10KS5098MS: BIOINFORMATICS: INFORMATION SCIENCES, MS

In Workflow
1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1992 Head (knox@illinois.edu)
3. 1468 Head (kereadel@illinois.edu)
4. LM Dean (kmartens@illinois.edu)
5. LP Dean (knox@illinois.edu)
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8. Provost (kmartens@illinois.edu)
9. Senate EPC (bjlehman@illinois.edu; kmartens@illinois.edu; moorhouz@illinois.edu)
10. Senate (jtempel@illinois.edu)
11. U Senate Conf (none)
12. Board of Trustees (none)
13. IBHE (none)
14. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

Approval Path
1. Wed, 06 May 2020 15:47:39 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Wed, 06 May 2020 15:56:16 GMT
   Emily Knox (knox): Approved for 1992 Head
3. Wed, 06 May 2020 16:25:02 GMT
   Karin Readel (kereadel): Approved for 1468 Head
4. Wed, 06 May 2020 16:35:34 GMT
   Kathy Martensen (kmartens): Approved for LM Dean
5. Wed, 06 May 2020 16:36:27 GMT
   Emily Knox (knox): Approved for LP Dean
   John Wilkin (jpwilkin): Approved for University Librarian
7. Wed, 03 Jun 2020 20:26:46 GMT
   Allison McKinney (agrindly): Approved for Grad_College
8. Tue, 11 Aug 2020 15:39:01 GMT
   Kathy Martensen (kmartens): Approved for Provost

History
1. Sep 9, 2019 by Mary Lowry (lowry)
2. Sep 9, 2019 by Mary Lowry (lowry)

Date Submitted: Wed, 08 Apr 2020 13:29:05 GMT

Viewing: 10KS5098MS: Bioinformatics: Information Sciences, MS
Changes proposed by: Dustin Janes

Proposal Type

Proposal Type:
Concentration (ex. Dietetics)
This proposal is for a:
Revision

Proposal Title:

If this proposal is one piece of a multi-element change please include the other impacted programs here. Example: A BS revision with multiple concentration revisions

Rename and Revise the Library and Information Sciences concentration in the MS in Bioinformatics.

EP Control Number
EP21.004

Official Program Name
Bioinformatics: Information Sciences, MS

Effective Catalog Term
Fall 2020

Sponsor College
School of Information Sciences

Sponsor Department
Information Sciences

Sponsor Name
Emily Knox

Sponsor Email
eknox@illinois.edu

College Contact
Emily Knox

College Contact Email
eknox@illinois.edu
Program Description and Justification

Justification for proposal change:

Renaming: changing the name of the concentration from "Graduate School of Library and Information Science Concentration" to "Information Sciences Concentration"
Justification: alignment with the School name change to "School of Information Sciences"

Curriculum: revising the fields of the curriculum to more accurately represent the areas of study in the concentration
Justification: incorporating fields that were not originally sought at conception of this concentration; such as medical informatics, data mining, and data analysis. The establishment and growth of complementary programs within the school, particularly the MS in Information Management, provides an opportunity to indicate the increased depth and breadth of the information sciences curriculum relevant to bioinformatics.

Is this program interdisciplinary?
Yes

Interdisciplinary Colleges and Departments (list other colleges/departments which are involved other than the sponsor chose above)

College
Information Science, School of

Department
Information Sciences

Do you need to add an additional interdisciplinary relationship?
No

Corresponding Program(s):

<table>
<thead>
<tr>
<th>Corresponding Program(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioinformatics, MS</td>
</tr>
</tbody>
</table>

Academic Level
Graduate

Is This a Teacher Certification Program?
No

Will specialized accreditation be sought for this program?
No
**Enrollment**

Describe how this revision will impact enrollment and degrees awarded.

Unchanged

**Delivery Method**

Is this program available on campus and online?

No

This program is available:

On Campus

**Budget**

Are there budgetary implications for this revision?

No

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?

No

**Resource Implications**

**Facilities**

Will the program require new or additional facilities or significant improvements to already existing facilities?

No

**Technology**

Will the program need additional technology beyond what is currently available for the unit?

No

**Non-Technical Resources**

Will the program require additional supplies, services or equipment (non-technical)?

