

INDIANA UNIVERSITY KOKOMO

Bachelor of Science in Informatics
Degree Program Review
Self Study Report

School of Sciences

2017

B.S. IN INFORMATICS DEGREE PROGRAM REVIEW

Review Process

A. Program Under Review: Bachelor of Science in Informatics (IU Kokomo, School of Sciences)

B. Review Period: 2007 - 2017

C. Steps in the Review Process:

1. Collection of Data
2. Self Study Report by faculty
3. External Review conducted by: Dr. Sridhar Ramachandran (IU Southeast)

I. Introduction

The Bachelor of Science (B.S.) in Informatics degree is housed in the School of Sciences at Indiana University Kokomo. The degree was established in 2007. At that time, the campus offered a computer information systems (C.I.S.) degree, which was phased out following the implementation of the informatics degree. Informatics is the study and applications of computing and information technology to a particular area or discipline of study. Informatics also considers the use of technology in organizations and in society. Informatics students are equipped to study information technology, consider its social impact, and find ways to use technology to solve problems. The overall objective of the informatics program is to produce qualified professionals who understand the ways people work with and use information, and who can develop solutions that are effective and easy to use. Informatics emphasizes problem solving, innovation, communication, and teamwork along with technical skills and knowledge. In 2017, IU Kokomo introduced an entirely new B.S. degree in computer science (a few courses overlap with informatics). In 2017, IU also began its new joint online informatics degree (IU Kokomo is part of the consortium). Informatics faculty at IU Kokomo are also teaching courses in these two new degrees.

2. Curriculum

The informatics students must complete all of the requirements of the Indiana University Kokomo general education curriculum (Table 1). They must also complete a variety of core informatics courses (Table 2). Finally, they must choose a cognate area and complete the course requirements for that cognate.

Table 1. General Education Categories and Courses taken by Informatics Majors at IU Kokomo.

| Title | Course # | Credits |
|-----------------------------------|------------|---------|
| 1. Communication Skills | ENG-W 131 | 3 |
| 2. Information Literacy | ENG-W 132 | 3 |
| | SPCH-S 121 | 3 |
| 3. Quantitative Literacy | MATH-M 118 | 3 |
| | MATH-K 310 | 3 |
| 4. Critical Thinking | INFO-I 303 | 3 |
| 5. Cultural Diversity | INFO-I 356 | 3 |
| 6. Ethics and Civic Engagement | Various | 3 |
| 7. Social and Behavioral Sciences | Various | 6 |
| 8. Humanities and Arts | Various | 6 |
| 9. Physical and Life Sciences | Various | 8 |

Table 2. B.S. in Informatics Degree-Specific Courses.

| Course # | Title | Credits |
|----------------------|----------------------------------|-----------|
| SSCI-S 105 | Freshman Learning Community | 1 |
| INFO-I 101 | Introduction to Informatics | 4 |
| INFO-I 201 | Math. Foundations of Informatics | 4 |
| INFO-I 202 | Social Informatics | 3 |
| INFO-I 210 | Information Infrastructure I | 4 |
| INFO-I 211 | Information Infrastructure II | 4 |
| INFO-I 213 | Website Design and Development | 3 |
| INFO-I 300 | Human-Computer Interaction | 3 |
| INFO-I 303 | Organizational Informatics | 3 |
| INFO-I 308 | Information Representation | 3 |
| INFO-I 356 | Globalization | 3 |
| INFO-I 450 | Systems Design | 3 |
| INFO-I 451 | Systems Development | 3 |
| | | 41 cr. |
| Cognate area courses | Various | 15-18 cr. |

The B.S. degree in informatics requires that students select a cognate area (15-18 cr), which is a second area of specialization. Cognate areas have been added over time and currently include the following:

- Biology
- Business
- Chemistry
- Cognitive science
- Computer science
- Environmental and earth science
- Mathematics
- New media
- Public and environmental affairs
- Sociology

The current requirements for the cognates are the following.

Biology Cognate

Required Courses:

- BIOL-L 105 Introduction to Biology (5 cr.)
- BIOL-L 364 Principles of Genetics (3 cr.)
- BIOL-L 211/213 Molecular Biology Lecture and Lab (5 cr.)

Select a minimum of 3 credit hours from the following courses:

- BIOL-L 321 Principles of Immunology (3 cr.)
- MICR-M 310 Microbiology (3 cr.)
- MICR-M 315 Microbiology Laboratory (2 cr.)
- BIOL-L 367 Cell Physiology (3 cr.)
- PHSL-P 416 Comparative Animal Physiology (3 cr.)
- BIOL-L 473 Ecology (3 cr.)

Business Cognate

Required Courses:

- ECON-E 200 Fundamentals of Economics (3 cr.)
or
ECON-E 300 Survey of Economics (3 cr.)
or
Both ECON-E 201 Introduction of Microeconomics and ECON-E 202 Introduction to Macroeconomics (6 cr.)
- BUS-W 100 Business Administration: Introduction (3 cr.)
- Select two of the following courses:
 - BUS-A 201 Introduction to Financial Accounting (3 cr.)
 - BUS-L 201 Legal Environment of Business (3 cr.)
or
BUS-K 201 The Computer in Business (3 cr.)
- Select two of the following courses:
 - BUS-D 301 The International Business Environment (3 cr.)
 - BUS-Z 302 Managing and Behavior in Organizations (3 cr.)
or
BUS-S 302 Management Information Systems (3 cr.)

Chemistry Cognate

Required Courses:

- CHEM-C 105/CHEM-C 125 Principles of Chemistry I (5 cr.)
- CHEM-C 106/CHEM-C 126 Principles of Chemistry II (5 cr.)
- CHEM-C 341 Organic Chemistry I: Lecture (3 cr.)
- CHEM-C 342 Organic Chemistry II: Lecture (3 cr.)

Select two of the following courses:

- CHEM-C 343 Organic Chemistry I Lab (2 cr.)
- CHEM-C 361 Physical Chemistry I (3 cr.)
- CHEM-C 310 Analytical Chemistry (3 cr.)
- CHEM-C 430 Inorganic Chemistry (3 cr.)

Cognitive Science Cognate

Required Courses:

- PSY-P 103 General Psychology (3 cr.)
- PSY-P 335 Cognitive Psychology (3 cr.)
- PHIL-P 100 Introduction to Philosophy (3 cr.)

Select one of the following courses:

- PHIL-P 360 Introduction to Philosophy of Mind (3 cr.)
- PHIL-P 304 Nineteenth-Century Philosophy (3 cr.)

- PHIL-P 335 Phenomenology and Existentialism (3 cr.)
- PHIL-P 352 Logic and Philosophy (3 cr.)

Select one of the following courses:

- PSY-P 259 Introduction to Psychological Inquiry (3 cr.)
- PSY-P 326 Behavioral Neuroscience (3 cr.)
- PSY-P355 Experimental Psychology (3 cr.)
- PHIL-P 150 Elementary Logic (3 cr.)
- Any philosophy course not selected from section listed above (3 cr.)

Computer Science Cognate

Required Courses: Select four of the following courses:

- CSCI-C 297 Special Topics (4 cr.)
- CSCI-C 343 Data Structures (4 cr.)
- CSCI-C 438 Computer Networks (4 cr.)
- CSCI-C 400 Client-Server Programming for the Web (4 cr.)
- CSCI-C 455 Analysis of Algorithms (3-4 cr.)
- CSCI-C 436 Introduction to Operating Systems (4 cr.)

Environmental and Earth Sciences Cognate

Select one of the following courses:

- GEOL-G 100 General Geology (5 cr.)
- GEOG-G 107 Physical Systems of the Environment (3 cr.)
- GEOL-G 133 Geology of the United States (5 cr.)

Required Course:

- GEOG-G 250 Computing in the Geospatial Sciences (3 cr.)

Select three or more of the following courses to complete the 15 credit hour minimum requirement:

- BIOL-L 473 Ecology (3 cr.)
- CHEM-C 300 Energy and Green Chemistry - A Natural Science Perspective (3 cr.)
- CHEM-C 390 Environmental Science (3 cr.)
- GEOL-T 326 Geology of Mineral Resources (3 cr.)
- GEOL-G 300 Environmental Geology and Urban Geology (3 cr.)
- GEOL-T 312 Geology of Indiana (3 cr.)
- GEOG-G 315 Environmental Conservation (3 cr.)
- GEOL-G 400 Energy: Sources and Needs (3 cr.)
- GEOL-G 421 United States Geology: Field Experience (1-5 cr.)
- PHYS-P 310 Environmental Physics (3 cr.)

Mathematics Cognate

Required Courses:

- MATH-M 215 Calculus I (5 cr.)
- MATH-M 216 Calculus II (5 cr.)
- MATH-M 311 Calculus III (4 cr.)

Select one of the following courses:

- MATH-M 303 Linear Algebra for Undergraduates (3 cr.)
- MATH-M 313 Elementary Differential Equations with Applications (3 cr.)
- MATH-M 347 Discrete Mathematics (3 cr.)
- MATH-M 360 Elements of Probability (3 cr.)

New Media Cognate

Required Courses:

- NMAT-W 201 Introduction to New Media (3 cr.)
- NMAT-D 216 Studio in Digital Media 1 (3 cr.)

Select three of the following courses:

- NMAT-D 316 Studio in Digital Media II (3 cr.)
- NMAT-W 345 Programming for Artists (3 cr.)
- NMAT-W 445 Advanced Web Design (3 cr.)
- NMAT-G 411 New Media Theory (3 cr.)
- SPCH-C 380 Organizational Communication (3 cr.)
- NMAT-W 305 Physical Computing (3 cr.)

Public Administration Cognate

Required Courses:

- CJHS-J 101 American Criminal Justice System (3 cr.)
- PAHM-V 171 Introduction to Public Administration (3 cr.)

Select three of the following courses:

- PAHM-V 263 Public Management (3 cr.)
- PAHM-V 366 Managing Behavior in Public Organizations (3 cr.)
- PAHM-V 376 Law and Public Policy (3 cr.)
- PAHM-V 348 Management Science (3 cr.)

Consult with an advisor for other PAHM courses that may apply.

Sociology Cognate

Required Courses:

- SOC-S 100 Introduction to Sociology (3 cr.)
or
SOC-S 101 Social Problems and Policies (3 cr.)
- SOC-S 252 Methods of Sociological Research (3 cr.)
- MATH-K 310 Statistical Techniques (3 cr.)
- Three additional sociology electives at the 300 to 400-level (9 cr.)

Minor in Informatics

The undergraduate minor in Informatics requires that students take courses from the following list (with a minimum grade of C-):

- INFO-I 101 Introduction to Informatics (4 cr.)
- INFO-I 210 Information Infrastructure I (4 cr.)
- INFO-I 300 Human-Computer Interaction (3 cr.)
- INFO-I 303 Organization Informatics (3 cr.)

