



JOINT ONLINE INFORMATICS B.S. DEGREE PROGRAM PROPOSAL

Indiana University East, Kokomo, Indianapolis,
Northwest, South bend, and Southeast

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April 30, 2015

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Introduction

This document describes the proposed framework of the joint Online Informatics degree at Indiana University. A committee comprised of faculty representatives from IU East, Kokomo, Northwest, Indianapolis, South Bend, and Southeast contributed to and approved this document. The program goals and learning outcome are first described followed by the proposed courses in the major. Following the course structure, a curriculum map is presented indicating the primary learning outcomes of each informatics course. In Appendix A, the key administrative components of the proposed program are described followed by a draft memorandum of understanding for the program. Finally, in Appendix B the course descriptions are provided.

Program Goals and Learning Outcomes

The learning goals for the proposed Online Informatics degree program were determined by the committee members to relate to six primary categories:

- A. Foundations of Informatics and Computing
- B. Problem solving and programming
- C. Analysis and design of large systems
- D. Collaboration and teamwork with emphasis on virtual teams
- E. Societal and ethical implications of informatics
- F. Application of Informatics skills to another area of specialization (cognate)

The committee developed the following learning outcomes which graduating students will meet and which will be directly measured in appropriate courses as indicated on the curriculum map. Each outcome is of the form “Upon successful completion of the joint Online Informatics degree program, the student shall be able to demonstrate ...”

- A. Foundations of Informatics and Computing
 - 1. Knowledge of discrete mathematics (Sets, functions, etc.)
 - 2. Ability to understand and apply statistics for data analysis
 - 3. Ability to understand and apply the concepts of probability
 - 4. Basics of computers and informatics (including hardware, software, survey of informatics cognates)
 - 5. Knowledge of basic information representation: (binary, octal, and hex number systems)
- B. Problem Solving and Programming
 - 1. Basic problem solving techniques (pseudocoding, flow charting)
 - 2. Low level representation of data (bit, byte, int, float, char, unicode, string, audio, video, image)
 - 3. Fundamental programming skills (variables, conditionals, loops, sub programs, and parameter passing)
 - 4. Proficiency in at least one programming language. Proficiency is defined as the ability to design, implement, test, and debug structured and object-oriented programs.

5. Ability to design, implement, test, and debug web-based solutions
 6. Ability to discuss and/or construct memory based structures and algorithms (Arrays (single, multidimensional), Lists (single, double, circular), stacks, queues, binary trees)
- C. Analysis and Design of Large Systems
1. Ability to use object oriented modeling to devise a solution to a large-scale problem
 2. Ability to perform functional decomposition of a large-scale problem
 3. Ability to develop a data model and subsequent design and implementation of a database for a discipline-specific problem (including knowledge of XML and SQL)
 4. Ability to carry out key tasks of project management as it relates to large information systems projects
 5. Ability to identify elements of proper interface design, and ability to build user-centered interfaces
- D. Collaboration and Teamwork with Emphasis on Virtual Teams
1. Proficiency of contemporary technological tools for communication and collaboration
 2. Proficiency of technological tools for collaboratively designing and coding programs
 3. Ability to effectively utilize oral, written, and visual communications of both qualitative and quantitative information within the context of a team
 4. Skills, behaviors and attitudes necessary to function as an effective team member
- E. Societal and Ethical Implications of Informatics
1. Articulate legal and ethical issues when using the creative work of others; respect the intellectual property of others
 2. Awareness of societal laws and ethical use of information including the use of scenarios and cases to show the applications of ethical principles
 3. Understanding of information privacy laws
 4. Create a personal code of ethics; articulate principles for resolving ethical conflicts
 5. Applications of ethical principles in research (IRB, human subject studies, animal studies, maintaining anonymity and proper data handling)
- F. Application of Informatics Skills to Another Area of Specialization (Cognate)
1. Assessed by each cognate area

As indicated by outcome F above, the Online Informatics degree will have a cognate (or area of specialization) that each student must choose. The specific learning outcomes for this category will hence vary by cognate and are not addressed in this document. However, the approval of cognates as well its outcome assessment will be under the purview of the faculty committee.

