Motion from CGE re: Changes to streamline PhD program in Information Systems
Approved by the Faculty Senate
22 November 2016

This information will be used to update the on-line University Catalog upon review and approval of the Graduate Council.

College: CCS Program: PhD in Information Systems

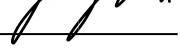
PROGRAM CHANGE

Description of Change: Several changes to streamline the IS PhD Program and make completion more practical, while still maintaining a satisfactory level of quality. Changes are:

- x Change programming foundation course from CS 602 to IS 601 (for incoming students without a computing background)
- x Remove networking foundation course (for incoming students without a computing background), as this is unnecessary for an IS PhD student
- x Make core courses identical to the MS IS core courses, plus a research methods course (IS 765), a research study course (IS 776), and 2 other 700-level courses. Students must take any specialty courses recommended by the student's advisor. We eliminated other required courses, opting for advisor recommendations only so students can focus on their research area needs.
- x Replaced qualifying exam based on coursework with a qualifying exam comprising a research study, to more effectively evaluate student's research potential.
- x Removed second level qualifying exam ("research proposition").
- x Made other miscellaneous requirements strongly recommended instead of mandatory, such as doing a specific number of article reviews and learning how to write grant proposals. x Loosened publication requirements to make completion more practical.
- x Other minor edits, such as in program goals and requirement summary lists.

Semester change will take effect: Spring 2017

REQUIRED COURSE APPROVALS

Department Chairperson:  Date: 10/31/2016 CGE

Chair: _____ Date: _____

Date Catalog updated: _____

[CHANGES IN ALL CAPS AND UNDERLINED]

Ph.D. in Information Systems

Overall Course Requirements

Students must maintain a grade average of 3.5 (B+) or better in core courses. No course with a grade less than B will count. Up to 2 courses may be independent study. At least 4 courses must be at the 700 level.

Ph.D. Program Goals

Students in the PhD program will be able to demonstrate the ability to:

1. understand the state of the art of IS practice
2. understand fundamental knowledge of AND APPLY RESEARCH METHODS WITHIN STUDENT'S CHOSEN FOCUS OF Human-Centered Computing (HCC) OR data intensive research
3. ~~understand and apply research methods in HCC and data intensive research~~
4. critically examine research in the student's chosen research area
5. develop a fundable research proposal
6. develop research questions, design research methodologies, implement systems, interpret results, and discuss implications for a research project in the student's chosen research area, and
7. teach effectively in one IS course

Ph.D. Program Overview and Credits

The PhD program has 4 stages. Full-time students entering with an IS Master's degree are expected to complete within 4 years. Those entering with only a Bachelors or a non-IS background are expected to complete within 5 years. Per NJIT policy, the maximum duration for the entire doctoral study is 7 years for both full-time and part-time students. The following table shows the expected and maximum time allowed for each stage.

Ph.D Program Stage Details

Stage 1: Foundation

Students will consult with the PhD Director to develop an appropriate set of foundation courses which must include the following if not previously studied.

Code	Title	Credits

IS Foundation		
IS 677	Information System Principles (Required)	3
Programming		
~~CS 602~~	~~Java Programming~~	~~3~~
IS 601	WEB SYSTEMS DEVELOPMENT	3
~~**Networking & Security (optionally choose at least one)**~~		~~**3-9**~~
~~CS 652~~	~~Computer Networks-Architectures, Protocols and Standards~~	
~~CS 656~~		
~~CS 696~~		
Course List		
	~~Internet and Higher-Layer Protocols~~	
	~~Network Management and Security~~	

Stage 2: Core Knowledge Acquisition

In this stage, students will focus on core courses, article reviews and the qualifying exam. Students may be required to take a different set of core courses or in a different sequence, depending on their educational background. Student additionally should participate in research activities. STUDENTS MUST TAKE FOUR 700-LEVEL COURSES TO GRADUATE.

