Open Elective 3	Open Elective 3
	Total 16	Total 15
Year 3	Fall	Spring
	Course credit	Course credit
	Professional Writing (PW) 3	<i>Teams & Organizations</i> 3
	<i>Object-Oriented Programming</i> 3	<i>Data Modeling and Manipulation</i> 3
	<i>Information Organization</i> 3	<i>HCI/UX/UI Design</i> 3
	<i>Statistics for Information Science</i> 3	<i>Information User Needs & Assessment</i> 3
	Open Elective 3	<i>Information & Org. Decision Making</i> 3
	Total 15	Total 15
Year 4	Fall	Spring
	Course credit	Course credit
	<i>Technologies, Infrastructure, and Architecture</i> 3	<i>Integrative Capstone</i> 3
	<i>Advanced Data Science</i> 3	<i>Web-Enabled Databases</i> 3
	<i>Data Sources & Manipulation</i> 3	Open Elective 3
	<i>Data Visualization</i> 3	Open Elective 3
	Open Elective 3	Open Elective 1
	Total 15	Total 13

Total credits = 120

Bold signifies major prerequisite, bold italics signify major core courses, italics signifies major electives

Notes: All students must complete two Distributive Studies courses that will also count for the I-Series requirement. * Students may also fulfill Understanding Plural Society and Cultural Competence with courses from Distributive Studies.

BSIS (Data Science specialization) Two Year Academic Plan for students entering with 60 credits and Associates degree

Year 3	Fall	Spring
	Course credit	Course credit
	Introduction to Info Science 3	Teams & Organizations 3
	Professional Writing (PW) 3	Data Modeling and Manipulation 3
	Object-Oriented Programming 3	HCI/UX/UI Design 3
	Information Organization 3	Information User Needs & Assessment 3
	Statistics for Information Science 3	<i>Information & Org. Decision Making</i> 3
	Total 15	Total 15
Year 4	Fall	Spring
	Course credit	Course credit
	Technologies, Infrastructure, and Architecture 3	Integrative Capstone 3
	<i>Advanced Data Science</i> 3	<i>Web-Enabled Databases</i> 3
	<i>Data Sources & Manipulation</i> 3	Open Elective 3
	<i>Data Visualization</i> 3	Open Elective 3
	Open Elective 3	Open Elective 3
	Total 15	Total 15

Bold signifies major prerequisite, bold italics signify major core courses, italics signifies major electives

Total credits = 60

Montgomery College -> BSIS Course Plans: AA in General Education

Bolded are major prerequisites

Year 1	Fall	Spring
	Fall	Spring
	Course credit	Course credit
	EN 101: Techniques of Reading & Writing I 3 (if needed for EN 102/9; elective if not needed)	ENGF: English Foundation: 3 EN 102 or EN 109
	MATF: Math Foundation: MA 110 3 or higher course	HLHF: Health Foundation: 1 HE 100 or other HLHF course
	ARTD: Arts Distribution 3	NSND: Natural Sciences Distribution 4 without (or with) Lab
	NSLD: Natural Sciences Distribution with Lab 4	BSSD1: Behavioral and Social Sciences 3 Distribution: PSY 102 or other BSSD course
	(E): MA 113 (Intro to Probability) 3	(E) CS 140 (Introduction to programming) 3
		(E) MA 117 (Elements of statistics) 3
	Total 16	Total 17
Year 2		
	Fall	Spring
	Course credit	Course credit
	SPCF: Speech Foundation: SP 108 SP 112 3	ARTD or HUMD: Arts or Humanities 3 Distribution
	BSSD2: Behavioral and Social Sciences 3 Distribution	CULTURE: AN101, AN105, EN204, 3 GE102, GE110, HS151, HS161, HS203, HS207, HS208, or HS210
	HUMD: Humanities Distribution 3	(E): Elective 3
	PE: PE101-199 – Physical education elective 1	(E): Elective 3
	(E): Elective 3	
	(E): Elective 3	
	Total 16	Total 12

Total credits = 61

Montgomery College -> BSIS Course Plans AA in Computer Science & Technologies – Computer Science

