



## University Senate TRANSMITTAL FORM

<b>Senate Document #:</b>	14-15-25
<b>PCC ID #:</b>	14024
<b>Title:</b>	Proposal to Establish a Bachelor of Science in Information Science
<b>Presenter:</b>	Gregory Miller, Chair, Senate Programs, Curricula, and Courses Committee
<b>Date of SEC Review:</b>	February 12, 2015
<b>Date of Senate Review:</b>	March 5, 2015
<b>Voting (highlight one):</b>	<ol style="list-style-type: none"><li>1. On resolutions or recommendations one by one, or</li><li>2. In a single vote</li><li>3. To endorse entire report</li></ol>
<b>Statement of Issue:</b>	<p>The College of Information Studies proposes to establish a Bachelor of Science in Information Science. 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, this program will prepare students to make a difference through information and technology by understanding, assessing, creating and managing systems to meet the needs of people, organizations and society in a variety of contexts.</p> <p>This program will draw on the strengths of the College of Information Studies across several domains: information policy, digital curation, information behavior, knowledge management, information visualization, mobile computing, online behavior, records management, social network analysis, information retrieval, privacy, and others. The program will differ from traditional Information Systems degree programs, which are typically offered by business schools and focus on system analysis and design within a business context. The proposed program will focus more on the nature of information, information behavior, and information technology, as it engages with a broader spectrum of information contexts, such as non-profit, government, and individual contexts. The program will provide excellent preparation for students interested in a variety of careers that include analyst, user experience and user interface designer, content manager,</p>

	<p>records manager, project manager, webmaster, knowledge manager, privacy officer, litigation support manager, and online community manager, among others.</p> <p>To earn the degree, students must complete 120 credits, of which 48 credits will be required for the major. There will be 33 credits of core requirements, including Introduction to Information Science; Information Organization; Information User Needs and Assessments; Teams and Organizations; Data Modeling and Manipulation; Technologies, Infrastructure and Architecture; Statistics for Information Science; Professional Writing, Object-Oriented Programming, User-Centered Research and Design, and Integrative Capstone (Systems Analysis &amp; Design). Students will also take 15 credits of restricted electives, for which students may opt to take an informal specialization in Data Science, which would include the following courses: Information for Decision Making; Data Sources and Manipulation, Advanced Data Science, Web-Enabled Databases, and Data Visualization.</p> <p>This STEM program will require new resources, and program delivery will begin only when those resources are identified. The first offering is planned to be at the Universities at Shady Grove, and resources from the University System of Maryland will be sought as part of a larger, system-wide, strategy for increasing instructional capacity in STEM fields in Montgomery County.</p> <p>The Senate PCC committee approved the proposal at its meeting on February 6, 2015.</p>
<b>Relevant Policy # &amp; URL:</b>	N/A
<b>Recommendation:</b>	The Senate Committee on Programs, Curricula, and Courses recommends that the Senate approve this new Program.
<b>Committee Work:</b>	The Committee considered the proposal at its meeting on February 6, 2015. Ann Weeks and Susan Winter of the College of Information Studies, presented the proposal and responded to questions. After discussion, the Committee voted unanimously to recommend the proposal, with the following strong recommendation. The Committee discussed a potential gap in the curriculum related to students developing a sufficient understanding of the role of language and culture in data elements. The PCC recommended that the College look for opportunities to address this either through courses in Linguistics, Anthropology, or Language, or through modules within the proposed courses. The College responded positively by indicating that they would look to address that gap by incorporating language and culture elements in its core courses,

	through a specialization in e-discovery, and by recommending LING220 once the program is delivered on the College Park campus. The PCC focused on initial delivery of the program at the Universities at Shady Grove, and recommended that the College return to the PCC prior to first delivery of the program on the College Park campus, with the expectation that revisions will likely be identified after some experience is gained at Shady Grove.
<b>Alternatives:</b>	The Senate could decline to approve the new program
<b>Risks:</b>	If the Senate does not approve the new program then the University will lose an opportunity to offer a new program that will help students gain advanced technical knowledge and strong administrative and communication skills, skills that will prepare them for the expanding field of information-related occupations.
<b>Financial Implications:</b>	This program will require new resources, and program delivery will begin only when those resources are identified.
<b>Further Approvals Required:</b> <i>(*Important for PCC Items)</i>	If the Senate approves this proposal, it would still require further approval by the President, the Board of Regents, and the Maryland Higher Education Commission.

THE UNIVERSITY OF MARYLAND, COLLEGE PARK  
PROGRAM/CURRICULUM/UNIT PROPOSAL

• Please email the rest of the proposal as an MSWord attachment to [pcc-submissions@umd.edu](mailto:pcc-submissions@umd.edu).

PCC LOG NO.

14024

• Please submit the signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus.

**College/School:** INFO - College of Information Studies  
**College/School Unit Code-First 8 digits:** 01203500

**Department/Program:** College of Information Studies  
**Department/Program Unit Code-Last 7 digits:** 1350101

**Type of Action (choose one):**

- |   |   |
|---|---|
| <input type="checkbox"/> Curriculum change (including informal specializations)     | <input checked="" type="checkbox"/> <i>New academic degree/award program</i>        |
| <input type="checkbox"/> Curriculum change for an LEP Program                       | <input type="checkbox"/> New Professional Studies award iteration                   |
| <input type="checkbox"/> <i>Renaming of program or formal Area of Concentration</i> | <input type="checkbox"/> New Minor  |
| <input type="checkbox"/> <i>Addition/deletion of formal Area of Concentration</i>   | <input type="checkbox"/> Request to create an online version of an existing program |
| <input type="checkbox"/> <i>Suspend/delete program</i>                              |   |

*Italics indicate that the proposed program action must be presented to the full University Senate for consideration.*

**Summary of Proposed Action:**

The College of Information Studies (iSchool) proposes to offer a Bachelor of Science in Information Science (BSIS) degree. 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 make a difference through information and technology by understanding, assessing, creating and managing systems to meet the needs of people, organizations and society in a variety of contexts.

BSIS will provide both breadth and depth developing graduates that select the right problems to work on, apply intellectual rigor and practical judgment in designing solutions, and exemplify professionalism through effective communication and collaboration. BSIS graduates will understand the context of problems, respect diversity, and leverage the powerful tools of the information age. The program is designed to allow students to complement their general education studies by gaining breadth and depth in core Information Science concepts and techniques. Graduates are expected to be employable in a variety of information science positions in non-profit, for-profit, government, and entrepreneurial settings and to be well-prepared to undertake advanced graduate studies in their field of choice.

**Departmental/Unit Contact Person for Proposal:** Susan J. Winter

APPROVAL SIGNATURES - Please print name, sign, and date. Use additional lines for multi-unit programs.

