



# **INFORMATION TECHNOLOGY DEPARTMENT PROGRAM REVIEW 2014**

**A PROCESS FOR  
SELF-EVALUATION AND  
CONTINUOUS IMPROVEMENT**

# Information Technology Department Program Review 2014

Bergen Community College

Programs: Information Technology, Medical Informatics, Game Programming, Game Testing

Program Review Team: see p. 5

Date of this Report: December 23, 2014

Period of Years Being Reviewed: 2007 - 2013

## Abstract

The Information Technology Department presents herewith, a comprehensive Program Review, tracing the development and growth of its programs since the last formal review (2006) and proposing a set of guidelines for its continued development and growth over the next five years. The set of programs operated by the Department has grown from six to 12 between 2006 and 2014. The number of declared majors has risen from 261 to 422, an average annual growth rate of 6%. Trends in industry, along with similar trends at sister institutions in NJ, as well as 4-year schools, indicate that this growth trend is very likely to continue well beyond the next five years, well into the 2020s. Meanwhile, faculty resources have not kept pace with the robust growth of these programs, the number of tenured and tenure-track faculty having decreased from 6 to 5 since 2006. Five program goals are proposed to address the unique concerns of these computing technology programs and to ensure that they are positioned to take full advantage of an excellent opportunity for continued growth over the next five years.

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## **Introduction**

This Departmental Program Review provides a comprehensive overview of all the program activity under the purview of the Information Technology (henceforward: INF) Department at Bergen Community College as of September, 2014. The purpose of this review is to provide both quantitative and qualitative data as the basis for self-evaluation, department-wide planning and decisions that will ensure the INF programs offer a robust education for both career-focused students and transfer students. A number of topics naturally arise that will inform the scope and range of this program review.

## **Terminology**

This Departmental Program Review actually embraces three distinct areas of the INF Department: the 'traditional' INF Programs (Networking Administration, Database Programming and Administration, Web Development and Management, Information Technology Professional Studies, Office Technology, Computer Technical Support and Networking Security) as well as Medical Informatics, and Game Programming / Game Testing. Medical Informatics is actually an interdisciplinary program, operating in conjunction with the Medical Office Assistant program. It is included in this Review because there are so many INF courses that comprise the degree and because its essential character is so well-aligned with rest of these computing technology majors. Throughout this Review reference will be made to 'INF/MED.INFO/GAM programs' (meaning the entire range of 12 Degrees/Certificates/Certificate of Achievement that make up the Department's programs), as well as, simply, 'INF' programs. Generally, the latter reference is historical, referring to the 'traditional' set of programs (all of which existed prior to the creation of the MED.INFO and GAM programs). Occasionally, 'INF' is used as a shorthand for the entire 'INF/MED.INFO/GAM' set of programs. Context should make it clear how the shorter term is being used. As of Fall 2014, the official name of the department (embracing all 12 programs) is the INF Department. As of January 2015, the INF Department and the Industrial Design Technology Department (IDT) are scheduled to be merged. The official name of the new, larger department is still to be determined.

## **Research Topics**

Students:

- Demographic characteristics and trends in INF/MED.INFO/GAM student cohort
- What areas of INF/MED.INFO/GAM offer the greatest opportunities for employment and advancement for newly graduated students
- How do students perceive the quality of their educational experiences with the INF/MED.INFO/GAM programs

Faculty:

- What are the academic and experiential backgrounds of the faculty?
- What qualifications should we be seeking in new faculty?
- What challenges and opportunities will we face in recruiting, hiring and retention of highly-qualified tenure-track faculty, as well as lecturers and adjuncts?

Curriculum:

- What are the unique characteristics of the INF/MED.INFO/GAM curriculum?

- Which parts of the curriculum are ‘forward-looking’ – which parts need to change?
- How can we ensure the curriculum will be relevant and robust going forward 5-10 years?
- What opportunities do we have to increase transferability of INF/MED.INFO/GAM programs?

Support:

- How well do college resources support the program?
- What additional support is needed?
- How can we involve our students (and graduates) more in the College’s institution-wide technical support infra-structure?

Community:

- How can we increase exchanges between community partners and INF/MED.INFO/GAM students/faculty? What bridges have already been built?
- What bridges have been built with the K-12 community in particular? How can we strengthen the pathways available for high-school students who want to pursue STEM educations and opportunities?

## **Program Review Committee**

Bill Madden, Information Technology Department Chair, Committee Chair

Gary Correa, Information Technology Department Faculty, Networking curriculum

Minas Kousoulis, Information Technology Department Faculty, Programming and Applications curriculum

Charles Njogu, Information Technology Department Faculty, Networking curriculum

Annette Rakowski, Information Technology Department Faculty, Applications and Networking curriculum

Emily Vandalovsky, Information Technology Department Faculty, Programming and Applications curriculum

Anita Verno, Information Technology Department Faculty, Programming and Web Development curriculum; Medical Informatics curriculum

Others involved with the Program Review process:

Carmen Martinez-Lopez, Dean, Division of Business, Social Sciences and Public Service

William Mullaney, Vice-President of Academic Affairs

Tonia McKoy and staff, Office of Institutional Research

Dr. David Lubliner, New Jersey Institute of Technology, Coordinator, Computer Technology Program

## Department Programs

The Department of Information Technology (Academic Department, as distinguished from Information Technology Services, which provide technical support for the College's computing infra-structure) is comprised of the Degrees, Certificates and Certificate of Achievement shown below. Please note: as of Spring 2015, all of our AAS degrees will be transferable to either New Jersey Institute of Technology or to Kean University, nearly all of them to both. AS.PS.INFO is generally transferrable to any 4-year school.

- AAS.IT.DB\* – Associates in Applied Science, Database Programming and Administration
- AAS.IT.NET\* - Associates in Applied Science, Networking Administration
- AAS.IT.WEB\* - Associates in Applied Science, Web Development and Management
- AAS.BT.OFF.TECH\*\*\*\* – Associates in Applied Science, Office Technology
- AS.PS. INFO\*\* – Associates in Science, Professional Studies, Information Technology
- AAS.SD.GAME.PGMG\*\*\* – Associates in Applied Science, Game Programming
- AAS.SD.GAME.TEST\*\*\* - Associates in Applied Science, Game Testing
- CERT.DB – Certificate in Database Programming and Administration
- CERT.OFF.TECH – Certificate in Office Technology
- CERT.COMP.SUPPORT – Certificate in Computer Technical Support
- COA.NET.SECURITY – Certificate of Achievement, Network Security

In addition, the following program, which is an interdisciplinary mix of INF and Medical Office Assistant (MOA) Program courses, falls at least partly under the purview of the INF department (in coordination with the MOA Program Coordinator, Prof. Steven Toth)

- AAS.MED.INFO\* – Associates in Applied Science, Medical Informatics

\* Transfers to New Jersey Institute of Technology's Computer Technology Program and pending articulation agreement with Kean University, Computer Science/Information Technology Program

\*\* Transfers to 4-year colleges and universities per Lampitt Law

\*\*\*pending articulation agreement with both NJIT and Kean

\*\*\*\*pending articulation agreement with Kean

One of the chief recommendations of this Program Review will be to recognize the ways in which the INF departmental offerings have grown and diversified since its last formal review (conducted in 2006) and to consider how the programs should continue to grow. There are also two programs (AAS.BT.OFF.TECH and CERT.OFF.TECH) that we may want to consider making fundamental changes to, in terms of nature and scope. The INF faculty are not convinced that the skillsets students develop in these two programs (as currently constituted) are nearly as compelling as they were 10 years ago.

## Data Sources

The INF Department is working with the Office of Institutional Research to use the results of annual surveys conducted of recent BCC graduates. The Department has a set of additional questions, specific to the Department, which it has used in the past and has refined for use in this program review (in conjunction with the standard survey) to better investigate the research topics that relate to students (see p1 above).

The Department has also polled each of the following specific populations to gain feedback concerning the Program Review process and the goals we set for the next five years:

- all current INF faculty (tenured, tenure-track, lecturers, adjuncts (21)
- all current INF Community Advisory Committee members (8)

## INF Department Mission and Goals (adapted from [www.bergen.edu/inf](http://www.bergen.edu/inf))

The Information Technology Department offers a transfer degree; seven career degrees, all with existing or pending transfer options to New Jersey Institute of Technology or Kean University; three one-year certificates; and a certificate of achievement. These programs provide a basic background in hardware, applications, programming, web development, networking, medical informatics, game development, and Internet concepts.

The Information Technology programs strive to prepare the student for careers involving business programming, medical informatics, network administration, network security, web development, database programming and administration, game development, computer support, and/or the effective use of computers in a modern office. All programs provide a basic background in applications and Internet concepts. Additionally, the program provides a solid foundation for future study towards a four-year degree.

Information Technology students need to develop a broad foundation in concepts that will help them remain adaptable in changeable work environments. The INF/MED.INFO/GAM programs at Bergen Community College address current and long-term trends in the marketplace. A number of our courses are available over the Internet as part of the College's distance learning programs.

## Information Technology Department Core Values

- Promote active, engaged learners in hands-on environments
- Develop critical thinking skills while developing practical, workplace skills
- Open gateways to the practical application of classroom learning (Service Learning, internships, independent technical support work)
- Prepare students for careers and/or for transfer to 4-year institutions
- Support students who pursue industry-standard certifications
- Promote collaborative work among all faculty in professional development, curriculum development and delivery
- Promote constant self-examination, continuous curriculum development, and ongoing professional development
- Review and enhance our partnerships with both 4-year institutions and with secondary schools, building pathways for K-12 students through community college and beyond to pursue computing technology education and careers.

## Department History

Prior to 1998, what is now the Information Technology Department was a Data Processing Program. It was the forward-looking vision of Prof. Robert Saldarini, Prof. Charles McNerney, and others that resulted in the development of the initial implementation of the Information Technology programs. The initial programs were all conceived of as implementations of various aspects of computing technology, particularly as they related to business needs. There were concentrations in software applications for business, business programming, web development and hardware support along with network administration.

With the hiring of Prof. Anita Verno in 1999, the programs almost immediately took on a very dynamic and malleable character. Prof. Verno insisted that the program offerings keep pace with changes in workplace demands on technology and with the growth of information technology itself. Flexibility and adaptability have been at the heart of the development of the INF programs ever since. The challenge is to be able to offer a curriculum that provides a clear and durable 'learning paradigm' for students while still remaining dynamic so that students emerge from the program with skill sets that are current and viable in the workplace. As an example, even our foundation course, INF-101 Introduction to Information Technology, changes significantly each year that we offer it. In Fall 2015 we plan to include a new Windows learning environment with the students using touch-screen interfaces. The current environment, Windows 7, has been active in our labs for a period of about 3 years, but circumstances and technologies have changed enough each year to require new text materials and/or online support materials almost every semester – all this for our foundation course. New units of instruction and topics must be incorporated each semester: growing adoption of mobile platforms, new software applications, cloud storage, cloud services, and political, social and cultural currents that affect (and are affected by) the emergence of new technologies, to name just a few of the topics. Almost all INF/MED.INFO/GAM courses require similar levels of adaptability and change on the part of instructors and students (and ITS support staff who must make sure that systems and computer laboratories work inter-operably across the entire campus).

From a core that taught only Business programming (as part of the Data Processing department), the INF programs grew to include web development and networking administration. With the merger of the Office Systems department, INF created a program in Office Technology, replacing the older outdated Office Systems degree. The INF/MED.INFO/GAM programs have continued to grow and diversify so that, in 2014, we offer 12 Degrees, Certificates and a Certificate of Achievement. Beyond the core of four programs, the Department has grown to include Medical Informatics (in conjunction with the Medical Office Assistant [MOA] Program), Game Programming, and Game Testing. In 2010 the INF programs 'moved out' on their own to become an independent department (no longer programs within the Business Department). This change reflected the idea that Information Technology is used in all walks of life, both professional and personal, business being only one venue, among many others, where computing technology is used. Subsequently, the Medical Informatics degree (AAS.MED.INFO), was developed as an interdisciplinary program (jointly operated by the INF and MOA departments). The two Gaming degrees (AAS.SD.GAME.PGMG and AAS.SD.GAME.TEST) were also added to the roster of programs falling under the purview of Information Technology.