Online Informatics Curriculum and Scheduling

Since the inception of the informatics program in early 2000's, different campuses of IU have housed the informatics program in different academic schools and have implemented INFO-I courses using different approaches. Every campus first developed their informatics curriculum by reviewing the original course descriptions from IU Bloomington. Each campus then used their own interpretations, faculty expertise, and existing campus resources to develop an informatics curriculum meeting the needs of their local community. Thus, the alignment of existing INFO-I courses between six different campuses proved

challenging, and the challenge was compounded by other important factors such as the cross listing of informatics courses with other departments (CS, Math, Business, etc.)

In order to meet the above challenges and develop a unified curriculum, this committee has created a series of new INFO-O courses for the new joint Online Informatics program which are not necessarily exact replicas of the INFO-I courses. Instead they contain the breadth of possibilities offered by *all* the campuses combined and when viewed in their entirety provide the same core learning outcomes as the existing face-to-face informatics programs. This approach allows the campuses to move forward with a joint vision for the curriculum in creating these online courses. This strategy also allows for campuses to align their face-to-face (INFO-I courses) with the new online program without negatively affecting their existing students' success and learning.

As outlined in the Program Administration section below, the curriculum is the purview of the faculty committee with representatives from each participating campus. The current proposed curriculum is described below although the faculty committee may continue to refine it. The required courses in the joint Online Informatics degree are (Descriptions can be found in Appendix B):

- 1) INFO-O 100 Informatics Foundations (3 cr.)
- 2) INFO-O 112 Tools of Informatics: Programming and Databases (3 cr.)
- 3) INFO-O 201 Mathematical Foundations of Informatics (3 cr.)
- 4) INFO-O 203 Social Informatics (3 cr.)
- 5) INFO-O 210 Problem Solving and Programming I (3 cr.)
- 6) INFO-O 211 Problem Solving and Programming 2 (3 cr.)
- 7) INFO-O 300 Human Computer Interaction (3 cr.)
- 8) INFO-O 307 Data Representation and Organization (3 cr.)
- 9) INFO-O 399 Database Systems (3 cr.)
- 10) INFO-O 413 Web Design and Development (3 cr.)
- 11) INFO-O 450 System Design (3 cr.)
- 12) INFO-O 451 System Implementation (3 cr.)
- 13) INFO-O 452 Project Management (3 cr.)

The path through the core courses for the degree program including prerequisites is shown below.

(Informatics Online Degree) Prereq Hierarchy (V.7)

