

**Departmental Response**  
**2007 Computer Science External Review**  
**Submitted by**  
**Department of Computer and Information Sciences**  
**April 9, 2007**

**Introduction**

Every seven years, computer science conducts a comprehensive external review of its program. These independent reviews provide important feedback to our department that can both validate the quality of the educational programs and reveal areas to focus future efforts. The last external review of the Computer Science program was conducted in 1999, when computer science was embedded as a sub-department within the department of Mathematics and Computer Science. This year, the department conducted its first external review as an independent department.

This year the department took the self-study and the external review process as an opportunity to evaluate its programs for possible accreditation by the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET). Approximately 10% of the computer science program in the United States are ABET accredited.

The department chose Professor John Impagliazzo of Hofstra University as our external reviewer. Dr. Impagliazzo is uniquely qualified to help us determine the fitness of our program for accreditation. He has served as a team leader for ABET accreditation teams. He is an authority in computer science education and serves as the chief editor for the ACM SIGCSE publications - considered to be top-tier journals and conferences in computer science education.

**Summary**

The computer science external review and the “Mock ABET Accreditation visit” was conducted during February 3<sup>rd</sup> through the 6<sup>th</sup> of 2007. During this visit, Dr. Impagliazzo reviewed the computer science program against the seven major accreditation criteria which are:

- 1) Objectives and Assessment
- 2) Student Support
- 3) Faculty
- 4) Curriculum
- 5) Laboratories and Computing Facilities
- 6) Institutional Support and Financial Resources
- 7) Institutional Facilities

Overall, Dr. Impagliazzo review can be characterized as positive. Two areas (“Objectives and Assessment”, and “Curriculum”) have been identified as requiring a more comprehensive review and revision by the

faculty. The remaining areas have been reviewed and identified as either strong or only needing minor adjustments.

Dr. Impagliazzo's report praises the computer science faculty, found them to be competent in their discipline and performing a good job with respect to teaching, research and service.

Students were found to be happy with their educational experience at IU South Bend. However, our current student advising has been identified as an area which needs adjustment in order to be inline with ABET requirements. According to Dr. Impagliazzo, ABET accreditation visiting teams look for a 25:1 ratio (or less) between advisors and advisees. In our department because the bulk of advising is performed by the chair and the associate chair, our ratio is approximately 80:1. The department has a plan to remedy this concern by distributing advising load among all the faculty members.

Dr. Impagliazzo has found the computer science laboratories (hardware, software and network) to be up-to-date and consistent with national standards. He also found the department's laboratory supervisors to be competent and adequately serving the laboratory, student and faculty needs for technical expertise. Dr. Impagliazzo did, however, identify the lack of regular (base budget) funding for the lab as a concern which needs to be addressed.

Dr. Impagliazzo has found the administration and institution to be supportive of the program. However, he identified the travel budget to be "marginal given the level of research activity of the faculty". The department has been able to subsidize faculty travel from the Informatics budget. Also, more faculty are applying for external and internal grants that could potentially ease this situation. In addition, as indicated above, he identified the lack of base laboratory budget to be a concern. The department will also continue to seek base budget funding from the administration to improve and sustain our laboratories. Dr. Impagliazzo also identified the position of associate chair in computer science as one that should receive some release time for his service. Currently the associate chair receives a stipend but no a course release time.

Dr. Impagliazzo has found the institutional facilities to be adequate, with the classrooms identified as being adequate and modern.

Library facilities are, for the most part adequate. However, Dr. Impagliazzo has identified the lack of access to IEEE publications as an area which could be improved. The department will leverage its informatics library budget to at least gain partial subscription to IEEE digital library of publications.

The department and the institution do not have the funds in place to replace faculty research equipment (initially purchased using startup funds). The faculty are encouraged to seek internal and external grant funding to replace their research equipment. However additional measures may be needed to remedy this concern.

## Detailed Analysis of Concerns Identified by Dr. Impagliazzo:

Dr. Impagliazzo's concerns can be categorized into three major categories. The first category falls under the program objectives and assessment; the second category falls under curriculum deficiencies, and the third category falls under resource deficiencies.