Starting very slowly in the early 2000s and continuing through to today at an accelerated pace, members of the INF department have reached out to the Computer Science (CS) department at the College. Over the last two year, particularly, with impending changes in administrative organization of all academic



departments across the entire College, the two departments have become more clearly aligned. Members of the Computer Science have expressed similar sentiments and are welcoming the opportunity to join forces. A number of our sister institutions already do have combined CS/IT departments and/or house both departments within the same academic divisions within their institutions. We believe this is a very natural and academically sound proposal for Bergen Community College, allowing the two entities to combine and coordinate resources, building curricula together while retaining the focus of each of their respective degrees. A similar alliance has already been forged with the Industrial and Design Technologies (IDT) Department. The common thread underlying all three departments is a heavy reliance on advanced computing technology for the delivery of curriculum and faculties who understand and can work with highly complex computing requirements across all three sets of curricula.

The INF Department has also enjoyed a very good working relationship with the Computer Technology Program at the New Jersey Institute of Technology (NJIT) over the past 15 years. The Coordinator of the Computer Technology Program at NJIT regularly consults with members of the INF Department. We have even developed curriculum at each of our schools that actively promotes pathways between the two schools. The majority of our students in four of our career degrees now elect to transfer to NJIT specifically and are often able to transfer additional credits with them (beyond the 64-66 that are required for graduation from Bergen). This saves the students a considerable amount of money of course.

## Information from Previous INF Program Review (2006)

The last time the INF programs conducted a program-wide review was in 2006, at which time only the 'core' INF programs were active (AAS.MED.INFO, AAS.SD.GAME.PGMG and AAS.SD.GAME.TEST did not yet exist). The process back then was not really like the current program review process at all. It was, in fact, the process that we now call Program Learning Goal Assessment. This contributed unfortunately to an early (and much too persistent) confusion on the Department Chair's part about how to conduct this review. Still, there were some results of the process conducted in 2006 that are germane to the current review. Following are a set of student learning outcomes that were being assessed, along with the results of the assessment. The material below (pp. 10-15) is adapted from the 2006 report (available at: <http://www.bergen.edu/inf/programreview>)

Students will be able to solve domain-specific problems after critically selecting among a set of information technology tools.

Note: This will be done with students in INF114, Microsoft Office\*

\*Addendum: due to unforeseen problems in course delivery (an important electronic support and assessment tool supplied by the textbook publisher was severely disabled and simply not ready for use through much of the semester), the discipline elected to substitute INF-228 Excel for Problem-Solving as an appropriate measure for this Outcome. INF-228 is a required course in all AAS degrees offered by the INF discipline (including OFF.TECH).

### 1. Means of Assessment & Sources of Data:

Students will select one or more tools and solve the business-related problems presented. Students will be evaluated on the appropriateness of their tool selections and their success in solving the problems.

Fifteen students were enrolled in a daytime section of INF-228 Excel for Problem-Solving, a 1-credit course. Two exams were administered, one halfway through the course and one at the end. Ten hands-on labs were assigned through the semester; students completing more than seven (7) of the labs earned extra credit. The two exams were both hands-on lab tests; that is, in each case students were required to solve a business problem using the resources of the Microsoft Excel application. Solving the business problem required that students select an appropriate set of tools in Excel (there are many scenario-analysis tools available in the software and part of the problem-solving process involves selection of the correct tools).

A sample business problem statement is attached (this problem was used on the second Exam), illustrating the nature of the domain-specific problems included in this course (Table 1).

### 2. Criteria for Success:

70% of students will earn a grade of 70 or better on specified projects. (Projects will be graded using rubrics).

A sample rubric (from the second Exam) is attached, showing how students were assessed on one of the exams (Table 2). This method of assessment was used throughout the course.

The last line of Table 3 shows that the class met the criteria for success, not only on individual assessments, but for the course as a whole. It should be noted that, because of the institutional Withdrawal policy, students who are not meeting the minimum criteria (essentially a grade of 'C' in the course) tend to withdraw from the course. This skews the overall class average upward. This was the case with Student #1.

### 3. Summary of Data Collected:

The method of assessment, illustrated above using the sample business problem and its associated rubric, were used throughout the course. In the case of hands-on lab assignments, simplified rubrics were used. Students earned either full credit or no credit for completing a lab. Students could earn extra credit for completing more than 7 of the 10 hands-on labs assigned during the semester.

Attached (Table 3) is a summary of the data collected: this is essentially the grading scheme used to assign grades at the end of the semester.

### 4. Use of Results:

This course, in its present form, was structured about two years ago specifically to address the emerging issue of outcomes-based assessment. As such, it fits very neatly into such a model. One possible use of the results reported here would be to consider the assessment methods used in this course as a possible prototype for other similar courses. Similar kinds of courses would have a heavy lab component, would be squarely aimed at issues of problem-solving and critical thinking, and would have a very clear relationship to real-world problems. In the case of Excel this is a very natural fit since it is used so widely as a decision support tool.

#### **Table 1 – Sample Business Problem**

1. Use *C:\temp* as your work space (for downloading files and developing your spreadsheet).
2. Download the following files from the Drop Box (under *Exam 2*):  
*PFWeb.htm*  
*PiperFitting.accdb*
3. Create a new Excel workbook named: *YourLastName\_Exam2.xlsx*
4. Import data from the *PFWeb.htm* web page and place it in Excel beginning at cell A4
5. Fix the column headings in B:E so they all appear on one row (row 5)
6. Import data from the *PiperFitting.accdb* Access database beginning at cell A11 (on the row immediately following the previous data).
7. Clean up the Access import so you are left with the raw, unformatted data (no row heading).
8. Replace the values in Column F (under *Total Cost*) with formulas that total each row.
9. Consider formatting the sheet to business standards (or wait till Step #20).
10. In A16 type: *Total Budget*
11. In F16 calculate the Total Budget
12. In A18 type: *Constraints*
13. In B18:B20 type: *Total Cost per Project (max)*; *Marketing Cost (min)*; and *Total Budget (max)*
14. In F18:F20 type: *60000*, *6000*, and *500000*

15. In A1:A2 type: *Piper Fitting Company; Optimized Project Budgets for 2008*
16. Save your work.
17. Consider formatting all items to business standards and center rows 1 and 2 over the rest of the spreadsheet (or wait till Step #20). Do NOT eliminate any extra rows.

Piper Fitting is running 10 projects as it heads into 2008. Each project has Production Costs, Fixed Costs, Marketing Costs and Advertising Costs. They have been allotted an overall budget of \$500,000 to run all 10 projects and they want to be sure to spend up to the budgeted amount.

At this point the Production Costs and the Fixed Costs will not change. However, as they move toward completion of the projects the Marketing and Advertising Costs will increase from levels shown in the worksheet. They want to project what those amounts will be, subject to the following constraints: overall budget for all 10 projects may not exceed \$500,000. The budget for any one project may not exceed \$60,000. The Marketing Cost for any project must be a minimum of at least \$6,000, but may not exceed half the Production Cost for that project.

18. Solve the problem using Solver.
19. Once you have found a solution, do a screen capture of JUST the Solver Parameters dialog box (*Alt-PrntScr*) and paste it in underneath, beginning in about row 22.
20. If you have not already done so, format material in columns A:F to business standards.
21. Proof your worksheet and, when ready, submit it to the Drop Box.
22. Verify with me that your submission was successful.
23. Delete all files in your work space and *Empty* the *Recycle Bin*.
24. Return these instructions to me.

**Table 2 – Sample Rubric and Student Performance on the Rubric**

Skill	Poss. Pts	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8	Student 9	Student 10	Student 11	Student 12	Student 13	Student 14	Average
File name: LastName_Exam2.xlsx	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Data imported from PFWeb.htm to A4	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Columns B:E set to Row 5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Data imported from Access into A11	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Access table converted to range	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Col headings in Row 11 removed	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Row totals in Column F	6.0	6.0	6.0	6.0	6.0	6.0	6.0	0.0	3.0	3.0	6.0	6.0	6.0	6.0	6.0	5.1
Label A16: Total Budget	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Formula F16: budget total	4.0	4.0	4.0	0.0	0.0	4.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	0.0	4.0	2.6
Constraint labels correct	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	2.9
Constraint amounts correct	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	2.8
Title row 1: Piper Fitting Company	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Title row 2: Optimized Project Budgets for 2008	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	2.8
A:F formatted to business standards	10.0	7.0	8.0	7.0	5.0	7.0	8.0	8.0	7.0	5.0	6.0	6.0	6.0	6.0	7.0	6.6
Solver goal: F16 max = 500000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	2.0	5.0	5.0	0.0	5.0	5.0	5.0	0.0	4.1
Change cells: D6:E15	6.0	6.0	6.0	6.0	6.0	6.0	6.0	0.0	6.0	6.0	0.0	6.0	6.0	6.0	6.0	5.1
Constraint 1: D6:D15 >= 6000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	1.0	0.0	0.0	5.0	5.0	5.0	5.0	4.0
Constraint 2: F6:F15 <= 60000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	0.0	0.0	5.0	5.0	5.0	5.0	4.2
Constraint 3: F16 <= 500000	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.0	4.0	0.0	0.0	5.0	5.0	5.0	0.0	3.5
Constraint 4: D6:D15 <= H6:H15	8.0	0.0	8.0	8.0	0.0	8.0	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
Solver parameters pasted in	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.0	5.0	5.0	5.0	5.0	4.6
Total	100.0	89.0	98.0	93.0	83.0	97.0	98.0	74.0	80.0	65.0	51.0	84.0	87.0	84.0	79.0	83.0

**Table 3 – Summary of Data**

	LabTest1	LabTest2	Num Assignments	Assignment Points	Final Average	Grade
INF228-001 Fall 2007	100	100		+3		
1 Student 1	24.0	0.0	5	0.0	12.0	W
2 Student 2	98.0	89.0	5	0.0	93.5	A
3 Student 3	93.0	98.0	4	0.0	95.5	A
4 Student 4	100.0	93.0	10	3.0	99.5	A
5 Student 5	79.0	83.0	7	0.0	81.0	B
6 Student 6	98.0	97.0	7	0.0	97.5	A
7 Student 7	95.0	98.0	8	1.0	97.5	A
8 Student 8	72.5	74.0	10	3.0	76.3	C+
9 Student 9	88.0	80.0	9	2.0	86.0	B+
10 Student 10	82.0	65.0	4	0.0	73.5	C
11 Student 11	91.0	70.5	8	1.0	81.8	B
12 Student 12	94.0	84.0	7	0.0	90.0	A
13 Student 13	78.0	87.0	9	2.0	85.0	B+
14 Student 14	87.0	84.0	7	0.0	85.5	B+
15 Student 15	90.0	79.0	7	0.0	85.0	B+
Averages	84.6	78.8	7.1		82.6	
% Students > 70%	93.3	86.7	73.3	n/a	93.3	

Students will be able to assemble data and communicate information using information technology tools.

Means of Assessment & Sources of Data. Project - assembly of data and presentation of findings. (Faculty will use an agreed upon rubric.)

Criteria for Success: 75% of students will earn 70 or better on specified projects

Students should be able to secure their rightful place within today's technological society.

Means of Assessment & Sources of Data. Graduate survey

Criteria for Success: 70 % are using information technology tools.

Office Technology

Students will critically select among a set of office technology tools to solve domain-specific problems.

Means of Assessment & Sources of Data: Given a scenario a student will be able to:

- 1) Choose correct tool(s)
- 2) Use chosen tools correctly
- 3) Solve the problem successfully  
(Faculty will use agreed upon rubric.)

Criteria for Success: 75% of students will earn a 70 or better on specified projects.

Students will be able to assemble data and communicate information using office technology tools.

Project - assembly of data and presentation of findings.  
(Faculty will use an agreed-upon rubric.)