** 39 credits of core
** 9 Credits of INFO Electives
** 15-18 of Cognate

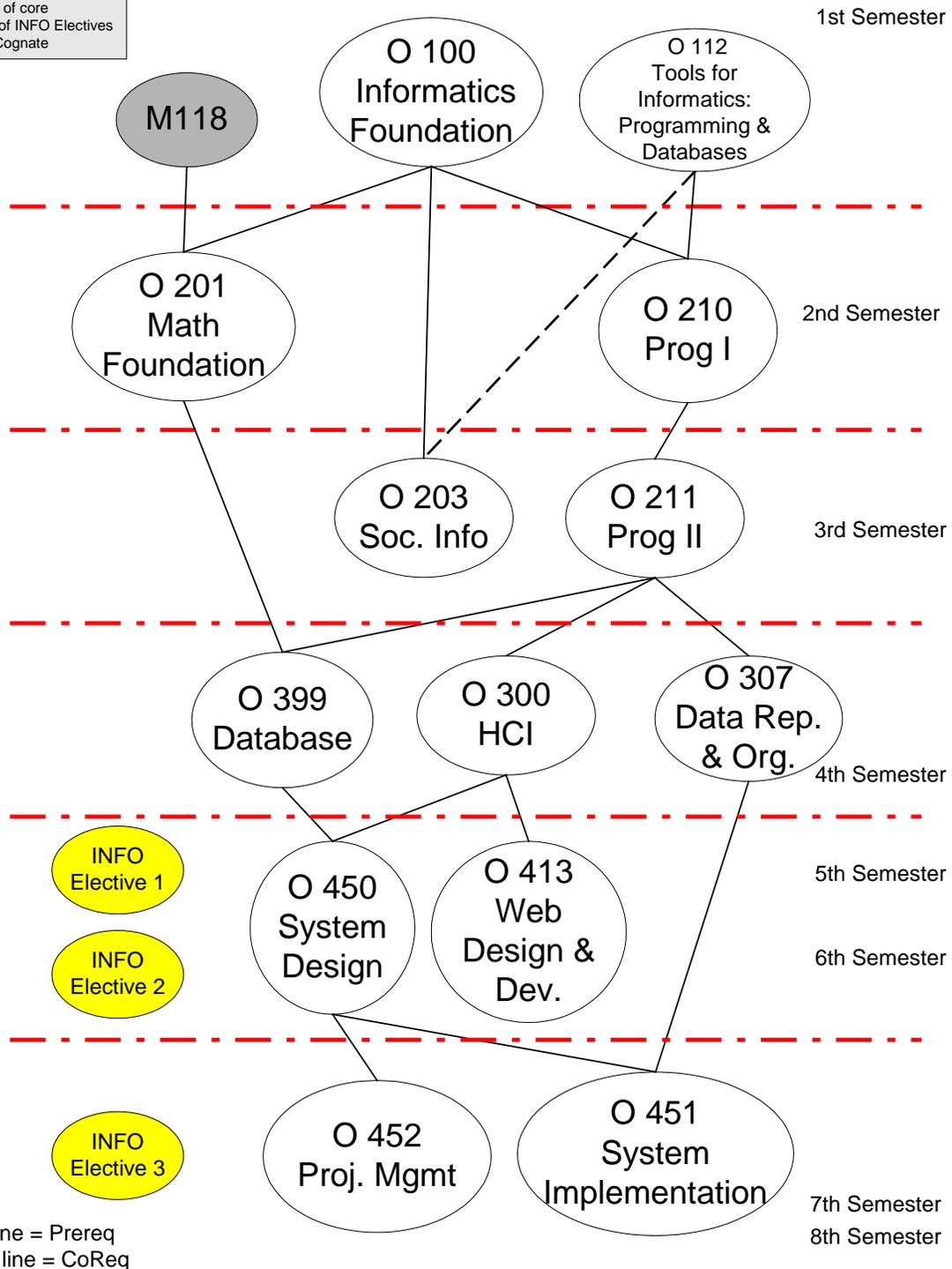


Table I below shows the courses that can be taught by each campus at this point in time for the joint Online Informatics program.

Core Courses	East	Indianapolis	Kokomo	Northwest	South Bend	Southeast
O100	X	X	X	X	X	X
O112	X				X	X
O201	X	X	X	X		
O203	X	X				X
O210	X	X	X	X	X	X
O211	X	X	X	X	X	X
O300	X	X	X		X	X
O307	X				X	X
O399	X	X	X	X	X	X
O413		X	X	X	X	X
O450	X		X	X	X	
O451	X		X	X	X	
O452	X	X		X		X

Table-I (Campus Commitment to Teach Online Sections of INFO-O Courses)

Every campus retains the right to teach any of the core or elective informatics courses. The schedule below is the commitment to **equitable** distribution of courses and students among campuses. In the spirit of cooperation, our goal will be to develop scheduling that will not intentionally target students from other campuses. Ideally, at the end of any two year period (moving average), all the campuses would have taught the same number of students, avoiding the zero-sum budgetary conflicts that have resulted from the current IUOCC model.

Table 2 below shows the tentative 4 year offering for the Core and Elective Online Informatics Courses.

Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
O100	O100	O100	O100	O100	O100	O100	O100
O112	O112	O112	O112	O112	O112	O112	O112
	O201		O201		O201		
		O203		O203		O203	
	O210	O210	O210	O210	O210	O210	O210
		O211	O211	O211	O211	O211	O211
			O300		O300		O300
				O307		O307	
			O399		O399		O399
				O413		O413	
				O450		O450	
					O451		O451
					O452		O452
			INFO Elective	INFO Elective	INFO Elective	INFO Elective	INFO Elective

Table-2 (Tentative Four Year Course Offering of INFO-O courses)

The enrollment for Online Informatics courses will be set at 25 per section. In the event that more than 25 students indicate the desire to register for a class, the campus offering the class can increase the class size to 30. If there is further enrollment demand, the Informatics Program Coordinator in consultation with the appropriate campus will attempt to open a new section of that course (if faculty resources are available) and the enrollment will be equally distributed among the sections. This algorithm will be used to add additional sections to the schedule.

Traditionally academic departments schedule their classes one year in advance. Hence, the participating IU campuses commit to offer the INFO-O courses listed in Sem 1 and Sem 2 columns, as shown below:

Fall 2016

- O100 (First campus: Northwest, Second campus: East)
- O112 (First campus: South East, Second campus: East)

Spring 2017

- O100 (First campus: East, Second campus: South Bend)
- O112 (First campus: South Bend, Second campus: Southeast)
- O201 (First campus: Northwest, Second campus: Indianapolis)
- O210 (First campus: Kokomo, Second campus: Indianapolis)

Table 3 below shows a Four Year Academic Plan for a Typical Online Informatics Major (All courses are assumed 3 credits unless otherwise specified)

Year	Fall	Spring
1	INFO-O 100 Informatics Foundations INFO-O 112 Tools of Informatics MATH-M 118 Finite Mathematics General Education General Education	INFO-O 210 Problem Solving and Programming I INFO-O 201 Math. Foundations of Informatics INFO-O 203 Social Informatics General Education General Education
2	INFO-O 211 Problem Solving and Programming I Science 300 Level Statistics General Education Science	INFO-O 307 Data Representation and Org. INFO-O 300 Human Computer Interaction General Education General Education (2 cr.) Science (4 cr.)
3	INFO-O 413 Web Design and Development INFO-O Elective General Education General Education Cognate 1	INFO-O 399 Database Systems INFO-O Elective General Education General Education Cognate 2
4	INFO-O 450 System Design INFO-O Elective General Education Cognate 3 Cognate 4	INFO-O 451 System Implementation INFO-O 452 Project Management General Education Cognate 5 Cognate 6

Table-3 (Four Year Academic Plan for a Typical Student Pursuing an Online Informatics Degree)

NOTE: The above four year plan assumes admitted students possess the mathematics and English skills to place in college level mathematics (MATH-M 118) and English (e.g., ENG-W 131) courses. Students needing preparatory courses may need to complete these classes prior to being admitted into the Online Informatics program.

Learning Outcomes and Curriculum Map

Table 4 below is a curriculum map which indicates which core course addresses (by introducing [**I**], reinforcing [**R**], or having the students master [**M**]) which program outcomes. **M*** indicates those courses where the students' mastery will be directly assessed and collected at the program level. The program outcomes as worded earlier in the document are high-level outcomes that can be measured in more than one way as the table below demonstrates. In each INFO-O course, learning goals and outcomes will be approved by the faculty committee, contained in the course syllabus, and worded in such a way to lend themselves to direct assessment.

	INFO-O100	INFO-O112	INFO-O201	INFO-O203	INFO-O210	INFO-O211	INFO-O300	INFO-O307	INFO-O399	INFO-O413	INFO-O450	INFO-O451	INFO-O452
A1			IRM*						M				
A2 ¹							R						
A3			IRM*										M
A4	IRM*												
A5	I	I			RM*								
B1	I	RM*			R	R				R			
B2	I	I			RM*					R			
B3	I	R			RM	RM*				R			
B4	I	I			R	RM*		M		M	M	M	
B5										M*			
B6	I	I			R	R		M*		M			
C1											M*	RM	
C2										M	M*	RM	
C3		I							M*		R	RM	
C4											I	RM	RM*
C5	I	I			R	R	RM*	R		R	R	R	
D1	I	I			R	R		R		R	R	RM*	M
D2										R	I	RM*	M
D3		I			R	R	RM	R			M*	RM	M
D4	I				R	R	RM	R			R	RM*	M
E1	I			RM*	R	R		R		R	R	R	R
E2				IRM*									R
E3				IRM*									R
E4				IRM*									R
E5				I									RM*

¹Directly assessed by the required statistics course.

