



2010 - 2011

ROADMAP

Ph.D.

A Ph.D. DEGREE GUIDE
FOR INFORMATION SCIENCES
AND TECHNOLOGY STUDENTS

IST@PENNSTATE

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A Message from the Associate Dean for Education



Welcome to the College of Information Sciences and Technology. You are about to begin a very important phase of your scholarly and personal life. The goal of the IST Ph.D. Program is to produce top-flight academic and industry professionals who do leading-edge research. We are excited that you have chosen to join our research community.

This is truly an exciting time. Although we are witnessing the explosion of information and the rapid growth of information technologies, we still face a number of challenges that create opportunities for exciting research. Our faculty are involved in a wide variety of research areas including social informatics, web science, health informatics, human-computer interaction, cyber security, privacy, and trust, cyber infrastructure, extreme events system science, and many other areas. We encourage you to explore these different areas and find the topic that motivates you.

We have developed the Ph.D. program to provide a great deal of flexibility in the coursework to best benefit your particular needs. For those students who would like a more structured approach to their coursework, we have introduced tracks into our graduate program. These tracks are guidelines to help you identify the courses that you should take for particular research areas. They can also help you to articulate the concentration of your doctoral studies when you graduate. Already, our alumni are emerging to become thought leaders in the academic world and in leading corporate and governmental laboratories.

This booklet is a roadmap designed to guide you through the requirements for your doctoral study. We will keep you informed of any updates to the program. If you have questions or need additional guidance, please don't hesitate to contact the staff in the Graduate Programs Office, Dr. Mary Beth Rosson, Dr. Madhu Reddy, or me.

Sincerely,

A handwritten signature in black ink that reads "Fred Fonseca". The signature is written in a cursive, flowing style.

Fred Fonseca
Associate Dean for Education

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About the College of Information Sciences and Technology

Vision: The Penn State College of Information Sciences and Technology will be one of the best i-schools in the nation. We will be an academic enterprise noted for excellence in learning, scholarship, and innovation. We will be known for producing graduates who are professional innovators. All this will be achieved through partnerships for excellence. We will be a truly new kind of college founded on and organized for the achievement of outstanding outcomes in all that we do.

Mission: Through our teaching, research, and service, our faculty and students will change the world with inspired socio-technical solutions. In so doing, we will empower people, organizations and communities to make effective and humane decisions. Through our work, we and others will not only better understand the information age, we will become thought leaders who affect the course of development of the digital, global society.

Founded in 1999, the College of Information Sciences and Technology (IST) is Penn State's visionary response to the rapidly growing need across many fields of study for leadership in information sciences and related technologies.

We are a community of scholars and practitioners – comprised of faculty, students, and partners – that values collaboration and interdisciplinary thinking. Our collaborative efforts, in both education and research, are producing advances in technology and our understanding of the way IT shapes our lives.

We offer interdisciplinary programs at the graduate and undergraduate levels, with courses designed to provide students with a broad knowledge base and the skills needed to address complex problems through technology.

To shape these leaders of tomorrow, we have engaged a diverse community of highly renowned faculty who are thought leaders in numerous fields including computer science, sociology, engineering, psychology, education, chemistry, artificial intelligence, and more. By synthesizing their varied expertise, they work together to guide and direct the course of development of the wide-ranging field of information sciences and technology.

Research in IST impacts nearly every aspect of people's lives: education, work, entertainment, health, safety, and national security. Fueling this research are dynamic partnerships we have initiated with corporations, government, and other learning institutions. These partners provide important connections for the exchange of data and information, the creation of new knowledge, opportunities for internships, and funding to support initiatives by IST faculty members and graduate students.

The physical and symbolic center of our college is the state-of-the-art IST Building on Penn State's University Park campus, a place that brings academics and professionals together on common ground for learning, research, and collaboration.

I. Faculty Advisor and Annual Review

Each Ph.D. student of the College of Information Sciences and Technology is assigned to a member of the Graduate Faculty of IST as his or her faculty advisor. We describe below the role of the faculty advisor and the matching process we use to make initial assignments of faculty advisors to students entering the Ph.D. program.

A. Role of Faculty Advisor

The role of the faculty advisor is to provide advice and mentoring to the Ph.D. student (advisee) on issues related to research and academics. During the first year of a student's Ph.D. study, the faculty advisor works with the student to identify potential research topics and survey related literature, which form the basis for the Candidacy Exam at the end of the first year. The faculty advisor also provides feedback to the student about research ideas, research progress, and research outcomes. The faculty advisor helps the student regarding academic concerns, such as the choice of tracks (see below), the selection of courses, and after the student passes the candidacy examination, the formation of the student's doctoral committee. The faculty advisor generally helps the student become familiar with the program and its requirements. Finally, the faculty advisor assists and advises the student on career planning.

B. Advisor Matching Process for Newly Admitted Students

The IST Graduate Programs Office within the Office for Education coordinates the assignment process (working with students and faculty members) to insure appropriateness of the assignments. The selection of a faculty advisor is facilitated through a process in which first-year Ph.D. students may choose to have face-to-face meetings with faculty members whose research interests seem to match their own. While these meetings will take place between August and September, students are encouraged to interact with faculty members of interest using e-mail/phone conversations during the summer. New students should arrive on campus before mid-August so these face-to-face meetings can be conducted before the start of the fall semester.

Based on the preferences of new students, the faculty members and funding availability, the advisor matching process is completed and new students begin their work with their advisor by mid-September.

C. Annual Review

An annual review will be conducted each April to evaluate the progress of Ph.D. students in their graduate studies. As a part of the review process, each Ph.D. student must meet with his or her faculty advisor to discuss research progress, related issues, and the plan for the following year. The outcome of the review meeting is summarized in the Graduate Student Annual Evaluation Form, which is submitted with an updated curriculum vitae of the graduate student to the IST Graduate Programs Office within the Office for Education. Students can also express their feedback regarding the mentoring or research compatibility of their faculty advisors during the annual review process.