Bolded are major prerequisites. Waive MATH 113 since MATH 181 Calculus I is more advanced

Year 1	Fall	Spring
	Fall	Spring
	Course credit	Course credit
	EN 101: Techniques of Reading & Writing I 3 (if needed for EN 102/9; elective if not needed)	ENGF: English Foundation: 3 EN 102 or EN 109
	MATF: Math Foundation: MA 181 4 or higher course	HLHF: Health Foundation: 1 HE 100 or other HLHF course
	ARTD: Arts Distribution 3	BSSD2: Behavioral and Social Sciences 3 Distribution
	NSLD: Natural Sciences Distribution with Lab 4	CS: CS 103 (Computer Science I) 4
	BSSD1: Behavioral and Social Sciences 3 Distribution: PSY 102 or other BSSD course	CS: CS 182 (Calculus II) 4
Year 2	Total 17	Total 15
	Fall	Spring
	Course credit	Course credit
	SPCF: Speech Foundation: SP 108 SP 112 3	ARTD or HUMD: Arts or Humanities 3 Distribution
	HUMD: Humanities Distribution 3	CULTURE: AN101, AN105, EN204, 3 GE102, GE110, HS151, HS161, HS203, HS207, HS208, or HS210
	NSND: Natural Sciences Distribution without lab 3	(E) CS 140 (Intro to Programming) 3
	CS: CS 204 (Computer Science II) 4	(E): CS 136 (Systems Analysis & Design) 3 or elective
	CS: CS 256 (Intro to discrete structures) 4	(E) MA 117 (Elements of statistics) 3 or elective
	Total 17	Total 15

Total credits = 64

Montgomery College -> BSIS Course Plans: AA in Computer Science & Technologies – Information Systems

Bolded are major prerequisites

Year 1	Fall	Spring
	Fall	Spring
	Course credit	Course credit
	EN 101: Techniques of Reading & Writing I 3 (if needed for EN 102/9; elective if not needed)	ENGF: English Foundation: 3 EN 102 or EN 109
	MATF: Math Foundation: MA 110 3 or higher course	HLHF: Health Foundation: 1 HE 100 or other HLHF course
	ARTD: Arts Distribution 3	BSSD2: Behavioral and Social Sciences 3 Distribution: PSY 102
	NSLD: Natural Sciences Distribution with Lab 4	IS: CS 136 (Systems Analysis and Design) 3 or elective
	BSSD1: Behavioral and Social Sciences 3 Distribution EC 201 (Principles of Economics I)	IS: CS 110 (Computer Concepts) or 4 CS/CA elective
		(E) MA 113 or Elective 3
	Total 16	Total 17
Year 2	Fall	Spring
	Course credit	Course credit
	SPCF: Speech Foundation: SP 108 SP 112 3	ARTD or HUMD: Arts or Humanities 3 Distribution
	HUMD: Humanities Distribution 3	CULTURE: AN101, AN105, EN204, 3 GE102, GE110, HS151, HS161, HS203, HS207, HS208, or HS210
	IS: CS 140 (Intro to Programming) 3	NSND: Natural Sciences Distribution without lab 3
	(E): CS 103 (Computer Science I) or CS 213 4	(E): CS 204, CS 214 or elective 3
	(E): MA 117 or elective 3	
	Total 16	Total 12