First Year			
1st Semester			
IS 631	Enterprise Database Management		3
IS 661	User Experience Design OR		~~3~~
IS 664	CUSTOMER DISCOVERY		3
IS 665	Data Analytics for Info System		3
~~IS 7XX Usability~~			~~3~~
ENG 503	Advanced English for International Teaching Assistants(international students only)		3
	Term Credits		12 ~~15~~
2nd Semester			
IS 663 ~~or R834 562~~	System Analysis and Design ~~or Research Design~~		3
IS 765 ~~or R834 607~~	Quantitative Methods in Information Systems Research ~~or Resrch Sem I: Quant Methods~~		3
~~IS 7XX User Experience Evaluation~~			~~3~~
~~PTC 698~~	~~Selected Topics in Professional and Technical Communication~~		~~3~~
IS 634 or IS 687 or IS 688	Information Retrieval or Transaction Mining and Fraud Detection or Web Mining	COURSES MOVED FROM YEAR 2	3
	Term Credits		9 ~~12~~

Second Year		
1st Semester		
~~IS 634~~ ~~or IS 687~~ ~~or IS 688~~	~~Information Retrieval~~ ~~or Transaction Mining and Fraud Detection~~ ~~or Web Mining~~	~~3~~
IS 684	Business Process Innovation	3
~~R834 575~~	~~Grant Writing & Grants Mgmt~~	~~3~~
IS 776	IS Research Study	3
~~IS 725~~	~~Independent Study in Information Systems~~	
	1 specialty course (as recommended by the advisor)	3
	Term Credits	**9** ~~**12**~~
2nd Semester		
IS 725	Independent Study in Information Systems OR a 700-level specialty course	3
~~IS 726~~	~~Independent Research II~~	
~~IS 776~~	~~IS Research Proposition~~	~~3~~
2 courses in specialty area (if recommended by the advisor)		6
	Term Credits	**3-9** ~~**12**~~
Third Year		
IS 726	Independent Research II (if needed to fulfill 700-level course requirements)	3
More specialty courses (~~if needed~~ if recommended by the advisor)		
	Term Credits	**0-9**
	Total Credits	**33-48**~~**51-63**~~

COURSE MOVED FROM 2ND SEMESTER/RENAMED

COURSE MOVED FROM 1st SEMESTER

COURSE MOVED FROM 2ND SEMESTER

Plan of Study Grid

Participation in Research Activities

IS research group meetings present an important opportunity for faculty and PhD students to immerse themselves in IS research paradigms, learn about research interests, present ideas, and find collaborators.

Full-time funded students must register for IS 791 Graduate Seminar and attend research group meetings, research talks, and serve on research proposition panels every semester. Part-time students also must register for the seminar and actively participate for at least 2 semesters, and are strongly encouraged to attend additional sessions as often as they can remotely via video conferencing. Exit requirements for IS 791 Graduate Seminar include presentations in research group meetings and satisfactory reviewing performance on research proposition panels.

~~Article Reviews~~

~~Critically reviewing articles is an important research skill and service to the community. Students must review at least 6 articles (3 conference papers and 3 journal papers, either before or after publication) to the satisfaction of faculty members from the IS Department, or other faculty approved by the PhD director. Faculty members must sign off on the quality of the reviews, and may require several revisions.~~

~~Students are responsible for finding faculty to pick papers and evaluate reviews, and students can work with several different faculty members to fulfill this requirement. Guidelines for article reviews are posted on the Department's PhD web pages. (Full-time students may complete this requirement within 2 years; and part-time students may complete this requirement within 3 years.)~~

~~Qualifying Exam~~

~~The qualifying exam is given each year in May. The exam has 2 sections:~~

~~x Quantitative research methods~~ ~~x Human-Centered Computing~~ ~~and Philosophy of Information Science~~

QUALIFYING EXAM CHANGED AND MOVED TO STAGE 3 BELOW

~~These topics will be covered in part through coursework, and in part through studying additional materials~~ ~~we make available.~~

~~A student failing both sections the first time or any part twice will be dismissed from the program. If a student fails only one section, one opportunity to retake that section will be offered in the following May. No other options besides retaking the exam will be considered.~~

Stage 3: Research & Teaching Apprenticeship This stage includes: x

finding a dissertation advisor x completing coursework x completing ~~required article reviews~~ A QUALIFYING EXAM (RESEARCH STUDY) x ~~regular~~ publishing x apprenticing teaching ~~x developing a research proposition and presentation.~~

Dissertation Advisor

Students must select a dissertation advisor by the end of the first year of entering Stage 3. This presumably was the student's faculty advocate during the admissions process, though this is a period for students to explore one or more areas of research as part of finding an exciting dissertation topic. Students may switch advisors as their research interests evolve. STARTING THIS STAGE, INCLUDING WHEN SWITCHING ADVISORS, NO STUDENT MAY BE WITHOUT AN APPROVED ADVISOR FOR MORE THAN 4 MONTHS.