In the case that a student's progress is viewed unsatisfactory by the faculty advisor, a report is written by the faculty advisor giving a detailed description about the deficiencies identified, as well as advice to the student for further improvements toward making satisfactory progress. If needed, the student and the student's faculty advisor can meet with the dean for research and education and the graduate program adviser to discuss whether or not the student needs to change his or her advisor.

II. General Assistantship Policies

Assistantships for Ph.D. students fall into two categories: Research Assistantship (RA) and Teaching Assistantship (TA). –Research assistantships are provided by a student's faculty advisor (or by another faculty member who has extra funds available), while teaching assistantships are provided by the college.

Assistantship appointments in IST are generally on a half-time basis requiring service of approximately 20 hours per week. Students with half-time appointments receive tuition to cover the mandatory course load of 9 to 12 credits per semester. Most appointments automatically conclude at the end of the each semester, if not before, and appointments carry no guarantee of renewal.

All international graduate assistants and any dependents who accompany them must have health insurance. –A student may choose to purchase insurance separately and provide evidence that the policy meets the standards of Penn State. –Otherwise, a student is enrolled in a group policy for students. More information can be obtained by contacting the Graduate Student Association (<http://www.clubs.psu.edu/up/gsa/>) or the Graduate Student Insurance Office (<http://www.sa.psu.edu/uhs/basics/insurance.cfm>).

Stipends are delivered electronically on the last working day of the month to the student's local bank account five times each semester and twice during the summer (if hired for summer). A newly appointed graduate assistant arriving in August may not receive his or her first paycheck until the end of September.

A. Research Assistantships

A research assistant's supervisor is usually the faculty advisor for the student, and will to some degree dictate the supporting course work and other aspects of the research assistant's preparation needed to fulfill the assistantship responsibilities. When the two roles are performed by the same faculty member, supervision of research assistant duties and progress towards completion of the doctoral thesis are difficult to separate. The combination of the research appointment and the registration for thesis credits must represent a realistic workload, keeping in mind the supporting course work the research assistant may be pursuing.

Research assistants may be expected to do any of the following: design and implement software; design and conduct experiments involving human subjects, including applications for Institutional Review Board (IRB) approval; collect and process data; search for materials at the University Libraries or perform Web research; interact with sponsors and vendors; prepare reports and related presentation materials; attend meetings and seminars; participate in writing manuscripts for conference and journal submissions; participate in preparing presentations for conferences; and assist in preparing research funding proposals as directed.

The research assistant's supervisor will clarify the specific work needed for a given research assistantship position, regularly oversee the work, and evaluate the work, dependability, and readiness of the RA to move to higher levels of responsibility such as taking the lead on data analysis, helping to supervise undergraduate research assistants, crafting of manuscripts, and making presentations.

B. Teaching Assistantships

All international students are required to take the American English Oral Communication Proficiency Test (AEOCPT) upon arrival and they cannot be assigned to a teaching assistantship until this test is passed or remediation steps have been completed. Any student who fails the AEOCPT will not be eligible to receive any funding until they pass all the required remedial English classes. Furthermore, enrollment in IST 602 is required for all students during their first semester regardless of their assistantship appointment.

This course is offered every fall semester and is designed to help new teaching assistants become more effective in their teaching. It also provides teaching assistants with the opportunity to learn some pedagogy and to discuss problems that arise in the classroom.

A teaching assistant (TA) is assigned to one or more specific courses for a particular semester, not to a faculty member per se. If a faculty member other than the student's advisor teaches the course to which the TA is assigned, the TA will be supervised in their teaching-related responsibilities by this other faculty member. We will refer to the faculty member who teaches the course section(s) to which a TA is assigned to as the TA's supervisor.

Teaching assistants should meet with their supervisors prior to the start of the semester, as well as during the semester. Hence, TAs should contact their supervisors to let them know when they are available for meetings prior to the start of the semester. Initially, the teaching assistants should receive a course syllabus, a textbook if one is used, any information to be distributed to the students, and specific details about their assignments. Teaching assistants and their supervisors should discuss the instructional goals and objectives of the course and the means to accomplish them. Periodically, meetings should be held to emphasize the purposes of specific assignments or projects and how these should be evaluated. Teaching assistants should expect to attend course lectures and labs, and to be aware of the instructor's emphasis and expectations of the students.

Teaching assistants may expect a wide variety of assignments including the following: grading homework, projects, and examinations; preparing assignments; preparing solutions for posting or distribution; maintaining office hours and holding special lab or review sessions; helping to prepare, photocopy, and administer examinations; prepare and set up demonstrations; processing grade data, and perhaps, assigning grades.

If a teaching assistant must be absent from an assigned job, due to illness or professional trips, they must notify the supervisor at the first knowledge of such an absence and work with the supervisor to have the responsibilities covered. *However, a TA should not make travel plans the week before the semester begins, during the last week of the semester, or the week immediately thereafter.* Otherwise, preparation before the semester and grade submissions after the semester suffers.

Before the first week of the semester, the teaching assistant and supervisor should meet and complete a check sheet to assure that all start-up details have been discussed and arranged. At mid-semester and again at the end of the semester, the teaching assistant and the supervisor should complete separate evaluation forms.

The IST Ph.D. program strongly encourages all Ph.D. students to have primary teaching responsibility for at least two semesters during their program of study. There may be times when the Associate Dean for Education will assign a student to a course for that purpose.

III. Ph.D. Degree Requirements

A. Full-time Matriculation

Graduate students in the IST Ph.D. program are expected to matriculate on a full-time basis at the University Park campus. There are no exceptions to the requirement for full-time on-site matriculation. In addition, applicants to the Ph.D. program are ordinarily expected to start in the fall semester of each year. Students do not need to be registered in summer if they have been registered the previous Fall and Spring Semesters.

B. General Requirements

The doctor of philosophy degree in Information Sciences and Technology (IST) offers advanced graduate education for students contemplating careers in academic teaching and research, or research in a non-academic setting. The program is multidisciplinary and interdisciplinary in nature and expects scholarship at the highest levels exhibiting depth of competency in at least one of the core areas of the Information Sciences and Technology.