Students are also required to take one course from the following list:

- INFO-I 202 Social Informatics (3 cr.)
- INFO-I 213 Website Design and Development (3 cr.)

Postbaccalaureate Certificate in Informatics

The I-PBC is designed for people who already have a baccalaureate degree in a non-information technology area and wish to take courses that will facilitate securing work in the IT field. The I-PBC consists of 29 credit hours.

| Curriculum | Course Number | Credit Hours |
|---|--------------------------|--------------|
| Introduction to Informatics | INFO-I 101 | 4 |
| Social Informatics | INFO-I 202 | 3 |
| Information Infrastructure I (Visual Basic) | INFO-I 210 | 4 |
| Information Infrastructure II (Java) | INFO-I 211 | 4 |
| Website Design and Development | INFO-I 213 | 3 |
| Topics in Probability and Statistics | MATH-M 133 | 2 |
| Human Computer Interaction | INFO-I 300 | 3 |
| Organizational Informatics | INFO-I 303 | 3 |
| Information Representation or Multimedia | INFO-I 308 or DPIS-D 250 | 3 |
| Total Certificate Program Hours | | 29 |

Finally, since about two years ago, a TSAP agreement is in place to articulate the B.S. in informatics with the two-year community colleges in Indiana.

3. Personnel

In informatics, there are currently three tenured/tenure-track faculty (one associate professor: Dr. Awny Alnusair and two assistant professors: Dr. Mohammad Almalag and Dr. Chen Zhong). A fourth faculty was hired in 2017, but she is assigned entirely to the new degree in computer science (Dr. Hong Liu). At the moment, we do not expect that Dr. Liu will teach INFO-I courses (unless cross-listed with CSCI-C courses), but this could change in the future depending on demand. Several other faculty previously taught in the informatics and have either retired (John Ross, Julia Tinsley) or left IU Kokomo to pursue other professional options (Gongjun Yan, Andrew Kurtz). A few adjunct faculty have also been employed to mostly teach non-major courses or a few selected INFO courses such as INFO-I 356 and INFO-I 202.

II. Review Criteria

A. Program Role and Mission and Consistency with University Mission:

1. Describe the ways in which the program advances the Campus' mission, vision, values, and strategic goals.

IU Kokomo's Mission Statement is the following:

The mission of Indiana University Kokomo, a regional campus of Indiana University, is to enhance the educational and professional attainment of the residents of north central Indiana by providing a wide range of bachelor's degrees, and a limited number of master's and associate degrees. Indiana University Kokomo is further dedicated to enhancing research, creative work, and other scholarly activity, promoting diversity, and strengthening the economic and cultural vitality of the region and the state through a variety of partnerships and programs.

IU Kokomo's Vision Statement is the following:

Indiana University Kokomo will be an educational institution of first choice. Students will have a transformative experience resulting in broad and deep knowledge, an ability to integrate professionalism and ethics, and exceptional skills in analytical and critical reasoning, innovative problem solving and effective communication. We will educate future leaders with a focus on inclusiveness, diversity, culture, civic engagement and globalization. Together with students, our faculty and staff will serve the world through scholarship, creative work, and community engagement.

The School of Sciences (SSCI) which houses the B.S. in informatics degree has the following Mission Statement.

The mission of the School of Sciences is to provide students with the undergraduate academic, research, and experiential background that will enable them to pursue meaningful careers in science-, mathematics-, and informatics-related fields or to meet general education or program requirements in their major. The purposeful combination of theoretical and practical educational experiences, coupled with the flexibility of the available degrees will enable students to prepare for a wide variety of graduate programs, professional schools, secondary school teaching careers, and/or entry into the workplace. Students graduating from the School of Sciences will be lifelong learners and able to make positive contributions in a world where quantitative and scientific literacy, sustainability, and environmental quality are being challenged.

The informatics program is pivotal to each of the mission and vision statements referenced above. In the broadest context, this program is one of the wide variety of degree programs offered by the campus through which students are able to engage in significant interdisciplinary academic work (via the required cognate). Informatics also prepares students very well for excellent careers that will strengthen the economic vitality of the region and of the state.

2. List key relationships between the program and external constituencies such as collaborations, partnerships with regional, community and state organizations, and/or businesses.

Partnerships with Businesses and Organizations

We have developed formal and informal relationships with various businesses in the region. In 2017, we were awarded a \$10,000 grant from the Delphi Foundation to create a series of outreach activities for high school students on the theme of programming, cybersecurity, and technology. These activities will begin in Spring 2018 under the format of "Cyber Saturdays". We have also developed informal relationships with businesses such as Syndicates Sales, Mythics, and Accenture to increase our visibility and enhance internship and employment opportunities for informatics and computer science students.

School of Sciences Advisory Board: The School of Sciences established an Advisory Board several years ago. The board consists of professional working in different fields relevant to the activities of the School of Sciences. This group has become very large in numbers and scope; a short-term goal is to restructure the Advisory Board into smaller boards that would be more specific for the various disciplines (including informatics) in the School of Sciences.

Internships and Professional Development: We strongly promote the importance of internships and make students aware of all internship opportunities (we often receive requests from businesses in the

communities for interns in the field of “IT”). Additionally, we have started to organize (in association with the informatics club) professional trips to further develop the professionalism of our students. In November 2016, we brought approximately 20 informatics majors to Google – Chicago, where they met with software engineers and toured the facilities. That trip was an eye-opener for many students. In November 2017, we will visit the Big Red II facility at IU Bloomington.

Partnership with K-12 Schools

Dr. Zhong hosted a booth for promoting our informatics degree at the Career Fair of the Maple Crest Middle School (a STEM School), Kokomo, IN. During the event, she demonstrated the LEGO robot programming and prototypes to the middle school students and answered their questions about this major and IU Kokomo. Informatics faculty (Alnusair, Almalag) routinely visit high schools in the region to promote our degree and to introduce students to the field of informatics. Numerous school visits have taken place in the last three years including visits to Kokomo HS, Carmel HS, Lewis Cass HS, Hamilton Southeastern HS, etc.

Partnerships with Professional Organizations and Journals

Dr. Chen Zhong received a Grace Hopper scholarship in 2017, which permitted her to attend the Grace Hopper 2017 Celebration of Women in Computing. Dr. Zhong and Dr. Liu have begun an informal group of “women in computing” on campus (including students and faculty). We hope to eventually form an official local chapter of the “Association for Women in Computing”. Dr. Zhong has served as Program Co-Chair at the 2017 International Conference of Technology Innovation, Management and Entrepreneurship, and she was a Session Chair at the IEEE International Conference on Intelligent Data and Security in 2015.

All informatics faculty (Alnusair, Almalag, Zhong) routinely peer-review manuscripts for publications and for conference proceedings. Examples of those would include (but not limited to): IEEE, SecureComm, International Conference on Computing, Networking, and Communications, ACM Symposium on Applied Computing, Journal of Advances in Engineering Software, Mobile Networks and Applications.

B. External and Internal Demand

1. Describe the external demand for graduates of the program. Refer to employment projections based on federal and state information and other resources.

There is a growing need, nationwide, for graduates with skills in informatics, computer science and computing-related disciplines. The job outlook for those graduates is excellent. According to the 2015 U.S. News and World Report, four of the top 11 best current jobs are in computer science-related fields (# 3 software developer, # 7 computer system analyst, # 8 information security analyst, # 11 web developer; <http://money.usnews.com/careers/best-jobs/rankings/the-100-best-jobs>). The U.S. Bureau of Labor Statistics predicts that:

[e]mployment of computer and information technology occupations is projected to grow 12 percent from 2014 to 2024, faster than the average for all occupations. These occupations are expected to add about 488,500 new jobs, from about 3.9 million jobs to about 4.4 million jobs from 2014 to 2024, in part due to a greater emphasis on cloud computing, the collection and storage of big data, more everyday items becoming connected to the Internet in what is commonly referred to as the “Internet of things,” and the continued demand for mobile computing.

The median annual wage for computer and information research scientists was \$108,360 per year (\$52.09 per hour) in 2014, which was significantly higher than the median annual wage for all occupations of \$35,540.

(<http://www.bls.gov/ooh/computer-and-information-technology/home.htm>)

Similar predictions have been made by various agencies including the Indiana Department of Workforce Development. For software developers, the 2014 median pay was \$97,990 per year with a much faster than average expected growth in job outlook (<http://www.bls.gov/ooh/computer-and-information-technology/software-developers.htm>). Finally, a report by the Center on Education and the Workforce at Georgetown University (<https://cew.georgetown.edu/wp-content/uploads/2014/11/stem-complete.pdf>) forecasts that computer occupations will make up more than 51% of STEM occupational growth by 2018. That report also indicates that computer occupations are more “resilient” than other STEM occupations in part because these occupations are mostly concentrated in the industries that have the fastest growth.

2. What steps has the program implemented to attract enrollment from high school students and transfer students?

Transfer Students: Our informatics degree now has an articulation pathway (Transfer Single Articulation Pathway or TSAP) with the network of Indiana community colleges. In 2017, the Dean of Sciences and faculty have visited Ivy Tech Community College campuses (and met with faculty and students) in Kokomo and Lafayette to promote and discuss our degrees.

High School Students: As mentioned above, informatics faculty and the Dean of Sciences routinely visit high schools in the region to promote our degree and to introduce students to the field of informatics. In 2018-19, we will collaborate with Kokomo High School and informatics faculty will offer two dual-credit computing courses to the high school students at the high school location. This will make our faculty and programs more visible to Kokomo High School students and hopefully help with recruitment.

Cognate in Computer Science and Cognate in Environmental Science: In 2015, we added two new cognates for informatics majors: i) Computer Science and ii) Environmental and Earth Sciences (including courses in “sustainability”). These cognates were added because of demand (especially for computer science) and faculty expertise within the School of Sciences. These cognates, especially the computer science one, have been popular and provide more cognate options for informatics students.

3. Describe internal demand for courses in the major using institutional data

The enrollment in the (now phased-out) computer information systems (CIS) degree peaked at 73 in 2001 (Table 3). IU decided to introduce informatics degrees on all of its campus in 2007-2008. During the transition period (from CIS to informatics), there was a noted decline in enrollment as students were not familiar with the new informatics degree. Since about 2011, the enrollment in informatics has been more robust (Table 3). In fall of 2017, we introduced a new degree in computer science, which enrolled 22 new freshmen (in addition to those 22 students, there are a few “undecided” students who are strongly interested in computer science/informatics). The enrollment in informatics in 2017 remains strong at 66 students.