**A) Program Objectives and Assessment:** In the area of assessment, the concerns are focused on the departments mission, identification of stake holders, lack of measurable program objectives, lack of direct assessment of program outcomes and sporadic and marginal data collection. Below is a detailed list of concerns raised by Dr. Impagliazzo:

- 1) The mission of the program is not well articulated.
- 2) Program objectives/goals do not exist. The program must have documented and measurable objectives.
- 3) Program outcomes do not conform to ABET's new outcomes.
- 4) Data relative to the objectives must be routinely collected and documented, and used in program assessments. And, the extent to which each program objective is being met must be periodically assessed.
- 5) The results of the program's periodic assessments must be used to help identify opportunities for program improvement.
- 6) The results of the program's assessments and the actions taken based on the results must be documented.
- 7) Map course outcomes to program outcomes and develop ways to measure them.

**B) Curriculum Deficiencies:** In the area of curriculum deficiencies, the concerns were primarily on the mathematic and science requirements. Some concerns were also raised regarding how the department ensures that area such as verbal and written communication, ethical conduct, and understanding of social implications of technology are reinforced and measured.

Dr. Impagliazzo did not voice any concerns about the core or advanced areas of computing. However, in order to address the identified deficiencies, the department may have to modify its core requirements. The department's curriculum committee will be brainstorming this issue during the spring 2007 semester. Below is a detailed list of concerns raised by Dr. Impagliazzo:

- 1) Mathematics requirements need adjustment. The current technical calculus courses (M208/M209) are not necessarily of high quality or what would be suitable for science majors.
- 2) The C251 (discrete mathematics / foundations of digital computing) could be counted as part of the mathematical requirements for our majors. For example, the 3 credit C251 can be viewed as 2 credits of CS, and one credit of Mathematics.
- 3) The program's math requirement is one credit short of the current ABET requirements.
- 4) The science requirements need adjustment. CS majors should be required to take science courses that are designed for science majors only. Students need to be exposed to scientific methods.
- 5) Ethics, social impacts of computing must be covered in one or more specific core courses or maybe a distinct one credit course. They should be documented, measured, and assessed.

- 6) Written and verbal communication skills must be developed and applied in one or more specific core courses. They should be documented, measured, and assessed.

**C) Resource Deficiencies:** In the area of resource needs, the concerns were primarily on the insufficient base funding for departmental laboratories, lack of access to IEEE journals, lack of release for associate chair in computer science, elevated advising load, insufficient travel funds for the level of scholarly activities and lack of base funding for replacement of faculty research equipment.

- 1) Current base funding for the CS laboratory is \$10,000. In order to maintain a 3 year replacement cycle, approximately \$30,000 will be needed. Currently, the CS labs are adequate; however, there is no stable source of funding for replacing equipment. In the recent past, the department has relied on budget augmentation, LAS college funds, CTE funds, or other one time budget requests.
- 2) Currently, the department associate chair receives no release time. Given the size and scope of responsibility of the associate chair (e.g. scheduling, advising, backing up the chair, etc.), a release may be appropriate. Currently, the associate chair receives \$1,200 stipend.
- 3) The department has access to ACM electronic journals and conference proceedings, however lacks access to IEEE publications. A full subscription to IEEE, costs approximately \$17,000, however a smaller subset may be obtained for approximately \$3,000).
- 4) Currently, the undergraduate advising load is divided between two faculty members. Each advising approximately 75 to 80 students per year. According to Dr. Impagliazzo, the advising load is too high, either a release, or some other method must be employed to reduce the advising ratio to 25 to 1 or fewer.
- 5) Travel funds appear to be inadequate for the level of faculty scholarly activity.
- 6) There is no plan/budget for replacing faculty research equipment.
- 7) Assessment Implementation Funding:
  - a) Startup: A total of 4 course release for the next two year to prepare the assessment instruments, develop rubrics, collect analyze the data, and refine the instruments.
  - b) Funds for attending conferences and workshops on accreditation and assessment.
  - c) Sustain and Maintain: One course release per year to collect and maintain accreditation documents.

## Departmental Action Plan

### A) Program Objectives and Assessment

A1) The mission of the program is not well articulated.

**Action Plan:**

*Faculty retreat to review and refine the department's mission statement. (End of spring or summer 2007)*

A2) Program objectives/goals do not exist. The program must have documented and measurable objectives.

**Action Plan:**

*Define the program objectives. For example:*

- 1) Prepare students for technology / computing jobs in the region and beyond.*
- 2) Prepare student for graduate studies in computer science.*
- 3) Talk to the constituencies (students, alumni, employers and graduate directors) to define and refine the program objectives/goals.*

*Keep the number of objectives minimal for the program. (No more than 2 or 3)*

A3) Program outcomes do not conform to ABET's new outcomes.