The curriculum consists of a core requirement and five suggested tracks: (1) computational informatics track, (2) artificial intelligence (AI) and cognitive science track, (3) human-computer interaction (HCI) track, (4) social and enterprise informatics track, and (5) security informatics track. The core requirement provides a common theoretical foundation for all Ph.D. students in IST. The tracks provide guidance for students to develop competency and an appropriate depth of understanding in a concentration area related to the research problems addressed by the dissertation. Please note, the tracks are only a suggested set of courses. Please discuss with your advisor, your particular situation and whether courses in a specific track will meet your needs. Students will be expected to complete a minimum of 40 course credits plus additional dissertation credits (for example, IST 600/601). Reflecting the interdisciplinary nature of the program, many elective courses of the track are offered by other colleges.

1. Core Requirement (16 credits)

All candidates are expected to develop a broad understanding of the core elements of people, information, technology, and the significant interactions among those elements. The core of the IST program is composed of four courses (3 credits each) and 4 credits in colloquia (IST 590).

- IST 511 Information Management: Information and Technology
or
IST 512 Information Processing Architecture and Technology
- IST 521 Human-Computer Interaction: The User and Technology
or
IST 522 Models and Theories of Human-Computer Interaction
- IST 531 Human Information Behavior: Information and the User
or
IST 532 Organizational Informatics
- IST 501 IST Integration
or
IST 503 Foundations for IST Research
- Colloquium (four semesters of 1 credit each). One semester of IST 594 for organizing the annual IST graduate symposium can be used to satisfy this requirement.

2. Prescribed and Elective Requirements (24 credits)

All candidates must develop an in-depth competency in their primary field, relevant research methods, and supporting field customized to support his or her thesis research.

To help students identify potential areas of interest, we have developed five tracks. Each track consists of 12 credits of prescribed courses and 12 credits of elective courses. A list of pre-approved prescribed and elective courses for these tracks is

given below. -However, each Ph.D. student should discuss with his or her advisor to identify courses that are relevant to the student's thesis research area, even if they are not listed below.

a. Computational Informatics Track:

Prescribed courses (12 credits) selected from the following:

- IST 515: Information Security and Assurance
- IST 516: Web and Internet Information Retrieval
- IST 541: Qualitative Research in Information Sciences and Technology
- IST 562: Foundations of Information Science
- IST 597: Medical Informatics
- IST 597: Intelligent Agents and Distributed Decision Making
- IST 597: Open Source
- IST 597: Service-Oriented Architecture
- IST 594: Colloquium on Computational Informatics (three semesters of 1 credit)
- Other IST courses except those taken to satisfy the core course requirements.

Elective courses (12 credits) selected from the following:

- EE 583/CSE 583: Pattern Recognition
- EE 561: Information Theory
- ENGL 511: Thesis Workshop and Professional Writing
- IE 522: Discrete Systems Simulation
- PHYS 597A: Graphs and Networks in Systems Biology
- CMPSC 442: Artificial Intelligence
- STAT 500: Applied Statistics
- STAT 501: Regression Methods
- STAT 503: Design of Experiments
- STAT 505: Applied Multivariate Statistical Analysis
- STAT 597/IST 597: Data Mining
- STAT 540: Statistical Computing
- STAT 416/MATH 416: Stochastic Modeling
- Other IST courses except those taken to satisfy the core course requirements or the required course requirements of the track or courses from other colleges approved by IST.

b. AI and Cognitive Science Track:

Prescribed courses (12 credits) selected from the following:

- IST 491: Advanced Java Programming, Data Structures, and Algorithms (or equivalent)
- IST 562: Foundations of Information Science
- IST 594: Colloquium on AI and Cognitive Sciences (three semesters of 1 credit)
- IST 597: Simulation as a Summary of Human Behavior
- IST 597: Intelligent Agents and Distributed Decision Making
- IST 597: Cognitive Science: Technology and Theory
- IST 597: Service-Oriented Architecture
- Other IST courses except those taken to satisfy the core course requirements.

Elective courses (12 credits) selected from the following:

- ECON 534: Game Theory
- IE 522: Discrete Event System Simulation

- IE 556: Robotic Concepts
- IE 557: Human-in-the-Loop Simulation
- IE 562: Expert Systems Design in Industrial Engineering
- IE 570: OR in Supply Chain
- ENGL 511: Thesis Workshop and Professional Writing
- CMPSC 442: Artificial Intelligence
- CMPEN 454: Fundamentals of Computer Vision
- CSE 583: Pattern Recognition – Principles and Applications
- CSE 585: Digital Image Processing II
- CSE 587: Interfaces to Virtual Psychology
- PSY 525: Seminar in Cognitive Psychology
- PSY 511: Foundations of Cognitive and Affective Neuroscience
- PSY 597: Computational Neuroscience
- PSY 597: Decision Making at Multiple Levels of Analysis: Current Models and Trends
- STAT 500: Applied Statistics
- STAT 501: Regression Methods
- STAT 503: Design of Experiments
- STAT 505: Applied Multivariate Statistical Analysis
- Other IST courses except those taken to satisfy the core course requirements or the required course requirements of the track or courses from other colleges approved by IST.

c. Human-Computer Interaction (HCI) Track:

Prescribed courses (12 credits) selected from the following:

- IST 525: Computer-Supported Cooperative Work
- IST 526: Development Tools and Visualization for Human-Computer Interaction
- IST 541: Qualitative Research in Information Sciences and Technology
- IST 562: Foundations of Information Science
- IST 594: Colloquium on HCI (three semesters of 1 credit)
- IST 597: Medical Informatics
- IST 597: Simulating Human Behaviors
- Other IST courses except those taken to satisfy the core course requirement.