Table 3. Enrollment in “computing degrees” (Computer Information Systems, Informatics, Computer Science) at IU Kokomo since 2001.

| | Total number of students in each major per year (Fall semester) | | | | | | | | | | | | | | | | | | |
|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Major | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Informatics B.S. | | | | | | | | 5 | 15 | 24 | 31 | 45 | 49 | 48 | 64 | 56 | 65 | 66 | 66 |
| Information Systems CIS B.S. (phased out in 2008) | 53 | 60 | 73 | 65 | 63 | 48 | 32 | 39 | 23 | 17 | 9 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Computer Science B.S. (new in 2017) | | | | | | | | | | | | | | | | | | | 22 |
| Total # of “computing” students | 53 | 60 | 73 | 65 | 63 | 48 | 32 | 44 | 38 | 41 | 40 | 47 | 49 | 49 | 64 | 56 | 65 | 66 | 88 |

4. How has the program addressed increased demand?

All computing courses for non-majors (mostly CSCI-C 100 and CSCI-C 106) are taught by adjunct faculty, with a few very rare exceptions over the years. As the number of students increased in the informatics degree program, we continuously requested more positions in informatics (requests were made at annual Campus Budgetary Hearings). When the informatics program began in 2007, we had two faculty in information systems and hired a new informatics faculty, thus we had 3 full-time positions until 2010. Following a retirement and a departure, we went down to 2 full-time faculty in 2010-11. Between 2011 and 2015, we had 2.5 faculty in informatics (a position was shared, 0.5 FTE with the new media program). In 2015, we went back up to 3 full-time positions (the shared position was transferred entirely to informatics). In fall 2017, a fourth faculty was hired, but this position is allocated entirely to the new computer science degree. The three resident “informatics faculty” teach all informatics courses, they teach some computer science courses, and they will begin to teach (Spring 2018) courses in the IU joint online informatics degree.

In recent years, we also started to utilize adjuncts to teach informatics courses for the majors. Adjuncts have taught INFO-I 356 (twice), INFO-I 101 (once), and INFO-I 202 (once) in the last two years.

5. What problems have been encountered in meeting demand?

As both informatics and computer science grow, we expect that we will need to rely more heavily on adjuncts. However, it is very difficult to find adjuncts with the right qualifications and the availability to teach those classes.

C. Productivity

Describe the resources generated and used by the program and key results of the uses of these resources in the areas of student retention, graduation rates, and number of degrees awarded, and services provided to non-majors and to campus-wide learning goals.

1. List grants and contracts received by the program in the last three years and indicate how these resources have affected program productivity and efficiency.

To meet these goals, the informatics faculty (specifically Dr. Alnusair) have been active in seeking funds to achieve some of those goals in collaboration with other faculty at IU. A first grant proposal was entitled “Improving Retention in Computational Sciences through Student Support, Student Engagement and Curriculum Enhancement.” It was submitted to NSF (\$ 908,945), but not funded. A second proposal (\$ 1,996,512), also submitted to NSF, was entitled “GEAR: Goals for Enrollment and Retention”. It was not funded. Even though these proposals were not funded, it gave Dr. Alnusair and his colleagues the opportunity to discuss best practices in the areas of retention and student success, especially as it relates to computing fields.

2. List in the table below the data on the program’s fall to fall retention rate, graduate rate, and number of degrees awarded.

Below in table 4 are retention data. Cohorts are defined as a group of new students declaring informatics as their major for the first term in a particular term. Fall to fall retention determines the one-year retention rates of new students for a particular term. With low numbers, it is difficult to make any conclusion regarding yearly retention data. However, if we agglomerate all the fall to fall retention data from Fall 2007 to Fall 2016, we find that 52 of 128 students (40.6%) were retained in the informatics major and that 66 of 128 students (51.6%) were retained on campus. These retention rates are lower

than IU Kokomo’s fall to fall retention rates which vary from 56.5% (Fall 2016 cohort) to 61.9% (Fall 2014 cohort). The reasons for those lower rates at IU Kokomo are not known, but several studies in the U.S. and in the U.K. have shown that the highest dropout rates by major are found in computer science (there are no national data for “informatics”). Some of the reasons often suggested include poor advising before college (students are advised to pursue a career in computing because of the job prospects) and misconceptions about the field. As Beaubouef and Mason (2005; The SIGCSE Bulletin 37: 103-106) stated, “... students like to play video games, so their dreams are to become video game programmers. They more often than not do not realize the mathematics and computer skills necessary for such endeavors.”

Table 4. Retention data (informatics B.S).

Fall to Fall Retention - Cohorts 2007 to 2016*

*Includes BS and Post-Bac programs

| | Cohort Count | Retained in Major | Retained in Major % | Retained Different Major | Retained Different Major % | Total Retained | Total Retained % |
|-----------|--------------|-------------------|---------------------|--------------------------|----------------------------|----------------|------------------|
| Fall 2007 | 7 | 2 | 28.6% | 0 | 0.0% | 2 | 28.6% |
| Fall 2008 | 12 | 5 | 41.7% | 2 | 16.7% | 7 | 58.3% |
| Fall 2009 | 12 | 5 | 41.7% | 0 | 0.0% | 5 | 41.7% |
| Fall 2010 | 19 | 10 | 52.6% | 3 | 15.8% | 13 | 68.4% |
| Fall 2011 | 19 | 6 | 31.6% | 2 | 10.5% | 8 | 42.1% |
| Fall 2012 | 8 | 2 | 25.0% | 0 | 0.0% | 2 | 25.0% |
| Fall 2013 | 15 | 4 | 26.7% | 2 | 13.3% | 6 | 40.0% |
| Fall 2014 | 8 | 3 | 37.5% | 2 | 25.0% | 5 | 62.5% |
| Fall 2015 | 14 | 13 | 92.9% | 0 | 0.0% | 13 | 92.9% |
| Fall 2016 | 14 | 2 | 14.3% | 3 | 21.4% | 5 | 35.7% |

Spring to Fall Retention - Cohorts 2008 to 2017*

*Includes BS and Post-Bac programs

| | Cohort Count | Retained in Major - Spring | Retained in Major % - Spring | Retained Different Major - Spring | Retained Different Major % - Spring | Total Retained - Spring | Total Retained % - Spring |
|-------------|--------------|----------------------------|------------------------------|-----------------------------------|-------------------------------------|-------------------------|---------------------------|
| Spring 2008 | 1 | 1 | 100.0% | 0 | 0.0% | 1 | 100.0% |
| Spring 2009 | 4 | 3 | 75.0% | 0 | 0.0% | 3 | 75.0% |
| Spring 2010 | 8 | 6 | 75.0% | 0 | 0.0% | 6 | 75.0% |
| Spring 2011 | 5 | 2 | 40.0% | 1 | 20.0% | 3 | 60.0% |
| Spring 2012 | 8 | 5 | 62.5% | 1 | 12.5% | 6 | 75.0% |
| Spring 2013 | 1 | 1 | 100.0% | 0 | 0.0% | 1 | 100.0% |
| Spring 2014 | 5 | 3 | 60.0% | 0 | 0.0% | 3 | 60.0% |
| Spring 2015 | 3 | 2 | 66.7% | 0 | 0.0% | 2 | 66.7% |
| Spring 2016 | 4 | 2 | 50.0% | 2 | 50.0% | 4 | 100.0% |
| Spring 2017 | 7 | 6 | 85.7% | 1 | 14.3% | 7 | 100.0% |

Spring to Fall retention includes only those students that are new to the major in the spring. Although we have spring to fall retention data for informatics, campus-wide data are not yet available, so comparisons are not possible.

Table 5 shows that slightly more informatics students graduated in 6 years (29 students or 24.4%) than in 4 years (24 students or 20.2%). This is not surprising since (historically) many of the informatics students have been working part-time and/or have been returning students. At IU Kokomo, the 6-year and 4-year graduation rates are approximately 40% and 20%, respectively. There is a lot of fluctuation with small numbers, but the informatics graduation rates are similar to those campus-wide rates. We expect that our future 4-year graduation rates will continue to climb as more of our students are traditional-age students and attend school full-time. Table 6 shows the enrollment course-by-course in INFO-I and CSCI courses (excluding CSCI-C 100 and CSCI-C 106) since 2006. The enrollment in 200-level and 300-level courses is steadily climbing. As shown by overall student enrollment (Figure 1), the enrollment in INFO and CSCI has steadily increased over time. It should also be noted that since Fall 2012, INFO-I 101 is a required course for all B.S. majors (but not B.A.) in the School of Sciences. This includes biology, chemistry, biochemistry, mathematics, and obviously informatics.

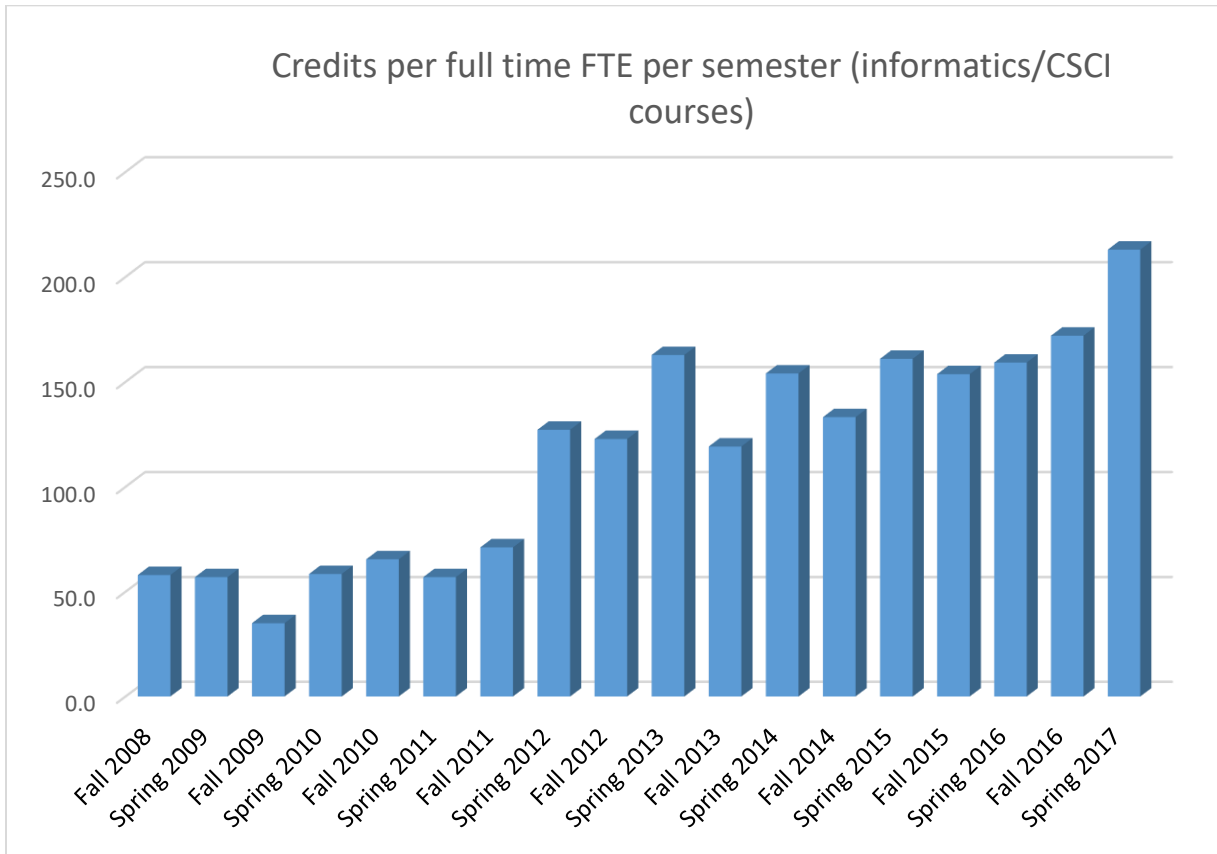
Table 5. Complete 4- and 6-year graduation rates for cohorts 2013 and earlier.