75% of students will earn 70 or better on specified projects

Students should be able to secure their rightful place (if so desired) within today's technological society.

Graduate survey

70 % are using office technology tools.

Source for material above (pp. 10-15) adapted from 2006 INF Program Review Report, available at <http://www.bergen.edu/inf/programreview>

## **Significant or New Developments Since Last Program Review (2006)**

**2006 – present: Continuous Curriculum Development.** The following courses have gone through formal curriculum review in recent years, resulting in continuous evolution of the INF/MED.INFO/GAM programs: INF-101 has received General Education status; new courses: INF-102, INF-217, INF-218, INF-219, INF-265, INF-266, INF-270, INF-271, INF-272, INF-273, and INF-274. Courses that have undergone significant changes as a result of new platforms, new operating systems, new applications, new publishers' support materials: INF-101, INF-108, INF-114, INF-145, INF-150, INF-153, INF-160, INF-217, INF-218, INF-219, INF-232, INF-252, INF-254, GAM-111, GAM-211, GAM-221, GAM-222.

**2006 – present: Building partnerships/internships/externships.** An initial grant-funded opportunity along with the science department enabled us to provide 10-week summer residencies for two summers at Brookhaven National Laboratory (2006 and 2007). Students from Computer Science, Physics and Information Technology formed small teams to engage in original research, mentored by scientists at Brookhaven, along with our own faculty mentors. The first summer residency (2006) resulted in the students creating original stereo 3-D visualizations of protein molecules. The second summer residency (2007) resulted in very interesting comparisons of the efficacy and efficiency of writing programs in C++ using graphics primitives libraries, compared to the same thing done using Java graphics libraries. C++ resulted in faster performance (only 3-4% on average); Java graphics libraries permitted much more rapid development (about 50% of the time needed to develop the equivalent code in C++).

Another grant-funded opportunity (2008-2009) enabled us to work with about half a dozen colleges in the northeast US on open-source Android development (HFOSS: Humanitarian Free and Open Source Software development). The aim of the grant was to foster practical application development skills among college students in service of humanitarian needs. The particular project our students worked on (again a 10-week summer program) enabled them to develop a smartphone application that would take the place of an EMS worker's manual clipboard for recording events in real time. The objective was to create a tool that would be more legible and useful to Emergency Room staff and that could be sent on ahead to the local ER via web upload (saving precious minutes) before the EMS vehicle even arrived at the local ER. Students completed a working prototype of the app during the 10-week period and presented results at a colloquium of all the participating colleges, at Trinity College in Connecticut at the end of the program. It is significant to note that the Bergen Community College student team was the sole 2-year school represented among the schools participating.

**2006 – present:** The Department also regularly works with local schools (K-12) to provide on-campus hands-on information technology workshops for younger students. Students engage in activities such as taking apart PCs, developing video games, and creating working web sites. This kind of partnership is designed to build pathways for young students into the world of STEM activities.

**2009-10: Development of new interdisciplinary degree in Medical Informatics (AAS.MED.INFO).** This degree is a mix of about half existing MOA courses and half existing INF courses. The emphasis is on developing database and programming skills, in addition to standard MOA skills, so that graduates have the ability to work on (develop, enhance) electronic databases in healthcare settings that allow for the creation of searchable, electronic medical records. This degree was developed in consultation with Dr. David Lubliner, Coordinator of the Computer Technology Program at New Jersey Institute of Technology. Dr. Lubliner suggested we develop the two-year program at Bergen by concentrating on electronic medical record-keeping. Student graduating with our AAS.MED.INFO would then be able to transfer the entire degree over to NJIT where, during their junior and senior years, they could concentrate on



Medical Monitoring. There is a proposed new course, Introduction to Medical Informatics, that will tie the two disciplines (MOA and INF) more closely together.

**2010:** Administrative Reorganization resulting in creating of an autonomous INF Department (separate from the Business Department)

**2010 – present:** The Department hosts an annual Compute@BCC workshop for regional high school technology faculty, coordinators and administrators as well as for colleagues from community colleges across New Jersey. Attendance at most events has been in the 65-75 range with attendees typically representing about 40-45 educational institutions from PA, NJ, NY and CT. These in-service professional development events have been very enthusiastically received by participants and have helped to promote the growth of the local chapter of the CSTA (Computer Science Teachers Association), a national professional association of high school computer science and technology teachers sponsored by the ACM (Association for Computing Machinery, the oldest and largest professional computing organization in the US).

**2011: Development of two new interdisciplinary degrees in Game Programming (AAS.SD.GAME.PGMG) and Game Testing (AAS.SD.GAME.TEST).** This was initially a joint effort among faculty from Information Technology, Computer Science, Physics, Art, and Music at the behest of then Academic Vice-President Gary Porter. MUS and ART faculty had to step back from the process during a critical portion of the planning phase (due to the untimely death of a faculty member and a major move to their present quarters in West Hall). The degrees that were implemented were initially skewed much too much in the direction of computer programming. Modifications have been (and are continuing to be) made to move the curriculum towards a balance of media-oriented skills (graphic arts/storytelling/audio) along with somewhat less of an emphasis on computer programming skills.

**2014:** The Department has just begun an initiative, along with the College's Information Technology Services department, to provide internships for INF/MED.INFO/GAM students so they may gain guided hands-on experience in actual production environments, thus putting to practical use, skills and knowledge they have gained in the classroom. An initial group of 10 interns began working in September 2014. It is anticipated, beginning Spring 2015 that as many as 25 interns can be working each semester.

## Focus on Students

Much of the information in this section is drawn from annual statistical analysis performed by the Department of Institutional Research on data provided by the Registration Department, and from annual student surveys conducted by the department of Institutional Research. Specifically, the statistical information cited here is drawn from the following three sources:

- InformationTechnologyPacket.pdf, available at: <http://www.bergen.edu/inf/programreview>
- 2013 Program Dashboard, available at: <http://www.bergen.edu/about-us/institutional-effectiveness/institutional-research/program-dashboards/2013-program-dashboards>
- 2012 Program Dashboard, available at: <http://www.bergen.edu/about-us/institutional-effectiveness/institutional-research/program-dashboards/2012-program-dashboards>

The cohort of students declaring any of the INF/MED.INFO/GAM majors is extremely varied: neophytes ('newbies' in our business) who know they want to do something with computers, but are not sure how to get started, through students who have somewhat limited experience in Information Technology (IT) and are fairly clear about direction (whether motivated by interest or by earnings opportunities), and on to students who have fairly considerable IT experience but who lack formal educational credentials. Members of this last population are often initially quite clear about their goals. Often though, students' goals change among our major IT avenues (networking administration, database programming and web development), even among the more experienced, mature students. Very few students have a clear grasp as to the scope of IT fields that exist: beginners simply because they have not been broadly exposed to the field, seasoned professionals because they have had to specialize in order to survive and who know their particular niche in IT, but who are often little aware of what else exists outside their area of specialization.

In this section we investigate three topics relative to our student population:

- Demographic characteristics and trends in INF/MED.INFO/GAM student cohort
- What areas of INF/MED.INFO/GAM offer the greatest opportunities for employment and advancement for newly graduated students
- How do students perceive the quality of their educational experiences with the INF/MED.INFO/GAM programs

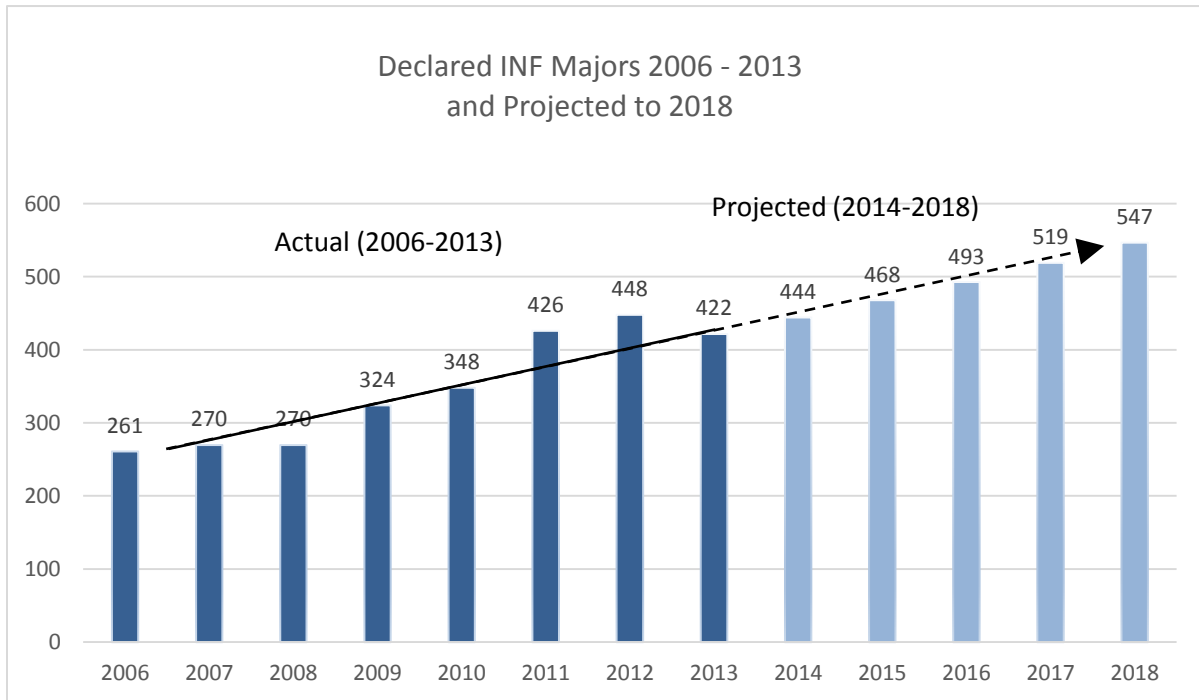
We also summarize our relative success in terms of students' GPAs and examine demographic trends that relate to success. Finally, we highlight noteworthy student accomplishments related to program activities.

### **Demographic characteristics and trends in INF/MED.INFO/GAM student cohort**

Data gathered from annual student surveys during the periods 2005 – 2013 reveal a number of interesting facts and trends. We present first a chart illustrating the overall growth (2006-2013) and projected growth (2014-2018) of the INF/MED.INFO/GAM programs. Following the chart, information on individual programs is presented. This section concludes with an overall summary.

The chart following this paragraph summarizes overall growth of the INF/MED.INFO/GAM programs for the period 2006-2013, with projected growth through 2018, based on a historical growth rate of 5.3%

sustained over the 8 year period from 2006-2013. Trends in employment growth in Information Technology fields (drawn from the Occupational Outlook portion of the Bureau of Labor Statistics web site) strongly suggest this growth trend is likely to be sustained well beyond 2018 (at least as far as 2022).



Source: *InformationTechnologyPacket.pdf* (<http://www.bergen.edu/inf/programreview>)

The Medical Informatics Program (AAS.MED.INFO) is relatively young. Data collection from annual student surveys was begun for the 2011-2012 academic year. After initial growth from 2011 to 2012 of 44%, enrollment leveled off from 2012 to 2013. Total credits taken similarly increased by 42% from 2011 to 2012 and then leveled off from 2012 to 2013. This is still a relatively small and young program. Data collection concerning enrollment characteristics extends back to 2009. Like most programs, MED.INFO is largely comprised of continuing students, although new student do constitute 30% of the total. As in many programs at the College, a very high percentage of majors require developmental math or developmental English (or both) - 80% or more in this program.

The Game Programming Degree (AAS.SD.GAME.PGMG) and the Game Testing Degree (AAS.SD.GAME.TEST) are the newest programs operated by the INF Department. Data collection from student surveys began with the 2011-2012 program year. The Programming degree has grown steadily since its inception: 16% growth in enrollment from 2011 to 2012 and a 95% growth in enrollment from 2012 to 2013. Total credits have shown a similar pattern: 14% and 92% growth rates from 2011-2012 and 2012-2013 respectively. The game testing degree program has had uneven growth. Enrollment almost doubled from 2011 - 2012 but then contracted by 22% the following year. The overall numbers are too small to draw many conclusions; however, curriculum changes for both GAME.PGMG and GAME.TEST are in process that will put much more emphasis on game development overall, rather than narrowly focusing on programming and testing.