Elective Courses (12 credits) selected from the following:

- IE 558: Engineering of Cognitive Work
- ENGL 511: Thesis Workshop and Professional Writing
- COMM 516: Introduction to Data Analysis in Communications
- COMM 517: Psychological Aspects of Communication Technology
- COMM 518: Media Effects
- PSY 525: Seminar in Cognitive Psychology
- STAT 500: Applied Statistics
- STAT 501: Regression Methods
- STAT 503: Design of Experiments
- STAT 505: Applied Multivariate Statistical Analysis
- Other IST courses except those taken to satisfy the core course requirements or the required course requirements of the track or courses from other colleges approved by IST.

d. Social and Enterprise Informatics Track:

Prescribed courses (12 credits) selected from the following:

- IST 535: Information Technology Valuation, Markets, and Innovation
- IST 536: Public and Community Informatics
- IST 541: Qualitative Research in Information Sciences and Technology

- IST 562: Foundations of Information Science
- IST 594: Colloquium on Social and Enterprise Informatics (three semesters of 1 credit)
- IST 597: Medical Informatics
- IST 597: Open Source
- IST 597: Service-Oriented Architecture
- Other IST courses except those taken to satisfy the core course requirement.

Elective courses (12 credits) selected from the following:

- MGMT 528: Seminar in Organizational Behavior
- MGMT 538: Seminar in Organizational Theory
- PSY 523: Social-Organization Psychology in Industry
- AEREC 510: Econometrics I
- AEREC 511: Econometrics II
- COMM 516: Introduction to Data Analysis in Communications
- ENGL 511: Thesis Workshop and Professional Writing
- MGMT 535: Statistical Research Methods
- MGMT 591: Organizational Research Design
- MGMT 592: Qualitative Methodology
- PHYS 597A: Graphs and Networks in Systems Biology
- SOC 518: Survey Methods I – Survey Design
- SOC 519: Survey Methods II – Analysis of Survey Data
- IST 421: Advanced Enterprise Integration
- IST/MIS 570: Information Technology Strategy
- SOCIO 476: Sociology of Science and Technology
- STAT 500: Applied Statistics
- STAT 501: Regression Methods
- STAT 503: Design of Experiments
- STAT 505: Applied Multivariate Statistical Analysis
- STS 470: Science, Technology, and Public Policy
- Other IST courses except those taken to satisfy the core course requirements or the required course requirements of the track or courses from other colleges approved by IST.

e. Security Informatics Track:

Prescribed courses (12 credits) selected from the following:

- IST 515: Information Security and Assurance
- IST 516: Web and Internet Information Retrieval
- IST 562: Foundations of Information Science
- IST 564: Crisis, Disaster and Risk Management
- IST 885: Introduction to Multi-Sensor Data Fusion
- IST 597: Intelligent Agents and Distributed Decision Making
- IST 597: Service-Oriented Architecture
- IST 594: Colloquium on Security Informatics (three semesters of 1 credit)
- Other IST courses except those taken to satisfy the core course requirements.

Elective courses (12 credits) selected from the following:

- ECON 501: Econometrics
- ECON 534: Game Theory
- IE 505: Linear Programming
- IE 516: Applied Stochastic Processes
- IE 522: Discrete Systems Simulation
- IE 570: OR in Supply Chain
- IST 451: Network Security

- IST 454: Computer and Cyber-Security
- IST 456: Security and Risk Management
- ENGL 511: Thesis Workshop and Professional Writing
- SRA 468: Visual Analytics for Intelligence and Security
- SRA 472: Information Privacy and Assurance
- CSE 543: Computer Security
- CSE 544: Advanced Systems Security
- CSE 545: Advanced Network Security
- CSE 546: Cryptography
- IN SC 561: Web Security and Privacy
- STAT 500: Applied Statistics
- STAT 501: Regression Methods
- STAT 503: Design of Experiments
- STAT 505: Applied Multivariate Statistical Analysis
- Other IST courses except those taken to satisfy the core course requirements or the required course requirements of the track or courses from other colleges approved by IST.

f. Other Possible Elective Courses (for all tracks above):

- STAT 510: Time Series Analysis
- STAT 511: Regression Models
- STAT 513: Theory of Statistics I
- STAT 540: Statistical Computing
- STAT 544: Categorical Data I
- STAT 551: Linear Models I
- STAT 553: Asymptotic Tools
- STAT 557: Data Mining I
- STAT 561: Statistical Inference

3. Language and Communication Requirements:

All candidates must be competent in the English language and must have demonstrated skills in the communication of ideas orally and in writing that are commensurate with the requirement of scholarly and professional work. The candidacy examination will be used to assess English proficiency after the first year of study, and to plan for any necessary remediation including additional courses, mentoring, or other activities.

4. Residency Requirement:

After admission to the doctoral program, students must be registered full-time (at least 9 credits) for at least two semesters in a one-year period (fall and spring or spring and the following fall). Summer semesters do not count towards the residency requirement.

IV. Candidacy Examination for Ph.D. in Information Sciences and Technology

The candidacy examination is a University-mandated procedure to assess whether the student is capable of conducting doctoral-level research. Toward this goal, the candidacy examination comprises a critical literature review on a topic decided jointly by the student and his or her research advisor. The critical review should include a literature survey of related background, a discussion of issues, related theories, and hypotheses that demonstrate the level of depth of their understanding of the research problem. The survey also should attempt to incorporate and synthesize perspectives from the vantage point of information, technology, and people. The exam is used to assess the student's critical thinking skills, and his or her capability to integrate

conceptualizations of related ideas, concepts, theories, and frameworks in the literature for exploring a thesis topic. The candidacy examination is administered by a committee assigned by the college. The advisor is a non-voting member of the committee. Voting members of the committee represent a mix of faculty members from more than one research area. Examples of research areas are computational informatics, AI and cognitive science, human-computer interaction, and social/enterprise informatics.

After a student passes the candidacy examination, the student takes the comprehensive examination, in which the student develops his or her research proposal and defends it.

A. Candidacy Examination Timeline

- The student works with the faculty advisor to submit the topic of the candidacy examination and up to three suggested committee members to the college by mid-April.
- The student is assigned a candidacy examination committee comprised of three faculty members by mid-May.
- The student submits the written candidacy examination to the committee and the IST Graduate Programs Office within the Office for Education on or before the first week in August. Committee members individually submit to the college their written evaluations of the exam.

