Intelligent Systems Program
Degree Requirements 2016 - 2017

The degree requirements described here are subject to change by the ISP faculty. A student has the option of meeting all of the requirements in effect when he or she entered the ISP or meeting all of the prevailing requirements of the program. Please check here periodically for changes and speak to your adviser or the ISP director if you have any questions about degree requirements or related issues.

To earn the Master of Science (MS) degree in the ISP, a student must successfully complete all of the following:

- Course Requirements
- MS Research Project

To earn the Doctor of Philosophy (PhD) degree in the ISP, a student must successfully complete all of the following:

- Course Requirements
- PhD Preliminary Evaluation Research Project
- PhD Comprehensive Examination
- PhD Dissertation Proposal Defense
- PhD Dissertation and Oral Defense

The student's adviser must be a member of the ISP faculty. Note that each new student is initially assigned an administrative adviser. A student's administrative adviser will not necessarily be the student's MS or PhD adviser.

To obtain a degree, a student must also be in good standing and at full student status (not provisional). To remain in good standing, a student must make sufficient progress on their degree requirements, and attend all but two (2) of the scheduled AI Forum talks per term and sign in so they get credit. Failure to meet this requirement will affect application for Andrew Mellon Fellowship candidacy, Dietrich School of Arts & Sciences Program funding candidacy, summer GSA funding, ISP Travel Grants and similar funding. In case of extenuating circumstances, the student should communicate the possible absence to the ISP director and administrator.

Course Requirements

General:

- Students must earn a grade of B- or better in each of the courses in the appropriate ISP curriculum (the General Intelligent Systems Track or the Biomedical Informatics Track).
- Students must complete at least 72 (PhD) or 24 (MS) credits (including coursework and research) with a QPA of at least 3.0.
- See information about transfer and cross-registered credits from other institutions and about course substitutions.

**General Intelligent Systems Track Curriculum**

**Prerequisites:**

Students are expected to have the undergraduate prerequisites needed to take the graduate courses required by the ISP. These may be required if not taken.

**Curriculum 2016 - 2017:**

<table>
<thead>
<tr>
<th>Courses</th>
<th>Master's Degree</th>
<th>Doctoral Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First-year students</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISSP 2020 Topics in Intelligent Systems</td>
<td>encouraged, but not required</td>
<td>required</td>
</tr>
<tr>
<td>INFSCI 3005 Intro to Doctoral Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISSP 2030 Advanced Topics in Intelligent Systems</td>
<td>required</td>
<td></td>
</tr>
<tr>
<td>ISSP 2160 / CS 2710 Foundations of Artificial Intelligence</td>
<td>required</td>
<td>required</td>
</tr>
<tr>
<td><strong>Core</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISSP 2170 / CS 2750 Machine Learning</td>
<td>2 required</td>
<td>2 required</td>
</tr>
<tr>
<td>ISSP 3712 / CS 3740 Knowledge Representation</td>
<td></td>
<td></td>
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<tr>
<td>ISSP 2230 / CS 2731 Introduction to Natural Language Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Theory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOST 2041 Intro to Statistical Methods 1</td>
<td>1 required</td>
<td>1 required</td>
</tr>
<tr>
<td>BIOST 2042 Intro to Statistical Methods 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOINF 2054 Statistical Foundations for Bioinformatics Data Mining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOINF 2118 Statistical Foundations of Biomedical Informatics</td>
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</table>
Biomedical Informatics Track Curriculum (ISP/MI)

This assumes that a student already has training in a health care field; if this is not so, then the faculty will select a set of courses that teach the student basic medical knowledge, and the student may take these courses as electives.

Prerequisites:

Students are expected to have the undergraduate prerequisites needed to take the graduate courses required by the ISP. These may be required if not taken.