Coursework

Students must complete their coursework by the end of this stage. Courses fall into three categories:

1. *Core Courses:* Completing the courses listed in Stage 2.
2. *Specific Knowledge for Research and Dissertation:* Students and their advisors are responsible for choosing courses that will provide appropriate knowledge to complete the student's dissertation, and to be considered knowledgeable in the student's chosen field. The advisor can recommend courses in excess of the official number of credits required for graduation if the additional knowledge is critical.
3. *General Knowledge for Teaching:* If necessary, students and their advisors are responsible for choosing additional courses providing enough knowledge to teach general undergraduate courses in Information Systems and/or in the students chosen specialty.

~~Research Proposition and Presentation~~ QUALIFYING EXAM: RESEARCH STUDY

~~Once a student has sufficient knowledge in a research area, the student will prepare a research proposition. The research proposition proposes a research project following an established grant proposal format. The research proposition is meant to demonstrate research readiness in preparation for dissertation work. The topic does not have to become the student's dissertation, but the ideal case will and also would yield an actual grant proposal that gains funding for the student's research. Propositions will be reviewed by faculty and peers in a fashion similar to the National Science Foundation review process. During this process, students will present their proposition in the IS Research Seminar once when developing the proposition to gain feedback, and again in the semester after passing the proposition. Finally, students must complete necessary revisions to the proposition no later than the following semester.~~

The research study serves as the PhD qualifying exam and demonstrates research readiness. Each student works with a faculty member to identify the topic of a research study, and then takes the lead in designing and conducting the study, and analyzing the results. The study should be submitted by the end of the first semester of this stage. At the start of the second semester the student will present the study and results in a department seminar, and prepare a quality publication as lead author. Recommended revisions to the study and publication must be completed by the end of the second semester. Because the study topic may be part of the faculty member's existing research efforts, the student must petition the department PhD committee to be allowed to utilize it as a dissertation topic. The student will register for IS 776 under the faculty member to conduct this Research Study. (IS 725 and IS 726 cannot be used for this Research Study.)

The faculty advisor (the faculty member working with the student) will propose a Qualifying Exam Committee (QEC) of 3 faculty members with sufficient familiarity of the topic or the study methodology. The QEC must be approved by the Department PhD Committee. The faculty advisor will not be a member of the QEC. Each QEC member will vote (pass-fail) on the Research Study as a whole (considering the design, execution, analysis, and written report to be submitted for publication). The student must receive a unanimous pass vote from the QEC to pass the Qualifying Exam.

~~Regular~~ Publishing

~~Students must submit one conference or journal paper every year. Students are strongly encouraged to coauthor papers with faculty and other doctoral students.~~

STUDENTS MUST HAVE ONE PAPER ACCEPTED FOR PUBLICATION IN A QUALITY CONFERENCE OR JOURNAL AS LEAD AUTHOR BY THE END OF THEIR THIRD YEAR. STUDENTS ARE STRONGLY ENCOURAGED TO START ON THIS REQUIREMENT DURING THIS STAGE AND OVER TIME SUBMIT MULTIPLE PAPERS TO ENSURE THAT IT IS MET. STUDENTS ALSO ARE ENCOURAGED TO CO-AUTHOR PAPERS WITH FACULTY AND OTHER DOCTORAL STUDENTS.

Teaching Apprenticeship

Students apprentice with a faculty member for a semester in preparation for a teaching practicum. During the apprenticeship, students typically will serve as a teaching assistant or grader.