The committee conducts an oral examination in mid-August. Based on the committee's evaluation of the critical literature review and the oral examination, the committee generates a report to recommend the outcome of the examination to the college. The report consists of review and breakdown of the strengths and weaknesses of the student.

B. Candidacy Examination Results

Possible results (and resulting actions) for the examination are summarized below.

1. *Satisfactory completion of the examination*—If a student successfully completes the examination (as determined by the dean of research and education and the Candidacy Examination Committee chair (normally the Graduate Program Advisor), the student may proceed in his or her Ph.D. studies.
2. *Retake required*—The student must retake the candidacy exam. This retake is in the form of a Master's Thesis Defense. If the student passes the defense, they will be awarded a Master's Degree and will then either be recommended to continue on with the Ph.D. program (i.e., pass the candidacy exam) or not (i.e., fail the candidacy exam). If they do not pass the defense, they will not be awarded a degree and will be asked to leave the graduate program of IST.
3. *Failure of the examination*—The student is informed by the dean for research and education that he or she failed the Ph.D. candidacy examination and is not eligible to continue the Ph.D. program. In such a case, the student's faculty advisor, the graduate programs advisor, and the dean for research and education will counsel the student. (The student *may* be provided an opportunity to complete a master of science degree in IST. If the student accepts this opportunity, a Resume Study/Change of Degree form must be completed and sent to the Graduate School.)

C. Documentation of Candidacy Examination Results

All examination results and actions are coordinated with the associate dean for education, who notifies the candidate and the candidate's advisor. The Office for Education will complete a doctoral candidacy report and file it with the Graduate School. This report (and all examination materials) will be filed in the student's graduate file.

The next major milestone for doctoral students who successfully complete the candidacy

examination are to complete his or her course work and prepare for their comprehensive examination, which is normally taken in the beginning of the student's third year in the Ph.D. program.

V. Doctoral Committee Selection

After successful completion of the candidacy examination and before the comprehensive examination, the student must formally select his or her Ph.D. committee. *It is expected that all members of this committee design and plan the student's comprehensive examination and that the entire committee is responsible for the intellectual development and research activities of the student during the post- candidacy period.* A Graduate Student Committee Procedures and Doctoral Committee Appointment Signature Form must be completed and submitted to the IST Graduate Programs within the Office for Education.

This committee will be composed of four or more graduate faculty members with at least three members of the committee having current graduate faculty appointments in IST. The committee chair must be a graduate faculty member in IST. The committee must have one outside member who is a Penn State graduate faculty member with no budgetary connection or conflict of interest with the IST program. An affiliated faculty member of IST with graduate appointment at Penn State may be counted as either an internal member or an outside member of an IST student's doctoral committee, but not both.

VI. Comprehensive Examination

When a candidate for the Ph.D. degree has completed most or all of their course work, a comprehensive examination is given. *The comprehensive examination is generally taken within twelve to eighteen months of passing the candidacy examination.* The comprehensive examination is intended to evaluate the candidate's mastery of the major, and if appropriate, minor field.

- A candidate for the Ph.D. must have satisfied the English competency and the communication and foreign language requirement before taking the comprehensive examination.
- All candidates are required to have a minimum grade-point average of 3.00 for work done at the University at the time the comprehensive examination is given, and may not have deferred or missing grades.
- The student must be registered as a full-time or part-time student for the semester in which the comprehensive examination is taken.
- The student can have no more than 12 graded "600-level" credits. After a student reaches the 12 credit limit, he should be assigned the grade of "R."

The examination is scheduled and announced officially by the IST Graduate Programs Office within the Office for Education. Two weeks notice is required by the Office of Graduate Enrollment Services for preparing the paperwork for this examination, which may be open to the public at the department's discretion. Therefore, notice should be given to the IST Graduate Programs Office within the Office for Education at least three weeks prior to the anticipated date. The exam has written and oral components and is given and evaluated by the entire doctoral committee. In many instances, the doctoral committee may choose to have the comprehensive examination as part of the IST dissertation research proposal (described subsequently). A favorable vote of at least two-thirds of the members of the committee is required for setting the format of the examination and recommending the passing of the comprehensive examination. In case of failure, it is the responsibility of the doctoral committee to determine whether the candidate may take another examination. The

results are reported by the IST Graduate Programs within the Office for Education to the Office of Graduate Enrollment Services.

At least three members of the doctoral committee (including the thesis advisor or chair) must be physically present at the comprehensive examination. The graduate student also must be physically present at the exam. (Thus, for a five-person committee, two members may participate via distance.) No more than one member may participate via telephone; a second remote member may choose to participate via video-conferencing. The examination request and a request for exceptions must be submitted to the director of graduate enrollment services by the IST Graduate Programs Office within the Office for Education for approval at least two weeks prior to the date of the exam. Special arrangements (i.e., requirements for meeting participation via distance) should be communicated to the student and the doctoral committee members well in advance of the examination.

When a period of more than six years has elapsed between the passing of the comprehensive examination and the completion of the program, the student is required to pass a second comprehensive examination before the final oral examination will be scheduled.

A. Content and Format of the Comprehensive Examination

The examination is designed, administered, and evaluated by the entire doctoral committee and may be either written or oral, or both. In many instances, the doctoral committee may choose to have the comprehensive examination consist of the IST dissertation research proposal (described subsequently).

Questions of the comprehensive examination should evaluate the candidate's mastery of the major, and if appropriate, minor field. This includes the candidate's mastery of the relevant literature, research methods, especially those related to the candidate's track, and how perspectives from the vantage point of information, technology, and people affect or are affected by the proposed research.

If the examination has a written component, all members of the doctoral committee must be solicited by the chair of the committee to provide questions. The committee as a whole sets the written examination. A written examination can be a take-home examination, a closed-book, proctored examination, or both.

As mentioned earlier, a possible design of the comprehensive examination is the dissertation proposal, which is described in detailed in the next section.