1. Department Committee Chair Susan J Winter Susan J Winter 12-9-14
2. Department Chair \_\_\_\_\_
3. College/School PCC Chair ANN C WEEKS Ann C Weeks 12-9-14
4. Dean JENNIFER PREECE Jennifer Preece 12-9-14

5. Dean of the Graduate School (if required) \_\_\_\_\_

6. Chair, Senate PCC Gregory Miller [Signature] 2/6/15

7. University Senate Chair (if required) \_\_\_\_\_

8. Senior Vice President and Provost \_\_\_\_\_

PROPOSAL FOR  
NEW INSTRUCTIONAL PROGRAM  
UNIVERSITY OF MARYLAND AT COLLEGE PARK, MARYLAND  
BACHELOR OF SCIENCE IN INFORMATION SCIENCE DEGREE

COLLEGE OF INFORMATION STUDIES  
DEAN JENNIFER PREECE

BACHELOR OF SCIENCE

## **I. EXECUTIVE SUMMARY**

The College of Information Studies (iSchool) proposes to offer a Bachelor of Science in Information Science (BSIS) degree. 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 make a difference through information and technology by understanding, assessing, creating and managing systems to meet the needs of people, organizations and society in a variety of contexts.

BSIS will provide both breadth and depth developing graduates that select the right problems to work on, apply intellectual rigor and practical judgment in designing solutions, and exemplify professionalism through effective communication and collaboration. BSIS graduates will understand the context of problems, respect diversity, and leverage the powerful tools of the information age. The program is designed to allow students to complement their general education studies by gaining breadth and depth in core Information Science concepts and techniques. Graduates are expected to be employable in a variety of information science positions in non-profit, for-profit, government, and entrepreneurial settings and to be well-prepared to undertake advanced graduate studies in their field of choice.

## **II. OVERVIEW and RATIONALE**

The iSchool takes an interdisciplinary approach and uses a wide variety of methodologies to explore major issues at the confluence of information, technology, and people. In the digital age, information science has emerged as a major field of study addressing the challenges of building an information-rich society. More data and more diverse forms of data, advanced technologies, and changing human needs have created an explosion of interest in advancing information science and practice. Methods and technologies for creating, collecting, classifying, representing, organizing, storing, curating, manipulating, accessing, retrieving, presenting, applying and analyzing information play a central role in yielding valuable insights and informing decision making. Equally important is tailoring these methods and techniques to the individual and social context in which digital information is a major concern including the cultural, economic, historic, legal and political environment.

Traditionally, information science has been the purview of highly specialized knowledge institutions such as libraries, museums and archives. Now, information challenges are being faced by a broad range of organizations, communities and individuals. Massive amounts of data are being routinely collected and analyzed leading to new discoveries and significant changes in government, business, science and society at large. The proposed Bachelor of Science in Information Science (BSIS) will help meet the growing need for skilled professionals who can understand, assess, create and manage information systems to meet stakeholder needs.

The BSIS prepares students to make a difference through information and technology by selecting the right problems to work on, applying intellectual rigor and practical judgment in

designing appropriate solutions, and exemplifying professionalism through effective communication and collaboration. BSIS will provide both breadth and depth developing employable graduates that understand the context of problems, respect diversity, and leverage the powerful tools of the information age.

The proposed BSIS is an innovative STEM degree program (Higher Education General Information Systems (HEGIS) code 0702: Information Sciences and Systems; U.S. Department of Education's National Center for Education Statistics Classification of Instructional Programs (CIP) code 11.0404 Information Science/Studies) that addresses the growing organizational demand for skilled information professionals who know how to manage information resources and technology in diverse domains, as well as those who understand data and information management, organizational management, information policy, computer science, and information systems. Consistent with the UMD Strategic Plan, the proposed program would "educate engaged and thoughtful citizens for life in a complex, vibrant, democratic society" and "enhance the State's economic well-being." 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 not currently served by the existing programmatic offerings in computer science, engineering, social sciences, the liberal arts, and humanities.

The BSIS will provide a broad grounding in information science concepts through a set of required core courses and depth in an area that best represents the student's interests by completion of advanced elective courses. The BSIS program is a bachelor's degree program for upper division college students with a basic understanding of a programming language, human psychology, statistics, and advanced mathematics. The program is designed to allow students who have completed their general education studies to complete their degree in two calendar years. It is not necessary that students have specific technology experience, although most are expected to come with knowledge of, and experience with, a variety of technologies. It is expected to attract a broad array of students who are interested in careers where the following are lead objectives:

- Meeting the needs of information creators and potential users who require continuing information organization, analysis, curation, monitoring, retrieval and analysis.
- Modifying and evolving approaches to meet changing information needs.
- Managing both published and unpublished information, where the volume of information is growing and is likely to be unstructured.
- Tying information management to personal, organizational and community objectives.

Graduates will be employable in a variety of information-intensive venues such as knowledge management offices, municipal, special and corporate libraries, auditing or legal offices, management services, administrative analysis settings, and elsewhere. Job titles are expected to include: Analyst, User Experience and User Interface Designer, Content Manager, Records Manager, Project Manager, Webmaster, Knowledge Manager, Privacy Officer, Litigation Support Manager, Online Community Manager, among others. The new BSIS degree will also provide excellent preparation for students who choose to continue their studies through enrollment in the existing specialized master's level degrees that the iSchool offers.



The new degree will draw on iSchool faculty strengths and research interests in several Information Science domains (e.g., information policy, digital curation, information behavior, knowledge management, information visualization, mobile computing, online behavior, records management, social network analysis, information retrieval, privacy, and others). Resources permitting (and by vote of the Faculty Assembly), the iSchool will initially offer a general Information Science degree and a specialization in Data Science (DS). Additional specializations may be added as resources permit to meet market needs.

***Market Analysis and Need***

In this information age, the market for sophisticated information professionals has grown dramatically and, like many STEM fields, Information Science is 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 primarily due 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 and strong administrative and communication skills<sup>1</sup>.

While other colleges and universities in the vicinity offer bachelor’s degrees in information systems (see Table 1), the UMD iSchool information science program proposed here is unique. The BSIS will be a STEM degree that is grounded in a perspective that equally emphasizes information, technology, and people and integrates significant design and development components. In contrast, other local programs are offered in departments and schools with a different perspective and focus. Schools of Business focus on managerial decision making to meet the needs of industry providing limited focus on information, interaction and system design and development. The industry focus of Schools of Business also limits the applicability of these information systems degrees to the needs arising from market failures and the information issues of non-profits, governments, society and individuals. 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.