Stage 4: Dissertation Process and Teaching Practicum This stage includes:

x writing and defending a dissertation proposal x

conducting the main study

x writing and defending the full dissertation thesis

~~x submitting publications based both on the proposal and final thesis~~

x SUBMITTING A PUBLICATION BASED ON THE THESIS, AND

x independent teaching practicum

Dissertation Proposal

The dissertation proposal is a binding contract between the dissertation committee and the student. If a student successfully defends a proposal, the research plan in the dissertation proposal is to be followed.

A dissertation proposal must show motivation, appropriate coverage of literature, a sound research framework, a prototype system (where appropriate), a pilot study (where appropriate), data analysis, and the detailed steps for completing the full dissertation.

Dissertation

The dissertation completes the research proposed, including a formal study, and descriptions of contributions and limitations.

~~Publishing~~

~~Before defending the dissertation proposal, a student must submit a paper based upon some aspect of it. Before defending the final dissertation, a student must submit a paper based on the results from its formal study (not just the pilot study from the proposal).~~

PUBLISHING DISSERTATION RESEARCH

BEFORE DEFENDING THE FINAL DISSERTATION, A STUDENT MUST SUBMIT A QUALITY PAPER APPROVED BY HIS OR HER ADVISOR BASED UPON A SUBSTANTIAL ASPECT OF THE THESIS WORK TO A RECOGNIZED CONFERENCE OR JOURNAL IN THE FIELD.

Independent Teaching Practicum

During the practicum a degree candidate will teach at least one previously apprenticed course under the course coordinator's direct supervision. Students must receive a satisfactory evaluation to pass this requirement.

FURTHER ONGOING ACTIVITIES

AS FUTURE RESEARCHERS, THROUGHOUT THEIR STUDIES PHD STUDENTS ARE ENCOURAGED TO WORK WITH FACULTY AND FELLOW STUDENTS TO:

x PUBLISH REGULARLY IN QUALITY CONFERENCES AND JOURNALS, INCLUDING CO-AUTHORING, x ATTEND CONFERENCES RELEVANT TO THE STUDENT'S RESEARCH AREA, x REGULARLY REVIEW CONFERENCE AND JOURNAL SUBMISSIONS, AND

x PARTICIPATE IN AUTHORING GRANT SUBMISSIONS AND WORKING ON GRANT-FUNDED PROJECTS.

Updated Program after Updating

Ph.D. in Information Systems

Program Web Site: is.njit.edu

The Information Systems (IS) PhD program is designed to produce scholars with a commanding knowledge of both theory and practice of IS for complex applications and environments. The program encourages an interdisciplinary approach to the exploration of information systems, and the evaluation of its effectiveness and consequences.

IS PhD dissertations must make a substantial scientific contribution to their particular area of research. PhD students can do research in two research tacks: Information Integration and Informatics (III), i.e., information science and data intensive research, and Human-Centered Computing (HCC).

Entrance Requirements

- Applicants from varying academic backgrounds may apply. Applicants without sufficient Information Systems, computing or mathematics/statistics background, however, will be assigned additional foundation coursework.
- Typically applicants are required to have a Master's degree with a demonstrated record of academic achievement and show promise of being able to excel in the program, but we make exceptions for outstanding students with a Bachelor's degree.
- GPA should be 3.5 or better on a 4.0 scale.
- To ensure that each student finds a dissertation advisor and committee with proper expertise, the PhD director will inform applicants who pass the first round of screening to contact and secure a faculty advocate with the proper expertise to assess and champion their applications. Once admitted, students will be mentored by their faculty advocate. Applicants should explore faculty web sites (is.njit.edu, look for those listed among our core faculty—assistant professors, associate professors and professors) and are encouraged to consult with the PhD director regarding research interests and contacting faculty.

Application Materials

The IS PhD application requires several items *in addition to* those required by NJIT. Therefore applicants must submit both (1) department-specific materials and (2) general NJIT-required materials. For complete details see is.njit.edu/academics .

Financial Support and Application Deadlines

Application deadlines are as follows:

- For Fall semester:
  - For those seeking financial support: December 15
  - For those not seeking financial support: February 15
- For Spring semester:

o For those seeking financial support: September 1 o
For those not seeking financial support: October 1

Part-Time Students

The IS PhD program welcomes part-time students, under the following conditions. Part-time students should arrange their work schedules to participate in research group meetings, seminars and other research activities as often as possible. These activities often take place during the day. Part-time students are required to obtain a leave from work obligations for at least one year in order to focus on their research proposition and dissertation research on a full-time basis.