If the examination has an oral component, all members of the doctoral committee must be given the opportunity to ask questions.

Students who pass the comprehensive examination are expected to have an in-depth expertise in the relevant track of their dissertation research and have an integrated understanding of the implications of their proposed research on broader issues related to information, technology, and people.

A student must be registered continuously for each fall and spring semester from the time he or she passes the comprehensive exam until his or her dissertation defense (final oral examination).

VII. Dissertation Research Proposal

A. Objective

The objective of the dissertation research proposal is to assess the direction and the appropriateness of the research that will serve as a basis of a Ph.D. dissertation. The

Ph.D. candidate must submit a dissertation research proposal to the candidate's doctoral committee that will be presented and defended at a formal meeting of the student's committee that is open to the University community.

B. Written Dissertation Research Proposal Format

The written proposal must include a review of the relevant literature, definition of the research concepts and approaches, and a research schedule with milestones. The written proposal should be given to the candidate's doctoral committee at least three weeks prior to the scheduled research proposal meeting. A sample dissertation research proposal outline is presented below.

Sample Research Proposal Outline

- I. Abstract
- II. Introduction
 - Problem definition and scope
 - Motivation from the perspectives of information, technology, and people
 - Research objective(s)
 - Research question(s)
- III. Review of literature
- IV. Proposed research
 - Research framework and approaches to be used
 - Rationale for proposed approaches
- V. Research plan
 - Key tasks and activities
 - Schedule
 - Expected contributions of the research
- VI. Bibliography/references

If human subjects are to be used, the student must complete the *Application for the Use of Human Participants* and submit it for approval to the Office of Research Protections (ORP) upon successful defense of the proposal. Forms are available at ORP, 212 Kern Graduate Building (865-1775) or they can be downloaded from the ORP Human Participants Web page at <http://www.research.psu.edu/orp/areas/humans/applications/index.asp>

C. Defense of Dissertation Research Proposal

The dissertation research proposal defense is scheduled by the IST Graduate Programs within the Office for Education to insure that notification can be given to the University community. Notice should be given to the IST Graduate Programs within the Office for Education at least three weeks prior to the anticipated date. The chair of the student's doctoral committee chairs the meeting. At least three members of the doctoral committee (including the thesis advisor or chair) must be physically present at the dissertation proposal defense. The graduate student also must be physically present at the defense. (Thus, for a five-person committee, two could participate via distance.) No more than one member may participate via telephone; a second member could participate via video-conferencing. If the dissertation proposal defense is being held as the comprehensive examination, the proposal defense request, and a request for exceptions must be submitted to the director of graduate enrollment services by the IST Graduate Programs Office within the Office for Education for approval at least two weeks prior to the date of the exam. Special arrangements, i.e., requirements for meeting participation via distance, should be communicated to the student and the doctoral committee members well in advance of the examination.

The candidate is asked to present and defend his or her dissertation research proposal to those attending the meeting. Questions are permitted from any of those in attendance. At the conclusion of the presentation and defense, all attendees except the candidate and the candidate's doctoral committee are requested to leave the meeting. Committee members can then ask any additional questions they feel are appropriate. The candidate is then asked to leave the meeting for a short period of time as the committee discusses and evaluates the proposal, the presentation, and the proposal's defense. The candidate then will be called back to discuss the evaluation.

A favorable vote of at least two-thirds of the members of the committee is required for passing the dissertation research proposal. In case of failure, it is the responsibility of the doctoral committee to determine whether or not the candidate can schedule a second dissertation research proposal. If the dissertation research defense is being held as the comprehensive exam, the results are reported by the IST Graduate Programs within the Office for Education to the Office of Graduate Enrollment Services.

D. Proposal Timeline

In general, a dissertation research proposal presentation occurs 12 to 16 months after the successful completion of the candidacy examination. The Ph.D. candidate should work closely with the chair of the doctoral committee with respect to the timing of the research proposal defense and should consult with all committee members with respect to the contents of the dissertation research proposal.

E. Evaluation of the Proposal

An evaluation of the research proposal is given to the candidate at the end of the defense by the Ph.D. committee. The evaluation includes an assessment of the research direction and the appropriateness of the intended work as a basis of a Ph.D. dissertation. Constructive criticism and suggestions for improvement will be part of the assessment. The proposal is deemed to be adequate if at least two-thirds of the committee approves the proposal. If the proposal is deemed to be inadequate for dissertation-level research, the committee can require the candidate to rewrite the proposal and can ask that it be defended again at a later date. If a student defense is found inadequate a second time, the student will be released from the Ph.D. program. The committee chair will prepare a short (one-page maximum) report of the evaluation, to be submitted to the IST Graduate Programs within the Office for Education, which will be included in the Ph.D. candidate's file.

VIII. Dissertation Defense (Final Oral Examination)

A. Objective

The objective of the dissertation defense (final oral examination) is to assess a Ph.D. candidate's research accomplishments based on the completion of a final draft of the candidate's dissertation thesis. This is to be facilitated by the Ph.D. candidate submitting the final draft of the dissertation to the candidate's Ph.D. committee and by presenting and defending the thesis at a formal meeting of his or her committee that is open to the University community. The final draft should be in a format that meets the editorial standards of the Graduate School.

B. Graduate School Guidelines

Guidelines and policies in official publications of the Graduate School and changes to them, take precedence over the content of this section. Please see [http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm).

The doctoral candidate who has satisfied all other requirements for the degree will be scheduled by the dean of research and education, on the recommendation of the doctoral committee chair, to take a final examination. Two weeks notice is required by the Office of Graduate Enrollment Services for scheduling this examination, so paperwork must be submitted to the IST Graduate Programs within the Office for Education three weeks in advance of the examination. Normally, the final oral examination may not be scheduled until at least three months have elapsed after the student has passed his or her Ph.D. dissertation proposal (oral comprehensive examination), although the director of graduate enrollment services may grant a waiver in appropriate cases. The deadline for holding the examination is 10 weeks before commencement. It is the responsibility of the doctoral candidate to provide a copy of the thesis to each member of the doctoral committee and the IST Graduate Programs within the Office for Education *at least two weeks* before the date of the scheduled examination.