Curriculum 2016 - 2017:
<table>
<thead>
<tr>
<th>Courses</th>
<th>Master's Degree</th>
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<tbody>
<tr>
<td>ISSP 2030 Advanced Topics in Intelligent Systems</td>
<td></td>
<td>required</td>
</tr>
<tr>
<td>ISSP 2083 / BIOINF 2032 Biomedical Informatics Journal Club</td>
<td>required</td>
<td>required</td>
</tr>
<tr>
<td>ISSP 2015 / BIOINF 2011 Foundations of Clinical and Public Health Informatics</td>
<td>required</td>
<td>required</td>
</tr>
<tr>
<td>ISSP 2160 / CS 2710 Foundations of Artificial Intelligence</td>
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<tr>
<td>ISSP 2170 / CS 2750 Machine Learning</td>
<td>1 required</td>
<td>1 required</td>
</tr>
<tr>
<td>ISSP 2230 / CS 2731 Introduction to Natural Language Processing</td>
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<tr>
<td>CS 1510 Design and Analysis of Algorithms (undergraduate level)</td>
<td>1 required</td>
<td>1 required</td>
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<tr>
<td>CS 2150 Design and Analysis of Algorithms (graduate level)</td>
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<tr>
<td>CS 3150 Advanced Topics in Design and Analysis of Algorithms</td>
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</tr>
<tr>
<td>BIOST 2041 Intro to Statistical Methods 1</td>
<td>1 required</td>
<td>1 required</td>
</tr>
<tr>
<td>BIOST 2042 Intro to Statistical Methods 2</td>
<td></td>
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<tr>
<td>BIOINF 2054 Statistical Foundations for Bioinformatics Data Mining</td>
<td></td>
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<tr>
<td>BIOINF 2118 Statistical Foundations of Biomedical Informatics</td>
<td>1 required</td>
<td>1 required</td>
</tr>
<tr>
<td>STAT 2131 Applied Statistical Methods 1</td>
<td></td>
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<tr>
<td>STAT 2132 Applied Statistical Methods 2</td>
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<tr>
<td>ISSP 2070 / BIOINF 2101 Probabilistic Methods for Computer-based Decision Support</td>
<td>2 required</td>
<td>2 required</td>
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<tr>
<td>ISSP 2081 Foundations of Bioinformatics</td>
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<tr>
<td>ISSP 2240 / INFSCI 2130 Decision Analysis and Decision Support Systems</td>
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<tr>
<td>BIOINF 2111 Cognitive Studies for Health Informatics</td>
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<tr>
<td>BIOINF 2017 Clinical Research Informatics</td>
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<tr>
<td>BIOINF 2121 Human Computer Interaction and Evaluation Methods</td>
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<td></td>
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<tr>
<td>BIOINF 2117 Applied Medical Informatics</td>
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<td></td>
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</table>
Courses

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<thead>
<tr>
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<th>Doctoral Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOINF 2016 Foundations of Translational Bioinformatics</td>
<td></td>
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<tr>
<td>BIOINF 2124 Principles of Global Health Informatics</td>
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</tbody>
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Advanced courses

Graduate-level (2000 or higher, 3 credits or more) lecture course that has your adviser's approval as being relevant to your studies in the ISP.

3 required

TA any biomedical informatics (BIOINF) course that is cross listed as an ISSP course.

not required

Required

MS Project and PhD Preliminary Evaluation

For this requirement, the student must complete a research project, approved by the student's preliminary evaluation committee, involving (1) significant research, design, or development work, (2) a written report, and (3) an oral presentation. Students must form a MS project committee (MS) or a preliminary evaluation committee (PhD) consisting of three faculty members, two of whom must be ISP faculty. The student's adviser chairs the committee, and must be an ISP faculty member.

Preferably, the research project is completed by the end of the summer term of the second year. Students who have not defended their research project by end of the fall term of their third year in the program will be placed on provisional status in the program, unless extenuating circumstances warrant an extension, as judged by the student’s preliminary evaluation committee.

Although not a requirement, it is strongly suggested that the student submit the project report for publication in a refereed journal or conference. Thus, the scope of the research project is intended to be at the level of a paper that is of publishable quality in a peer-reviewed AI journal or conference.

The steps to completing the project are as follows:

- Submit a project proposal to your committee for its approval.
- Perform the work, and write a project report.
- Submit your project report to your committee at least two weeks in advance of your oral presentation of the work.
- Present your work in a talk given to your committee. As a guideline, you should give about a 30-minute talk and leave about 30 minutes for questions and discussion. The ISP faculty should be invited to the oral presentation. General questions relating to the field
of AI are appropriate at this examination. The oral presentation may take place in an open forum, such as the ISP AI Forum, followed by a closed session with just your committee and any other ISP faculty members who wish to be present.

The committee will evaluate the project and presentation. The following criteria should be considered: The project and presentation should represent independent research, design, or development work; they should be technically sound; and they should be relevant to the ISP. Also, the student should display breadth of knowledge, understanding of the significance and motivation of the work, and understanding of the relationship of the work with prior work; and, the presentation should be clear. The committee will combine that evaluation with an evaluation of the student’s progress in coursework to arrive at an overall evaluation of one of the following:

**MS**

- Pass.
- Provisional pass: Must complete additional requirements specified by the committee in order to obtain a pass.
- Fail

**PhD**

- Pass at the PhD level.
- Provisional pass at the PhD level: Must complete additional requirements specified by the committee in order to obtain a pass.
- Pass at the MS level: Student obtains a terminal MS degree, once all course requirements for the MS are completed.
- Fail

Students who pass will need a card signed by their committee to obtain credit for passing. Contact the ISP program secretary at least two weeks before the oral portion of the preliminary evaluation, so the card can be available at the meeting to be signed.

**PhD Comprehensive Examination**

For the PhD comprehensive examination, students should follow these steps:

Form a comprehensive examination committee consisting of at least three faculty members, two of whom must be ISP faculty. The student's PhD adviser chairs the committee and must be an ISP faculty member. The faculty on a given student’s comprehensive examination committee are often the same as the faculty on that student’s preliminary evaluation committee, but they need not be.