| Cohort Count | Sum of Degrees - 4 Year | Sum of Degrees - 6 Yr | 4 Year Grad Rate | 6 Year Grad Rate | Sum of Other Degree 4 Yr | Sum of Other Degree 6 Yr | 4 Year Grad Rate Other Degree | Grad Rate - 6 Years Other Degree | 4 Yr Grad Rate - All from INFO Cohort | 6 Yr Grad Rate - All from INFO Cohort |
|--------------|-------------------------|-----------------------|------------------|------------------|--------------------------|--------------------------|-------------------------------|----------------------------------|---------------------------------------|---------------------------------------|
| Fall 2007 | 7 | 0 | 0.0% | 0.0% | 0 | 0 | 0.0% | 0.0% | 0.0% | 0.0% |
| Spring 2008 | 1 | 0 | 0.0% | 0.0% | 0 | 0 | 0.0% | 0.0% | 0.0% | 0.0% |
| Fall 2008 | 12 | 1 | 8.3% | 16.7% | 0 | 1 | 0.0% | 8.3% | 8.3% | 25.0% |
| Spring 2009 | 4 | 1 | 25.0% | 25.0% | 2 | 2 | 50.0% | 50.0% | 75.0% | 75.0% |
| Fall 2009 | 12 | 2 | 16.7% | 16.7% | 2 | 2 | 16.7% | 16.7% | 33.3% | 33.3% |
| Spring 2010 | 8 | 2 | 25.0% | 25.0% | 2 | 2 | 25.0% | 25.0% | 50.0% | 50.0% |
| Fall 2010 | 19 | 5 | 26.3% | 36.8% | 2 | 4 | 10.5% | 21.1% | 36.8% | 57.9% |
| Spring 2011 | 5 | 3 | 60.0% | 60.0% | 1 | 1 | 20.0% | 20.0% | 60.0% | 60.0% |
| Fall 2011 | 19 | 5 | 26.3% | 31.6% | 2 | 2 | 10.5% | 10.5% | 36.8% | 42.1% |
| Spring 2012 | 8 | 2 | 25.0% | 37.5% | 1 | 1 | 12.5% | 12.5% | 37.5% | 50.0% |
| Fall 2012 | 8 | 1 | 12.5% | 12.5% | 0 | 0 | 0.0% | 0.0% | 12.5% | 12.5% |
| Spring 2013 | 1 | 1 | 100.0% | 100.0% | 0 | 0 | 0.0% | 0.0% | 100.0% | 100.0% |
| Fall 2013 | 15 | 1 | 6.7% | 6.7% | 0 | 0 | 0.0% | 0.0% | 6.7% | 6.7% |

Table 6. Enrollment (total number of students) in informatics and computer science classes between Fall 2006 and Spring 2017. This list does not include CSCI-C 100 and CSCI-C 106, which are courses for non-majors.

| | Fall 2006 | Spring 2007 | Fall 2007 | Fall 2008 | Spring 2009 | Fall 2009 | Spring 2010 | Fall 2010 | Spring 2011 | Fall 2011 | Spring 2012 | Fall 2012 | Spring 2013 | Fall 2013 | Spring 2014 | Fall 2014 | Spring 2015 | Fall 2015 | Spring 2016 | Fall 2016 | Spring 2017 |
|----------------------|-----------|-------------|-----------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|------------|-------------|------------|-------------|
| INFO-1 101 section 1 | 2 | | 2 | 7 | | 10 | | 11 | | 25 | 24 | 26 | 17 | 26 | 19 | 24 | 27 | 20 | 16 | 29 | 26 |
| INFO-1 101 section 2 | | | | | | | | 9 | | | | 17 | | 17 | | 24 | | 30 | | 22 | |
| INFO-I 201 | | | | | | | 9 | | | | 16 | | | | 25 | | 19 | | 21 | | 23 |
| INFO-I 202 | | | 1 | | 8 | | | | 18 | | 1 | | 30 | | 16 | | 25 | | 28 | | 23 |
| INFO-I 210 | | | 2 | 3 | | 8 | | 4 | | 20 | | 22 | | 25 | | 23 | | 23 | | 26 | |
| INFO-I 211 | | | | | 3 | | 3 | | 4 | | 14 | | 18 | | 11 | | 16 | | 19 | | 26 |
| INFO-I 213 | | | | 4 | | 2 | 2 | 5 | | 8 | | 17 | | | | | | | | 26 | 23 |
| INFO-I 300 | | | | | | | 10 | | | | 20 | | | | | | | 26 | | 26 | |
| INFO-I 303 | | 1 | | | | | 15 | | | | 14 | | | | 26 | | 15 | 19 | | | 20 |
| INFO-I 308 | | | | | 5 | | | | 7 | | | | 26 | | | | 19 | | 16 | | 19 |
| INFO-I 356 | | | | | | | | | | 10 | | 23 | | 14 | | 15 | 9 | | | | 10 |
| INFO-I 391 | | | | | 1 | | | | 1 | | | | | 1 | | | | | | | |
| INFO-I 399 | | | | | | | | | | | | | | | | | | | | | |
| INFO-I 400 | | | | | | | | | | | | | 10 | | | 6 | | | | | |
| INFO-I 450 | | | | 1 | | | | 8 | | 1 | | 6 | | 16 | | 18 | | 10 | | 11 | |
| INFO-I 451 | | | | | 2 | | | | 8 | | 1 | | 6 | | 11 | | 16 | | 10 | | 10 |
| CSCI-C 297 | | | 1 | | | | | | | | | | | | | | | | | | |
| CSCI-C 390 | | | | | | | 2 | | | | | 1 | | | | | | | | | 1 |
| CSCI-C 400 | | | | | | | | | | | | | | | | | | | 13 | | |
| CSCI-C 436 | | | | | | | | | | | | | | | | | | | | | |
| CSCI-C 455 | | | | | | | | | | | | | | | | | | | | | 5 |
| CSCI-C 343 | | | | | | | | | | | | | | | | | | | | | |
| CSCI-B 438 | | | | | | | | | | | | | | | | | | | | 9 | |
| Total | 2 | 1 | 6 | 17 | 19 | 20 | 39 | 37 | 38 | 54 | 100 | 88 | 130 | 85 | 122 | 95 | 152 | 137 | 123 | 149 | 186 |

Figure 1. Faculty Productivity Based on Total Major Credit Hours (INFO-I courses and CSCI courses for the computer science cognate).



The credit hours per full time FTE per semester (Figure 1) has also steadily increased from about 50 cr. in 2008-2011 to around 150 cr. in recent semesters, and it was as high as 213 cr. in Spring 2017. This shows a significant increase in productivity and a maturation of the informatics program.

Provide information relating to other areas in which the major has contributed to Campus-wide initiatives in the areas of learning, engagement, diversity, and others not already reported in a previous section of this report. These might include but are not limited to involvement in freshmen learning communities, Campus-community partnerships and collaborations, and Campus diversity initiatives. Please provide specifics regarding the number of individuals involved in each initiative, the duration of the involvement, as well as the impact of the initiative on the Campus.

Dr. Almalag and informatics students have helped out for several years with an outreach event we hold on a Saturday every winter with the Girl Scouts. Every February, the School of Sciences partners with the local Girl Scouts to offer a Saturday of “science activity”. Dr. Almalag and his students have introduced basic programming skills (using the LEGO robots as a teaching) to the Girl Scouts. This type of activity may hopefully attract more female students in the future. We typically host about 30-40 girls each year.

Dr. Zhong has initiated an informal group about “Women in Computing” to create a supportive environment for female students and to help them develop their networking skills. Dr. Zhong has attended a recent Grace Hopper Celebration of Women in Computing (conference series). The goal is to form a formal chapter of “Women in Computing” on campus and to continue to attract women to the fields of informatics and computer science.

In 2018, we will begin a partnership with Delphi Electronics to offer four or five “Cyber Saturdays” in the spring. These will be outreach events for high schools and will consist of activities in programming, cybersecurity, networks, and electrical engineering (with Delphi engineers). We hope to attract 20-25 high school students to those days.

Incoming informatics students (freshmen) used to enroll in a School of Sciences Freshmen Learning Community (FLC) in their first semester. In recent years, those FLCs were taught by biology or physics faculty. In 2017-18, we began to offer one FLC section per semester specifically for students in informatics and computer sciences. Dr. Alamalag is teaching the first one (Fall 2017 – enrollment of 29 students), whereas Dr. Alnusair will teach the next one in Spring 2018. These new FLCs allow informatics/computer science students to start building communities early while learning more about their disciplines.

D. Program Quality

Describe activities of the program that lead to high program quality and provide documentation of how that quality is measured.