**Action Plan:**

*Adopt and/or adapt the 2007-2008 ABET program outcomes:*

The program enables students to achieve the following attributes by the time of graduation:

- (a) An ability to apply knowledge of computing and mathematics appropriate to the discipline;
- (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;
- (c) An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;
- (d) An ability to function effectively on teams to accomplish a common goal;
- (e) An understanding of professional, ethical, legal, security, and social issues and responsibilities;
- (f) An ability to communicate effectively with a range of audiences;
- (g) An ability to analyze the local and global impact of computing on individuals, organizations and society;
- (h) Recognition of the need for, and an ability to engage in, continuing professional development;
- (i) An ability to use current techniques, skills, and tools necessary for computing practice.

The program enables students to achieve the following additional attributes by the time of graduation:  
(Specific to CS)

- (a) An ability to apply mathematical foundations, algorithmic principles, and computer science theory

in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;

(b) An ability to apply design and development principles in the construction of software systems of varying complexity.

A4) Data relative to the objectives must be routinely collected and documented, and used in program assessments. And, the extent to which each program objective is being met must be periodically assessed.

**Action Plan:**  
*Develop direct assessment method (test, assignment, rubric, etc.) for each course/program objective. Collect and document it.*

*Create an assessment czar position in the department who will work with the faculty and collect this information.*

A5) The results of the program's periodic assessments must be used to help identify opportunities for program improvement.

**Action Plan:**  
Naturally, the department already uses assessment information to help identify opportunities for program improvement. ([http://www.cs.iusb.edu/internal/1999\\_2006\\_Program\\_Improvements.pdf](http://www.cs.iusb.edu/internal/1999_2006_Program_Improvements.pdf))

The department conducts annual as well as three year assessment reports, conducts annual alumni surveys, informally poles its alumni and employer, etc. However, a more systematic approach much be developed and the department must better document how it uses its assessment results to improve its programs.

Improve the existing alumni survey, employer surveys, develop an advisory board, better document when the department adopts or adapts ACM/IEEE curriculum recommendation, document efforts to comply with ABET criteria, etc.

A6) The results of the program's assessments and the actions taken based on the results must be documented.

**Action Plan:**  
Addressed in A4 and A5

A7) Map course outcomes to program outcomes and develop ways to measure them.

**Action Plan:**  
**(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline;**

*Pick 2 or 4 required courses (C243, C251, C455, C435) and measure if the students can apply*

knowledge of computing and mathematics.

**(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution;**

**(c) An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs;**

*Pick 1 or 2 required courses (C308, C435) and measure if the students can identify and define the computing requirements and the appropriate solutions to a problem. Document how they were able to design and implement the solution, and how they were able to evaluate the fitness of their solution.*

**(d) An ability to function effectively on teams to accomplish a common goal;**

*Pick one or two required courses (C308 and perhaps another course) and measure if the students are able to work within a team. Have the students divide the work, pick a team leader, complete a self-and-peer evaluation form. Write a final report about their experience working within a team.*

**(e) An understanding of professional, ethical, legal, security, and social issues and responsibilities;**

*Address social and ethical issues in C101 (e.g. discuss the ACM/IEEE code of ethics)*

*Address Security issues as they relate to operating systems in C151.*

*Measure student understands of these concepts via an assignment and/or a test. Document this measurement.*

*Adding Social/Ethical content to C101 and C151 may not adequately satisfy the ABET requirements. Therefore, it may be best to create a one or two-credit course on the professional issues of computing OR use I202(Social Informatics) if modified appropriately. In this course we can require all students to make an oral presentation, discuss openly ethical implications of computing, and write an essay on a particular topic. This approach will support part e and f.*

**(f) An ability to communicate effectively with a range of audiences;**

*Increase the minimum grade requirement for W131 and S121 to C or better.*

*Require technical papers and technical presentation in at least two CS courses (e.g. C311, C308).*

*Develop a rubric for measuring and grading the presentations and papers. Measure it and document that you measured it.*