<b>Schools of Business</b>	Howard University Loyola University of Maryland Morgan State University Salisbury University University of Baltimore University of Maryland College Park
<b>Departments of Computer Science, Engineering, and/or Information Technology</b>	George Mason University Towson University University of Maryland, Baltimore County University of Maryland College Park University of Maryland University College
<b>Professional Studies</b>	George Washington University

Table 1. Colleges and universities in the College Park Maryland vicinity offer bachelor’s degrees in related areas

<sup>1</sup> <http://www.bls.gov/ooh/>

In the Baltimore, MD-Washington, DC, metropolitan area, the University of Maryland's program will be the only bachelor's degree in information science that is offered by a College of Information Studies, thus the only program with the balanced and broad iSchool perspective. Appendix A lists bachelor's programs in information systems in Maryland and the Washington, DC, metropolitan area.

Similarly, each of Maryland's Historically Black Institutions (HBIs) (Bowie State University, Coppin State University, Morgan State University, and University of Maryland Eastern Shore) offer undergraduate programs with an emphasis on the business environment that have some overlap with the proposed BSIS. However, these programs emphasize aspects of information systems, technology, and processes that differ 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, where coursework integrates the study of management information systems with topics in business, accounting, and economics and coverage of information science issues outside of industry settings is limited. Morgan State University offers a Bachelor of Science in Information Systems, also 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.

In the international iSchool community of academic programs, bachelor's degree programs have been increasing in number in recent years. Fourteen self-identified iSchools<sup>2</sup> in the United States currently offer Bachelor of Science degrees. Of those, eight programs are similar to the proposed program in terms of the topical emphasis of the curriculum and prerequisites, which combine information studies, computer science, statistics, and mathematics. Appendix B describes all Bachelor of Science programs in United States iSchools, with similar programs indicated in bold font.

*Initial Specialization in Data Science:* Within the information sciences, there is a particularly healthy job market for "big data-savvy...professionals at all levels."<sup>3</sup> As digital data generation and storage have undergone exponential growth, there is a pressing need for graduates able to leverage big data to create new opportunities by increasing organizational transparency, instrumenting controlled digital experiments, tailoring offering to population segments, supporting human decision-making, and encouraging innovation.<sup>4</sup> McKinsey Global Institute reports that, "By 2018 the United States alone faces a shortage of 140,000 to 190,000 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."<sup>5</sup> The Bureau of Labor Statistics recognizes big

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<sup>2</sup> See [www.ischools.org](http://www.ischools.org) for a list of iSchools.

<sup>3</sup> Dillow, C. (2013). Big employment boom. *Fortune*, 09/04/2013. Available at: <http://tech.fortune.cnn.com/2013/09/04/big-data-employment-boom/>

<sup>4</sup> Ibid

<sup>5</sup> 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. <sup>1</sup>McKinsey&Company (May 2011), Available at:

data as a major growth area and reports that big data work is happening across several of its current occupational and industry classes.<sup>6</sup>

On November 23, 2014, a one-time search of two online employment databases representing private and federal government sectors found many opportunities for graduates (within 60 miles of College Park, MD for Monster and in Maryland, DC and Virginia for USAJobs). The keywords and hits are reported below in Table 2.

	Monster (private sector)	USAJobs (federal government)
Data analysis	779	239
Data mining	71	6
Data scientist	49	30
Data specialist	405	185
Information analysis	1,000+	385
Total	2,300+	945

Table 2. Data- and information-oriented job opportunities near College Park Maryland for BSIS graduates. Figures might include duplicates where two keyword searches retrieved the same job.

The proposed program includes a specialty in Data Science. Only a handful of programs in the United States offer undergraduate majors, minors, or concentrations in data science, which has been called, “the competitive advantage of the future.”<sup>7</sup> Locally, George Mason University in Fairfax, Virginia, offers a B.S. in Computational and Data Science with much more of an emphasis on mathematical modeling and less coverage of information science issues and of contextual application. Currently, no other iSchool offers an undergraduate data science specialty, 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. Appendix A lists bachelor’s programs in data science in Maryland and the Washington, DC, metropolitan area

The proposed BSIS will enable the iSchool and the University of Maryland to increase access to high-quality, professional STEM education for residents of Maryland. Because of the University’s and College’s reputation, students from other locations will be attracted to the BSIS program, as well.

### III. CURRICULUM

#### *Description of the BSIS*

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[http://www.mckinsey.com/Insights/MGI/Research/Technology\\_and\\_Innovation/Big\\_data\\_The\\_next\\_frontier\\_for\\_innovation](http://www.mckinsey.com/Insights/MGI/Research/Technology_and_Innovation/Big_data_The_next_frontier_for_innovation)

<sup>6</sup> Royster, S. (2013). Working with big data. *Occupational Outlook Quarterly*, 57(3). Available at: <http://www.bls.gov/opub/ooq/2013/fall/art01.pdf>.

<sup>7</sup> 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>

The BSIS will teach future information professionals to manage issues at the confluence of information, technology and people with a focus on the users of information, the contextual domain, the content, the technology, and the global environment (See Figure 1).

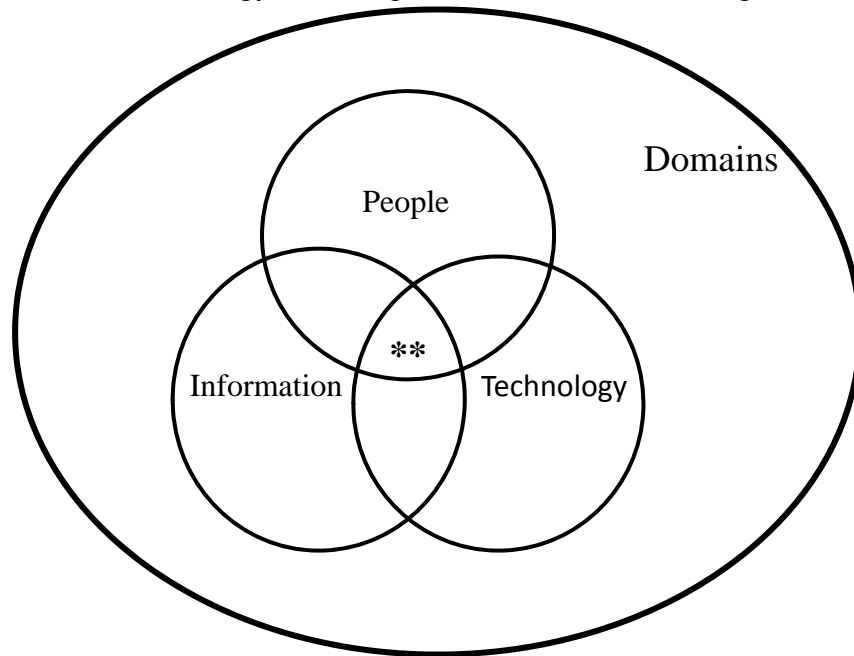


Figure 1: BSIS Curriculum Overview

As shown below, mastery will include both breadth and depth. Breadth will be obtained through successful completion of 11 core courses: two in each of the major areas (information, technology, and people), one in each area of overlap between two major areas and two integrative courses at the nexus of all three areas. Depth will be developed through successful completion of five elective courses of the student’s choosing.