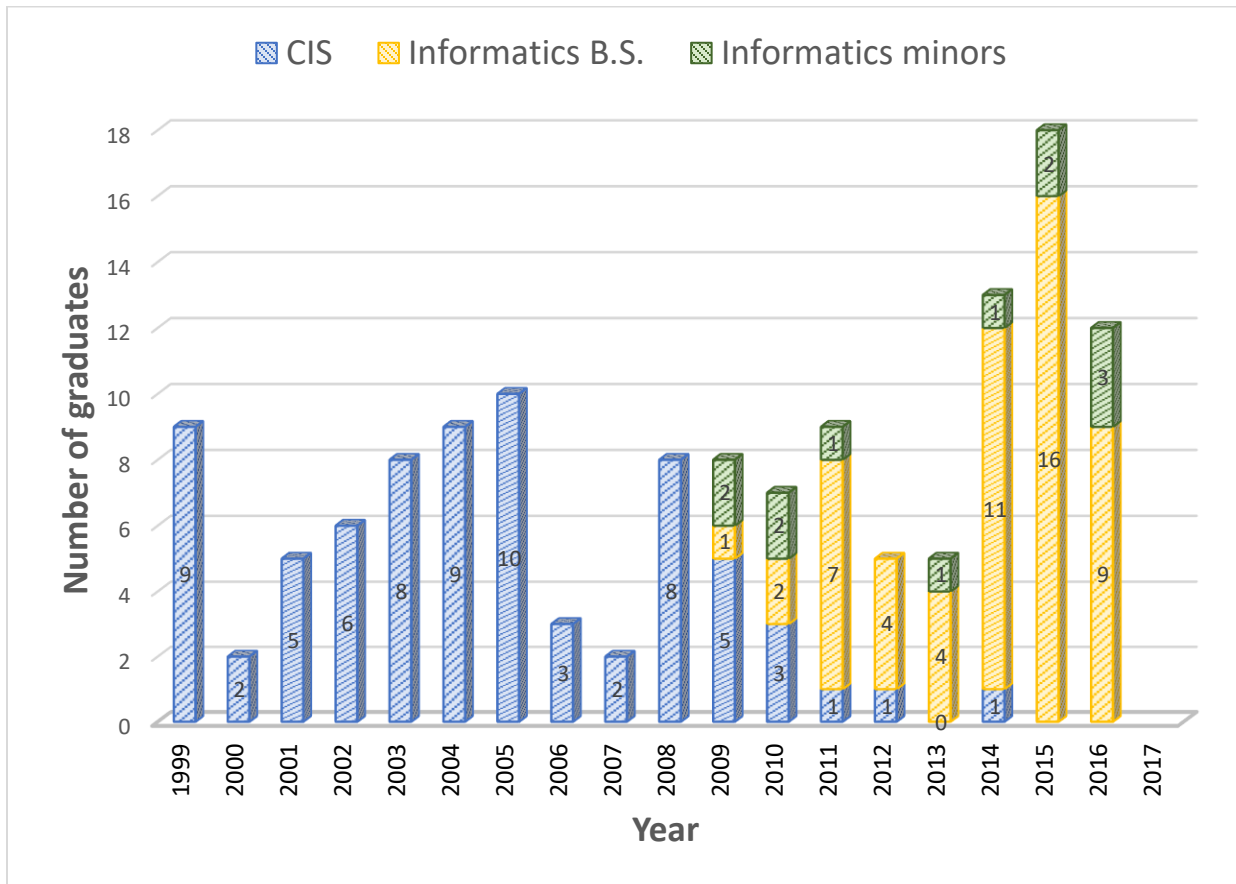
1. Provide evidence of the students’ successful achievement of the program’s learning outcomes.

The detailed B.S. in Informatics assessment plan and reports can be found in the Appendix. Assessment was previously managed by Dr. John Ross who retired in 2015. With his retirement, there were some gaps in assessment, but the situation has now been rectified.

2. Provide outcome information on graduates as available, in particular, employment and enrollment in graduate programs. Information on exit exams, licensure, and other tests and exams should also be provided, especially when comparative results are available.

As shown below (Figure 2), the number of graduates of the informatics program has constantly increased over time, peaking at 16 in 2015. As of August 2017, 60 students have graduated with an informatics B.S. degree from IU Kokomo (this number includes 6 who have graduated so far in 2017; several are pending as December 2017 graduates). These graduates have no difficulty finding employment in a variety of businesses and positions. Examples of recent graduates and their employment are listed below. Many are employed in software development, web development, and IT/IS support. Additionally, a few students graduate every year with a minor in informatics. In 2017, we had our first graduate of the post-baccalaureate certificate in informatics.

Figure 2. Number of Informatics B.S. and Computer Information Systems graduates since 1999 per calendar year.



Informatics alumni and their current positions (partial list of graduates in recent years)

1. E.F. F: Systems Administrator, Cass County (<http://www.co.cass.in.us/dav/index.htm>)
2. K.E.: Laboratory Information Systems Support Specialist at Orchard Software (<http://www.orchardsoft.com/>)
3. E.S.: Production Data Analyst, Harvey Industries, Wabash IN
4. M.M: Web and Applications Developer at AC3 (Advanced Centers For Cancer Care), Southbend, IN
5. T.P.: Database Manager & Quality Data Analyst at Chrysler - Kokomo Casting Plant
6. G.G.: Web Developer at TrendyMinds (<http://trendyminds.com/>)
7. M.T.: JavaEE Developer, Sub Contractor for the Government
8. A.B.: Senior Java Developer at Indiana Farm Bureau Insurance in Indianapolis (<http://www.infarmbureau.com>)
9. J.M.: Database Developer at AgReliant Genetics
10. A.B.: Computer & Network Security Specialist at the US Army in Georgia
11. M.T.: Web Developer at CSC - Computer Sciences Corporation
12. A.A.: Production Owner Architect at Cerner Corporation

13. W.H. Tier 2 Support Specialist - Synovia Solutions
14. L.B.(Informatics PostBaccalaureate Certificate): Fuzion Analytics, Carmel, IN
15. N.R.: Manufacturing Analyst/ JD Edwards Specialist
16. D.B.: Software Engineer at Dialing Innovations
17. S.C.: Web Developer at The Collins Group Inc.
18. R.T.: UX Developer at Jobson Interactive
19. S.A.: IT consultant at American Structurepoint, Indianapolis, IN
20. M.F.: Database Administrator at Wabash National Corporation, Lafayette, IN

3. Discuss the benefits, impact, and importance of accreditation where appropriate.

There is no accreditation process for the B.S. degree in informatics.

4. What steps has the program taken to develop pedagogical innovation and forward-looking curricula?

All informatics faculty (past and present) have been dedicated teachers. All of them have developed numerous courses (or made significant changes to courses). When the degree was launched in 2007-08, the faculty at the time had to create completely new courses. Over time, new faculty have been hired and added to the program, and they brought their own expertise and continue to develop the curriculum in many different ways.

Curriculum Innovation: The redesign of INFO-I 210 and INFO-I 211

In order for Informatics students to learn computer programming, these students take a sequence of two programming courses. INFO-I 210 (Information Infrastructure I) is the first in the sequence and INFO-I 211 (Information Infrastructure II) is the second programming course in the sequence. Up until Fall 2016, I210 was taught using the Visual Basic programming language and I 211 was taught using the Java language. Beginning Fall, 2017 Informatics faculty have decided to redesign these two courses where Java is the only programming language used in both courses. The decision was supported by positive experiences from other institutions. Basically, this redesign allows students to focus on learning programming concepts and techniques rather than spending time and effort learning the syntax of a particular programming language. Additionally, this redesign gives the instructors the ability to introduce more advanced programming topics and techniques as well as ensuring that students have a more meaningful and easier introduction to programming using the Java language as opposed to Visual Basic. In the end, if a student is proficient in one programming language, it is quite easy for that student to learn another language whenever needed.

Curriculum Innovation: 100% online courses

In the Informatics program, we have developed and taught two 100% online courses. These courses are INFO-I 213 (Website Design and Development) and INFO I300 (HCI-Interaction Design). The courses have been offered online for a few years already (since 2014 in the case of INFO-I 213) and they have been successful and quite popular among students. Furthermore, we have developed and are currently teaching a CS course as part of the CS cognate for Informatics students, CSCI-C 297 is a special topics in Computer Science and focuses on computer networking technologies.

Curriculum Innovation: Freshmen Learning Community

Recently the informatics program began offering a section for the Freshmen Learning Community (SSCI-S 105) specifically directed to majors in informatics and computer science. The seminar focuses on applications, studying skills, and the development of critical thinking as it relates to those disciplines.

Curriculum Innovation: INFO-I 450 and INFO-I 451 (sequence course)

INFO-I 450 and INFO-I 451 are offered as a year-long sequence of two courses. A few years ago, Dr. Almalag redesigned INFO-I 450 and INFO-I 451 courses to allow the students to develop a real life information system and practice all the stages in the System Development Life Cycle (SDLC) as a capstone project. INFO-I 450 introduces the basic concepts underlying systems analysis and design, focusing on contextual inquiry/design and data modeling, as well as the application of those techniques in the analysis and design of organizational information systems. This course positions students to have common systems analysis backgrounds to allow them to work in teams to create documents and develop information systems. It also includes the study of human-computer interface issues that are essential to the successful implementation of any system. Besides learning textual facts, the focus is on three key career skills: critical thinking, oral communication, and professional work ethic. In INFO-I 450, the students act as system analysts, whereas in INFO-I 451, the students act as database designers and system developers. The objectives of INFO-I 450 are:

The capstone project main goal is to let the students practice the SDLC. The project is divided into two main parts. First part of the project is focused on the systems analysis and design, which is covered in INFO-I 450 course. The second part of the project is focused on the implementation and testing, which takes place in INFO-I 451 course in the spring semester. Each part is divided into several phases and each phase is graded separately. But all phases are related since the output from one phase is the input of the following phase. Each phase produces a type of documents and these documents are added together to the final report. The students are assigned to teams. Each team has 2-3 students, based on the project size. The projects are “real life” projects, and they have been picked out from our campus and other organizations in Kokomo area.

Curriculum Innovation: INFO-I 202

INFO-I 202 Social Informatics is a required course for the Informatics major. A primary goal is to develop computer professionals who understand the implications of what they create and how it fits into society at large. The previous format of the course included a lot of reading and class presentation. Although these activities can train the students’ critical thinking capability, it is hard for the instructor to evaluate the learning outcome. Besides, it cannot fulfill the needs of the students in Informatics for hands-on experience in solving real-world problems. Therefore, Dr. Zhong redesigned the course by making three main changes.

- 1) Intensive hands-on activities are provided in the classes. These hands-on activities include data visualization, privacy and security data analysis, class debate on controversial topics related to technology, and questionnaire design.
- 2) Various topics on security and privacy have been added to the course content, including third-party tracking, cryptography, web security, database security, intrusion detection, surveillance and freedom of speech.
- 3) Students were asked to work on a research paper by selecting a research topic related to course content and leveraging the methodology taught in this course.

Finally, one informatics faculty (Dr. Alnusair) received a Trustees Teaching Award in 2015 to recognize his excellence in teaching.

5. Provide evidence of advising effectiveness.

Since 2008, the campus has adopted a professional advising model and informatics majors are advised by two professional advisors. The advisors work very closely with the Dean and the faculty regarding issues such as course scheduling, registration, course sequences, course transfers, student success, etc.

6. Provide evidence of faculty engagement in scholarship and service.

The informatics faculty members have always been very engaged in research and have very strong publication and conference presentation records. They are also committed to undergraduate student research.

Faculty Research

Since 2008, informatics faculty members have published 28 journal articles, 3 book chapters, given numerous conference presentations (and several were published in conference proceedings that were peer-reviewed) (Table 7), and have collaborated with about 10 IU Kokomo undergraduate students in their research. Many of the students have been co-authors on papers and conference presentations. This is an excellent amount of activity (considering the small number of faculty at any given time) and clearly indicates the commitment to scholarly activities. A summary of the current informatics faculty's research activities is below. More details about their scholarly work and publications can be found in their CVs in the appendix.