Total credits = 61

APPENDIX E: FACULTY CREDENTIALS

First Name	Last Name	Title	Degree	Institution	Areas of Expertise
June	Ahn	Assistant Professor, iSchool and College of Education	Ph.D. in Urban Education Policy	University of Southern California	Social computing, youths and education; education informatics, policy and reform
John	Bertot	Professor	Ph.D. in Information Systems	Syracuse University	Information and telecommunications policy; e-government; planning and evaluating library services, with an emphasis on networked services; public library use of and involvement with the internet
Brian	Butler	Professor	Ph.D. in Information Systems	Carnegie Mellon	IT impacts on geographically-embedded markets, business continuity management, dynamics of online communities and other technology-supported groups, social networking systems, politics of technology implementation in organizations, impact of electronic commerce on inter-organizational relationships
Marshini	Chetty	Assistant Professor	Ph.D. in Human-Centered Computing	Georgia Institute of Technology	Broadband networks, information and communication technologies for development; Human Computing Interaction
Vedat	Diker	Senior Lecturer and Director of iSchool Programs at Shady Grove	Ph.D. in Information Science	SUNY Albany	Modeling and simulation of socio-economic systems, social and human impacts of information and communication technologies.
Niklas	Elmqvist	Associate Professor	Ph.D. in Computer Science	Chalmers University of Technology, Sweden	Information visualization, visual analytics, human-computer interaction
Leah	Findlater	Assistant Professor	Ph.D. in Computer Science	University of British Columbia	Personalized interfaces, interaction techniques, accessibility, and information and communication technologies for development

Jen	Golbeck	Associate Professor	Ph.D. in Computer Science	University of Maryland, College Park	Social networks, trust, intelligent systems, semantic web
Paul	Jaeger	Professor	J.D. and Ph.D. in Information Studies	Florida State University	Information law and policy, access for underserved populations, disability and accessibility, information and human rights, e-government, and social theory of information
Katy	Lawley	Lecturer	Ph.D. in Information Studies	University of Maryland, College Park	Metadata, organization of information, structures for representing information spaces, cognitive aspects of information seeking
Doug	Oard	Professor	Ph.D. in Electrical Engineering	University of Maryland, College Park	Information technology, user modeling, information retrieval
Katie	Shilton	Assistant Professor	Ph.D. in Information Studies	University of California, Los Angeles	Social and ethical implications of emerging technologies; information policy; social values and technology design
Jessica	Vitak	Assistant Professor	Ph.D. in Media and Information Studies	Michigan State University	Computer-mediated communication, social media, relationship maintenance, impression management, privacy, social capital, context collapse
Kathy	Weaver	Lecturer	Ph.D. in Information Systems	University of Maryland, Baltimore County	Computerized learning experiences, computerized conversation agents
Andrea	Wiggins	Assistant Professor	Ph.D. in Information Science and Technology	Syracuse University	Collaboration, data management, open participation systems, citizen science
Susan	Winter	Lecturer and Associate Dean of Research	Ph.D. in Business Administration	University of Arizona	ICT on the organization of work
Yla	Tausczik	Assistant Professor	Ph.D. in Social and Personality Psychology	University of Texas at Austin	Social computing, online communities, computer-mediated communication, problem-solving in groups

APPENDIX F: COURSE DESCRIPTIONS

BS in Information Science Course Descriptions

CORE courses (10 courses, 30 credits)

- 1. Introduction to Information Science (3 credits)**
Prerequisite or co-requisite for all other BSIS courses. This introductory course examines the breadth of topics covered within Information Science, including the nature and roles of information and information institutions, information behavior, studying information behavior, information policy, and the information professions.
- 2. Information Organization (3 credits)**
Introductory course examining the theories, concepts, and principles of information, information representation, indexing, record structures, and presentation of information. Topics to be covered include the methods and strategies to develop systems for storage, organization, and retrieval of information in a variety of organizational and institutional settings.
- 3. Information User Needs and Assessments (3 credits)**
This course will focus on the use of information by individuals, including the theories, concepts, and principles of information, information behavior and mental models. Methods for determining information behavior and user needs, including accessibility issues will be examined and strategies for using information technology to support individual users and their specific needs will be explored.
- 4. Teams & organizations (3 credits)**
Prerequisite: PSYC 100. This course examines the principles of managing projects through planning and execution including estimating costs, managing risks, scheduling, staff and resource allocation, communication, tracking, and control. There will also be a focus on the principles, methods and types of leadership and team development with an emphasis on goal setting, motivation, problem solving, and conflict resolution.
- 5. Data Modeling and Manipulation (3 credits)**
This course is an introduction to databases, the relational model, entity-relationship diagrams, user-oriented database design and normalization, and Structured Query Language (SQL). Through labs, tests, and a project, students develop both theoretical and practical knowledge of relational database systems.
- 6. Technologies, Infrastructure and Architecture (3 credits)**
Prerequisite: Data Modeling & Manipulation. This course examines the basic concepts of local and wide-area computer networking including an overview of services provided by networks, network topologies and hardware, packet switching, client/server architectures, network protocols, and network servers and applications. The principles and techniques of information organization and architecture for the Web environment will be covered along with such topics as management, security, authentication, and policy issues associated with

distributed systems.