The transfer degree in Information Technology (AS.PS.INFO) has grown rapidly since 2010: 68% growth in enrollment 2010 - 2011, followed by 34% growth 2011-2012. Total credits similarly have grown 62% from 2010-2011 and 35% from 2011-2012. Data on completion rates extends back to 2009. The rates are quite low: varying from 2.4% to 7.1% (average over the period 2009-2013 is 3.9%). This bears further investigation; one hypothesis: possibly, many new students are advised into this transfer degree by general advisors in the Advising Center and discover part-way through that they prefer the career options in IT (especially since they can still transfer to NJIT). We have some anecdotal evidence from IT advisors to support this hypothesis; however, this should be examined more closely. Data recorded in the 2008 and 2009 surveys indicates a transfer rate of 43% (reasonable, but could be improved). The same survey data also indicate a graduation rate of 33% which is an anomaly since this is a transfer program – technically, the graduation rate in a transfer degree should always be 0%. Job placement statistics were collected in 2009 and 2010, showing rates of 100% and 33% respectively. Again, this is somewhat anomalous since, as a transfer program, the expectation is that completers move on to 4-year schools and do not seek employment right away. 22% of the AS.PS.INFO cohort are new students; 70% are continuing students and 8% are transfer students. This is in line with most INF/MED.INFO/GAM programs, with perhaps a slightly larger cohort of transfer students than in other INF/MED.INFO/GAM degrees (which are all career-oriented). As in many College programs an overwhelming majority of students in this major require remediation - upwards of 80%.

The AAS.IT.DB program is the current degree code for the Database Programming and Administration degree. Prior to 2010 the code for this program was AAS.BT.INFO at which time curriculum changes took effect with concomitant change in nomenclature. The information that follows reflects aggregate results from both versions of the program. There has been a steady decline in numbers, despite curriculum changes in 2010 designed to modernize the curriculum. This bears further investigation. One hypothesis: though BLS.GOV (Bureau of Labor Statistics Occupational Outlook web site) shows that the occupational outlook for most IT positions through 2022 is 'Faster Than Average' to 'Much Faster Than Average' (their two highest categories), the job title of Computer Programmer specifically shows only an 'Average' growth rate over that period. This is actually an improvement from their projections in 2010 which showed that there was a projected decline of 4% in the outlook for Computer Programmers through 2020. There may be a continuing perception among students that computer programming is not a viable career path. Another oddity: on the BLS.GOV website, if the occupation title is 'Software Developer' (which seems at least somewhat similar to 'Computer Programmer') the projections are among the very best on the entire website, high in the 'Much Faster Than Average' category. Recent anecdotal evidence (Fall 2014) from Rutgers University and from Brookdale Community College seem to indicate that enrollment trends in computer programming over the last 12 months may be growing once again. Additional statistical information: 33% of this cohort are new students; 53% are continuing; 14% are transfers. Data on academic preparedness, although somewhat uneven, indicate that a somewhat higher than average percentage (as much as 33%) of this cohort, compared to other cohorts, appears to be college-ready (requiring no remediation). That is in alignment with a common perception that programmers are adept with both language and logic skills and, perhaps, enter such a degree program already equipped with such skills, at least to an extent.

The AAS.IT.NET (Networking Administration) program is the largest Information Technology program. It grew by 20% from 2010 to 2011 then declined by 6% from 2011 to 2012. Similarly total credits increased by 25% then declined by 12% in those same years. Full-Time Equivalent students grew steadily from 2009-2011 and then just as steadily declined from 2011 - 2013. This bears further investigation and seems at odds with our experience. Networking Administration is a high-growth area and affords some of the best opportunities for IT workers through 2022, at least according to the

BLS.GOV Occupational Outlook web site. Completion rates for the period 2009 – 2013 vary from 5% to 10.7% (average = 8.0%). We are not entirely convinced that these figures accurately depict what is happening in this degree. We DO know that a large number of these majors articulate on to the Computer Technology Program at New Jersey Institute of Technology and that, in fact, quite a number of them take advantage of very generous policies at NJIT that enable them to transfer many technical (INF) credits beyond the 64-66 that are part of this degree. We will investigate this in conjunction with the Program Coordinator at NJIT to examine more closely just what is going on. One hypothesis: students who pursue this degree become concerned with earning extra technical credits that help them transfer to New Jersey Institute of Technology (NJIT) with advanced standing. It may well be that they do not particularly concern themselves with completing the formal requirements for BCC's degree and simply transfer to NJIT once they have accumulated (on average according to the Coordinator at NJIT) 75-80 transferable credits. We have had as many as half a dozen students who have managed to transfer 88-90 credits from Bergen to NJIT. This has not, however, been examined in any systematic fashion. Data collected in 2005 – 2009 indicate that the transfer rate is quite high for a career program. In large part this is due to the articulation agreement that the College has for several of its programs with NJIT's Computer Technology Program. Data collected over the same period regarding graduation rates provide a somewhat uneven picture (0%, 11%, 24%, 6%, 20%; average of 12.2%) though in at least two years (2007 and 2009) they significantly exceeded Bergen's general graduation rate (24% and 20% respectively). Data collected from 2007 – 2010 indicate that job placement figures range from 54% to 82%; average = 68%). In this cohort, 17% are new students; 80% are continuing students and 2.5% are transfers. A surprisingly high percentage of students are college ready, though a clear majority of students (except in 2011, when 60% were College Ready) still required remediation.

AAS.IT.WEB is the program code for the Web Development and Management career degree. Since 2011 there has been a steady decline in FTEs. This is somewhat surprising and is somewhat at odds with the enrollment numbers which are somewhat steadier (showing a significant dip only in 2011). It may be that there are a larger-than-usual number of part-time students in this program. Completion rates vary from 2.4% to 9.2% (average = 5.2%). See the discussion above (paragraph preceding this one) concerning AAS.IT.NET completion rates. We believe that similar issues apply here (students concerning themselves primarily with maximizing the number of credits they can transfer to NJIT and not necessarily concentrating on our internal formal graduation requirements). Data collected from 2005 – 2009 and from 2007 – 2010 indicate that the transfer rate is actually unexpectedly low (0% for the first four years and 20% for the fifth year) since this is 1 of 4 INF career degrees that transfer to NJIT's Computer Technology Program. Graduation rates were 100% and 40% in two of five years which is excellent, but 0% in two other years and 10% in one year. Job placement for the three years shown were 67%, 100% and 100%. New students accounted for 28% of this cohort; continuing students were 68% and transfers were 4%. During three years (2011-2013) for which there are complete figures, the Web Development program consistently records some of the highest percentages College-Ready students of any INF/MED.INFO/GAM program (close to 30%). Still, a majority of students do need remediation.

AAS.BT.OFF.TECH is the code for the career degree in Office Technology. This career degree has been non-transferable till this year. There is an articulation agreement with Kean University that is in its final stages of approval. This program has maintained a steady population of about 20 FTE since 2010. Completion rates vary from 0% - 4.1%. This is quite low and is of concern since this program has not had any transfer option. One hypothesis: students in this degree may be switching out of this degree, precisely because it does not have the transfer option. More investigation is needed, although there have been proposals to simply eliminate this degree. There is a perception among INF faculty that it has

perhaps outlived its usefulness in the workplace as a credible degree. On the other hand, the pending articulation agreement with Kean University may provide additional stimulus for enrollment in this program. Data collected in 2005 – 2009 and 2007 – 2010 indicate that job placements varied from 33% to 100% with no discernible pattern. Graduation rates were 25% in the first and fifth years tracked, but were 0% in between. The transfer rate is 0% since this career degree has had no transfer option. 31% of this cohort are new students; 62% are continuing and 7% are transfers.

The CERT.DB Database Programming and Administration Certificate is a small program designed for a rather specialized audience; students who already have a degree outside the IT field, who are returning to school to build their technical skill sets. Often these students are not seeking another credential; rather they 'cherry-pick' the courses that will help make them more attractive to potential employers. Since this program folds entirely into the larger AAS.IT.DB degree there is no danger in this being so small a program. These students take courses right along with classmates in the larger degree program. Often these students are not particularly interested in completing the program. The only year for which the following data is available, 2012, shows that 100% of the students were college-ready (not surprising considering that the target audience is college graduates).

The CERT.OFF.TECH Office Technology Certificate is a small program and is likely to remain that way. It probably should be terminated. Enrollments are small and completion rates are generally very low. Many of these students switch to more substantial majors that provide better employment opportunities. At one time this was a viable option for high school graduates looking for a fairly easy path to employment, albeit strictly as entry-level workers. As technology and software applications have matured (and workplace expectations have also grown), the skill-sets provided by this certificate are not really even minimal anymore,

CERT.COMP.SUPPORT is the Computer Technical Support Certificate. This small program has had a steady FTE population of about 7 for the past three years. Although it has a clearly defined target population, there is a perception among INF faculty, that this CERT is perhaps too limited in scope at this point, providing at best a minimal set of skills to gain entry into the workplace. It folds entirely into the larger AAS.IT.NET degree and many times we advise students in this certificate to 'raise their sights' and consider the more robust degree. It probably operates best as a bridge program to the larger IT.NET degree; often entering students who lack self-confidence experience their first real academic success in this program and are able to consider larger pursuits. On its own it offers enough of a set of skills that graduates can gain employment, but only in entry-level positions and sometimes with only modest opportunities for advancement. We have had occasional college graduates (coming from non-technical majors) who see this program as an opportunity to gain entry to the IT world. We generally advise such students (those that already possess another degree) to pick specific technical courses that will make them more attractive to potential employers and not necessarily concentrate on completing the formal requirements for this Certificate. Completion rates in this Certificate vary from 3% to 14.3% (average: 7.3%).

COA.NET.SECURITY is the Certificate of Achievement in Network Security (a specialized set of 5 courses [15 credits]). This very small program occupies a very limited niche in the INF department. It is positioned as a follow-on course of study to the AAS.IT.NET degree and, while there are individual courses in the COA that work very well (INF-271 Ethical Hacking and INF-274 Wireless Networking especially), the COA has not captured the imagination of students. This COULD change if the State of NJ follows through with an initiative to limit many 'two-year' degrees to 60 credits (currently, all INF/MED.INF/GAM degrees at Bergen require 64-66 credits to graduate). With such a limit in place, a

12-15 credit COA 'add-on' to the degree could become a very viable option for students seeking to build their cyber-security skills without committing themselves to much beyond an AAS educationally. Currently, what seems to be happening is that students who would normally consider this certificate tend, instead, to transfer to New Jersey Institute of Technology which includes a concentration in Network Security as part of the BSCT (Bachelor of Science in Computer Technology).

There are a number of general conclusions that can be drawn from the analysis of student survey data, from information available on the Bureau of Labor Statistics Occupational Outlook web site and from enrollment tracking information maintained by the Information Technology Department itself.

We refer the reader back to the chart at the beginning of this section (p18). The single most compelling fact is that the INF/MED.INFO/GAM programs have been, and will continue, growing at about a 5.3% annual rate.

Enrollment tracking information over the last three years reveals that the INF/MED.INFO/GAM programs overall have been growing steadily. From Fall 2012 to Fall 2013 total registrations in all INF, MED.INFO and GAM courses grew from 954 to 994 (4.2%). This growth must be seen in context. The College as a whole experienced a decline in enrollment of approximately 5.5% over the same period, so that the INF/MED.INFO/GAM programs were running close to 10% ahead of general trends. From Fall 2013 to Fall 2014 enrollment grew again from 994 to 1,012 an increase of 1.8%. Enrollment figures for Fall 2014 for the College indicate a drop of about 2.0% overall. In that context, INF/MED.INFO/GAM enrollments have outpaced the College by close to 4%. An interesting, but somewhat anomalous corollary to this concerns the number of declared INF/MED.INFO/GAM majors which has been tracked since 2009. Year-over-year figures show an increase from 2009-2010 of 7.4%, 2010-2011 of 22.4%, 2011-2012 of 5.2%, followed by a decline of 5.8% from 2012-2013. The decline in declared majors is somewhat difficult to explain given that was the same period during which enrollments across the curriculum increased by 4.2%. A somewhat smaller population (somewhat mirroring the declines the College as a whole experienced during that period) were taking a greater number of credits than ever before. Perhaps the more significant 'big picture' is the realization that right straight through the worst of the Great Recession, enrollments in INF/MED.INFO and GAM have been quite robust and generally growing at a healthy pace.