**(g) An ability to analyze the local and global impact of computing on individuals, organizations and society;**

*Covered in the new professional ethics course mentioned above.*

**(h) Recognition of the need for, and an ability to engage in, continuing professional development;**

*Do not teach tools, instead ask the students to learn the tools on their own and develop a two page how-to document on each tool, language, etc. that is used in CS courses. The how-to documents should be graded by their peers for content, clarity, and usefulness. The how-to documents should be graded by the instructor as acceptable or unacceptable. Each student must develop a total of five how-to documents during their tenure at IUSB.*

*Also, covered in the new professional ethics course mentioned above.*

*Students must attend at least 3 professional and technical presentations during their academic career at IUSB. (e.g. Make IT Happen, Campus Theme Events, Presentation at ND, local or regional conferences, Local ACM presentation at IUSB or ND, Search and Screen Lectures, etc.)*

**(i) An ability to use current techniques, skills, and tools necessary for computing practice.**

*Object Modeling, Data Modeling, Processing Modeling, UML, Client server computing, Web based computing, Parallel computation, Web Services, Cyber Security, etc.*

The program enables students to achieve the following additional attributes by the time of graduation:  
**(Specific to CS)**

**(a) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;**

*C243, C251, C308, C435, C455*

**(b) An ability to apply design and development principles in the construction of software systems of varying complexity.**

*C308, C435*

## B) Curriculum Deficiencies

B1) Mathematics requirements need adjustment. The current technical calculus courses (M208/M209) are not necessarily of high quality or what would be suitable for science majors.

### **Action Plan:**

#### **Option 1:**

*Review the grades from M208/M209 since 2002 when the math department was first asked to offer this sequence. Compare the results with prior semesters (prior to 2002) as well as recent semesters (2002-2006) of M215/M216 offering.*

*Also compare the grades/performance of students in those courses that rely on M208/M209 as prerequisite (i.e. M301, M260, M261, C251, C455) and perform a pre and post analysis.*

*If the analysis above shows inferior results, determine the pedagogical reasons why 3 credit calculus courses appear to produce inferior results?*

*Interview the math faculty who regularly offer this course and determine the root cause of the problem.*

*Interview the CS faculty who rely on M208/M209 sequence to determine if their students are lacking mathematical skills.*

#### **Option 2:**

*Drop the M208, M209 requirements and require M215 instead.*

*Increase Statistics from 2 to 3 credits.*

B2) The C251 (discrete mathematics / foundations of digital computing) could be counted as part of the mathematical requirements for our majors. For example, the 3 credit C251 can be viewed as 2 credits of CS, and one credit of Mathematics.

### **Action Plan:**

*If satisfactory results is not obtained from the review of M208/M209 analysis, then*

- 1) Count the C251 course as a 1 or 2 credit discrete math course, with the remaining counting toward CS requirements.*

B3) The program's math requirement is one credit short of the current ABET requirements.

### **Action Plan:**

*Resolved by B2 above.*

B4) The science requirements need adjustment. CS majors should be required to take science courses that are designed for science majors only. Students need to be exposed to scientific methods.

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| <p><b>Action Plan:</b></p> <p><i>Talk with Physics, Chemistry and Biology. Identify a 2 course sequences in those departments that are primarily taken by majors. Courses should reinforce critical thinking and problem solving. For example:</i></p> <p><i>PHYS P201 General Physics 1 (5 cr.)</i><br/><i>PHYS P202 General Physics 2 (5 cr.)</i></p> <p><i>CHEM C105 Principles of Chemistry I (3 cr.)</i><br/><i>CHEM C125 Experimental Chemistry I (2 cr.)</i><br/><i>CHEM C106 Principles of Chemistry II (3 cr.)</i><br/><i>CHEM C126 Experimental Chemistry II (2 cr.)</i></p> <p><i>BIOL L101 Introduction to Biological Sciences I (5 cr.)</i><br/><i>BIOL L102 Introduction to Biological Sciences II (5 cr.)</i><br/><i>Or</i><br/><i>INFO Intro to Bioinformatics (4)</i><br/><i>BIOL 211 Molecular Biology (3)</i><br/><i>BIOL 311 Genetics (3)</i></p> <p><i>Modify the CS science requirements so that students will have to take one of the above sequences, plus the Physics P303 (Digital Electronics)</i></p> <p><i>Drop the current requirement that indicates “at least two different sciences must be taken”. This will allow student to potentially take 3 physics courses to satisfy their science requirements.</i></p> <p><i>Encourage students to obtain a minor in one of the sciences.</i></p> |
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B5) Ethics, social impacts of computing must be covered in one or more specific core courses or maybe a distinct one credit course. They should be documented, measured, and assessed.