Both the thesis advisor and the student are responsible for ensuring the completion of a draft of the thesis and for adequate consultation with members of the doctoral committee well in advance of the final oral examination. Major revisions to the thesis should be completed before this examination. The dissertation should be in its final draft, with appropriate notes, bibliography, tables, etc., at the time of the final oral examination; both the content and style should be correct and polished by the time this final draft of the thesis is in the hands of the doctoral committee.

The final examination of the doctoral candidate is an oral examination administered and evaluated by the entire doctoral committee. It consists of an oral presentation of the thesis by the candidate and a period of questions and responses. These will relate in large part to the dissertation, but may cover the candidate's entire program of study, because a major purpose of the examination also is to assess the general scholarly attainments of the candidate. The portion of the examination in which the thesis is presented is open to the public.

At least three members of the doctoral committee (including the thesis advisor or chair) must be physically present at the final oral examination. The graduate student also must be physically present at the examination. No more than one member may participate via telephone or video-conferencing. The examination request and a request for exceptions must be submitted to the director of graduate enrollment services through the IST Graduate Programs Office within the Office for Education for approval at least three weeks prior to the date of the examination. Special arrangements, such as, requirements for meeting participation via distance, should be communicated to the student and the doctoral committee members well in advance of the examination.

- The student must be registered as a full-time or part-time degree student for the semester in which the final oral examination is taken.
- The student is required to have a minimum grade-point average of 3.00 for work done at the University at the time of the final oral examination and may not have deferred or missing grades.
- The student can have no more than 12 graded "600-level" credits.
- The student must have completed his residency requirement by the time the final oral examination is scheduled.
- There must be a three-month time elapse between the comprehensive exam and the final examination.
- The final oral examination must be scheduled within six years of the comprehensive examination.

A favorable vote of at least two-thirds of the members of the committee is required for passing. The results of the examination are reported by the IST Graduate Programs within the Office for Education to the Office of Graduate Enrollment Services within ten days of the examination. If a candidate fails, it is the responsibility of the doctoral committee to determine whether or not another examination may be taken.

C. General Dissertation/Thesis Requirements

The Graduate School, the University Libraries, and the graduate faculty of Penn State have established format standards that a dissertation or thesis must meet before it receives final approval as a fulfillment of a graduate requirement. The Thesis Office is the unit of the Graduate School responsible for certifying that dissertations and theses have been prepared in accordance with these established regulations.

A dissertation or thesis also is a requirement of the IST doctoral program. Every dissertation/thesis must be reviewed and approved by Thesis Office staff. That office reviews for format only and does not edit for spelling, grammar, or punctuation. When a dissertation or thesis is submitted to the Thesis Office, it must meet the formatting and deadline requirements set forth in the latest edition of the *Thesis Guide* (<http://forms.gradsch.psu.edu/thesis/thesisguide.pdf>). The Center for Academic Computing provides a list of thesis resources to facilitate the writing process and offers PSUThesi, a software package that contains a collection of templates including styles, macros, toolbars, menus, and layouts. In addition, the Statistical Consulting Center gives free advice to graduate students working on thesis research.

A doctoral dissertation or thesis must be submitted to the university. For more information on electronic dissertations or theses (eTDs), visit the eTD Web site at <http://www.etd.psu.edu/>.

In all cases, the dissertation or thesis author bears the ultimate responsibility for meeting Graduate School requirements. It is the dissertation or thesis author who must pay the dissertation/thesis fee, activate the intent to graduate, meet deadlines for submission and corrections, and obtain signatures from appropriate faculty members.

A summary of the dissertation or thesis submission requirements is provided below. The dissertation or thesis author should:

- Become familiar with the format requirements by reading the *Thesis Guide* carefully (<http://www.gradsch.psu.edu/current/thesis.html>).
- Be aware of all Graduate School and Thesis Office deadlines as indicated on the Graduate School Calendar at <http://www.gradsch.psu.edu/calendar/gradcal.html>.
- Activate the intent to graduate on eLion during the semester in which you plan to graduate. Go to <http://www.gradsch.psu.edu/current/thesis.html> for deadline.
- Send a Submission Form and a draft of the dissertation (as a Word or PDF file) to the Thesis Office by the specified deadline (format review).
- Defend the dissertation and make any changes required by the committee. This can be done either before or after the format review, as long as deadlines are met. Receive approval from the committee in the form of signatures on the doctoral approval page.
- Review the dissertation one final time to be sure that no further changes are needed. It will not be possible to make corrections after final approval by the Thesis Office. Convert the file into a PDF for eTD submission. If you cannot do this, contact the Thesis Office for assistance.

- Go to the eTD website (http://www.eta.libraries.psu.edu/index_maint.html) and upload the final eTD; submit supporting materials to the Thesis Office. (Note: It doesn't matter if you upload first or submit the materials first). Supporting materials are: signed Doctoral Approval Page, ProQuest/UMI Agreement, Survey of Earned Doctorates, and \$82 thesis fee (cash or a check payable to Penn State).
- Await notification of eTD approval by e-mail. If changes are required, you will be notified. Your eTD will be accessible on the eTD website immediately after graduation unless you have restricted access.
- If bound copies are needed, contact the Multimedia & Print Center on campus (<http://www.multimediaprint.psu.edu>) or you may use an off-campus source. All copies are the author's responsibility. The Graduate School does not provide copies.

IX. Additional Information

A. Internal Transfer of Credits

Students may request an internal transfer of up to 10 credits into the IST Ph.D. program by addressing a memo to the graduate program advisor with a detailed description of the course work taken, the credits of each course, and the comparable course in the IST field. This request should be sent electronically to the IST Graduate Programs Office within the Office for Education. In addition, a memo from the student's adviser should be submitted stating that he or she is in agreement with the transfer.