Graduation rates, completion rates and transfer rates need further investigation. Of particular interest are the completion rates for students in our most-established programs (AAS.IT.NET, AAS.IT.DB, and AAS.IT.WEB). Though these are career degrees, many of these students elect to take advantage of the articulation agreement we have with New Jersey Institute of Technology. Official completion rates are quite low in all three of these programs; yet, the Coordinator of the Computer Technology Program at NJIT has assured us repeatedly that 'the average BCC student transfers in to my program with between 75 and 80 credits from BCC'. We have not formally tracked these students, but do have a working hypothesis as to what might explain an apparent discrepancy in this regard: NJIT permits students to transfer in a host of technical INF courses (well beyond those formally specified in the articulation agreement), and grants them advanced credit toward their baccalaureate for these courses. It may well be that students simply concentrate on maximizing the opportunity to transfer as many less-expensive community college credits as they can without bothering to complete formal degree requirements at Bergen. Most students will take 10-15 extra credits with them; a few exceptional students have taken as many as 88-90 credits with them. NJIT has a 'residency' requirement that permits a maximum of 93 credits earned elsewhere before completing the final 35 credits at NJIT. The residency requirement is targeted at other 4-year institutions; it is something of a credit to BCC that our curriculum is rich enough

to include enough advanced technical electives that students can get to 90 transferable credits! Of course, if our hypothesis concerning completion rates is not valid, then we must look at other factors that may be contributing to the low rates.

Another, more disturbing generalization, drawn from this analysis, is the realization that remediation is such a large and necessary component of students' education at Bergen. Even in the programs that attract higher-functioning students to begin with, the majority of program participants require remediation. In the analysis above, only one of our larger programs (AAS.IT.NET and only in 2011) recorded a majority of students (60%) being College Ready. The general AVERAGE within programs seems to run at about 80% (4 out of every 5 students) requiring remediation! The statistics do not include details showing whether or not the remediation required is in English Basic Skills or in Developmental Math. The general trend, across the College, is that remediation is generally needed in both areas. In technology-heavy Information Technology courses, anecdotally, INF faculty have noted that many students are weak in both areas. Most INF/MED.INFO/GAM courses do not address these issues head-on, except in a handful of courses specifically devoted to developing technical writing skills and/or spreadsheet analysis skills. However, the need for remediation is crucial and perhaps bears more investigation in terms of what more we can do in all of our technology-driven courses to help more of our students tackle these important issues.

#### **What areas of INF/MED.INFO/GAM offer the greatest opportunities for employment and advancement for newly graduated students?**

The Bureau of Labor Statistics (bls.gov) maintains an Occupational Outlook web site where users can look up specific occupation titles to see what the hiring projections are over the next several years. Current projections are for the period 2012-2022 (prior projections were for the period 2010-2020). In most job categories related to Information Technology hiring projections have shown growth rates in the 'Faster Than Average' to 'Much Faster Than Average' categories (their two highest categories). This has been consistent since we first started tracking trends on this web site in 2009. Again, through the worst parts of the Great Recession, opportunities in IT have consistently been among the best available across the US economy. There was only one job title that suffered during the 2009 – 2014 period: Computer Programmer. In 2009 there was a 4% decline projected for the period 2010 – 2020. With the latest projections that has improved somewhat: the need for Computer Programmers during the period 2012 – 2022 is expected to grow by about 8% which is considered Average. If the title changes from 'Computer Programmer' to 'Software Developer', growth leaps to 22% which is considered 'Much Faster than Average'. The BLS web site also shows median salaries for all job titles listed. In most IT-related jobs median salaries are quite high, ranging from \$72,560 for Network and Computer Systems Administrators to \$93,350 for Software Developers. One outlier is the Computer Support Specialists who can expect a median salary of \$48,900. These are, of course, median salaries and do not represent what our graduates can expect as new entrants to the labor market; however, when compared to other professions across the US economy, most of these median salaries fare quite well. Also, these are national figures. In the NY Metropolitan Area we would expect many of these figures to be somewhat higher, given that cost-of-living is higher than average in this region.

One important counter-example concerns graduates of the GAM degrees. We have been very careful to advise ALL new students in these two degrees that local opportunities for employment may be very limited and that, in fact, employment in general for these two-year career degrees may be challenging. We advise most of them to continue their educations at New Jersey Institute of Technology, Kean University, Bloomfield College, or to consider schools in Florida (Full Sail), Washington state (DigiPenn)



or Vancouver (Vancouver Film School). Interest in Game Development is very high among new students; we have no trouble at all filling two foundation courses (GAM-110 Introduction to Game Architecture and Design and GAM-111 Game Programming 2-D). A lot of entering students, who are quite enthusiastic 'players' of games, find out that they are not nearly as enthusiastic about 'making' games and so the drop rate is quite high between the first and second semesters. On the other hand, those that remain are astonishingly passionate about their work, even though they are well aware of the limited opportunities for local employment at the conclusion of their programs.

### **How do students perceive the quality of their educational experiences with the INF programs?**

Response rates on the student surveys are quite low so it is difficult to draw meaningful conclusions from any one survey year. However, in aggregate, looking at data collected over several years, we see some meaningful trends. Data were collected from 2007 – 2012 for seven questions. Below, the aggregate results are analyzed. The source for this data is contained in InformationTechnologyPacket.pdf, available at: <http://www.bergen.edu/inf/programreview>

- *Have you continued your education after finishing at Bergen Community College?* Of 27 responses, 12 continued at another degree-granting institution, 5 continued at a non-degree-granting institution and 10 did not continue their education.
- *What was your experience in transferring credits from Bergen to your next school?* Of 16 responses, 5 transferred all credits with no problems, 4 transferred all or almost all credits, 1 transferred most credits, 2 found that few or no credits transferred, and 4 responded that the issue was not applicable to them.
- *What kind of major did you declare?* Of 13 responses, 10 declared an IT-related major, 2 declared a non-IT-related major and 1 had not declared a major.
- *What is your employment status?* Of 27 responses, 14 were employed full-time in a single job, 1 was employed full-time in two or more jobs, 7 were employed part-time in 1 or more jobs, 2 were temporarily employed, none were unemployed and seeking, 3 were unemployed but not seeking employment.
- *How important was your BCC education in obtaining employment?* Of 26 responses, 2 indicated that their BCC education was crucial, 6 felt that it was important, 2 felt that it was not helpful, and 16 indicated the question was not applicable to them.
- *How quickly did you find employment?* Of 27 responses, 9 gained employment prior to, or became employed immediately after graduating, 2 were employed 1-3 months after graduation, none were employed 4-6 months after graduation, and 5 were employed 7 or more months after graduation. There were 11 responses indicating the question was not applicable to them.
- *What role did your BCC have in relation to your employment?* Of 25 responses, 11 indicated that their education helped them obtain their job, 9 indicated that it helped their performance on the job, 1 indicated that it helped get a raise or a promotion and 4 indicated that their education was not very helpful in regard to their employment.

The overall conclusion we derive from these responses indicates that, for students, their engagement with the INF/MED.INFO/GAM programs has been largely beneficial to them: nearly two-thirds went on for additional education; nearly two-thirds were successful in transferring significant amounts of credit on to their next school; most were declared majors in IT; most were employed (though the nine who were employed only part-time or temporarily are a concern); 80% felt their education was helpful in obtaining employment; nearly all were employed (though the 5 who took over half a year to gain employment are a concern); and over 80% felt that their education had a positive impact on their employment.

Demographic characteristics were tallied from 2008 – 2011. Beginning in 2010, the demographic breakdowns were done somewhat differently, so not all data is comparable for the entire period. Over the 4-year period, of the 70% of the overall population who reported a racial affiliation, 55% were White; 18.5% were Hispanic; 16% were Asian; and 10% were Black. The remaining half a percent reported being Native American or of Mixed Race. However, there were a significant number of the population who either reported that they were Non-resident Aliens (8.7% of the overall total), or did not disclose any racial affiliation (22.2%).

Gender was tallied on the student surveys, but not in a way that yielded useful results for this Program Review. The tally was done by percentages of each racial group affiliation, so that we can tell, for instance that 30.8% of all females enrolled in the IT.DB program in Fall, 2013 were white. What the tally does not provide is an absolute number of those females. We do know that females are VERY MUCH an under-represented population across most IT-related disciplines. This is a matter of how we collect the data and should be changed in the future. It is interesting to note that 43% of full-time INF/MED.INFO/GAM faculty are female as are 33% of the adjunct faculty (overall: 37% are female), but the percentage of students who are female is MUCH lower (probably under 10%). There is certainly much work to be done to build a more robust cohort of females in IT-related disciplines. This is part of a well-known issue of long standing in regard to so-called STEM disciplines (Science, Technology, Engineering and Math). We do not propose a specific solution here in this Program Review, but we are well aware of the challenges and certainly are working toward solutions, especially with colleagues in the other STEM disciplines.

### **Success Rate**

The Coordinator of the Computer Technology Program at New Jersey Institute of Technology, where a great many of our AAS students transfer, has told us on several occasions that transfers from Bergen maintain GPAs that are a full half-point higher than transfers from any of the other community colleges. This is anecdotal, of course, and we are in the process of seeking some hard data to support this assertion.

### **Special Accomplishments**

Students in INF/MED.INFO/GAM programs have distinguished themselves in numerous ways. There are a number of students, as in any discipline, who excel academically including a few who have maintained perfect or nearly perfect GPAs. More interesting, actually, are students who have distinguished themselves in somewhat non-traditional ways. In past years INF/MED.INFO/GAM majors have constituted a prime recruitment pool for the College's own Information Technology Services (ITS) staff, particularly as Student Technology Consultants (STCs), and a number of these students have gone on to become regular ITS staff as well. Beginning in Fall 2014 many of the students who would have served as

STCs are instead becoming interns, thereby earning college credit while also gaining guided production-environment experience. A number of the STCs/interns have distinguished themselves in very interesting and compelling ways. Four examples follow (available at: <http://www.bergen.edu/inf/programreview>).

Example 1: About 4-5 years ago, EP (FERPA regulations require we respect students' privacy, so only initials are used here), a student who maintained a GPA of 3.9, came to the INF faculty to ask why the College did not maintain its own student email system. We put him in touch with the College's Chief Information Officer who gave EP the task of researching what would be needed to implement such a system (a system that could scale up to meet the needs of some 20,000+ students and alumni). EP's research required him to investigate, among other topics: equipment needs, integration with existing computing infrastructure, software platforms and products capable of handling anticipated loads, system design, and costs of implementation, operation, maintenance and upgrades. EP completed the task in about one semester and the system the College now uses was directly built using his designs, blueprints and specifications.

Example 2: Student DR approached the INF faculty with the idea that he would like to do a research project on virtualization technology. At the time no one on campus, neither IT faculty nor ITS staff, knew much about this emerging technology. DR was hired as an STC to investigate virtualization to see what impact it might have on the delivery of IT classes at Bergen. It took him a bit longer than a semester, but he produced a series of recommendations that resulted in the INF department switching over to delivery of 4-5 courses using virtualization technology. This saved the College several tens of thousands of dollars in new equipment expense since we were able to use existing equipment hosting virtual sessions where course content could be delivered. It also made it possible for students to reproduce these same virtual environments on their computers at home, thereby strengthening their learning and enriching their experience. Though we have not done so yet, there is significant interest in developing a new course that explores virtualization as a topic in and of itself.