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| <p><b>Action Plan:</b></p> <p><i>Require I202 Social Informatics for all CS majors. (Also see section A7e)</i></p> <p><i>In addition requiring INFO I202 (Social Informatics), cover ethical issues in at least two CS (C101, C151) courses. Develop rubrics for measuring it. Measure it, and document that you measured it.</i></p> |
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B6) Written and verbal communication skills must be developed and applied in one or more specific core courses. They should be documented, measured, and assessed.

| <b>Action Plan:</b>   |
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| Increase the minimum grade requirement for W131 and S121 to C or better. (Also see A7f)   |
| Consider requiring the English dept's Technical Writing course for all majors.  |
| Require technical papers and technical presentation in at least two CS courses. Develop rubrics for measuring and grading the papers and presentations. Measure it and document that you measured it. |

## C) Resource Deficiencies

C1) Current base funding for the CS laboratory is \$10,000. In order to maintain a 3 year replacement cycle, approximately \$30,000 will be needed. Currently, the CS labs are adequate; however, there is no stable source of funding for replacing equipment. In the recent past, the department has relied on budget augmentation, LAS college funds, CTE funds, or other one time budget requests.

**Action Plan:**

In order to maintain a 3 year replacement cycle, approximately \$30,000 will be needed.

C2) Currently, the department associate chair receives no release time. Given the size and scope of responsibility of the associate chair (e.g. scheduling, advising, backing up the chair, etc.), a release may be appropriate. Currently, the associate chair receives \$1,200 stipend.

**Action Plan:**

Request at least one course release per year for the associate chair in computer science.

C3) The department has access to ACM electronic journals and conference proceedings, however lacks access to IEEE publications. A full subscription to IEEE, costs approximately \$17,000, however a smaller subset may be obtained for approximately \$3,000).

**Action Plan:**

Request that the library purchase a subscription to the IEEE. At this point a smaller subset may be obtained for approximately \$3,000. The informatics library budget could be used for this purpose.

C4) Currently, the undergraduate advising load is divided between two faculty members. Each advising approximately 75 to 80 students per year. According to Dr. Impagliazzo, the advising load is too high, either a release, or some other method must be employed to reduce the advising ratio to 25 to 1 or fewer.

**Action Plan:**

Either provide release time to existing advisors or divide the students among the faculty. Maintain an advising ratio which is 25 to 1 or less.

C5) Travel funds appear to be inadequate for the level of faculty scholarly activity.

**Action Plan:**

Request additional travel funds for the college. Subsidize faculty travel from informatics travel budget.

C6) There is no plan/budget for replacing faculty research equipment.

**Action Plan:**

In addition to encouraging faculty to obtain external grants, the graduate program should work more

closely with the IU central administration to further develop the research infrastructure at IU South Bend. This includes budgetary planning for research equipment.

Overhead funding from existing grants should be used as seed funding for additional faculty research support.

C7) Assessment Implementation Funding:

- a) Startup: A total of 4 course release for the next two year to prepare the assessment instruments, develop rubrics, collect analyze the data, and refine the instruments.
- b) Funds for attending conferences and workshops on accreditation and assessment.
- c) Sustain and Maintain: One course release per year to collect and maintain accreditation documents.

**Action Plan:**

**Startup:** Request one course release per semester for a period of two years. The release will allow for the creation of a departmental assessment czar. This individual will work with the faculty, the assessment committee and UCET to prepare the assessment instruments, develop rubrics, surveys, collect analyze the data, and refine the instruments.

**Submit an assessment grant proposal,** requesting \$2000 to attend workshops on ABET assessment and accreditation.

**Sustain and Maintain:** Request one course release for one faculty to systematically collect and maintain assessment data, keeping the department on track for future accreditation visits.