Distance Students

The IS PhD is an on-campus program; we cannot accommodate distance learning students.

Overall Course Requirements

Students must maintain a grade average of 3.5 (B+) or better in core courses. No course with a grade less than B will count. Up to 2 courses may be independent study. At least 4 courses must be at the 700 level.

PhD Program Goals

Students in the PhD program will be able to demonstrate the ability to:

1. understand the state of the art of IS practice
2. understand fundamental knowledge of and apply research methods within the student's chosen focus of Human-Centered Computing (HCC) or data intensive research
3. critically examine research in the student's chosen research area
4. develop research questions, design research methodologies, implement systems, interpret results, and discuss implications for a research project in the student's chosen research area, and
5. teach effectively in one IS course

PhD Program Overview and Credits

The PhD program has 4 stages. Full-time students entering with an IS Master's degree are expected to complete within 4 years. Those entering with only a BS or a non-IS background are expected to complete within 5 years. Per NJIT policy, the maximum duration for the entire doctoral study is 7 years for both full-time and part-time students. The following table shows the expected and maximum time allowed for each stage.

Table 1: PhD Program Stages and Durations

Stage	Description	Main Activities	Maximum Duration (Full-time)	Maximum Duration (Part-time)
1	Foundation *(If entering with only a BS degree.)*	x Foundation courses	1 year	2 years
2	Core Knowledge Acquisition	x Core courses	1 year	2 years
3	Research and Teaching Apprenticeship	x Core courses, cont. x Coursework in specialty area x Qualifying Exam: Small research study x Publishing x Teaching apprenticeship	1 year	2 years
4	Dissertation Process and fulfilling teaching requirement	x Proposal x Teaching practicum x Dissertation	3 years	4 years

PhD Program Stage Details

Stage 1: Foundation

Students will consult with the PhD Director to develop an appropriate set of foundation courses, which must include the following if not previously studied.

Table 2: Required Foundation Courses

Area	Courses	Description	Comments
IS Foundation	IS 677	Information System Principles	required
Programming	IS 601	Web Systems Development	required

Stage 2: Core Knowledge Acquisition

In this stage, students will focus on core courses, article reviews and the qualifying exam. Students may be required to take a different set of core courses or in a different sequence, depending on their educational background. Students additionally should participate in research activities. Students must take four 700-level courses to graduate.

Table 3. Standard Core Courses

Year 1	
Fall	IS631 Enterprise Database Management

	IS661 User eXperience Design (UXD) or IS 664 Customer Discovery
	IS665 Data Analytics
	ENG503 Spoken English for TA's (international students only)
Spring	IS663 Systems Analysis and Design
	Data Intensive Research, select one from: x IS634 Information Retrieval x IS687 Transaction Mining and Fraud Detection x IS688 Web Mining
	IS 765 Quantitative Methods in Information Systems Research

Year 2	
Fall	
	IS684 Business Process Innovation
	IS 776 Research Study
	1 course in specialty area (as recommended by the advisor)
Spring	2-3 courses in specialty area (if recommended by the advisor)
	IS725 Independent Study (if needed to fulfill 700-level course requirements)
Year 3	
Fall/Spring	More specialty courses (if recommended by the advisor)
	IS726 Independent Study (if needed to fulfill 700-level course requirements)

Participation in Research Activities

IS research group meetings present an important opportunity for faculty and PhD students to immerse themselves in IS research paradigms, learn about research interests, present ideas, and find collaborators.

Full-time funded students must register for

IS 791 Graduate Seminar (Non-credit)

and attend research group meetings, research talks, and serve on research proposition panels every semester. Part-time students also must register for this Seminar and actively participate for at least 2 semesters, and are strongly encouraged to attend additional sessions as often as they can remotely via video conferencing. Exit requirements for IS 791 include presentations in research group meetings, and satisfactory reviewing performance on research proposition panels.