Example 3: RT is a current STC and a student intern. He has found the experience of working in a production environment so stimulating and enriching to his education that he OFTEN chooses to work past his regular compensated hours, specifically so he can complete projects and gain deeper experience in his chosen area (Network Administration). As an STC he has become indispensable to the ITS department and is often tasked with assignments that carry a high degree of responsibility and trustworthiness with them.

Example 4: TG began as a student at Bergen about three years ago. He excelled so well with his classes that he was hired as an STC early on and again, distinguishing himself in that capacity, was given high-responsibility assignments. Following graduation, he was hired by the ITS department and now works on a number of high-responsibility projects, including being one of two persons primarily responsible for the imaging of all computer laboratory workstations across the entire campus (there are many different software images that must be built to meet the needs of many different academic programs). He is also completing a current project doing software imaging on a number of brand-new INF faculty laptops which will be used to demonstrate and engage students with new Windows environments.

The four examples cited above are by no means unique. They are included specifically to give a sense of how well students' experiences in the classroom translate into real-world opportunities, often well before they graduate.

**Focus on Faculty**

In this section we investigate three topics:

- What are the academic and experiential backgrounds of the faculty?
- What qualifications should we be seeking in new faculty?
- What challenges and opportunities will we face in recruiting, hiring and retention of highly-qualified tenure-track faculty, as well as lecturers and adjuncts?

Additionally, we will present results of a faculty survey conducted to assess levels of satisfaction with the INF programs/department and to provide a sense of how the faculty thinks the programs should change and grow. Also included are sections on Faculty Development and Special Recognitions.

**What are the academic and experiential backgrounds of the faculty?**

INF/GAM/MED.INFO faculty consist of three tenured members, two tenure-track members, two full-time Lecturers and 14 part-time adjuncts. Over a great number of years, we have worked hard to promote a highly collaborative environment, particularly with regard to development and delivery of curriculum. Our curriculum is very dynamic and malleable due to the nature of the field: IT is always moving forward, often at a dizzying rate. We work carefully, with software companies, authors, publishers of text materials and online content, as well as with academic partners (other schools) and our own technical support staff (ITS) at the College to make sure that our offerings are always current and forward-looking. Listed below are the academic and professional profiles of all INF faculty:

Tenured: Gary Correa, William Madden, Anita Verno

Tenure-track: Minas Kousoulis, Emily Vandalovsky

Lecturers: Charles Njogu, Annette Rakowski

Adjuncts: Marc Caruso, Christopher Cioppa, Loretta Dicker, Brian Fuschetto, Stephen Gonzalez, Amarjit Kaur, Danuta Kuc, Samuel Maldonado, Troy Miller, Daniel Nasello, Frank Prior, Christian Robustelli, Emily Touma, Raymond Touma

Gary Correa, Assistant Professor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MBA Finance</li> <li>• BS Electrical Engineer</li> </ul>	<ul style="list-style-type: none"> <li>• Security Plus</li> <li>• Network Plus</li> <li>• CNI-Certified Novell Instructor</li> <li>• MCT-Microsoft Certified Trainer</li> <li>• 10 Microsoft certifications</li> <li>• 10 Novell certifications</li> </ul>	<ul style="list-style-type: none"> <li>• 13 years Bergen Community College</li> <li>• 15 years Computer Learning Center</li> </ul>	<ul style="list-style-type: none"> <li>• 28 years teaching various aspects network administration</li> <li>• 14 years Electrical Engineering experience in Aerospace industry</li> </ul>

Minas T. Kousoulis, Assistant Professor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>MS Computer Science</li> <li>BS Computer Science</li> </ul>		<ul style="list-style-type: none"> <li>2 years Bergen Community College</li> <li>6 years Montclair State University</li> </ul>	<ul style="list-style-type: none"> <li>14 years independent IT consultant (developed websites, created web services and trained clients; developed and maintained networked system environments)</li> </ul>
<p><b>Publications:</b></p> <ul style="list-style-type: none"> <li>M.T. Kousoulis, G.E. Antoniou, <b>4D FIR Digital Filter Realizations</b>, 5th Latin-American Symposium on Signals, Circuits and Systems (IEEE LASCAS 2014), Santiago, Chile, 2014</li> <li>M.T. Kousoulis, G.E. Antoniou, <b>Realization of 4D Lattice Structured Digital Filters</b>, 4th IEEE Latin-American Symposium on Circuits and Systems (IEEE LASCAS 2013), Cusco, Peru, 2013</li> </ul> <p><b>Conference scientific committee member:</b></p> <ul style="list-style-type: none"> <li>International Conference of Computing in Engineering, Science and Information (IEEE ICC 2009), Fullerton, California, 2009</li> </ul> <p><b>Affiliations:</b></p> <ul style="list-style-type: none"> <li>Association for Computing Machinery (ACM)</li> <li>Institute of Electrical and Electronics Engineers (IEEE)</li> </ul>			

William Madden, Associate Professor Chair, Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>MS Computer Science</li> <li>BS Social Work</li> </ul>		<ul style="list-style-type: none"> <li>14 years Bergen Community College</li> <li>8 years Gibbs College</li> <li>18 years Cleveland Music School Settlement</li> <li>5 years Cleveland Public Schools</li> </ul>	<ul style="list-style-type: none"> <li>16 years database programmer, technical support worker/manager</li> <li>30 years part-time IT consultant</li> <li>Association for Computing Machinery</li> <li>Computer Science Teachers Association</li> </ul>

Emily Vandalovsky, Instructor Department of Information Technology
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Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS in Educational Technology</li> <li>• BS Computer and Information Science (Magna cum Laude)</li> </ul>		<ul style="list-style-type: none"> <li>• 8 years Bergen Community College</li> <li>• (adjunct professor, lecturer, tenure track FT faculty)</li> <li>• 3 years Ridgewood Community School (instructor)</li> <li>• 4 years Big Apple Educational Center (training specialist / instructor / program developer)</li> </ul>	<ul style="list-style-type: none"> <li>• 2 years National Discount Brokers (systems analyst)</li> <li>• 3 years PaineWebber (software engineer)</li> <li>• Association for Computer Machinery</li> <li>• Computer Science Teachers Association</li> <li>• Community College Computer Consortium of NJ</li> </ul>

Anita Verno, Associate Professor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS Computer Science</li> <li>• BA General Science</li> </ul>	<ul style="list-style-type: none"> <li>• CompTIA A+ Certified Technician</li> </ul>	<ul style="list-style-type: none"> <li>• 16 years Bergen CC (through 12/31/2014)</li> <li>• 6.5 years Bergen County Technical Schools (Tech HS and Academy for Business and Computer Technology)</li> <li>• 1 year Don Bosco Prep</li> <li>• 16.5 years (see next column) educating business professionals about computers and computer software</li> </ul>	<ul style="list-style-type: none"> <li>• 11.5 years - independent consultant (computer education, analysis, design, code, document, install, and support of microcomputer apps)</li> <li>• 4 years - United Computing Systems: Project Consultant, Sales Representative, Sr. Applications Analyst, Applications Analyst. Responsibilities included systems development, technical support, client education, inside sales.</li> </ul>
<ul style="list-style-type: none"> <li>• 1 year - Compu-Serv Network Inc: Account Representative. Responsibilities included systems development, technical support, client education, inside sales.</li> </ul> <p><b>Publications:</b></p>			

- Co-author, **Our Digital World**, Paradigm Publishing. Now in its 3rd edition.
- Co-author, **Guidelines for Microsoft Office 2013**, Paradigm Publishing
- Co-author, **Guidelines for Microsoft Office 2010**, Paradigm Publishing
- Co-author, numerous research reports supporting K-12 computer education.

**Affiliations:**

- CSTA: Computer Science Teachers Association (Founding member, Board Member, Advisory Council Member)
- ACM: Association of Computing Machinery
- Oracle Academy Introduction to Computer Science member
- Oracle Academy Advanced Computer Science member

Charles Njogu, Lecturer Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MSc Management and Systems</li> <li>• MA Finance and Economics</li> <li>• BSc IT- Network Design and Management</li> <li>• Advanced Diploma Computer Studies</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco CCNA</li> <li>• Microsoft: MCITS, MCP</li> <li>• CompTIA: Project+, Network+, Security +</li> <li>• Others               <ul style="list-style-type: none"> <li>○ CIW JavaScript Specialist</li> <li>○ CKM</li> <li>○ CKEE</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• 2 years Bergen Community College</li> <li>• 2 years Montclair State University</li> <li>• 5 years Raritan Valley Community College</li> </ul>	<ul style="list-style-type: none"> <li>• 6 years Technical Support</li> <li>• 5 years IT consultant</li> </ul>

Annette D. Rakowski, Lecturer Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MBA - Masters Business Administration Specialization – High Technology &amp; Marketing</li> <li>• BA Teaching Specialization Family Child Studies / Psychology</li> </ul>	<ul style="list-style-type: none"> <li>• New Jersey State Approved Teaching Certification</li> <li>• Web Development Certificate Program</li> <li>• E-Commerce Certificate Program</li> <li>• Adobe Graphics Certificate Program</li> <li>• Certified Paralegal</li> <li>• (SHRM) Human Resources Certificate Program</li> </ul>	<ul style="list-style-type: none"> <li>• 9 Years Bergen Community College – Information Technology Continuing Education, &amp; CITL Departments</li> <li>• 7 Years – The Young School, Ridgfield, NJ – Computer Teacher K-6</li> <li>• 13 Years –Trainer of Office &amp; Computerized Accounting Software Applications on</li> </ul>	<ul style="list-style-type: none"> <li>• 7 Years+ Network Administration &amp; IT Support: Maintaining hardware, software, operating systems, and network on location and in the cloud.</li> <li>• 13 Years+ Website Development- HTML and Open Source Content Management Websites – WordPress and Drupal</li> <li>• 16 Years+ - Computer Trainer Office and</li> </ul>

		location at various businesses	Accounting Applications • 10 Years+ – Social Media Marketing and E-Commerce
<ul style="list-style-type: none"> <li>• Founder &amp; Vice President – Rochelle Park Chamber of Commerce</li> <li>• New Jersey Association of Women Business Owners</li> </ul>			

Marc Caruso, Adjunct Instructor Department of Information Technology CEO, TechFox, LLC <a href="http://www.TechFox.it">www.TechFox.it</a>			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• BA Communication</li> </ul>		<ul style="list-style-type: none"> <li>• 14 years Bergen Community College</li> </ul>	<ul style="list-style-type: none"> <li>• 22 years -Network Admin</li> <li>• 15 years - IT Consultant for TechFox, LLC</li> <li>• Manage the day to day network operations of 40+ companies encompassing 60+ locations</li> </ul>

Chris Cioppa, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS Educational Technology</li> <li>• BS Physical Education; minor: Psychology</li> </ul>	Business Operation Defense Operation against Cyber-Terrorism	<ul style="list-style-type: none"> <li>• 22 yrs Bergen Community College</li> <li>• 7 yrs SUNY Maritime College</li> <li>• 10 yrs FBI Infragard</li> </ul>	<ul style="list-style-type: none"> <li>• 10 yrs OHLS / FBI Cyber Terrorism / EMP / Social Net</li> <li>• 7 yrs Intermodal Security</li> </ul>

Loretta Dicker, Adjunct Instructor Department of Information Technology Associate Professor, Atlantic Cape-May Community College			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS Computer Science</li> <li>• BA Mathematics</li> </ul>	Microsoft Certified Professional: Windows Server	<ul style="list-style-type: none"> <li>• 3 years Bergen Community College (1 full time, 2 adjunct)</li> <li>• 14 years full time Atlantic Cape Community College</li> <li>• 1 year full time Gibbs College</li> <li>• 1 year full time</li> </ul>	<ul style="list-style-type: none"> <li>• 20 years Information Systems as programmer, programming manager, and Director of MIS at Rudco Industries, Workbench Industries, Lion Ribbon Corp., and RGA</li> </ul>