**BSIS Core Courses**

Two integrative core courses focus on issues at the confluence of information, technology and people: Introduction to Information Science and Integrative Capstone/Field Study. The remaining nine core courses and the emphasis of each is shown below in Table 3.

	<b>Information</b>	<b>Technology</b>	<b>People</b>
<b>Information</b>	<ul style="list-style-type: none"> <li>➤ Information Organization</li> <li>➤ Statistics for Information Science</li> </ul>		
<b>Technology</b>	<ul style="list-style-type: none"> <li>➤ Technologies, Infrastructure, and Architecture</li> </ul>	<ul style="list-style-type: none"> <li>➤ Object-Oriented Programming</li> <li>➤ Data Modeling and Manipulation</li> </ul>	

<b>People</b>	➤ Information User Needs and Assessments	➤ User-Centered Research and Design	➤ Teams and Organizations ➤ Professional Writing
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Table 3: BSIS core courses by focus.

Students will also complete five Program Electives.

***Program-Level Learning Outcomes***

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

1. Demonstrate an understanding of information design and management in organizations: the interrelationships among information consumers or creators, information content, and the conduits through which information flows.
2. Apply basic principles to the design and management of information.
3. Assess the impact of existing or emerging technologies on organizational practices and the flow of information across various organizations.
4. Employ state-of-the-art tools and techniques to create, manage, and analyze information.
5. Demonstrate an understanding of such issues as the security, privacy, authenticity, and integrity of information within organizations.

***Brief Catalog Description***

The Bachelor of Science in Information Science (BSIS) program addresses the growing need for skilled information professionals who can strategically develop and use new information methods and technologies in a wide variety of contexts. The BSIS program prepares students to understand, assess, create and manage information services and systems, organizations, and digital technologies from a multidisciplinary perspective. The BSIS program teaches future information professionals to manage issues related to information users, information, organization and content, technology, and the global environment.

***General Requirements for Degree***

The BSIS degree requires the completion of 120 credit hours with a minimum 2.0 grade point average. The specific course requirements are the General Education requirements and a 48 credit hour program as outlined below.

The specific course requirements include:

- Eleven core courses (listed below)
- Five major electives

Students will also be required to complete four pre-requisite courses from outside the major requirements. Three of these may count toward their general education requirements.

Additional open electives may be iSchool courses, courses taken in other departments at the University of Maryland, or courses taken elsewhere, including the metro area’s Consortium of Universities. A maximum of nine upper division credits may be taken outside the iSchool.

Undergraduate School policies and procedures on transfer of credit apply to courses taken at other institutions.

***List of Courses by Title and Number (Including Prerequisites)***

Core (11 Courses = 33 credits)

1. Introduction to Information Science  
Prerequisite or co-requisite for all other BSIS courses
2. Information Organization
3. Information User Needs and Assessments
4. Teams and Organizations  
Prerequisite: Introduction to Psychology
5. Professional Writing
6. Data Modeling and Manipulation
7. Technologies, Infrastructure and Architecture  
Prerequisite: Data Modeling and Manipulation
8. Statistics for Information Science  
Prerequisite: College Math and Introduction to Statistics
9. Object-Oriented Programming  
Prerequisite: Introduction to Programming for Non-Computer Science Majors
10. User-Centered Research and Design  
Prerequisite: Introduction to Psychology and Object-Oriented Programming
11. Integrative Capstone (Systems Analysis & Design)  
Prerequisite: Completion of BSIS Core Courses

Major Electives (5 courses = 15 credits)

Topics will reflect Faculty and student interests and are expected to vary.

**BSIS Course Descriptions**

Core

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 is Intro to Psychology

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. **Professional Writing** (3 credits)

[Delivered by the English Department]

This course will examine professionalism, communication, teamwork, leadership, and interpersonal networking to strengthen students as they seek to excel professionally. Topics to be covered include developing and presenting business cases and project plans, personal branding, conducting informational interviews, and effective written and oral communication.

6. **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.

7. **Technologies, Infrastructure and Architecture** (3 credits)

Prerequisite is 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.

8. **Statistics for Information Science** (3 credits)

Prerequisite: College Math and Introduction to Statistics

This course is an introduction 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.

9. **Object-Oriented Programming** (3 credits)

Prerequisite: Introduction to Programming for Non-Computer Science Majors

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.

**10. User-Centered Research and Design (3 credits)**

Prerequisite: Introduction to Psychology & Object-Oriented Programming

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.

**11. Integrative Capstone (Systems Analysis & Design) (3 credits)**

Prerequisite or Corequisite: is Completion of BSIS Core Courses

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***

A Data Science (DS) specialty will be the only specialty initially available to students. Data science involves extracting information from diverse data sources to create information without exposing users to the underlying analytics or data.<sup>8</sup> 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. As the market demands and resources permit, the iSchool expects to add additional specializations in areas such as digital youth, online health, or new media.

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  
Prerequisite is College Math and Introduction to Statistics
2. Data Sources and Manipulation  
Prerequisite is Information Organization, Data Modeling and Manipulation, and Object-Oriented Programming
3. Advanced Data Science  
Prerequisite is Statistics for Information Science
4. Web-Enabled Databases  
Prerequisite is Data Modeling and Manipulation

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<sup>8</sup> Booz, Allen, Hamilton (2013) A Field Guide to Data Science.



## 5. Data Visualization

### Elective Course Descriptions

#### 1. **Information for Decision Making** (3 credits)

Prerequisite: College Math and Introduction to Statistics

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 connectability 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.

### ***Reliance Upon Courses Provided through other Academic Units***

BSIS students will complete their General Education outside of the iSchool course offerings including an introductory course in psychology, an advanced college math course and a course in statistics. In addition, students will complete an introductory programming course offered by the computer science department for non-majors. One course in Professional Writing for Information

Science students will also be designed and delivered by the University of Maryland, College Park’s (UMDCP) Department of English.

**Academic Requirements**

The requirements to earn the BSIS are summarized in Appendix C and the projected BSIS class schedule is shown in Table 4 (no specialization) and Table 5 (data science specialization).