Stage 3: Research & Teaching Apprenticeship

This stage includes:

x finding a dissertation advisor, x
completing coursework,
x completing a qualifying exam (research study), x
publishing, and x apprenticing teaching

Dissertation Advisor

Students must select a dissertation advisor by the end of the first semester of entering Stage 3. This presumably was the student's faculty advocate during the admissions process, though this is a period for students to explore one or more areas of research as part of finding an exciting dissertation topic. Students may switch advisors as their research interests evolve. Starting this stage, including when switching advisors, no student may be without an approved advisor for more than 4 months.

Coursework

Students must complete their coursework by the end of this stage. Courses fall into three categories:

1. *Core courses:* Completing the courses listed in Stage 2.

2. *Specific Knowledge for Research and Dissertation:* Students and their advisors are responsible for choosing courses that will provide appropriate knowledge to complete the student's dissertation, and to be considered knowledgeable in the student's chosen field. The advisor can recommend courses in excess of the official number of credits required for graduation if the additional knowledge is critical.

3. *General Knowledge for Teaching:* If necessary, students and their advisors are responsible for choosing additional courses providing enough knowledge to teach general undergraduate courses in Information Systems and/or in the student's chosen specialty.

Qualifying Exam: Research Study

The research study serves as the PhD qualifying exam and demonstrates research readiness. Each student works with a faculty member to identify the topic of a research study, and then takes the lead in designing and conducting the study, and analyzing the results. The study should be submitted by the end of the first semester of this stage. At the start of the second semester the student will present the study and results in a department seminar, and prepare a quality publication as lead author. Recommended revisions to the study and publication must be completed by the end of the second semester. Because the study topic may be part of the faculty member's existing research efforts, the student must petition the department PhD committee to be allowed to utilize it as a dissertation topic. The student will register for IS 776 under the faculty member to conduct this Research Study. (IS 725 and IS 726 cannot be used for this Research Study.)

The faculty advisor (the faculty member working with the student) will propose a Qualifying Exam Committee (QEC) of 3 faculty members with sufficient familiarity of the topic or the study methodology. The QEC must be approved by the Department PhD Committee. The faculty advisor will not be a member of the QEC. Each QEC member will vote (pass-fail) on the Research Study as a whole (considering the design, execution, analysis, and written report to be submitted for publication). The student must receive a unanimous pass vote from the QEC to pass the Qualifying Exam.

Publishing

Students must have one paper accepted for publication in a quality conference or journal as lead author by the end of their third year. Students are strongly encouraged to start on this requirement during this stage and over time submit multiple papers to ensure that it is met. Students also are encouraged to co-author papers with faculty and other doctoral students.

Teaching Apprenticeship

Students apprentice with a faculty member for a semester in preparation for a teaching practicum. During the apprenticeship, students typically will serve as a teaching assistant or grader.

Stage 4: Dissertation Process and Teaching Practicum

This stage includes:

x writing and defending a dissertation proposal, x conducting the main study, x writing and defending the full dissertation thesis, x submitting a publication based on the thesis, and x independent teaching practicum

Dissertation Proposal

The dissertation proposal is a binding contract between the dissertation committee and the student. If a student successfully defends a proposal, the research plan in the dissertation proposal is to be followed.

A dissertation proposal must show motivation, appropriate coverage of literature, a sound research framework, a prototype system (where appropriate), a pilot study (where appropriate), data analysis, expected contributions, and the detailed steps for completing the full dissertation.

Dissertation

The dissertation completes the research proposed, including a formal study, and descriptions of contributions and limitations.

Publishing Dissertation Research

Before defending the final dissertation, a student must submit a quality paper approved by his or her advisor based upon a substantial aspect of the thesis work to a recognized conference or journal in the field.

Independent Teaching Practicum

During the practicum a degree candidate will teach at least one previously apprenticed course under the course coordinator's direct supervision. Students must receive a satisfactory evaluation to pass this requirement.

Further Ongoing Activities

As future researchers, throughout their studies PhD students are encouraged to work with faculty and fellow students to:

x publish regularly in quality conferences and journals, including co-authoring, x attend conferences relevant to the student's research area, x regularly review conference and journal submissions, and x participate in authoring grant submissions and working on grant-funded projects.

Keywords: CGE, PhD, Information Systems