Table-4 (Curriculum Map: Mapping Degree Outcomes and INFO-O Core Courses)

Appendix A

Proposed Administrative Structure and MOU

This appendix includes a proposed memorandum of understanding (MOU) based on the agreed-upon MOU for the Bachelor of Applied Science joint online degree program, and the RN to BSN online degree program. For the Joint Online Informatics degree we propose a similar governance structure with a committee of faculty and a committee of deans overseeing curricular and administrative matters, respectively. A Program Coordinator will centralize record keeping, data collection, and other administrative duties (specific responsibilities are outlined below) while reporting to both committees. The necessary infrastructure to support both students taking and faculty teaching INFO-O course are also described below.

1) Consortium Membership

Membership in this consortium has been open to all IU campuses. As of the date of this agreement consortium members are the following campuses of Indiana University: East, Kokomo, Indianapolis, Northwest, South Bend, and South East. These campuses agree to collaborate on this joint online degree for a period of four years from the date of its implementation. At the end of the four years, campuses may choose to withdraw from this agreement, and any IU campus that elected not to participate previously may choose to join.

2) Consortium Goals

- a. Develop and offer a high-quality Online Informatics program at Indiana University that complements the existing face-to-face programs in participating campuses.
- b. Promote a spirit of collaboration rather than competition among the participating campuses, in such areas as ensuring equitable distribution of courses and students among the campuses.
- c. To reach new student populations for Indiana University and to provide additional course and program options for IU students. Also, to provide a more flexible path to obtaining an informatics degree for non-traditional students, working adults, and others who are not currently served by Indiana University campuses.
- d. Develop and provide a robust set of standards for assessment for students and ensure program outcomes.
- e. To increase the number of baccalaureate degrees in Informatics in the state of Indiana.

3) Governance

- a. The Faculty Committee will be comprised of up to two informatics faculty members from each participating campus (two members will allow for better continuity, however only one vote per campus). The Faculty Committee will oversee this joint Online Informatics degree curriculum and student learning assessment.

Responsibilities:

- i. Approving any changes to the BS in Informatics (Online) curriculum, including the modification of core and elective courses, the addition of new courses, and addition of new cognates.
- ii. Ensuring that curricular changes that require campus approvals are submitted to the appropriate campus units for such approvals.

- iii. Ensuring that student learning assessment is carried out appropriately.
- iv. Addressing other curricular, assessment, and communication functions as necessary.

Membership and Voting:

- i. The chair of the committee will be selected by the committee members and will serve for a two year term. The position of the chair will rotate among the campuses.
- ii. Committee members will serve staggered two year terms and be appointed by the director, chair, or coordinator of informatics at each campus.
- iii. Each campus, regardless of size will have one vote.

- b. The Deans Committee will be comprised of the deans of the schools in which the Online B.S. in Informatics is housed at each campus, or their designees. The Deans Committee will have administrative oversight for the degree program.

Responsibilities:

- i. Promoting a spirit of collaboration, rather than competition, among the participating campuses, in such areas as ensuring equitable distribution of courses and students among the campuses.
- ii. Developing and implementing a process for reviewing and evaluating the program. (e.g., a formal program review to be conducted every five years)
- iii. In coordination with the campus informatics program directors, specify how faculty will be selected to teach in the degree program.
- iv. Determining how serving on the Online Informatics curriculum and other committees contributes to a faculty member's load.
- v. Establishing a method of communication about issues related to coordination and administration of the Online Informatics degree.
- vi. Address other administrative functions as needed.