<b>Year 3</b>	<b>Fall</b>	<b>Spring</b>
	Course credits	Course credits
	<i>Introduction to Info Science</i> 3	<i>Teams &amp; Organizations</i> 3
	<i>Professional Writing (PW)</i> 3	<i>Data Modeling and Manipulation</i> 3
	<i>Object-Oriented Programming</i> 3	<i>User-Centered Research and Design</i> 3
	<i>Information Organization</i> 3	<i>Information User Needs &amp; Assessment</i> 3
	<i>Statistics for Information Science</i> 3	<i>BSIS Major Elective</i> 3
	<b>Total 15</b>	<b>Total 15</b>
<b>Year 4</b>	<b>Fall</b>	<b>Spring</b>
	Course credits	Course credits
	<i>Technologies, Infrastructure, and Architecture</i> 3	<i>Integrative Capstone</i> 3
	<i>BSIS Major Elective</i> 3	<i>BSIS Major Elective</i> 3
	<i>BSIS Major Elective</i> 3	Open Elective 3
	<i>BSIS Major Elective</i> 3	Open Elective 3
	Open Elective 3	Open Elective 3
	<b>Total 15</b>	<b>Total 15</b>

Bold signifies major prerequisite, bold italics signify major core courses

Table 4: BSIS Projected Class Schedule with No Specialization

<b>Year 3</b>	<b>Fall</b>	<b>Spring</b>
	Course credits	Course credits
	<i>Introduction to Info Science</i> 3	<i>Teams &amp; Organizations</i> 3
	<i>Professional Writing (PW)</i> 3	<i>Data Modeling and Manipulation</i> 3
	<i>Object-Oriented Programming</i> 3	<i>User-Centered Research and Design</i> 3
	<i>Information Organization</i> 3	<i>Information User Needs &amp; Assessment</i> 3
	<i>Statistics for Information Science</i> 3	<i>Information &amp; Org. Decision Making</i> 3
	<b>Total 15</b>	<b>Total 15</b>
<b>Year 4</b>	<b>Fall</b>	<b>Spring</b>
	Course credits	Course credits
	<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 &amp; Manipulation</i> 3	Open Elective 3
	<i>Data Visualization</i> 3	Open Elective 3
	Open Elective 3	Open Elective 3
	<b>Total 15</b>	<b>Total 15</b>

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

Table 5: BSIS Projected Class Schedule with Data Science Specialization

**Total credits = 60**

#### **IV. STUDENT LEARNING OUTCOMES AND ASSESSMENT**

The degree to which the BSIS is meeting its goals will be assessed by means of the program's Learning Outcomes Assessment Plan. The Undergraduate Programs 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 will contain the results of the assessment and recommendations for program improvement based on the results.

The Learning Outcomes and Assessment Plan is included in Appendix D. Learning outcomes will be assessed throughout the Information Science core courses through appropriate metrics designed for each course.

##### ***Academic Oversight and Program Governance***

The proposed program will be directed through the mechanisms that are in place in the iSchool to provide direction for the existing programs. The College will have an Undergraduate Academic Program Director who will be a full-time faculty appointed by the Dean for a three-year term and may be reappointed. The Undergraduate Academic Program Director, in collaboration with the Associate Deans, the Academic Administrators, and members of the faculty, shall provide intellectual leadership for the BSIS and chair the standing committee that is responsible for determining the academic and pedagogic strategies, and the courses, that make up the program.

The Undergraduate Program Committee will meet regularly to deal with issues that are specific to the BSIS, including the approval of new course offerings and the regular review of courses, specializations, and admissions. In cooperation with the iSchool Student Services Office's (SSO) the committee will develop and review policies for the recruitment and admission of students. Each fall semester, the committee shall set admissions requirements and guidelines for the BSIS Program. The committee or its designee shall review and approve or deny BSIS students' petitions. The committee or its designee shall review BSIS students in academic difficulty and make recommendations for remedial actions or refer students to the Committee on Students in Academic Difficulty. The committee or its designee shall make decisions regarding scholarships, awards, or honors that may be given only to students in the BSIS Program and perform other administrative functions delegated by the College Assembly or requested by the Dean.

The Programs, Courses, and Curriculum (PCC) Committee will advise the Undergraduate Program Committee about university regulations for reviews, program revisions, and creation of new programs, tracks, specializations, certificates, and courses. The PCC will review all recommendations regarding programs, tracks, specializations, or certificates before the information is presented to the College Assembly for approval.

The College Assembly will formulate, approve, and review educational and other policies specific to the College. It shall discuss and/or initiate action deemed necessary or advisable by the Undergraduate Academic Program Director. It shall regularly review the strategic plan of the College and recommend and approve changes.

### ***Quality Assurance***

The iSchool is developing a set of metrics that will be used to develop, monitor, evaluate, and continually improve the quality of its programs. 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 of each course.

The metrics address areas such as: career outcomes, student satisfaction, course overview and introduction; learning objectives, assessment and measurement; resources and materials; learner engagement; course technology; learner support; and accessibility. Additional metrics are being developed to evaluate faculty and student services.

## **V. FACULTY AND ORGANIZATION**

### ***Program Faculty and their Credentials***

Courses will be taught by regular, full-time College Park faculty or adjunct faculty who have been approved for teaching by the Committee on Appointments of the iSchool. Regular, full-time College Park faculty will teach a high proportion of the courses.

## **VI. COMMITMENT TO DIVERSITY**

The iSchool at the University of Maryland is dedicated to supporting non-traditional students, students from diverse ethnic backgrounds, as well as those working for organizations that support underrepresented groups. Courses will feature 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.

## **VII. REQUIRED RESOURCES**

The resources required to design and deliver the BSIS will depend partly upon the number and location of students. However, the following expense categories are expected:

### **Personnel**

- BSIS Director
- BSIS Coordinator
- Administrative Support/Student Services
- Tenured/Tenure Track and Professional Faculty
- Adjunct Teachers
- Graduate Student Assistantships

### **Space**

- Offices and Labs
- Classroom and Instruction

## **VIII. CONCLUSION**

Information Science is a rapidly expanding field with a growing need for professionals skilled in understanding, assessing, creating and managing systems to meet the needs of people, organizations and society in a variety of contexts. The BSIS offered by the University of Maryland's iSchool is designed to meet this need. This innovative program will prepare students to understand issues at the confluence of information, technology and people and to make a difference through information and technology by selecting the right problems to work on, applying intellectual rigor and practical judgment in designing solutions.

**APPENDIX A**  
**BACHELOR'S PROGRAMS IN INFORMATION SYSTEMS, INFORMATION**  
**SCIENCE, AND DATA SCIENCE IN THE VICINITY OF UMCP**