7. Statistics for Information Science (3 credits)

Prerequisite: Math 115 (or higher) and STAT 100 (or equivalent). This course is an introduction to descriptive and inferential statistics, graphical techniques, and the computer analysis of data. Topics to be covered include basic procedures of hypothesis testing, correlation and regression analysis, and the analysis of continuous and binary dependent variables.

8. Object-Oriented Programming (3 credits)

Prerequisite: CMSC 122 or CMSC 106. This course is an introduction to programming, emphasizing understanding and implementation of applications using object-oriented techniques. Topics to be covered include program design and testing as well as implementation of programs.

9. User-Centered Research and Design (3 credits)

Prerequisite: PSYC 100 & CMSC 122 or CMSC 106. This course is an introduction to human-computer interaction (HCI), this course focuses on how HCI connects psychology, information systems, computer science, and human factors. User-centered design and user interface implementation methods discussed include identifying user needs, understanding user behaviors, envisioning interfaces, and utilizing prototyping tools, with an emphasis on incorporating people in the design process from initial field observations to summative usability testing.

10. Integrative Capstone (Systems Analysis & Design) (3 credits)

Prerequisite or Co-requisite: Completion of BSIS Core Courses or by permission. This project-based course will focus on structured systems analysis and design efforts, including analyzing system context, behavior, and structure; identifying stakeholders; gathering requirements; and redesigning systems to make them more beneficial to the organization.

Areas of Specialization

The first specialization to be offered is Data Science. The DS specialization is intended for students who want to follow the “Data Analyst,” data scientist, or information analyst path, thus requiring advanced understanding and skills for managing, manipulating, and mobilizing data to extract insight, create value, and achieve organizational goals in a variety of sectors. Through successful completion of five electives, students in the Data Science specialization will learn to manage, manipulate, analyze, and present published and unpublished data to extract insight, create value, and achieve organizational goals in a variety of sectors. Data science electives will focus on commonly used data handling, manipulation and analytic processes, tools, and techniques.

Data Science Specialization Electives (5 courses = 15 credits)

1. Information for Decision Making (3 credits)

Prerequisite: MATH 115 (or higher) & STAT 100 (or equivalent). This course examines the use of information in organizational and individual decision-making, including the roles of information professionals and information systems in informed decision-making through techniques such as

data analysis and regression, optimization, sensitivity analysis, decision trees, risk analysis and business simulation models.

2. Data Sources and Manipulation (3 credits)

Prerequisite: Information Organization, Data Modeling and Manipulation and Object-Oriented Programming. This course will examine knowledge organization using classificatory structures and creation of metadata element sets for representation. It will also be an exploration of data sources including survey research, experimentation, observation, archival research, and in-depth interviewing focusing on practical issues of data collection, preparation, management, storage, retrieval and analysis. Other topics will include the creation, application, and use of a variety of systems and techniques for information organization and representation.

3. Advanced Data Science (3 credits)

Prerequisite: Statistics for Information Science. This course will be an exploration of some of the best and most general approaches to get the most information out of data through clustering, classification, and regression techniques. Topics include storage and scaling of large heterogeneous data, statistical inference, probability, experimental design, machine learning, network analysis, information visualization, and data ethics and policy.

4. Web-Enabled Databases (3 credits)

Prerequisite: Data Modeling and Manipulation. This course will be an exploration of the basic methods and tools for developing dynamic, database-driven web sites, including acquiring, installing, and running web servers, database servers, and connectivity applications.

5. Data Visualization (3 credits)

This course is an exploration in the theories, methods, and techniques of the visualization of information, including the effects of human perception, the aesthetics of information design, the mechanics of visual display, and the semiotics of iconography.