Membership and Voting:

- i. The chair of each committee will be selected by the committee members and will serve for a two-year term; the position of the chair of each committee will rotate among the campuses thereafter.
- ii. Committee members will serve staggered two year terms.
- iii. In each committee, each campus, regardless of size, will have one vote.

- c. Program Coordinator of the Joint Online Program. The Program Coordinator will report directly to the Faculty Committee and Deans Committee. This 12 month position will provide uniform coordination and accountability in the area of assessment, data collection, data analysis, policy creation, student support, marketing, and scheduling. The Program Coordinator is responsible for:

- i. Developing specific requirements to encourage online course quality. These may include:
 - a. Requirements for online courses (e.g., each course will undergo informal Quality Matters [QM] peer review) and each faculty will undergo training offered by any of the campus Centers for Teaching and Learning that is specifically designed for online courses)
 - b. Requirements for faculty teaching online courses in the program (e.g., full-time tenured or tenure track , terminal degree in informatics (or related area) or areas appropriate to their teaching assignment)

- ii. Ensuring curricular integrity of program offerings, through the implementation of a systematic evaluation process.
 - iii. Oversight of the administration of specialized formative evaluation for Online Informatics courses. (This evaluation will survey the student about the "online nature of the course".)
 - iv. Oversight of student academic advising.
 - v. Serving as external representative and spokesperson for the program.
 - vi. Coordinating the marketing program.
 - vii. Coordinating with the office of online education.
 - viii. Work with the Faculty Committee and Deans Committee to develop procedures and policies.
 - ix. Coordinate faculty teaching assignments in collaboration with the Faculty Committee and Deans Committee.
 - x. Monitor credit hour generation for the joint online program.
 - xi. Track enrollment, retention, and degree completion.
 - xii. Field student complaints across the campuses and report to the appropriate deans when mediation and/or relief is necessary.
 - xiii. Coordination and maintenance of a centralized program-level repository for academic integrity issues reported by faculty.
 - xiv. Other duties as appropriate.
- d. Curriculum
- i. The 120 credit hours joint Online degree requirements are as follows:
 - a. 39 hours of core Informatics courses
 - b. 9 hours of elective Informatics 300 and 400 level courses
 - c. 15 - 18 hours of Informatics cognate courses
 - d. 4 - 6 hours of mathematics
 - e. Up to 38 hours of general education (determined by campus of residence)
 - f. 6 - 10 hours of science
 - g. Additional credit hours can be taken as informatics electives or general electives.
 - ii. Any change to the above curriculum must be approved by the Faculty Committee. For example:
 - a. All INFO-O courses (courses specifically designed for the online multi-campus informatics program) must be approved by the Faculty Committee.
 - b. All Online Informatics cognates must be approved by the Faculty Committee.
 - c. All cross-listing and joint-listing of INFO-O courses must be approved by the Faculty Committee.
 - iii. With the spirit of cooperation in creating this joint Online Informatics degree, participating campuses agree to only schedule online courses agreed by the consortium members to be taken by students across campuses. The undersigned campuses agree not to offer any core or required elective courses that are part of the face-to-face or online Informatics degree through IU-wide initiatives such as IUOCC. The provision under which a student may substitute an online or face-to-face class is articulated in the following section.
- e. Admission and Assignment of Students to Campuses