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

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

**APPENDIX B**  
**U.S. ISCHOOLS WITH BACHELOR OF SCIENCE PROGRAMS**  
(Similar programs highlighted in bold)

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



University of Maryland, Baltimore County	Department of Information Systems	B.S. in Information Systems <a href="http://informationsystems.umbc.edu/home/undergraduate-programs/undergraduate-degree-programs/bachelor-of-science-in-information-systems/">http://informationsystems.umbc.edu/home/undergraduate-programs/undergraduate-degree-programs/bachelor-of-science-in-information-systems/</a>	
<b>University of Michigan</b>	School of Information	B.S. in Information (beginning F2014) <a href="https://www.si.umich.edu/content/bsi">https://www.si.umich.edu/content/bsi</a>	<ul style="list-style-type: none"> <li>• Computational informatics,</li> <li>• Data mining &amp; Information analysis,</li> <li>• Life science informatics,</li> <li>• Social computing</li> </ul>
<b>University of North Carolina, Chapel Hill</b>	School of Information and Library Science	B.S. in Information Science <a href="http://sils.unc.edu/programs/undergraduate/bsis">http://sils.unc.edu/programs/undergraduate/bsis</a>	<ul style="list-style-type: none"> <li>• Databases,</li> <li>• Geographic information systems,</li> <li>• Human-computer interaction,</li> <li>• Health information systems,</li> <li>• Networks,</li> <li>• Programmer/Analyst,</li> <li>• Web development,</li> <li>• Web design</li> </ul>
University of North Texas	College of Information, Department of Library and Information Sciences	B.S. in Information Science <a href="http://lis.unt.edu/BSIS">http://lis.unt.edu/BSIS</a>	<ul style="list-style-type: none"> <li>• Information science &amp; Knowledge organization,</li> <li>• Project &amp; Knowledge management,</li> <li>• Information management &amp; Health informatics,</li> <li>• Digital content &amp; Information systems</li> </ul>
University of Pittsburgh	School of Information Sciences	B.S. in Information Science <a href="http://www.ischool.pitt.edu/bsis/">http://www.ischool.pitt.edu/bsis/</a>	<ul style="list-style-type: none"> <li>• Information systems,</li> <li>• User-centered design,</li> <li>• Networks and security</li> </ul>
<b>University of Washington</b>	Information School	B.S. in Informatics <a href="http://ischool.uw.edu/academics/informatics">http://ischool.uw.edu/academics/informatics</a>	<ul style="list-style-type: none"> <li>• Human-computer interaction,</li> <li>• Information architecture</li> </ul>
University of Wisconsin, Milwaukee	School of Information Studies	B.S. in Information Science and Technology <a href="http://www4.uwm.edu/sois/programs/undergraduate/bsist.cfm">http://www4.uwm.edu/sois/programs/undergraduate/bsist.cfm</a>	

**APPENDIX C**  
**ACADEMIC REQUIREMENTS**  
**THE BACHELOR OF SCIENCE in INFORMATION SCIENCE PROGRAM**

The BSIS degree program is an academic STEM program. 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 a SSO advisor, the BSIS student devises a course plan to meet the graduation requirements: eleven core courses, five major electives, and four open electives, for a total of twenty courses (60 credits). **At least 51 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 (11 Courses = 33 credits)

1. Introduction to Information Science
2. Information Organization
3. Information user needs and assessments
4. Teams & organizations
5. Professional Writing
6. Data Modeling and Manipulation
7. Technologies, Infrastructure and Architecture
8. Statistics for Information Science
9. Object-Oriented Programming
10. User-Centered Research and Design
11. 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/ Business 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, as well as the following:

- A student must maintain a cumulative grade point average of C (2.0 on a 4.0 scale) for all courses taken for undergraduate credit since matriculation into the program.
- A student must complete the required core courses with a course grade of C (2.0 on a 4.0 scale) or better in each course.
- 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.
- A student whose cumulative grade point average is lower than 2.0 upon or after the completion of fifteen credit hours of undergraduate level courses is automatically placed on academic probation by the Undergraduate School for the following full semester. (See Undergraduate Catalog for more information about steps)
- A student must complete a program of 60 credit hours of approved upper level course work with a grade point average of at least a C (2.0 on a 4.0 scale) to earn a degree.

### ***Dismissal from the Program***

A student found guilty of plagiarism will be dismissed from the program. A student is automatically removed from academic probation when he or she corrects the problem that led to probationary status. A student placed on or withdrawn from academic probation will receive written notification of such actions and of relevant College procedures. (See The Undergraduate School Catalog for information on the Undergraduate School policy on academic probation.)

### ***Repeating a Course***

A student may choose to take a course more than once or may be required to do so by the iSchool's Undergraduate Program Committee. While the course may be repeated as required by the faculty or to earn a better grade, the course counts only once toward the degree. All grades for undergraduate students, whether or not the course counts toward the degree, remain as part of the student's permanent record.

### ***Core Courses***

The iSchool's Undergraduate Program Committee may require a student who fails to earn a C or better in a required core course to repeat the course. The following are restrictions:

- Permission of the Undergraduate Program Committee is required to repeat a required core course.
- The Undergraduate Program Committee may specify when and/or with which instructor the course is to be repeated.
- Whether higher or lower, the later grade will be counted toward the degree and used in computing the grade point average.



## APPENDIX D ASSESSMENT PLAN BACHELOR'S OF INFORMATION SCIENCE

Program Contact: Dr. Ann Carlson Weeks  
Phone: (301)405-2060  
E-mail: acweeks@umd.edu

Date submitted to Academic Unit Head: \_\_\_\_\_

### *Expected BSIS Student Learning Outcomes*

- 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 effective written and oral presentation skills in a professional setting.
- Demonstrate the principles and techniques of database design.
- Demonstrate the principles, evaluation, and implementation of local and wide-area computer networking, including issues about 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 connectability 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.

## Resources and Expenditures:

Note that new resources will be required to initiate this program. The budgets below are an estimate of the cost of operating the program at the Universities at Shady Grove. A budget request will be made to the University System of Maryland for resources for this program as part of a larger initiative to bring new programs to Shady Grove's new Biomedical Sciences and Engineering Building, for which construction is scheduled to begin in winter 2017.

**TABLE 1: RESOURCES**

Resources Categories	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds		\$0	\$0	\$0	\$0	\$0
2. Tuition/Fee Revenue (c+g below)		\$77,240	\$238,667	\$409,701	\$590,775	\$695,410
a. #FT Students		9	27	45	63	72
b. Annual Tuition/Fee Rate		\$8,081	\$8,324	\$8,573	\$8,831	\$9,096
c. Annual FT Revenue (a x b)		\$72,731	\$224,739	\$385,802	\$556,327	\$654,876
d. # PT Students		1	3	5	7	8
e. Credit Hour Rate		\$317	\$327	\$337	\$347	\$357
f. Annual Credit Hours		14	14	14	14	14
g. Total Part Time Revenue (d x e x f)		\$4,509	\$13,928	\$23,899	\$34,448	\$40,534
3. Grants, Contracts, & Other External Sources		\$0	\$0	\$0	\$0	\$0
4. Other Sources		\$0	\$0	\$0	\$0	\$0
<b>TOTAL (Add 1 - 4)</b>	<b>\$0</b>	<b>\$77,240</b>	<b>\$238,667</b>	<b>\$409,701</b>	<b>\$590,775</b>	<b>\$695,410</b>