		Computer Learning Center • 1 year adjunct at Rutgers Newark, Fordham Bronx, Edward Williams College	Associates. • Institute of Electrical and Electronics Engineers
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Brian Fuschetto, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• AS Education</li> <li>• BS Business Education</li> <li>• Professional Degree in Web Development</li> <li>• MA Curriculum, Instruction &amp; Assessment</li> </ul>	<ul style="list-style-type: none"> <li>• NJ Instructional Licenses:               <ul style="list-style-type: none"> <li>○ Keyboarding</li> <li>○ Data Processing</li> <li>○ General Business Studies</li> <li>○ Bookkeeping &amp; Accounting</li> </ul> </li> <li>• NJ Structured Learning Experience</li> <li>• Microsoft Office Specialist:               <ul style="list-style-type: none"> <li>○ Word</li> <li>○ Excel</li> <li>○ PowerPoint</li> <li>○ Access</li> </ul> </li> <li>• Adobe Certified Trainer</li> </ul>	<ul style="list-style-type: none"> <li>• 16 Years - New Jersey Public Schools (1999 – present)</li> <li>• 3 Years - Comp USA Corporate Training (1997 – 1999)</li> <li>• 5 Years - Bergen Community College (2010 – Present)</li> </ul>	<ul style="list-style-type: none"> <li>• Computer Science Teacher's Association</li> <li>• New Jersey Business and Technology Education Association</li> <li>• National Business Education Association</li> <li>• New Jersey and National Education Associations</li> <li>• Association of Supervision &amp; Curriculum Development</li> <li>• 12 Years - Programming &amp; Web Development Consultant for Apex Computers, LLC</li> </ul>

Stephen Gonzalez, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• Vancouver Film School, Diploma in Game Design</li> <li>• Bergen Community College, Associates in Applied Science in Computer Animation</li> </ul>		<ul style="list-style-type: none"> <li>• 2 years – Bergen Community College adjunct</li> </ul>	<ul style="list-style-type: none"> <li>• 8 years student technology consultant</li> <li>• 4 years professional tutor</li> </ul>

Amarjit Kaur, Adjunct Instructor Director, Center for Innovation in Teaching and Learning (Distance Learning)
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Department of Information Technology Adjunct			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS Curriculum and Instruction</li> <li>• Ed.D.. Instructional Technology and Media</li> </ul>	<ul style="list-style-type: none"> <li>• System Design and Implementation</li> </ul>	<ul style="list-style-type: none"> <li>• 7 years, Bergen Community College, NJ</li> <li>• 6 years, DOT, NY</li> <li>• 2 years, High School, New Delhi</li> </ul>	<ul style="list-style-type: none"> <li>• NIIT, India</li> <li>• Association for Computing Machinery</li> </ul>

Danuta Kuc, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MBA International Business/Minor in Finance</li> <li>• MIS Computer Technology/Minor in Accounting</li> </ul>	<ul style="list-style-type: none"> <li>• PMP Certification</li> </ul>	<ul style="list-style-type: none"> <li>• 4 years at BCC</li> <li>• 7 years at St. Francis College in Brooklyn</li> <li>• 5 years at Pace University in NY</li> <li>• 3 years substitute teacher in all levels of elementary, middle and high school public schools</li> </ul>	<ul style="list-style-type: none"> <li>• 40 years in industry in Computers</li> <li>• 3 years at Bank of Tokyo Mitsubishi as VP Test Manager in Quality Assurance</li> <li>• 13 years at Brown Brothers Harriman as Associate and then AVP in Testing, Quality Assurance, Test Automation, Project Management, Change Control, Quality Control, Configuration Management</li> </ul>
<ul style="list-style-type: none"> <li>• 4 years at Merck, Project Manager and head of Quality Assurance, Head of Help Desk</li> <li>• 7 years at Goldman Sachs, Associate in Mid Range Systems, Mainframe, Testing, Scheduling, Documentation, Project Management</li> <li>• 4 years at Manufacturers Hanover Trust, Project Management, Developer, Midrange Systems</li> <li>• 7 years at Exxon, mainframe developer, Head systems Analyst, Project management</li> <li>• 4 years in the Netherlands, Europe at Seamac, Project management, Office Manager</li> <li>• Organizations: <ul style="list-style-type: none"> <li>○ ACM</li> <li>○ Professional Women in Computing</li> </ul> </li> </ul>			

Samuel Maldonado, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• BA Psychology</li> </ul>		<ul style="list-style-type: none"> <li>• 2 years Bergen</li> </ul>	<ul style="list-style-type: none"> <li>• 30 years Special</li> </ul>

<ul style="list-style-type: none"> <li>• BA Economics</li> <li>• MS Distributed Information Systems Engineering</li> <li>• MS Psychology</li> <li>• MS Hypnotherapy</li> <li>• PhD Health Psychology (Expected completion date March 2015)</li> </ul>		Community College <ul style="list-style-type: none"> <li>• 30 years Verizon</li> <li>• 1 year M&amp;S Psychotherapy &amp; Counseling</li> <li>• 2 years Educational &amp; Behavioral Health Services</li> </ul>	Services Engineering <ul style="list-style-type: none"> <li>• 3 years In-home Therapist</li> </ul>
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Troy Miller, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• BA American Studies</li> <li>• MFA Theatre</li> </ul>	<ul style="list-style-type: none"> <li>• Microsoft Office Master 2003, 2007, 2010</li> </ul>	<ul style="list-style-type: none"> <li>• 9 years Bergen Community College</li> <li>• 7 years Adjunct Faculty Essex County College</li> <li>• 3 years Johns Hopkins University - Center for Talented Youth</li> </ul>	<ul style="list-style-type: none"> <li>• 11 years Technical Trainer, Desktop Support</li> </ul>

Daniel Nasello, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS, Information Systems</li> <li>• BS, Computer Technology</li> </ul>		<ul style="list-style-type: none"> <li>• 2 years New Jersey Institute of Technology</li> <li>• 1.5 years Passaic County Community College</li> <li>• 1 year Bergen Community College</li> </ul>	<ul style="list-style-type: none"> <li>• Combusion Innovation, Partner (1.5 years)</li> <li>• iOS and Android Developer</li> <li>• Backend Web Developer (PHP)</li> <li>• JavaScript Game Programmer</li> </ul>

Frank Prior, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience
<ul style="list-style-type: none"> <li>• M. Div (Theology)</li> <li>• M.B.A. (Management/Finance)</li> </ul>	<ul style="list-style-type: none"> <li>• NJ Certificate Teacher of Technical Occupations:</li> </ul>	<ul style="list-style-type: none"> <li>• 18 Years Bergen Community College</li> </ul>	<ul style="list-style-type: none"> <li>• Director of Technology at Saint Joseph Regional HS</li> <li>• Senior</li> </ul>

	Computer Science Technology	<ul style="list-style-type: none"> <li>• 9 Years Immaculate Heart Academy</li> <li>• 3 Years Saint Joseph Regional HS</li> </ul>	Programmer/Analyst J.P. Morgan Chase Corp
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Christian Robustelli, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• MS, Computer Science</li> <li>• B.S. Degree in Industrial and Production Engineering</li> <li>• Associate in Network Administration</li> </ul>	<ul style="list-style-type: none"> <li>• A+</li> <li>• Network+</li> <li>• CCNA</li> <li>• CCNP</li> </ul>	<ul style="list-style-type: none"> <li>• 1 year at Bergen Community College</li> </ul>	<ul style="list-style-type: none"> <li>• Escalation Engineer at Riverbed Technology</li> <li>• 4 years Network Admin at Bergen Community College</li> </ul>

Emily Touma, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
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Raymond Touma, Adjunct Instructor Department of Information Technology			
Degrees	Certifications	Teaching Experience	Professional Experience/Affiliations
<ul style="list-style-type: none"> <li>• BA Political Science</li> <li>• MS Telecommunication and Information Management</li> </ul>	<ul style="list-style-type: none"> <li>• CNE</li> <li>• MCSE</li> <li>• CCNA</li> <li>• CISSP</li> </ul>	<ul style="list-style-type: none"> <li>• 5 years, Bergen Community College</li> </ul>	<ul style="list-style-type: none"> <li>• Information Management at 3 major regional banks.</li> <li>• Information Security consultant</li> </ul>

**What qualifications should we be seeking in new faculty?**

INF faculty are distinguished by two characteristics: their hands-on expertise with the content they teach and their teaching effectiveness. We require that any new tenure-track faculty have a masters degree in Computer Science or Information Technology or a closely related field and that they have both relevant significant experience in production environments and significant college-level teaching experience.

The dual requirement of both industry experience AND teaching experience limits somewhat the pool of qualified candidates. Most IT workers can make so much MORE income in business than they can in education that it is indeed rare to find good solid individuals who have a commitment to both. Still,

because the opportunities in IT are so extensive in the tri-state metropolitan area, we have had no problem in attracting reasonable pools of candidates for tenure-track positions at Bergen.

**What challenges and opportunities will we face in recruiting, hiring and retention of highly-qualified tenure-track faculty, as well as lecturers and adjuncts?**

Many of the challenges we expect to face are really no different than what we have faced in the past: recruiting faculty who have a sufficient level of technical ability and knowledge and who also have skills in the classroom is never an easy task.

Going forward we face an additional feature in the landscape of contemporary academia: an increased emphasis on hiring adjuncts and lecturers where, in previous years, the assumption would have been that we should be hiring tenure-track lines. In the particular case of the INF department we have an additional wrinkle: the three senior tenured faculty are closer to the ends of their careers than they are to the starts of their careers. As a matter of fact, INF has already recently lost two senior faculty to retirement (two years ago). One of those positions has been replaced with a new tenure-track appointment (after a year with no replacements). Going forward, it is the strongly held belief of the senior INF faculty that there must be meaningful succession planning. There is NO DOUBT that the best curriculum development and program planning is driven by tenured and tenure-track faculty. An over-reliance on lecturers and adjuncts simply does not permit a program to grow and change in the substantial ways that INF has been able to for the past 15 years. If we are to continue developing the dynamic programs we are able to offer it will be because we have a robust core of tenured and tenure-track faculty driving the change (just as they have in the past). We are able to get a limited amount of involvement from lecturers and adjuncts, and we are certainly very glad to have the level of loyalty, support and engagement of these faculty that we do. However, because of the nature of our hiring practices with these groups, it is not possible to build anything close to the long-term investments in the future of the INF/MED.INFO/GAM programs that are a natural consequence of the reciprocal investment the College has made in its tenured and tenure-track faculty. For the future of the INF department (and the future of higher education in general) it is CRUCIAL that the College address this issue head-on. Too often our barometer is set to measure very short-term (1 to 2 year) 'dollars and non-sense' goals. Instead, we really need to be taking a much broader approach to ensure that our programs are robust well into the future.

With lecturer hires we have tended to set the bar at a standard very similar to that for tenure-track appointments. In fact, in one recent case, we were able to recruit a faculty member as a lecturer who had been a very close second-choice candidate for a tenure-track hire. There is no reason to set the bar for lecturer hires any differently than we have in the past. Because of policy it is currently not possible to retain lecturers for more than 4 semesters, which is often very frustrating and disappointing to the affected faculty (as well as to the rest of us).

With both lecturers and adjuncts we do need to address pay scales. It is very difficult to retain adjuncts (especially in INF) because they can make so much more money in industry (and in fact can make significantly more money as adjuncts at other schools – our current pay scale is that low). Our pay scale for lecturers also is quite low. The result is that adjuncts and lecturers are 'always looking' to improve their prospects. While that is very frustrating for us (and has even forced us occasionally to have to find new hires in the middle of a semester), it is hard to find much fault with such actions. This kind of problem may be somewhat peculiar to INF because the IT job-market has for many years been rife with rather volatile but very remunerative opportunities.