### **Other miscellaneous adjustments:**

- *Pages 55 and 56, the total number of advanced credits should be at least 16 credits. Divide the core courses that have advanced content into partial credits. e.g. 2 + 2 or 1 +3.*
- *Pages 68 to 111, the “Estimated Curriculum Category Content” should add up to the number of credits for the course (or less in cases where time is spent on other Curriculum Categories.)*
- *Page 68 to 111, the “Course Goals” should be rename “Course Outcomes”*
- *The department uses the word core differently than ABET. In ABET terms, core means fundamental or foundational. We use the word Core as required courses. That is one reason that we have different opinions about your advanced algorithms course. It is not in the (ABET) core because one should use the core to build advanced topics. Your advanced algorithms course is basically a terminal course.*
- ***Course Objective (Goal)** should be one sentence.*
- ***Course Outcomes**  
By the end of the course, students will be able to:  
Then include 5 or 6 bullets.  
(The more outcomes we have the more difficult it is to measure them and to show we have met them.)*

## Conclusion

Indiana University South Bend began offering computer science degrees in 1984. The degree program was initiated within the Department of Mathematics, which was later renamed as the Department of Mathematics and Computer Science. The program continued to flourish between 1984 and 2000, graduating approximately 200 students. In 2000, the Computer Science separated from Mathematics into a distinct department. Almost immediately, the department began to expand its programs as well as increasing the number of faculty. The faculty grew from five to eight in 2001, and currently it stands at 9.5 (FTE). This year, the department is searching for two additional faculty members (one of which will be a replacement position). During the same six year period, the department has introduced a number of new programs such as B.S. in Informatics, M.S. in Applied Mathematics and Computer Science; as well as a number of certificate programs which provide computing courses for non-majors, and professional in the community.

Our faculty are committed to excellence and remain active in their teaching, research and service. During the past six years, the faculty have added nearly twenty new courses and have published over eighty scholarly articles, with over 10% coauthored by undergraduate and graduate students. The faculty have obtained nearly twenty-five internal and external grants, including funding for assessment, research, and instruction.

Despite concerns over outsourcing and fallout of the dot-com industry, our enrollment has remained strong. Today, we have approximately 175 students in our BS in Computer Science, 40 in the B.S. in Informatics and 30 graduate students.

Approximately 75% of our alumni work and live in the Michiana (Southern Michigan, Northern Indiana) region. Feedback from our graduates indicates that they are successful in finding suitable positions. Currently, requests from the regional companies for new graduates exceed our ability to train and graduate students. The average salary for our graduates in the region is approximately \$45,000. After a number of years in the work force, the average salary reported by our alumni exceeds \$70,000.

The department has plans for developing a graduate program in computer science, and is assessing the viability of concentrations from software engineering, artificial intelligence, database systems, computer networks, computer graphics and/or computer security. In addition, the department has solicited an external review to accelerate the process of obtaining ABET accreditation.

Based on the review of the 2006 ABET accreditation requirements, we believe that our program must improve in the following areas in order to be prepared for ABET accreditation:

- The program needs to increase its science requirements to 15 credits. Currently we require 13 credits. The science credits must include two science laboratories.
- The program must increase its mathematics requirements to 15 credits. Currently, we require 14 credits including 6 credits of calculus, 3 credits of linear algebra, 3 credits of combinatorial counting and probability, and 2 credits of statistics.
- The program needs to improve the oral and written communication skills of its graduates. (Core as well as elective courses must require graded term papers and presentations.)
- Closed labs in C101 and A201 must be expanded to 3 hours per credit hour.
- To encourage faculty, academic advising must be recognized and compensated by the administration.
- The department must work to obtain library and electronic access to IEEE publications.

- Recognition of faculty scholarly activities and merit raises.
- The department must obtain an increase in its laboratory budget consistent with a 2.5 to 3 year replacement cycle for lab equipment.
- The department must obtain additional lab space for faculty and student research projects.
- The department must refine its documentation and measurement of assessment activity. (electronic web based tools for collecting assessment information)
- The department must improve its course display material (specifically collect graded assignments and tests to maintain with each course binder.)
- The department must document and measure how course outcome, contribute to program outcomes. (Faculty surveys, Course displays)
- The department must be able to show how each graduating student has been able to meet program outcome. (Student portfolios)
- The department must form an advisory board which could help the department better understand the needs of the industry.
- The department must develop a mechanism for measuring and evaluating the knowledge and skills of its graduates. (e.g. developing a senior exit interview)
- The department must do more to support and retain qualified students in its programs.

In summary, despite the issues identified above, the state of our department is strong, the faculty are energetic and active in their discipline, the students body is engaged and interested, our laboratory resources are adequate, support from the administration is has been very good in recent years, and the department has been successful in developing new programs, attracting talented faculty and obtaining state funding for its programs.