Table 7. Research publications by current and past faculty members in informatics.

| Year | Book Chapters | Refereed Journal Articles | Conference Proceedings (peer-reviewed) | Conference Presentations |
|--------------|---------------|---------------------------|--|--------------------------|
| 2008 | | 1 | | |
| 2009 | | | | 1 |
| 2010 | | 3 | | |
| 2011 | 2 | 4 | | 3 |
| 2012 | | 8 | 1 | 4 |
| 2013 | | 2 | 1 | 4 |
| 2014 | | 4 | | 4 |
| 2015 | | 2 | 1 | 1 |
| 2016 | | 2 | 2 | 3 |
| 2017 | 1 | 3 | 2 | 1 |
| Total | 3 | 29 | 7 | 21 |

Dr. Awny Alnusair, Associate Professor - Research Summary:

While research in software understanding, maintenance, and software reuse remains my ongoing focus, I have been also involved in other research projects that explore slightly newer and emerging topics. These efforts are twofold. Firstly, and most recently, I have been increasingly involved in research projects that intend to provide effective mechanisms for identifying and recommending suitable and relevant multimedia contents in Ambient Intelligent Environments. Secondly, I have also been involved in research projects in cyber security and cyber situational awareness (CSA).

At the software engineering/maintenance front, the primary goal of my research in this area has been trying to enhance the current practices of understanding and reusing software by providing a comprehensive environment that addresses major software understanding issues. In order to achieve this goal, my research objective has been to design and develop an integrated framework that tackles the following multiple interconnected program understanding issues, including design pattern recovery, component search and retrieval and automatic source-code recommendation.

At the Social media recommendation front, the primary goal of this research in this area is to address the problem of recommender systems that can be used to identify and retrieve relevant multimedia content and services in ambient environments tailored to user’s needs.

At the cyber security front, our research focuses on the multimedia nature of cyber security data and examines the possibilities of implementing a cloud-assisted recommendation systems that can identify and retrieve multimedia data of interest based on contextual information and cyber security analysts’ personal preferences. The goal is to provide a recommendation system that benefits cyber analysts by establishing a bridge between their personal preferences, the contextual information of their analytical process, and the various types of modality of multimedia data.

Grants Applied for and Declined

1. Grant Title: Improving Retention in Computational Sciences through Student Support, Student Engagement and Curriculum Enhancement. Joint grant proposal submitted with Hossein Hakimzadeh (PI) and CO-PIs: Awny Alnusair, Suranga Hettiarachchi, Bhaskara Kopparty, April Savoy
 - Amount requested: **\$908,945**
 - Proposal#1432259. Submitted on February 2, 2014
 - Status: declined.
2. Grant Title: GEAR: Goals for Enrollment and Retention. Joint grant proposal submitted with April Savoy (PI) and CO-PIs: Awny Alnusair, Suranga Hettiarachchi, Bhaskara Kopparty, Hossein Hakimzadeh.
 - Amount requested: **\$ 1,996,512**
 - Proposal#1317456. Submitted on December 10, 2012
 - Status: declined.

Grants Awarded: Indiana University Grants

1. IUK Summer Faculty Research Fellowship Grant (Summer 2015). A research proposal submitted to IUK Academic Affairs in October 2014. This research project focuses on service recommendation in Ambient Intelligent Environments.
 - Amount requested and awarded: **\$6000**
2. IUK Grant-in-Aid for Faculty Research (Spring 2014). An undergraduate research proposal submitted to IUK Academic Affairs in 2013. This grant was used to support students who are involved in my research projects on anti-pattern detection in software systems. A large component of this grant was used for providing my students with financial support as well as funding their travel to conferences.
 - Amount requested: **\$4000**
 - Amount awarded: **\$3500**
3. IU Overseas Travel Grant (Spring 2013). Awarded by Indiana University Office of VP for International Affairs. This grant was used to support my trip to Portugal to present my paper at the ACM Symposium on Applied Computing.
 - Amount awarded: **\$800**
4. Two IUK Applied Learning Travel Grants (2013 and 2014). Awarded to my students to attend and present our research at the National Conference on Undergraduate Research (NCUR 2013) and NCUR 2014.
 - Total amount requested and awarded: **\$1000**
5. IUK Summer Faculty Research Fellowship Grant (Summer 2012). A research proposal submitted to IUK Academic Affairs in October 2011. This research project focuses on applying semantic technologies to improving current practices in software comprehension.
 - Amount requested and awarded: **\$6000**
6. Sony Electronics/Intel Corporation. Faculty Scholarship Award (**\$2800**), April, 2012

Dr. Mohammad Almalag, Assistant Professor – Research Summary

My research interests include wireless sensor networks, Mobile Ad-hoc Networks (MANETs), Vehicular Ad-hoc Networks (VANETs), network simulation, and Cloud computing. My dissertation focused on designing a new Media Access Control (MAC) protocol for VANETs. The goal was to improve upon the current IEEE standard for vehicular communications, which has problems in high traffic density conditions. The performance of my protocol was measured by the delivery delay and reception probability of all type of messages in VANETs.

Vehicular Cloud on-demand while parking is a project I am working on at this point. The main goal of this project is to design a communication protocol that utilizes the computing power in modern vehicles while they are parked. This can be done by leasing the computing power of the vehicle to a Cloud computing provider (such as Amazon). There are several benefits of this technology. For example, it could be deployed at the parking garage at the shopping centers. Instead of paying for parking, the vehicle owner can lease the computing power to a cloud provider and park the vehicle for free.

Vehicular Cloud on-demand while parking is targeting the parking garages that are going to be occupied by a large number of vehicles for a long time, such as shopping centers and daily parking at the airports. The reason for focusing on this type of garages is that they will be more attractive to cloud providers to invest in the infrastructure. Each parking garage will have several stations, based on the size of the garage, which will cover all the parking lots at the garage. This will create a grid of several vehicle and treat them as virtual machines.

One of the challenges in vehicle Cloud is managing the vehicles. When vehicles move, they leave the grid and cannot be in range of any stations, which may cause an undesirable situation that will lead to migration of data from the vehicle to another, or to another RSU. In this proposal, I am going to target the vehicles that will remain in the same place for the longest possible time.

Grants

1. Summer Faculty Fellowship, Indiana University Kokomo, 2017
Summer Faculty Fellowship, Indiana University Kokomo, 2014

Dr. Chen Zhong, Assistant Professor – Research Summary

Dr. Zhong has worked on multiple projects related to cyber security and informatics education.

Cyber Security Operation Tracking.

Chen worked with two professors of Penn State on a book chapter about the operation tracking and knowledge reuse methods for facilitating cyber defense analysis. The book chapter has been published in Peng Liu, Sushil Jajodia, and Cliff Wang (Eds.), Recent Advances in Cyber Situation Awareness, Springer vol.10030, 2016.

Cyber Security Operation Reuse and Experience Retrieval.

In collaboration with the professors of Penn State, Chen developed an intelligent system that automates cyber security data triage by leveraging the previous analysts' operations. This work is under submission to IEEE Systems Journal. To further leverage the expert analysts' knowledge, Chen further developed a

trace retrieval system that can provide guidance to novice analysts on data triage in cyber defense analysis. This work has been under submission to Elsevier, COMPUTERS & SECURITY.

Cyber Security Collaborative Visual Analysis System.

Chen advised three undergraduate students in Informatics on research project about collaborative support system for cyber defense analysis. The students published a conference paper at the International Conference of Technology Innovation, Management and Entrepreneurship (TIME-2017, Springer).

Multimedia Cyber Security Operation Recommendation System.

Chen worked with Awny Alnusair on the context-aware multimodal recommendation system in cyber situational awareness. A journal paper has been published in Multimedia Tools and Applications (2017).

Grants:

Subcontract "Recognizing Unexplained Behavior in Network Events" (ARO, \$700,000), Pennsylvania State University Award from DARPA (Solicitation: W911NF-12-R-0012-04). Indiana University Kokomo Summer Faculty Fellowship, 2017.

Faculty Service and Engagement

Informatics faculty members are very active in a variety of service activities both on campus and off-campus as outlined below (more details can be found in their CVs in the appendix). They are very engaged in their professional societies and are active citizens of the campus.

Dr. Awny Alnusair, Associate Professor - Service to the University, School and Department

During my time at IU Kokomo, I have tried my best to get involved in activities that allow me to provide quality service at various fronts including, my department/school, my campus, the community as a whole, and most importantly the student body.

At the department level, service is an integral part of my day-to-day professional life. My top priority when serving my department is to ensure that the school of sciences/program goals that I can impact are met. For example, when the goal was to increase enrollment and improve retention rates in the Informatics program, I have visited many high schools in northern Indiana and north central Indiana to bring awareness to the current demand for computing professionals. During these visits, I have spoken to hundreds of high school students about my university and the Informatics program that we offer. At this level, I was also involved in enhancing current programs as well as creating new ones. For example, I have participated in the development of a new degree in Computer Science. Furthermore, I currently assume the responsibility of coordinating the assessment efforts for the Informatics programs. Finally, at the department/program level, I have been providing mentoring for new faculty in the Informatics and Computer Science programs.

At the campus and university levels, I strived to direct my efforts where my participation on committees can be meaningful based on my strengths and experiences. This is evident from my involvement in committees such as the IU online committee which has just completed the development of a joint online B.S. degree in Informatics for six IU campuses, chairing the Distance Education Committee, and serving as a member in committees such as the Graduate Programs Committee, Board of Review Committee, and a number of Search and Screen Committees. This committee work has been very rewarding to me as it allows me to have an active voice for change.

I have to admit though that my service to the community is quite limited and currently focused on service to the profession through my participation on several professional associations, serving as a reviewer for premier international journals, and serving on technical program committees for prestigious computing conferences and workshops.

Finally, at the student level, I have been trying to create meaningful relationships both with my students as well as the rest of the students in the Informatics program. This involvement goes beyond my regular duties of mentoring students and supervising their internships, practicums, and independent studies. I have established the Informatics club and currently serving as a co-advisor of this club. Furthermore, my relationship with my students continues outside classroom and even after they graduate.

Dr. Mohammad Almalag, Assistant Professor - Service to the University, School and Department

Dr. Almalag have been an active member in service at IUK. He has been part of several committees in our academic unit and at the university level, such as the Strategic Planning Committee, Educational Policies Committee, Diversity Committee, and the Faculty Developments and Grants Committee. He has also been a member in several search committees, such as Assistant Professor of Computer Science, Librarian and Archivist, Assistant V. Chancellor for Academic Affairs and Student Success, and Assistant Professor of Informatics. On the community level, he has done several high school visits and talk about our program and the demand for Informatics in today's market. For about three years, he has given lessons to Girl Scouts on LEGO programming during their visit to campus in February.

Dr. Chen Zhong, Assistant Professor - Service to the University, School and Department

Google Trip:

Dr. Zhong organized a trip to visit Google for the undergraduate students of Informatics in Nov, 2017. In preparation of the trip, Chen contacted the software engineers at Google and arranged the activities and time with them. During the day of visit, Chen, together with Awny Alnusair and the Dean, led the students to Google at Chicago. The visit included a campus tour, which showed students the working environment of Google, and a panel discussion which enabled the students to interact with three software engineers. All the students said the trip was very beneficial and impressive.