If the request is denied, the student may not petition again regarding the issue of the transfer of credits from another program.

Because Penn State has no total credit requirement for the Ph.D. degree program, any credit transfers will apply only within the administration of IST's graduate program and will not appear on the student's official transcript.

B. Intent to Graduate

Students who plan to graduate at the end of the semester are responsible for indicating their intent to graduate on eLion by the deadline stated on the graduate calendar (<http://www.gradsch.psu.edu/calendar/gradcal.html>). Any changes to a student's graduation status after the designated time period must be made by contacting the IST Graduate Programs within the Office of Research and Education at 865-8711.

All degrees conferred are tentative until final grade reports have been received and all requirements fulfilled, even though the student's name may appear in the commencement program. A student's transcript or diploma, or both, may be withheld until any outstanding financial obligations to the University have been paid.



STUDENT/ADVISOR CHANGE FORM

STUDENT

I agree to change my advisor from _____ to _____ for my Ph.D. studies at IST.

Student Name (printed) **Student's Signature** **Date**

ADVISOR

I agree to advise _____ during the remainder of his/her Ph.D. studies at IST.

New Advisor Name (printed) **New Advisor's Signature** **Date**

I agree to **NOT** advise _____ during the remainder of his/her Ph.D. studies at IST.

Previous Advisor Name (printed) **Previous Advisor's Signature** **Date**

Return to Graduate Programs in 102H IST Bldg. for Graduate Program Director approval.

Grad Program Advisor's Signature **Date**

College of
Information Sciences and Technology

STUDENT/CO-ADVISORS CHANGE FORM

STUDENT

I agree to change my co-advisors from _____ and _____ to
_____ and _____ for my Ph.D. studies at IST.

Student Name (printed)

Student Signature

Date

NEW CO-ADVISORS

We agree to advise _____ during the remainder of his/her Ph.D.
studies at IST.

Co-Advisor Signature

Co-Advisor Signature

Date

PREVIOUS CO-ADVISORS

We agree to **NOT** advise _____ during the remainder of his/her
Ph.D. studies at IST.

Co-Advisor Signature

Co-Advisor Signature

Date

**Return form to Graduate Programs in 102H IST Bldg. for GRADUATE
PROGRAM ADVISOR APPROVAL**

Grad Program Advisor's Signature

Date

Request for Independent Study* IST 596 -2010-2011

IST 596 is available for all graduate students. However, you are responsible for finding an IST faculty member willing to serve as your instructor. Please complete the following information with the instructor and then set up an appointment with your advisor to review this application form with them.

Name of Student: _____ **PSU I.D. #** _____

Email: _____

Faculty member you will be working with: _____

Number of credits for which student is enrolling: _____

Semester for which student is enrolling: please CIRCLE appropriate semester/session

FA 2010 SP 2011 SU 2011 (1st 6-week) SU 2011 (2nd 6-week) SU 2011 (all semester)

Brief description of course - **Please complete full description on back page as well.**

A statement indicating why the applicant's interest cannot be served by a regularly scheduled IST course:

Approved:

Instructor: _____ **Date:** _____

Advisor: _____ **Date:** _____

Grad Director: _____ **Date:** _____

Return form to Graduate Programs, 102H IST Bldg., to obtain Grad Director's signature and add the course.

*Be sure you fully understand how your independent study credits will be used in your overall plan of study.

Request for Independent Study (Page 2)

Title:

Course Description:

Learning Objectives:

Course Activities:

Assessment:

Professor-Student Interaction:

Exam Scheduling Request

_____ *Ph.D. Dissertation Proposal (Oral Comprehensive)*

_____ *Final Thesis Defense (Masters or Ph.D.)*

Name of Student: _____ **I.D.** _____

Degree: _____

Date of Exam: _____ **Time:** _____

For Final Defense Only: Title of Thesis: _____

Note: Please send electronic copy of thesis abstract to skelleher@ist.psu.edu or mhill@ist.psu.edu 7-10 days before exam.

Room will be scheduled by the Graduate Program Coordinator (do not complete)
Room _____

Committee Chair: _____
Name

Co-Chair: _____
Name

Major Field Member(s): _____
Name

Name

Outside Member(s): _____
Name

Special Member(s): _____
Name

Return form to Grad Programs, 102H IST Building to schedule exam. Thank you.



Request for Research Study Credits 2010-2011
IST 600/601/610/611

IST 600, 601, 610 and 611 research courses are available for all IST graduate students. Please complete the following information with the faculty member who is directing (Chair of your committee) your thesis or dissertation research.

Please circle appropriate course and semester below (and fill in credits if appropriate).

Name of Student: _____ I.D. _____

Email: _____

Faculty Member who is directing your research (Chair of your committee) _____

MASTERS STUDENTS OR PHD STUDENTS WHO STILL HAVE COURSE REQUIREMENTS TO MEET.

IST 600 – Number of credits for which student is enrolling: _____
A letter grade is not assigned for these courses—you will receive a grade of “R” for successful thesis research completion. If thesis research is unsatisfactory, you will receive an “F”.

IST 610 – part-time research -- only to be used by students not in residence.
Number of credits for which student is enrolling: _____
A letter grade is not assigned for these courses—you will receive a grade of “R” for successful thesis research completion. If thesis research is unsatisfactory, you will receive an “F”.

PHD STUDENTS—successfully completed comps and no longer need to take courses.

IST 601 is full-time dissertation research on-campus. Number of credits for which you are enrolled is Zero (0)—however, **your enrollment will reflect full-time status.**

IST 611 is part-time dissertation research off-campus. Only to be used by students not in residence.
Number of credits for which you are enrolled is Zero (0)—**your enrollment will reflect part-time status.**

Semester for which student is enrolling: please CIRCLE appropriate semester/session

FA 2010 SP 2011 SU 2011 (1st 6-week) SU 2011 (2nd 6-week) SU 2011 (all semester)

Approved:

Faculty: _____ Date: _____

Grad. Program Approval: _____ Date: _____

Return form to Graduate Programs, 102H IST Building to add course.