**TABLE 2: EXPENDITURES**

Expenditure Categories	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1.F.T. Faculty		\$332,500	\$388,360	\$400,011	\$412,011	\$424,371
2. P.T. Faculty		\$10,000	\$20,000	\$40,000	\$41,200	\$41,200
3.Admin. Staff	\$239,400	\$246,582	\$253,979	\$261,599	\$269,447	\$277,530
4.Total Support Staff	\$0	\$0	\$79,800	\$82,194	\$84,660	\$87,200
4. Equipment		\$75,000	\$25,000	\$25,000	\$25,000	\$25,000
5. Library		\$5,000	\$5,000	\$5,000	\$5,000	\$5,000
6. USG Room Usage Fees	\$15,000	\$15,000	\$20,000	\$20,000	\$20,000	\$20,000
6. New or Renovated Space		\$0	\$0	\$0	\$0	\$0
7. Other Expenses: Operational Expenses	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
<b>TOTAL (Add 1 - 7)</b>	<b>\$264,400</b>	<b>\$694,082</b>	<b>\$802,139</b>	<b>\$843,804</b>	<b>\$867,318</b>	<b>\$890,301</b>

## BSIS (Choose Your Own Path 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
	<b>MATH 115 (MA)</b> 3	<b>STAT 100</b> (Analytic Reasoning: AR) 3
	<b>PSYC 100</b> (History/Social Science: HS) 3	History/Social Science (HS) 3
	Humanities (HU) 3	<i><b>Introduction to Info Science</b></i> 3
	UNIV 100 1	Open Elective 3
	Open Elective 3	
	<b>Total 16</b>	<b>Total 15</b>
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, CMSC 106 or 122 or higher	Course credit	Course credit
	Natural Science Lab (NL) 4	Natural Science (NS) 3
	<b>CMSC 106 (DS – SP) or 122</b> 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
	<b>Total 16</b>	<b>Total 15</b>
Year 3	Fall	Spring
	Course credit	Course credit
	<i><b>Professional Writing (PW)</b></i> 3	<i><b>Teams &amp; Organizations</b></i> 3
	<i><b>Object-Oriented Programming</b></i> 3	<i><b>Data Modeling and Manipulation</b></i> 3
	<i><b>Information Organization</b></i> 3	<i><b>User-Centered Research and Design</b></i> 3
	<i><b>Statistics for Information Science</b></i> 3	<i><b>Information User Needs &amp; Assessment</b></i> 3
	Open Elective 3	<i>Major elective</i> 3
	<b>Total 15</b>	<b>Total 15</b>
Year 4	Fall	Spring
	Course credit	Course credit
	<i><b>Technologies, Infrastructure, and Architecture</b></i> 3	<i><b>Integrative Capstone</b></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
	<b>Total 15</b>	<b>Total 13</b>

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

**Total credits = 120**

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
	<b>MATH 115 (MA)</b> 3	<b>STAT 100</b> (Analytic Reasoning: AR) 3
	<b>PSYC 100</b> (History/Social Science: HS) 3	History/Social Science (HS) 3
	Humanities (HU) 3	<i><b>Introduction to Info Science</b></i> 3
	UNIV 100 1	Open Elective 3
	Open Elective 3	
	<b>Total 16</b>	<b>Total 15</b>
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, CMSC 106 or 122 or higher	Course credit	Course credit
	Natural Science Lab (NL) 4	Natural Science (NS) 3
	<b>CMSC 106 (DS – SP) or 122</b> 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
	<b>Total 16</b>	<b>Total 15</b>
Year 3	Fall	Spring
	Course credit	Course credit
	<i><b>Professional Writing (PW)</b></i> 3	<i><b>Teams &amp; Organizations</b></i> 3
	<i><b>Object-Oriented Programming</b></i> 3	<i><b>Data Modeling and Manipulation</b></i> 3
	<i><b>Information Organization</b></i> 3	<i><b>User-Centered Research and Design</b></i> 3
	<i><b>Statistics for Information Science</b></i> 3	<i><b>Information User Needs &amp; Assessment</b></i> 3
	Open Elective 3	<i>Information &amp; Org. Decision Making</i> 3
	<b>Total 15</b>	<b>Total 15</b>
Year 4	Fall	Spring
	Course credit	Course credit
	<i><b>Technologies, Infrastructure, and Architecture</b></i> 3	<i><b>Integrative Capstone</b></i> 3
	<i><b>Advanced Data Science</b></i> 3	<i><b>Web-Enabled Databases</b></i> 3
	<i><b>Data Sources &amp; Manipulation</b></i> 3	Open Elective 3
	<i><b>Data Visualization</b></i> 3	Open Elective 3
	Open Elective 3	Open Elective 1
	<b>Total 15</b>	<b>Total 13</b>

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

**Total credits = 120**

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 (UMD SG)  
 Students enter with Associated degree = 60 credits (see other tables)

Year 3	Fall	Spring
	Course credit	Course credit
	<i>Introduction to Info Science</i> 3	<i>Teams &amp; Organizations</i> 3
	<i>Professional Writing (PW)</i> 3	<i>Data Modeling and Manipulation</i> 3
	<i>Object-Oriented Programming</i> 3	<i>User-Centered Research and Design</i> 3
	<i>Information Organization</i> 3	<i>Information User Needs &amp; Assessment</i> 3
	<i>Statistics for Information Science</i> 3	<i>Information &amp; Org. Decision Making</i> 3
	<b>Total 15</b>	<b>Total 15</b>
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 &amp; Manipulation</i> 3	Open Elective 3
	<i>Data Visualization</i> 3	Open Elective 3
	Open Elective 3	Open Elective 3
	<b>Total 15</b>	<b>Total 15</b>

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

**Total credits = 60**

Montgomery College/Shady Grove Course Plans  
AA in General Education

Bolded are major prerequisites

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

**Total credits = 61**

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

**Total credits = 64**

Montgomery College/Shady Grove Course Plans  
AA in Computer Science & Technologies – Information Systems

Bolded are major prerequisites

Year 1	Fall	Spring
	<b>Fall</b>	<b>Spring</b>
	Course credit	Course credit
	EN 101: Techniques of Reading & Writing I (if needed for EN 102/9; elective if not needed) 3	ENGF: English Foundation: EN 102 or EN 109 3
	MATF: Math Foundation: MA 110 or higher course 3	HLHF: Health Foundation: HE 100 or other HLHF course 1
	ARTD: Arts Distribution 3	BSSD2: Behavioral and Social Sciences Distribution: <b>PSY 102</b> 3
	NSLD: Natural Sciences Distribution with Lab 4	IS: CS 136 (Systems Analysis and Design) or elective 3
	BSSD1: Behavioral and Social Sciences Distribution EC 201 (Principles of Economics I) 3	IS: CS 110 (Computer Concepts) or CS/CA elective 4
		(E ) <b>MA 113</b> or Elective 3
<b>Year 2</b>	<b>Total 16</b>	<b>Total 17</b>
	<b>Fall</b>	<b>Spring</b>
	Course credit	Course credit
	SPCF: Speech Foundation: SP 108 SP 112 3	ARTD or HUMD: Arts or Humanities Distribution 3
	HUMD: Humanities Distribution 3	CULTURE: AN101, AN105, EN204, GE102, GE110, HS151, HS161, HS203, HS207, HS208, or HS210 3
	IS: <b>CS 140</b> (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 ): <b>MA 117</b> or elective 3	
	<b>Total 16</b>	<b>Total 12</b>

**Total credits = 61**

**TO:** Dr. Susan J. Winter  
Assistant Program Director, MIM

**FROM:** Karen Patterson  
Librarian for the College of Information Studies, College Park

Daniel Feinberg  
Librarian for the College of Information Studies, Shady Grove

**DATE:** October 24, 2013

**RE:** Library Resources to Support the Bachelor of Science in Information Science Degree

Data analytics is interdisciplinary in nature covering information science, information management, business management, computer science, information technology, information systems, and data management.