Maple Crest Career Fair:

Dr. Zhong hosted a booth for promoting informatics major of IU Kokomo in the career fair at the Maple Crest middle school. During the events, Dr. Zhong demonstrated the LEGO robot programming and prototypes to the middle school students and answered their questions about this major and IU Kokomo.

Computer Science Search Committee:

Dr. Zhong served in the committee for the search for the candidate of the assistant professor position in Computer Science.

E. Potential

Describe the relationship between current resources and program capacity. Support your responses with substantive explanations and forecasts based on measurable trends and other data.

1. What is the program's maximum capacity for majors and minors with current resources? What is the maximum for service courses? In the last five years, what steps have been taken to strengthen the program and increase enrollment, and eliminate underused capacity?

With current resources and course offerings, the B.S. in Informatics degree has room for some growth, but it is getting near capacity. This is demonstrated by the fact that many courses enroll 20 to 30 students on a regular basis. We do not have enough faculty (or adjuncts) to offer additional sections of most courses. Another important factor to consider is that two new degrees were added in 2017 (B.S. in computer science and joint online B.S. in informatics). Informatics faculty are already teaching CSCI classes and Dr. Alnusair will teach our first INFO-C course (the INFO-C courses are the ones offered specifically for the joint online degree) in Spring 2018. So far, one new faculty has been hired specifically for the computer science degree. However, with continued growth in informatics (and expected growth in computer science), this will rapidly stretch our ability to serve all of our students and we anticipate that more faculty will be needed as we continue to attract more students.

2. Has the program implemented any measures to increase efficiency in the last five years? Describe any reallocations of greater efficiency within the program or department. How might the program improve productivity through consolidation or through internal/external partnerships?

Perhaps the most important aspect of this self study is the reflection that it engenders. As a result of this study we affirmed several important and very positive things:

- Our tenure-track faculty are very productive as researchers who have engaged and inspired our students to do publishable and reportable research projects;
- Our faculty are heavily engaged in their roles as teachers; teachers not only of information in informatics/computing/computer science, but, as importantly, teachers of the critical thinking processes that characterize those who are successful in any branch of science and mathematics;
- Our faculty are strongly committed to service to the discipline and its professional societies, to the campus, and to the greater community.

To increase productivity (enrollment and graduation), we have had several discussions with the informatics faculty. The results of these discussions are the following:

- A postbaccalaureate was introduced several years ago to provide this option to graduates who would like to enhance their credentials.
- New cognates in computer science and in environmental and earth sciences were introduced a few years ago. The CS cognate has been especially popular with students, and has served as a "launching pad" for creating the new B.S. in computer science (Fall 2017).
- Dr. Ross designed INFO-I 356 Globalization (3 cr), which introduced informatics students to various issues related to global business and information technology. The course was approved as meeting the campus general education learning outcomes for cultural diversity.
- We highlighted a few years ago the need to better market the informatics degree. Since then, faculty and administrators have visited many schools in the region (including as far as Hamilton County) to talk about informatics and careers in computing. We work very closely with the

Admissions Office to reach those schools. We have also made connections with Ivy Tech Campuses in the region, and there is a TSAP agreement for the informatics degree.

- **External Reviewer’s Comments/Concerns on each of the Review Criteria:**
- **Program Role and Mission and Consistency with University Mission:**
- **External and Internal Demand**
- **Program Quality**
- **Productivity, Costs, Efficiency**
- **Potential**
- **Additional Information**

In addition to commenting on each criterion, external reviewers are asked to fill in the grid below, providing a summative judgment on the overall success of the program on each criterion.

External Reviewer Feedback

| Criterion | Yes | No |
|--|-----|----|
| Does the program demonstrate significant alignment with campus Mission, Values, and Strategic Plans? | | |
| Does the program demonstrate substantial internal demand? | | |
| Does the program demonstrate substantial external demand? | | |
| Compared to other similar programs at similar institutions, is it of high quality? | | |
| Do program trends suggest potential for future program growth? | | |
| Did the additional information provided suggest that the program demonstrates significant contributions to the Campus, region? | | |

IV. Deans' Recommendations Regarding the Future Status of the Program:

- **Programs that are recommended for revision, merging or other action** will be charged to present specific plans for revision, etc. by December 1 following the recommendation of the deans. These plans must provide measurable objectives and a year by year plan for the delivery of these objectives. Failure to meet objectives may result in a decision to eliminate the program.
- **Programs that are recommended for additional investment** will be charged to present specific plans for revision, expansion, etc. by December 1 following the recommendation of the deans. These plans must show how additional investment will positively affect the program in the categories of productivity and quality, and indicate how these enhancements will be measured over time both quantitatively and qualitatively.
- **Programs that are recommended for elimination** will be charged to present specific plans for phasing out the program, accommodating the graduation [of current students???]
- **Programs that are recommended for no change in status and** will not be required to make adjustments to their operations, nor will they be identified for the infusion of new resources.

Program recommended for revision ____

Program recommended for additional investment ____

Program recommended for elimination ____

Program recommended for no change in status ____

Appendix

Informatics Program Review - Response to the reviewer's suggestions and recommendations:

Item 2.a)

Informatics faculty understand the demand for course sequences where course projects extend from one semester to the next. Currently INFO I450 and INFO I451 (capstone courses) provide a course sequence where each group of students plan and design an information system in I450 and develop their designs in I451. Based on the reviewer's comments, Informatics faculty are now considering a computer programming project that begins in INFO I210 and will be completed in the following semester when students take the second programming course, INFO I211. Based on the current courses we offer in the program, I210 and I211 seem to be the best candidates to implement such recommendation of course projects that extend from one semester to the next.

Item 2.b)

In reference to the demand for providing students the opportunity to refurbish course projects in future courses, Informatics faculty are looking into the current projects offered in lower level courses in order to identify which projects can be further enhanced in future courses when the students gain more knowledge about the subject. It seems that projects that fall under the umbrella of design and development would be the best candidates for implementing this suggestion. We are considering this suggestion as it can show the connection between courses in the Informatics curriculum.

Item 3.a)

We appreciate that Dr.Sridhar Ramachandran recognized the diversity of learners enrolled in INFO I-101 because of the interdisciplinary aspects of Informatics. We appreciate his suggestion of offering redesigned course specific for the learners from a particular major or with the same background. However, we have to consider whether it would be an ideal approach, especially for our department with a small group of Informatics faculty. First of all, INFO I-101 is an introductory course in Informatics with no prerequisite on any Informatics courses. The objective of the course is to teach the learners the basic knowledge of Informatics (such as hardware, software, programming, computer networks and the Internet), which aims to benefit the learners from all majors in general. Besides, it gives the learners a lot of opportunities to interact with a diverse group of people and to learn from others who bring a different perspective. This exposure increases learners' capacity for viewing issues and problems from different angles and enhances the learners' creativity and problem-solving abilities.

To tackle the multiple needs from the diverse learners, we have come up with several teaching methods to engage them better.

- (1) Multiple bonus projects are offered to the students in this course. These projects are term-long projects and will offer extra credits to the learners. Each term-long project is designed to instruct the students in a field of interest. The topics include programming, cybersecurity, statistical data analysis using R, database, and informatics career plan.

- (2) Since students have a variety of learning styles, a mix of classroom activities and assignments have been used in teaching this course, such as hands-on labs, group discussion, multi-choice question quizzes, and instructed labs.
- (3) Self-reading goes first. Textbook reading is required every week before the class meetings. The textbook used for this course is well-written and friendly to beginners. It is beneficial to let the students go through the contents before the lecture so that they can have full control to the pace when they learn the contents for the first time.
- (4) A lecture is mixed with hands-on activities. The hands-on activities can reinforce the students' understanding.

Item 3.b)

In response to the reviewer recommendation that the capstone sequence coursework be aligned with professional industry certification pathways/designs like PMITS (Project Management in IT Security), CompTIA Project+ certification, CAPM (Certified Associate in Project Management) etc. The faculty understand the need and the benefits of such certification for the students during the capstone project and after graduation. However, including that in INFO 450/1 will not be feasible due to the amount of material that need be covered in these courses. The faculty agreed on introducing such certification to students in early courses, 300 level courses.



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December, 06, 2017

Program Review: Informatics, Indiana University Kokomo.

Reviewer: Dr. Sridhar Ramachandran, Coordinator & Associate Professor of Informatics,
School of Natural Sciences, Indiana University Southeast, New Albany, Indiana.

Reviewer’s Summary

This review is based on my campus visit of November 20th, 2017, and on my evaluation of the self-study report produced by the Informatics faculty. Prior to the visit, Dr. Christian Chauret (Dean of the School of Sciences) shared with me a Box folder that contained Informatics Assessment Reports, current Curriculum Vitae of the Informatics faculty and Informatics Assessment Plans till the year 2020. During my visit, I had the opportunity to discuss the program’s current status at length with Informatics faculty Drs. Alnusair and Zhong and to inspect their workplace and laboratories. While on campus, I also had meetings with many Informatics students, as well as with the Dean of the School of Sciences (Dr. Christian Chauret), the Associate Dean of the School of Sciences (Dr. Patrick Motl), the Vice Chancellor for Academic Affairs (Dr. Mark Canada), and the academic advising staff for the School of Sciences (Heather Humphrey & Quiana Preston). The meetings were all affable and every individual that I interacted with was very willing to collaborate in sharing information about the Informatics Program. Based on the data presented to me and from the information that I collected during my visit, I have filled out the external reviewer feedback grid (given below).

| External Reviewer Feedback Criterion | Yes | No |
|--|-----|----|
| Does the program demonstrate significant alignment with campus Mission, Values, and Strategic Plans? | ✓ | |
| Does the program demonstrate substantial internal demand? | ✓ | |
| Does the program demonstrate substantial external demand? | ✓ | |
| Compared to other similar programs at similar institutions, is it of high quality? | ✓ | |
| Do program trends suggest potential for future program growth? | ✓ | |
| Did the additional information provided suggest that the program demonstrates significant contributions to the Campus, region? | ✓ | |

Additionally, regarding the Informatics program, I can make five main observations from all the data presented to me and evaluated by me:

1. The performance of the Informatics program’s faculty is excellent. On top of a teaching load of 8 or 9 credit hours per semester (with research release) for Drs. Alnusair, Almalag and Zhong and multiple service duties, they have managed to publish 29 journal articles and 3 book chapters, submit a decent number of grant proposals (consistently and regularly) and also actively participate at scholarly conferences (21 conference



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presentations). In addition, they have supervised undergraduate research work for many informatics majors and directed/mentored capstone projects, activities that are very time consuming but vital for undergraduate involvement in research. For a program with such a small faculty team, their productivity is impressive.