No
Resources

Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

Unchanged

Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

Unchanged

Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does this new program/proposed change result in the replacement of another program?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

Yes

Required courses

ANSC 542 - Applied Bioinformatics
ANSC 545 - Statistical Genomics
CHBE 571 - Bioinformatics
CPSC 567 - Bioinformatics & Systems Biol
CS 466 - Introduction to Bioinformatics
IB 467 - Principles of Systematics
MCB 432 - Computing in Molecular Biology
CS 411 - Database Systems
CS 466 - Introduction to Bioinformatics
CS 473 - Algorithms
CPSC 565 - Perl & UNIX for Bioinformatics
STAT 428 - Statistical Computing
STAT 440 - Statistical Data Management
STAT 448 - Advanced Data Analysis
STAT 480 - Data Science Foundations
STAT 525 - Computational Statistics
ANSC 441 - Human Genetics
ANSC 444 - Applied Animal Genetics
ANSC 446 - Population Genetics
BIOP 401 - Introduction to Biophysics
BIOP 550 - Biomolecular Physics
CPSC 452 - Advanced Plant Genetics
CPSC 466 - Genomics for Plant Improvement
CPSC 563 - Chromosomes
CPSC 564 - Molecular Marker Data Analyses
CPSC 566 - Plant Gene Regulation
MCB 400 - Cancer Cell Biology
MCB 501 - Advanced Biochemistry

Explain how the inclusion or removal of the courses/subjects listed above impacts the offering departments.

These are the courses outside of the iSchool listed in the program.

Financial Resources

How does the unit intend to financially support this proposal?

Unchanged

Will the unit need to seek campus or other external resources?

No

Is this program requesting self-supporting status?

No

Program Regulation and Assessment

Is the career/profession for graduates of this program regulated by the State of Illinois?

No

Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf). For proposals for new bachelor’s degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.

Revised programs

Bioinformatics Revision 8.26.docx
Attach a side-by-side comparison with the existing program AND, if the revision references or adds “chose-from” lists of courses students can select from to fulfill requirements, a listing of these courses, including the course rubric, number, title, and number of credit hours.

Catalog Page Text

Statement for Programs of Study Catalog

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Choose One (1) course from each of the following areas:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Data Stewardship</strong></td>
<td></td>
</tr>
<tr>
<td>IS 455</td>
<td>Database Design and Prototyping</td>
<td></td>
</tr>
<tr>
<td>IS 515</td>
<td>Information Modeling</td>
<td></td>
</tr>
<tr>
<td>IS 537</td>
<td>Theory &amp; Practice of Data Cleaning</td>
<td></td>
</tr>
<tr>
<td>IS 543</td>
<td>Digital Preservation</td>
<td></td>
</tr>
<tr>
<td>IS 547</td>
<td>Foundations of Data Curation</td>
<td></td>
</tr>
<tr>
<td>IS 575</td>
<td>Metadata in Theory &amp; Practice</td>
<td></td>
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<tr>
<td></td>
<td><strong>Data Analytics</strong></td>
<td></td>
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<tr>
<td>IS 407</td>
<td>Introduction to Data Science</td>
<td></td>
</tr>
<tr>
<td>IS 445</td>
<td>Data Visualization</td>
<td></td>
</tr>
<tr>
<td>IS 507</td>
<td>Data, Statistical Models and Information</td>
<td></td>
</tr>
<tr>
<td>IS 527</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>IS 557</td>
<td>Applied Machine Learning: Team Projects</td>
<td></td>
</tr>
<tr>
<td>IS 567</td>
<td>Text Mining</td>
<td></td>
</tr>
<tr>
<td>IS 577</td>
<td>Data Mining</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>System Policy &amp; Design</strong></td>
<td></td>
</tr>
<tr>
<td>IS 419</td>
<td>Entrepreneurial Information Technology Design</td>
<td></td>
</tr>
<tr>
<td>IS 445</td>
<td>Data Visualization</td>
<td></td>
</tr>
<tr>
<td>IS 504</td>
<td>Sociotechnical Information Systems</td>
<td></td>
</tr>
<tr>
<td>IS 584</td>
<td>Advanced Topics in Ethics and Privacy (Privacy in the Internet Age)</td>
<td></td>
</tr>
<tr>
<td>IS 586</td>
<td>Usability Engineering</td>
<td></td>
</tr>
<tr>
<td>IS 594</td>
<td>Advanced Topics in Management and Policy (Information Policy)</td>
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<tr>
<td></td>
<td><strong>Electives</strong></td>
<td>12</td>
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<tr>
<td>IS 424</td>
<td>Social Computing</td>
<td></td>
</tr>
<tr>
<td>IS 464</td>
<td>Information Assurance</td>
<td></td>
</tr>
<tr>
<td>IS 517</td>
<td>Methods of Data Science</td>
<td></td>
</tr>
<tr>
<td>IS 571</td>
<td>Advanced Topics in Use and Users of Information (Info Services for Diverse Users)</td>
<td></td>
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<tr>
<td>INFO 591</td>
<td>Grad Bioinformatics Seminar</td>
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</tr>
<tr>
<td></td>
<td>For Thesis Option up to 8 hours:</td>
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</tr>
<tr>
<td></td>
<td>IS 599</td>
<td>Thesis Research</td>
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<td></td>
<td><strong>Total Hours</strong></td>
<td>36</td>
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</table>