The University of Maryland (UM) Libraries currently support the graduate programs offered by of the College of Information Studies and the undergraduate/graduate programs in business and computer science.

The new undergraduate degree at Universities of Shady Grove is based on the Data Analytics Specialization in the Masters in Information Management (MIM) program. Undergraduate versions of the existing master level courses will be created, which will result in all new classes. Taking this into consideration, the University of Maryland Libraries current library collections, collecting practices and funding are adequate to support the instruction and research needs of the newly proposed undergraduate degree, the Bachelor of Science in Information Science.

### **Monographs**

The Libraries' current collection of information science books and related books in business, and computer science is sufficient to meet the needs of the program. The ongoing acquisition of scholarly books is expected to be adequately covered through existing acquisition practices and budgeting.

Priddy Library houses a collection of monographs and serials to support the information studies program.

The McKeldin Library and Engineering and Physical Sciences Library (EPSL) houses a major collection of monographs and serials relevant to information studies, business and computer science. Undergraduate students at Shady Grove can request monographs to be sent to Priddy Library. At this time, the UM libraries collection policy recommends e-preferred monographs, in lieu of print resources, which provides the undergraduates with immediate electronic access.

For example, the Safari Tech Books Online is an electronic reference library for Information Technology and Computer Science books. It includes hundreds of books published by O'Reilly, designed to address the needs for reference content in the areas of information technology, desktop applications and business.

Membership in the University System of Maryland and Affiliated Institutions (USMAI) consortium of sixteen libraries enables the students to borrow monographs from these participating libraries: Bowie State University, Center for Environmental Science, Coppin State University, Frostburg State University, Morgan State University, Salisbury University, St. Mary's College of Maryland, Towson University, University of Baltimore, University of Baltimore Law Library, University of Maryland, Baltimore County (UMBC), University of Maryland, Eastern Shore, University of Maryland Health Sciences and Human Services Library, University of Maryland Law Library, University of Maryland University College.

### **The Collection: Journals**

A search was performed in *Journal Citation Reports 2012*, a database that uses citation data to rank and determine the impact factor of journals in an academic field. Of the **85** titles listed in the Information Science and Library Science category, UM Libraries has **84%** of the titles. The Libraries' current serial holdings includes both core and relevant titles in the field. To support the proposed degrees access is available at the present time to the following ranked journals:

Annual Review of Information Science & Technology  
ASLIB Proceedings  
Government Information Quarterly  
Information & Management  
Information Processing and Management  
Information Society  
Information Systems Research  
Journal of Information Science  
Journal of Management Information Systems  
Journal of the American Society for Information Science and Technology  
MIS Quarterly

In reviewing the Journal Citation Reports 2012 list, here are a few titles that are not UM holdings and relevant to the field (price is based on 2014 quote):

- *Journal of Information Technology*                      \$ 1,105 per year
- *European Journal of Information Systems.*      \$1,101 per year
- *Journal of Knowledge Management*              \$3,379 per year
- *Journal of Organizational and End User Computing*      \$625 per year

The **total** for the above journal titles subscriptions is \$6,210.00

The JCR titles are just a small percentage of the serials titles held, for example, Library & Information Science Source database, the premiere Information studies database, has over 440 journal titles available full-text. *A significant part of the UM Libraries serials collection is electronically accessible for students and faculty.*

After perusing syllabi and in prior discussion with faculty, the following journals support the students enrolled in the MIM program:

*CIO*  
*Forbes*  
*Fortune*  
*McKinsey Quarterly*  
*MIT Sloan Management Review*  
*Harvard Business Review*  
*Public Administration Review*  
*California Management Review*  
*ACM transactions of database systems (TODS)*  
*Communications of the ACM*  
*Interactions*  
*Data & Knowledge Engineering*  
*Data Mining & Knowledge Discovery*  
*International journal of information management*  
*International Journal of Technology Management & Sustainable Development*  
*Journal of Information Systems Technology & Planning*  
*Journal of Information Systems & Planning*  
*Journal of Information Technology & Politics*  
*Managing Information*  
*Wired*

If the current proposal expand to incorporate other specializations in the Information Studies curriculum, the collection presently adequately supports the other specializations.

### **The Collection: Electronic Resources**

The UM Libraries subscribes to the information studies database, Library & Information Science Source. Library & Information Science Source is the definitive resource in the field of library and information science. Library & Information Science Source is a combination of three databases: Library & Information Science Retrospective: 1905-1983, Library Literature & Information Science Full Text and Library, Information Science and Technology Abstracts with Full Text (LISTA).

Additional databases which will support the program are: Business Source Complete, Gartner, Factiva, ACM Digital Library, Computer and Information Systems Abstracts, Computer and Applied Sciences Complete, and IEEE Xplore Digital Library, Science Direct, JSTOR, Scopus, and Web of Science.

### **Interlibrary Loan**

When resources are not part of our holdings within the sixteen University System of Maryland and Affiliated Institutions (USMAI) libraries, the Interlibrary Loan Office can obtain monographs, journal articles, dissertations, government documents and technical reports at no charge to the student or faculty. This service will support the instruction and research needs of the undergraduate students.

## **Staff Resources**

All library personnel provide support to the curricular and research needs of academic departments at the University of Maryland. Two information studies library liaisons are available to provide in-depth research consultations with the undergraduate student. The Priddy Library at Universities of Shady Grove has the liaison on site for the studies. The second liaison is on the College Park campus.

## **Funding**

Based on our assessment, the Libraries' determination is that existing resources would likely be sufficient. However, current resources fall short. In order to support the programs at a level of quality that would be commensurate with the University's goals, additional funding is required.

### **Ongoing funding needs (based on titles listed)**

\$6 210.00	Journal subscriptions
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## **Conclusions**

At the present time, library holdings are at least adequate to support the proposed set of courses. Journal collections, however, remain particularly vulnerable. As a result, the level of future support is dependent upon ongoing funding and other circumstances