2. In spite of being relatively new, the program has developed considerably, with collaborations with a large number of other programs on campus, a decent number of graduates comparable to that of older, more established programs with similar or larger faculty teams, and solid evidence of successful student outcomes. The program graduated 11 students in the 2014 academic year; 16 in 2015; and 9 in 2016 - given the age of the program and the size of the faculty team, this can be considered a notable achievement.
3. The program has the potential for considerable growth as it develops more face-to-face, online and hybrid courses, establishes even more collaborations (by expanding on the cognates being offered), grows its Postbaccalaureate Certificate in Informatics, attracts more students into pursuing the Minor in Informatics and increases current recruitment and retention efforts. Informatics has also contributed to the development of a Transfer Agreement with Ivy Tech, and has extended its teaching modalities to accommodate a broader variety of learners.
4. Both faculty members that I interacted with (Drs. Alnusair and Zhong) have expressed their satisfaction with the fact that the Dean (Dr. Christian Chauret) and Academic Affairs are very receptive and understanding of the needs of the program and have tried their best to support it.
5. The program's internal assessment data of Learning Outcome A3 shows that student learning and outcomes are appropriately aligned. As the program continues to grow, it is vital that more assessment data be collected from a variety of courses in the program and in different ways to assess all the program goals and learning outcomes more regularly and continuously.

In summary, the Informatics program has achieved quite a bit in its short life, and it is contributing considerably to the mission of the School of Sciences and Indiana University Kokomo (IUK). At the same time, there are some emerging challenges for program development in the near future that must be addressed head on if the program is to continue its successful trajectory. Chief among them are:

1. **Visibility:** Informatics is a new degree, and many college recruits are not even aware of its existence. At the same time, Informatics has a high potential for growth. For the program to fulfill its potential, it is crucial that outreach efforts are extended and sustained. Prospective students must be given reasons to want to attend IUK, and Informatics should be visible to these prospective students as a new and vibrant discipline with excellent employment potential. For example, advertising the program's successful graduates and demonstrating the impact they are making to the community can help the program gain additional support from funding agencies and partnering industrial organizations as well as recruit new participants into the program.



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2. **Distinctness:** Informatics exists independent of Computer Science, and not many college recruits are aware of the distinction. Also, given that the B.S. Informatics program at IUK now has two tracks: the face-to-face option that is administered and managed locally and the completely online (100% online) option that is collaboratively managed by several IU campuses, it is vital for the face-to-face option to identify, retain and market its distinctiveness. For the on-campus Informatics program to grow, develop and sustain, it is crucial that recruitment, retention, collaboration and outreach efforts focus on the distinctness of the program (from other programs that it is associated with).
3. **Resources (space):** The laboratory space of the program is barely adequate at this point. Specifically, the fact that capstone students and undergraduate research students do not have a dedicated and secure lab space that is exclusively available to them to store, and work on sensitive research projects can be detrimental to the ability of the program to support undergraduate research in the future. For example, if the program was to buy 3D printers for use in student projects and coursework, a dedicated space will be required to house the printers and restrict its access (when in use) because the printing process can take several hours and the machine should be able to print uninterrupted.
4. **Resources (faculty):** Current faculty - Drs. Alnusair, Almalag and Zhong have done a very good job of developing the Informatics program so far, but it is difficult to see how they can do any more than they are currently doing. Apart from teaching Informatics courses, the faculty is being tasked with having to teach Computer Science (CS) courses to support the new CS program as it grows and establishes itself. In addition to this, the Informatics faculty team is also being required to offer courses towards the online Informatics (INFO-C) Joint degree program that is a 'new' program in itself (Dr. Alnusair is scheduled to teach INFO-C 210 in Spring 2018). Taken together, the three faculty team is being overstretched and is currently teaching in three degree programs simultaneously. In this sense, the Informatics program is at an inflection point: without additional full-time faculty, the program cannot take advantage of its growth opportunities. Additional faculty would more evenly distribute the teaching load, bring in essential 'new' expertise required for the growth of the program and leave more time for faculty members to carry out important tasks like recruiting, collaboration, course development, grant writing and research.

To summarize, the Informatics Program at IU Kokomo has progressed considerably since its inception, but is currently reaching the limits of development in its current format. In order to ensure continued growth, it is necessary that additional resources (in the form of additional full-time faculty and dedicated lab space) are invested in the program.

Additional Suggestions and Recommendations

1. During my campus visit, I had a very productive meeting with the academic advising staff for the School of Sciences - Heather Humphrey & Quiana Preston. Both the advisors were knowledgeable, enthusiastic and genuinely passionate about advising Informatics



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students. From my interaction, I concluded that the advisors (and advising) would greatly benefit if helpful and informational material is shared with them (for example: Informatics course syllabi, pamphlets clearly explaining the differences between a Computer Science career and an Informatics career, sample Alumni employment data with salary information, etc.). I would suggest using a shared Box folder between the program faculty, dean's office and the advisors. With time, it would also be beneficial to collaboratively develop a Frequently Asked Questions (FAQ) list that can be shared with the students pre and post their advising appointment.

2. My meeting with the Informatics students was very informative. Several students showed up for the almost hour long open discussion session. When I polled the students about their satisfaction with the program (as it is offered currently), I noticed high student satisfaction for the program with a majority of the students stating that they were highly satisfied. As the session progressed, I could ask a few probing questions and record the student responses. I am sharing my notes from the session below:
 - a. When I asked the students what would make their student experience even better, they unanimously asked for more 'new' Informatics course sequences that they could take. They were interested in having course projects extend from one course into another mimicking a modular approach to project design (much like the capstone experience but sooner in their coursework). As the on-campus Informatics program continues to grow, I would recommend that the program focus on offering course sequences (e.g. I-300 in FA & I-441 in SP) or develop and include new sequences like the I-423/24 sequence and/or the I-110/11 sequence to name a few. This would also help students practice on teamwork and work on larger projects early on before they enter the capstone sequence.
 - b. When I asked the students what would make their course experience even better, a majority of them asked for course projects that could be refurbished in future courses. The students were passionate about the projects they are building and wanted to repurpose it by enhancing it with every new skill that they were learning in their coursework. This intrinsic motivation can be used for continual program enhancement. With a detailed collaborative plan, this strategy can be gradually built into all the Informatics course offerings in an attempt to further highlight the connectivity between the courses offered in the program. This design can also encourage students to want to stay with the on-campus program and take courses offered locally.
 - c. When I asked the students what additional help (from the program) would help with uplifting their comfort level with understanding course level concepts and assignment instructions, a majority of them asked for a 'help center' (much like *The Math Commons @ IUK*). Indeed, a free-of-cost help center that houses Informatics tutors (senior students) that the students can seek concept related help from would be a good addition to the program's already excellent services. I would strongly recommend that the Informatics program give this suggestion serious consideration.



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3. My meeting with the informatics faculty (Drs. Alnusair and Zhong) was also very generative. We discussed at length on several issues, possible solutions, and future directions regarding course design and program enhancements. I am sharing my notes from the session below:
 - a. I was very impressed by the use of the INFO-I 101 course as a required course for all B.S. majors in the School of Sciences. We discussed how the diversity of learners in the I-101 classroom can be used to especially highlight the interdisciplinary aspects of Informatics (and also get non-informatics students interested in a Minor in Informatics). I would recommend that the I-101 course be redesigned so that it can be dynamically rearranged every semester (with minimal load on the instructor) to accommodate the needs of the learners in that particular offering. For example, I-101 can have simple database projects that have students explore a certain database. The target database assigned to a student can be decided based on the student's interest – a biology student can be asked to explore the GenBank database (<https://www.ncbi.nlm.nih.gov/genbank>) while a chemistry major can be asked to explore the NMRShiftDB database (<https://nmrshiftdb.nmr.uni-koeln.de/>).
 - b. We also discussed at length about the capstone sequence INFO-450/1. We discussed about the challenges of building project teams, about 'scope creep', and risk mitigation scenarios that are commonly encountered. To combat this challenge, I would recommend that the capstone sequence coursework be aligned with professional industry certification pathways/designs like PMITS (Project Management in IT Security), CompTIA Project+ certification, CAPM (Certified Associate in Project Management) to name a few. This will help run and manage the capstone project (and documentation) in a professional way and also offer the students an opportunity to attempt the certification upon graduation (adding to their career portfolio). Most importantly, employing the assessment instruments used by the professional societies to the capstone sequence can streamline the data collection process.
 - c. Given the interdisciplinary nature of Informatics, I would encourage that students and faculty be provided access and membership to a variety of professional digital libraries. I would recommend that permanent annual funding be made available for this and that the membership is available at no-cost to the faculty and students. The material from the libraries can then be included into the course reading material and would be helpful in diversifying the course readings to showcase the interdisciplinary aspects of the informatics program. It will also help in creating empathy for other disciplines while allowing students to think outside the 'box' or 'silo'.
 - d. A student graduating with a B.S. in Informatics from IUK currently has to take ~38 credit hours of non-informatics general education courses, take 41 credit hours of Informatics specific courses and take ~18 credit hours of cognate course work. Taken together this amounts to ~97 credit hours. Given that the student has ~23 credit hours of course work available outside of the Major to reach the minimal 120 credit hours



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for graduation, I would recommend that the Informatics program (and the School of Sciences) plan on utilizing this to enhance their students' career preparedness. For example, a permanent tie up with a local company (e.g. Syndicates Sales, Mythics and Accenture) to offer regular and planned co-ops and internships for course credits at the 3xx and 4xx level would be one such solution.

- e. It was impressive that the Informatics program was awarded \$10,000 by the Delphi Foundation to create a series of outreach activities on the IUK campus for local high school students on the theme of cybersecurity and technology. In that context, as the Informatics program grows and secures more such funding, it would be beneficial (and strategic) for the program to develop/establish its own 'center' housed in the School of Sciences that can coordinate, manage, collect data and assess the effectiveness of Informatics related outreach activities. This can be useful for compiling data when seeking grants, collaborations and partnerships. The center can also employ the expertise of the Informatics faculty (and students) in providing assistive service (e.g. data analysis, data visualization, cybersecurity analysis, website development, etc.) to various on-campus and the local/neighborhood communities (e.g. non-profit organizations). This will increase the program's visibility on campus and also help highlight its distinctiveness and strengths.
4. It is commendable that there already is a TSAP (Transfer Single Articulation Pathways) agreement with Ivy Tech for the informatics degree. I was also impressed to learn about the upcoming collaboration of the Kokomo High School with the IUK informatics faculty for offering two dual-credit computing courses to the high school students at the high school location. In both cases, I would encourage that full time faculty (not adjuncts) be tasked with teaching the 'first' informatics course that these students take. This is to ensure that the program is appropriately represented and that the faculty member is knowledgeable about the workings of the program (including knowing fine details about the spectrum of courses within the program) and can provide answers to specific questions that the students may have about the program.

If you have any additional questions about this review, please do not hesitate to let me know. I can be reached at sriramac@ius.edu or by regular mail at the address below

Wishing you well,

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