- i. Students must apply and be admitted to the Online Informatics program.
- ii. Indiana residents and, residents in out-of-state counties with reciprocity agreements will be encouraged to seek admission to the campus nearest their home address. In the event that the campus is unable to admit a qualified student to the program, the campus will refer the student to the next-closest campus for possible admission.
- iii. Out-of-state students (other than reciprocity students) and international students (not residing in United States) who seek to be admitted to the program, will be referred for admission to a specific campus on a rotating basis.
- iv. Once a student is admitted to a campus, that campus will be responsible for providing student services such as registration, financial aid, IT support, academic advising, and will confer the degree.
- v. Campuses (e.g., faculty, advisors, administrators, or other officers) will not encourage students to transfer from their campus of enrollment to another campus. However, if a student chooses to move to the region of another campus, they may choose to formally transfer to that campus. (Students who transfer to another campus will be responsible for completing that campus's general education requirements.)
- vi. Upon approval of the Program Coordinator, students enrolled in a traditional on-campus Informatics programs may apply to be accepted into the joint Online Informatics program. Similarly, students in the joint online program may transfer to the face-to-face program with the approval of their campus advisor and campus informatics director. To curb potential abuse of this policy, the maximum number of transfers between the programs will be limited to two.
- vii. Joint Online Informatics degree students may petition to substitute an INFO-O course (required or elective) with an INFO-I course if the online course is not being offered during that semester. Such substitutions must be approved by their advisor and informatics director in consultation with the course faculty who may determine if the requested INFO-I substitution is equivalent to the replaced INFO-O course. In other circumstances the student must submit a petition to the Program Coordinator of the Online Program.
- viii. Face-to-face Informatics degree students may petition to substitute an INFO-I course (required or elective) with an INFO-O course. Such substitutions must be approved by their campus advisor and informatics director and in consultation with the course faculty.
- ix. To progress satisfactorily, a student must maintain an overall GPA of 2.0 and obtain a passing grade (C or better) in their informatics core and informatics elective courses. Students with GPA of less than 2.0 will be placed on probation under the administration of the student's home campus and subject to that campus' probation and dismissal policy.

f. Student Support Infrastructure

To deliver a high quality student experience to online students, a robust, multilayer student support infrastructure is needed. At a minimum such infrastructure includes:

- i. Online Academic Advisor (professional or faculty advisor). Appropriate advising system for maintaining accurate degree plans and advising records.
- ii. Online Student Advocate. An example of this service is described in the following link: <https://www.youtube.com/watch?v=ta5adnYgXi0>

- iii. Online and On-campus Testing centers. (to maintain the integrity of the informatics program, we expect IU Office Of Online Education or the participating campuses provide appropriate authentication mechanism and proctoring facilities)
- iv. Online Tutoring (for every class that requests it)
- v. Online SI (for every class that requests it)
- vi. Appropriate online library resources and support
- vii. Appropriate UITS support for the learning management system and software required for students and instructors in the Online Informatics program
- g. Faculty Support Infrastructure
 - i. Online Informatics Program Technology Fund (\$10,000 annually): Faculty developing and teaching online courses typically require hardware and software resources. In order support the faculty technology needs, an annual budget of \$10,000 per participating campus is estimated.
 - ii. Provide QM training to all faculty members who will be developing and teaching courses in the Online Informatics degree program
 - iii. Support with QM certification for courses
- h. Tuition and Fees; Revenue Sharing

Indiana University's VPCFO and the current tuition structure determine how students are charged. In general, student will pay the tuition and fees of their home campus.
- i. Reviewing this Agreement
 - i. The undersigned Indiana University campuses agree to collaborate on this joint degree for a period of four years from the date of its implementation.
 - ii. At the end of four years, campuses may choose to withdraw from this agreement, and any campus which elected not to participate previously may choose to join.
 - iii. Campuses which are not part of the joint degree program agreement may not offer the same or substantially similar degree program independently.

Signature lines for appropriate campus administrators

Director of Informatics, IUE	Dean, IUE	EVCAA, IUE	Chancellor, IUE
Director of Informatics, IUPUI	Dean, IUPUI	EVCAA, IUPUI	Chancellor, IUPUI
Informatics faculty representative, IUK	Dean, IUK	VCAA, IUK	Chancellor, IUK
Director of Informatics, IUN	Dean, IUN	EVCAA, IUN	Chancellor, IUN
Director of Informatics, IUSB	Dean, IUSB	EVCAA, IUSB	Chancellor, IUSB
Director of Informatics, IUSE	Dean, IUSE	EVCAA, IUSE	Chancellor, IUSE

Appendix B

Online Informatics Course Descriptions

P = Prereq
C = Coreq
R = Recommended

INFO-O 100 Informatics Foundations

P: None. Introduction to informatics, basic problems solving and elementary programming skills. It also provides a survey of computing tools in the context of selected disciplines (cognates).