Choose three major subareas of AI. One of these areas is flexible; the other two should be chosen from the ISP list of sub-areas below. The flexible area must be unanimously approved by
the students' committee (but does not need to be approved by the director). Biomedical Informatics students should choose "Biomedical Informatics" as one of the subareas.

- AI and Business/Accounting
- AI and Law
- AI and Medicine
- AI and MIS
- Bioinformatics
- Case-based Reasoning
- Cognitive Architectures (or Subsymbolic Approaches)
- Connectionist Approaches
- Statistics and Evaluation Methods
- Expert Systems
- Intelligent Interfaces
- Intelligent Tutoring Systems
- Knowledge Representation
- Machine Learning
- Biomedical Informatics
- Natural-language Processing
- Planning
- Reasoning About Uncertainty
- Robotics
- Vision

Work with the committee to finalize the reading for the three chosen subareas. Have the committee approve the list.

Work with your committee members (or their designated administrative assistants) to set the following dates for the examination:

- The date and time the written examination is distributed to you.
- The date and time you return the examination, which by default is nine days after receiving it. Your committee can designate an examination period of fewer or more than nine days, and through your adviser you may request that they do so.
- The date and time you orally defend your examination answers before your committee. You should schedule two hours for your oral exam defense, although typically less time will be needed.

Your committee will provide a list of written questions. Unless an exception is made by your committee, you will have nine days to provide the written answers to these questions. At the end of those nine days, you should distribute your answers to each of your committee members. Be sure to check that each has received your answers.

An oral examination will take place after the comprehensive committee has read your answers; the committee should be given a minimum of three days to read your answers before the oral
examination. The ISP faculty (only) will be invited. You will be asked questions by your committee about your answers on the written examination, and more broadly, about your knowledge of the material in the three areas of concentration you have chosen.

At the end of your oral examination, your committee will evaluate your performance as one of the following:

- Pass.
- Provisional pass: Must complete additional requirements specified by the committee in order to obtain a pass.
- Fail.

An evaluation by the comprehensive examination committee of "fail" will be considered by the ISP faculty at large, who will make a determination about the status of the student in the ISP, including whether the student is allowed to re-take the examination or whether he or she is terminated from the program.

Students who pass the comprehensive examination will need a card signed by their committee to obtain credit for passing. Contact the ISP program secretary at least two weeks before the oral portion of the comprehensive examination, so the card can be available at the meeting to be signed.

Note: According to the Dietrich School of Arts and Sciences graduate school guidelines, the comprehensive examination should be passed AND admission to candidacy for the PhD degree granted AT LEAST EIGHT MONTHS BEFORE SCHEDULING OF THE FINAL ORAL DISSERTATION DEFENSE. Please review the University of Pittsburgh Graduate and Professional Bulletin in the areas covering Comprehensive Examination, Doctoral Committee, and Admission to Candidacy for the PhD Degree. In addition, please review the guidelines regarding Statute of Limitations and Leaves of Absence. PhD degree must be completed within a period of 10 years from initial registration, or eight years if the student received a master's degree.

**PhD Dissertation**

In pursuing the PhD dissertation, students should follow these steps:

Find a dissertation adviser and form a dissertation committee. The dissertation committee consists of at least four faculty members. At least three of these committee members must be ISP faculty members; the chair of the committee is the student's PhD adviser and must be an ISP faculty member. Committee members must also have graduate faculty status. See a current list of faculty with graduate faculty status. Also review the Dietrich School of Arts and Sciences policy regarding the composition of doctoral dissertation committees. The committee members need not be the same as those faculty who served on a given student’s preliminary evaluation committee and comprehensive examination committee. If any of your committee are from outside the University or are not part of the graduate faculty, you will need to have them approved to serve;
this consists of submitting their curriculum vitae and a letter explaining your choice of this person to the ISP program director, who will add a letter to the graduate assistant dean to this packet. Please submit this request for the director’s approval with supporting material to the ISP program administrator. This must be approved in writing by the Dietrich School of Arts and Sciences assistant dean before the individual can be a member of your committee.

Write a dissertation proposal. Present the proposal to your committee. Your committee must approve your proposal. You will need a form signed by your committee and the ISP director to complete this process. Contact the program administrator at least two weeks before meeting so the form can be available for signature at the meeting.

Carry out the research. Write the dissertation.

Announcement of your dissertation defense must appear in University Times and Pitt Chronicle. Send information to the ISP administrator at least five weeks before your oral defense date. This information will be sent to the University Times and Pitt Chronicle. The announcement includes the student name, the title of the dissertation, and the time and place of the defense.

Have an oral defense, which is open to the University at large. You will need a card signed by your committee to obtain credit for passing the dissertation requirement. Contact the program secretary two weeks before your defense, so the card can be available for signature at the meeting.

Credit for doctoral research is ordinarily obtained through the course ISSP 3000 Research and Dissertation PhD or Fulltime Dissertation Study. Students who have completed all course requirements, passed the PhD comprehensive examination, completed 72 credits of graduate student, and are working fulltime on their dissertations are encouraged to register for Fulltime Dissertation Study.