**Other Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Other requirements may overlap</td>
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</tr>
<tr>
<td></td>
<td>A concentration is required.</td>
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</tr>
<tr>
<td></td>
<td>Minimum 500-level Hours Required Overall:</td>
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<tr>
<td></td>
<td>Minimum GPA:</td>
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EP Documentation

DMI Documentation

Banner/Codebook Name
MS: Bioinformatics: LIS - UIUC

Program Code:
10KS5098MS

Conc Code
5098

Degree Code
MS

Major Code
4026

Program Reviewer Comments
Karin Readel (kereadel) (Wed, 06 May 2020 16:23:35 GMT): In appendix B of the "side by side" document, the URL for the campus wide Bioinformatics site (where core courses are listed) is wrong. It should be https://www.informatics.illinois.edu/bioinformatics-masters/

Key: 876
Appendix A: Proposed Curriculum Revisions

<table>
<thead>
<tr>
<th>Current Requirements:</th>
<th>Current Hours</th>
<th>Revised Requirements:</th>
<th>Revised Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Common Core Requirement</td>
<td></td>
<td>Campus Common Core Requirement</td>
<td></td>
</tr>
<tr>
<td>Biology Core</td>
<td>4 Hours</td>
<td>Biology Core</td>
<td>4 Hours</td>
</tr>
<tr>
<td>Computer Science Core</td>
<td>4 Hours</td>
<td>Computer Science Core</td>
<td>4 Hours</td>
</tr>
<tr>
<td>Fundamental Bioinformatics Core</td>
<td>4 Hours</td>
<td>Fundamental Bioinformatics Core</td>
<td>4 Hours</td>
</tr>
</tbody>
</table>

Concentration Core Requirements (choice of 3 in these 4 areas)

<table>
<thead>
<tr>
<th>Current Hours</th>
<th>Revised Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Organization and Knowledge Representation</td>
<td>4 Hours Data Stewardship 4 Hours</td>
</tr>
<tr>
<td>Information Resources, Uses and Users</td>
<td>4 Hours Data Analysis 4 Hours</td>
</tr>
<tr>
<td>Information Systems and Access</td>
<td>4 Hours System Policy and Design 4 Hours</td>
</tr>
<tr>
<td>Disciplinary Focus</td>
<td>4 Hours</td>
</tr>
<tr>
<td>Total Core Requirements</td>
<td>24 hours Total Core Requirements 24 hours</td>
</tr>
<tr>
<td>Electives</td>
<td>12 hours Electives 12 hours</td>
</tr>
<tr>
<td>Total Hours</td>
<td>36 hours Total Hours 36 hours</td>
</tr>
</tbody>
</table>

Appendix B: Current Concentration Core Requirements

CORE REQUIREMENTS

To satisfy the campus core requirements, one (1) course must be taken from each of the three (3) Core Areas: Biology, Computer Science, and Fundamental Bioinformatics. The courses approved for the core in the Biology, Computer Science, and Bioinformatics areas are listed on the campus-wide MS in Bioinformatics site. Additionally, the iSchool requires one (1) four-hour course in three of the following four (4) areas:

Information Organization and Knowledge Representation

LIS 561 Information Modeling
LIS 590II Interfaces to Information Systems
LIS 590I Indexing and Abstracting
LIS 590DM Document Modeling
LIS 590OD Ontology Development
LIS 590ON Ontologies in Natural Science
LIS 590RO Representing and Organizing Information Resources
Information Resources, Uses and Users

LIS 503 Use and Users of Information
LIS 522 Information Sources in the Sciences
LIS 530I Biological Informatics Problems and Resources
LIS 590TR Information Transfer and Collaboration in Science

Information Systems and Access

LIS 453 Systems Analysis and Management
LIS 456 Information Storage and Retrieval
LIS 556 Implementation of Information Retrieval Systems
LIS 560 Digital Libraries
LIS 566 Architecture of Network Information Systems
LIS 590DP Document Processing
LIS 590EP Electronic Publishing
LIS 590LD Literature-based Discovery

Disciplinary Focus

LIS 530B Health Sciences Information Services and Resources
LIS 590HI Healthcare Informatics (Healthcare Infrastructure)
LIS 590BD Biodiversity Informatics

A typical student will thus take 6 required courses (24 hours): 1 Biology, 1 Computer Science, 1 Fundamental Bioinformatics, and 3 LIS. The student must then choose 3 courses (12 hours) of electives to complete the degree. It is strongly encouraged that up to 2 courses of these electives (8 hours) are thesis. A recommended list of electives is given above. Our expectation is that each student will arrange a custom program of study, suitable for the information management of their particular bioinformatics application.

A student who has already completed coursework comparable to one or more of the required courses for the MS in bioinformatics prior to enrolling in the degree program may petition to waive enrollment in that required course and replace it with a comparable number of hours of elective credit toward the MS in bioinformatics. Such a petition needs to be approved by the advisor, the iSchool associate dean, and the Graduate College. Additionally, students may request transfer of credit for graduate level coursework from any accredited institution (maximum 8 hours) that has not already been applied towards a degree.

Appendix C:
Revised Concentration Core Requirements

Students will complete 36 graduate credit hours to earn an MS in Bioinformatics from the iSchool. The MS degree is offered in both thesis and non-thesis options. To satisfy the campus core requirements, one course must be taken from each of the 3 core
areas: biology, computer science, and fundamental bioinformatics. The courses approved for these core requirements are listed on the campus-wide MS in Bioinformatics site. In addition, students completing the Information Sciences Concentration must choose 1 course from each of the following 3 areas: Data stewardship; Data analytics; and Systems policy and design. A course can meet only 1 of the requirements (i.e. the same course cannot satisfy both the iSchool and Campus level requirements. Similarly a course can only be used to satisfy one of the area requirements within the iSchool).

The student must then choose 3 courses (12 hours) of electives to complete the degree. Up to 2 courses of these electives (8 hours) can be thesis. A recommended list of electives is given below. Our expectation is that each student will arrange a custom program of study, suitable for the information management of their particular bioinformatics application.

### Data Stewardship

- IS 455  Databases Design and Prototyping
- IS 531  Foundations of Data Curation
- IS 532  Theory & Practice Data Cleaning
- IS 561  Information Modeling
- IS 562  Metadata in Theory & Practice
- IS 586  Digital Preservation

### Data Analytics

- IS 457  Intro to Data Science
- IS 542  Data, Stat, Info
- IS 557  Text Mining
- IS 559  Network Analysis
- IS 590DT  Data Mining
- IS 590DV  Data Visualization

### System Policy & Design

- IS 490IT  Entrepreneurial IT Design
- IS 543  Sociotechnical Info Sys
- IS 555  Usability Engineering
- IS 590DV  Data Visualization
- IS 590IP  Information Policy
- IS 590PV  Privacy in the Internet Age
• IS 590SDP Scientific Data Policy Seminar

Electives

• IS 490GH  Global Health Informatics
• IS 530I  Bio Informatics Probs & Res
• IS 583  Grad Bioinformatics Seminar
• IS 590OD  Ontology Development
• IS 590MD  Methods for Data Sciences
• IS 590SF  Social Computing
• IS 462  Information Assurance
• IS 547  Info Srvcs Diverse Populations