INFO-O 112 Tools for Informatics: Programming and Databases

C: INFO-O 100. Introduction to programming and database concepts with an emphasis on computational thinking, basic programming, basic data modeling and querying. Introductory concepts and syntax will be covered along with debugging programs and modifying and accessing data using visual tools.

INFO-O 201 Mathematical Foundations of Informatics

P: MATH-M 118. An introduction to methods of analytical, abstract, and critical thinking; deductive reasoning; and logical and mathematical tools used in information sciences. The topics include propositional and predicate logic, natural deduction proof system, sets, functions and relations, elementary statistics, proof methods in mathematics, and mathematical induction.

INFO-O 203 Social Informatics

P: INFO-O 100, R: INFO-O 112. Introduction to key ethical, privacy and legal issues as related to informatics, and social research perspectives and literatures on the use of information and communication technologies. Topics include: intellectual property, legal issues, societal laws, ethical use of information, information privacy laws, personal code of ethics, principles for resolving ethical conflicts, and popular and controversial uses of technology. This course also outlines research methodologies for social informatics.

INFO-O 210 Problem Solving and Programming I

P: INFO-O 112. First in a two-course sequence of intensive computer programming. In this course, students will design, develop, test, and debug software solutions using a given programming language.

INFO-O 211 Problem Solving and Programming II

P: INFO-O 210. Second course in the two-course sequence of intensive computer programming. In this course, students will learn and apply object oriented computer programming concepts and techniques. The course will also provide a brief introduction to data structures and files.

INFO-O 300 Human Computer Interaction

P: INFO-O 211. This course will provide an introduction to the core topics, approaches and developments in the field of Human Computer Interaction (HCI). The course introduces the process involved in designing and evaluating interactive technologies. Topics include interaction design,

evaluation, usability, user psychology, web design, prototyping, requirements and analysis, and other related issues.

INFO-O 307 Data Organization and Representation

P: INFO-O 211. This course will provide an introduction to ways in which data can be organized, represented and processed from low-level to high level. Topics include construction of memory based structures and algorithms using arrays (single, multidimensional), lists (single, double, circular), stacks, queues, binary trees, and hash tables, and basic file manipulation.

INFO-O 399 Database Systems

P: INFO-O 211, C: INFO-O 201. This course will provide an in-depth discussion of database systems fundamentals. The course emphasizes the concepts underlying various functionalities provided by a database management system, and its usage from an end-user perspective. Topics include: overview and architecture of database systems, the relational database modeling and querying, and basic XML database modeling and querying.

INFO-O 413 Web Design and Development

P: INFO-O 211, INFO-O 300. This courses introduces Website design and development, topics include client-side technologies such as Hypertext Markup Language (HTML, XML), the document object model (DOM), Cascading Style Sheet (CSS), JavaScript and jQuery, AJAX, front-end framework, and server-side technologies.

INFO-O 450 System Design

P: INFO-O 300, INFO-O 399. This course introduces the concepts of large scale system design and development. Topics include: the software development life cycle, specification, analysis, design, modeling, use cases, user interface design, planning, estimating, reusability, portability, working in teams, introductory project management and CASE tools. Student teams will present their final project design.

INFO-O 451 System Implementation

P: INFO-O 450. This course introduces the concepts of large scale system implementation. Topics include: implementation of data models, user interfaces, and software systems, working in teams, software testing, planning, estimating, and post-delivery maintenance. The students will work in teams and will utilize project management tools and revision control and source code management systems. Student teams will present their final project design.

INFO-O 452 Project Management

P: INFO-O 450. This course will provide an in-depth discussion of project management in an Informatics setting. Students will become conversant in the tools and techniques of project management, such as project selection methods, work breakdown structures, network diagrams, critical path analysis, critical chain scheduling, cost estimates, earned value management, motivation theory and team building.