## Faculty Development

The INF Department is pro-active in seeking out opportunities for the professional development of its faculty. We are particularly sensitive to the fact that many professional development opportunities that deal with the development of new IT-related technical skill sets are NOT available through traditional university-based programs, so that we often turn to large software and hardware companies to provide those opportunities. The very largest of them (notably Microsoft, Oracle, IBM and Autodesk) provide online repositories of good portions of their software catalogs which they make available free of charge to faculty and students at institutions of higher education. For a modest fee each year, Microsoft makes additional so-called Premium Content available to faculty and students (through their Microsoft Development Network Academic Alliance, or MSDNAA, Program). Similarly, Oracle makes curriculum and technical support available for a number of technical courses through their Oracle Academy Program. While the intent of these efforts is to induce faculty and students to use (and develop an affinity for) their products, the free access to both mainstream software products and to so-called 'back-end' products such as server operating systems, enterprise-level database products, as well as to professional computer language development, web development and game engine environments is indispensable for faculty. Together with the myriad of web sites devoted to providing extensive tutorials on all these products, such resources are invaluable to the continuous cycle of retooling and growth that characterizes the life of IT faculty (and students!).

The INF department has also provided support for reimbursements of testing fees to both faculty and students who take and pass industry-standard certifications in various IT areas. Over time we have provided reimbursement to both students and faculty for the following certifications: A+, Network+, Security+, Cisco, Oracle Certified Administrator (OCA), and 4 portions of the Microsoft Certified Solutions Expert (MCSE) Certification.

The department encourages faculty to attend professional academic conferences. There are two special subgroups of the Association of Computing Machinery (ACM), itself the world's largest educational and scientific computing society: The Special Interest Group Computer Science Educators (SIGCSE) and the Special Interest Group Information Technology Educators (SIGITE) national conferences are major venues, but we also encourage attendance at the Community College Computer Consortium which meets three times a year to address issues of particular interest to NJ community college computer science and information technology faculty. Major textbook publishers also produce conferences where, while the focus is upon products the particular publisher offers, the quality of the presentations and sessions is often quite good. As in most cases where colleagues convene, it is the informal exchanges among attendees that is perhaps most valuable.

The department also does outreach to regional high schools, community colleges and 4-year schools with an annual 'Compute@BCC' conference designed to build bridges and pathways among attendees so that students can more easily connect themselves to computing technology education and see their way forward from high school through community college and on to 4-year institutions.

The department does regular outreach to younger populations as well by providing hands-on computing technology workshops for school and community groups with attendees as young as 6-7 years old. These opportunities are good, not only for those attending, but for the INF faculty as well, helping them to extend their own skill sets with non-traditional audiences.

Finally, the College runs a Center for Innovation in Teaching and Learning (CITL) which provides professional development workshops for those wishing to innovate in the classroom. A good portion of the CITL workshops deal with techniques for conducting classes online or partially online, though they also deal with innovative uses of computing technology in the classroom. INF faculty have been regularly involved both as participants and as presenters in these workshops. The Director of CITL serves as an adjunct in the INF program, teaching an online technical communications course.

## **Focus on Curriculum**

In this section we investigate four topics:

- What are the unique characteristics of the INF/MED.INFO/GAM curriculum?
- Which parts of the curriculum are ‘forward-looking’ – which parts need to change?
- How can we ensure the curriculum will be relevant and robust going forward 5-10 years?
- What opportunities do we have to increase transferability of INF/MED.INFO/GAM programs?

In addition, sections on New Courses, Course Modifications, Instructional Methods, Student Learning and Outcomes Assessment, Student Satisfaction with Academic Preparation and Special Recognitions are included.

### **What are the unique characteristics of the INF/MED.INFO/GAM curriculum?**

More so than almost any other set of programs at the College, INF/MED.INFO/GAM programs change constantly. Every single semester a number of our courses are undergoing significant changes to make sure that they remain current and forward-looking. Faculty have to constantly retool themselves to stay on top of technology trends. Perhaps the most challenging aspect of the INF/MED.INFO/GAM curriculum is for us to find a ‘sweet spot’ where we can continue to operate within the current definition of a course (as contained in the catalog course description) and yet deliver content that is relevant, current and likely to match what students will find in production environments. In order to minimize pressure on the curriculum review process, we work very carefully on course descriptions so they have a reasonable ‘shelf-life’. Despite these efforts, it is in the nature of contemporary IT that not only does content change, but paradigms shift often and enough that we do need to make curriculum review and updates an ongoing priority. For those of us who have worked in IT for a number of years, this is a simple fact of life. The pace of change we accept as ‘normal’ would be intolerable for many others.

We place a great reliance on hands-on work with equipment and software. Often, in an INF/MED.INFO/GAM class, the lecture stops and the instructor indicates that students ‘must now wrap your fingers around the equipment/software and wrestle with it – it’s the best way to truly learn what you need to learn’.

### **Which parts of the curriculum are ‘forward-looking’ – which parts need to change?**

As of Fall 2014, the Networking Administration curriculum is perhaps to most responsive to market conditions. This coming semester various courses will be addressing the use of at least 3 new versions of operating systems and platforms. As well, within the past 1.5 years, at least three new courses have been added to the curriculum, and another 3 have been phased out.

The Department is also considering some major changes to the Database Programming and Web Development curricula. This is a rare instance where, rather than seeing opportunities to increase specialization in each program (as is happening in the Networking Administration degree), there is an opportunity for some convergence. Professional programmers today need to know a fair amount of web development and, conversely, professional web developers need to know a fair amount of programming. We see an opportunity to bring these two degrees closer together and, among other things, are looking at the development of a new course in Python programming. Including Python in our curriculum, in turn, has implications for the overall structure of both our Database Programming and our Web Development degrees, affecting the sequence and number of other programming courses needed by students in both degrees. Part of the motivation for this change has to do with changes in the



workplace and in terms of what our academic partners (4-year schools) are suggesting for transferability.

There is one set of programs that we are considering dropping (or radically changing) at some point: AAS.BT.OFF.TECH and CERT.OFF.TECH. Early on (in the 1980s, 1990s and even a portion of the 2000s, the skills that are the province of OFF.TECH (largely skills using mainstream business applications such as Microsoft Word, Excel, PowerPoint and, to some extent, Access) were a great passport into the workplace. These days having skills in Word and PowerPoint, certainly, are much less compelling to employers – they are becoming something of a commonplace. Having very good skills in Excel does differentiate job candidates, so OFF.TECH skills still do have a place in the INF/MED.INFO/GAM curriculum. Relational database (Microsoft Access) skills are also a differentiator, but there does not seem to be that much specific demand for those skills in the workplace, at least not in front-office environments. Still, a skillful front-office worker, who knows how to build sophisticated multi-table queries in Access would certainly find interesting opportunities in the workplace, much more so than one who did not possess such skills.

One thought is to recast the OFF.TECH programs as courses of study intended to build problem-solving skills (Excel) and database-query skills (Access) with perhaps something of a cross-platform (desktop/laptop/mobile/cloud) software application support component.

As of Fall 2014, we are in the final stages of arranging a brand-new articulation agreement with Kean University. The AAS.BT.OFF.TECH degree, which until now has not afforded any transfer opportunities, will be included in the articulation agreement with Kean.

### **How can we ensure the curriculum will be relevant and robust going forward 5-10 years?**

In one sense, this is impossible to answer. There are new trends emerging in IT all the time, some of which are quite radical and require significant paradigm shifts. A good example is our Application Development course (which, in its current implementation, has really become a mobile application development course). Four years ago, no one in academia was even aware that such a thing as mobile application development was possible to consider, at least not in a two-year academic environment. Two years ago a former student of ours who had moved on to NJIT (and has now completed a Masters Degree there) piloted a mobile application development course at NJIT, the first of its kind. Within three semesters the single course has grown to two sections at NJIT, a section at Passaic Community College and, as of Spring 2014, a section at BCC. At NJIT the two sections fill and close within days of their announcement each semester.

How do our faculty plan for such changes? We are constantly ‘looking around the bend’ at emerging trends. None of us can pretend to know what the IT landscape will look like in 5, much less 10, years. We peer ahead as far as we reasonably can and make carefully considered choices about moving ahead. So far, INF has been extraordinarily successful in this regard; making the choices we have, we have made no serious mis-steps. Industry has gone ‘the right way’ every time. We also try, as much as possible, to abstract from the particular decisions we make, the underlying concepts and ideas that drive those decisions so that, if we have to adapt and change, we are not doing so reactively. Example: 4 years ago we chose Oracle Database software as the engine that would drive our three database courses, INF-217, -218 and -219. There were some very practical and expedient reasons for choosing Oracle: they were, and have remained, the market leader among enterprise-level database products, they offered their own courses and curriculum, providing training on their product and, most importantly for us, they

made that training available at reduced cost to community college faculty with the added inducement that we could then turn around and offer our own versions of those courses (with full curriculum support from Oracle) at our regular community college tuition rate (about 1/8<sup>th</sup> of Oracle's own tuition). Though the courses are Oracle-based, we are very careful to work with students in these three courses, always having them take a step back from what they are immediately learning to ask the question: 'This is how Oracle asks me to perform this particular task – what if I was using an IBM DB2 database or a Microsoft SQL Server database instead?' Going forward, IBM could conceivably overtake Oracle as market leader. We have positioned ourselves so that if such a change occurs we are ready to adapt and use whatever tools makes best sense.

### **What opportunities do we have to increase transferability of INF programs?**

INF has 7 career degrees and 1 transfer degree. We knew, at the outset, that transferability would be a likely issue for the career degrees. It was not hard to see, back in 2000, that a student with a two-year AAS in IT might want to have an 'upgrade' path. We set about to find an appropriate academic partner and found the New Jersey Institute of Technology (NJIT) almost immediately. Since NJIT is a technical university, it is fundamentally different from most 4-year schools. It similarly emphasizes technical courses the way our AAS degrees do, except that it, of course, extends the learning to 128 credits. We found a very comfortable partner in NJIT's Computer Technology Program for three of our AAS degrees: AAS.IT.NET, AAS.IT.DB, and AAS.IT.WEB. Later, when NJIT decided to add a Medical Informatics degree, they very deliberately sought our partnership and, together, we engineered the AAS.MED.INFO degree with the idea that it too would articulate to NJIT.

INF also has the AS.PS.INFO degree which is a transfer degree. It is structured very differently from all the career degrees and hence is suitable for transfer to most 4-year liberal arts institutions, but does not work well transferring to NJIT. (That becomes an important advisement issue for our AS.PS.INFO majors).

We are in the final stages of completing an articulation agreement with Kean University. The CS/IT department at Kean has expressed interest in making scholarships available to transfer students coming from community colleges. Though Kean is a 4-year school, its CS/IT programs are highly technical and fit our AAS degrees extremely well. As of Fall 2014 all of the internal details of articulation have been worked out and the remaining steps to finalize articulation with Kean (as well as an update to our existing articulation agreement with New Jersey Institute of Technology) are largely the formal ones of securing appropriate authorization from the administrations of each institution.

We have also updated our existing articulation agreement with New Jersey Institute of Technology. Both articulation agreements will include the AAS.IT.NET, AAS.IT.DB, AAS.IT.WEB, AAS.MED.INFO, AAS.SD.GAME.PGMG and AAS.SD.GAME.TEST programs. Kean will also include the AS.PS.INFO transfer degree as well as the AAS.BT.OFF.TECH program, which is the first time this particular program will provide students a transfer opportunity.

### **New Courses and Significant Course Modifications**

See section 'Significant or New Developments since last program review (2006)' – p15 of this document, for details. Since 2006 three (3) new degrees have been added to the curriculum, 11 new courses have been developed and 17 courses have had very significant modifications (often a succession of such

modifications within individual courses) due to changes in platforms, operating systems, application software, publisher's textbook materials and their online support materials/tools).

### **Instructional Methods**

Please refer to the bulleted 'Core Values' in the 'Mission' section of this document (p. 7). The INF/MED.INFO/GAM faculty believe that activities in the classroom should relate well and easily to industry practice. The great majority of classes are taught in computer labs and the pervasive paradigm for delivery of content is based on the idea that most 3-credit INF/MED.INFO/GAM courses take place in a '2-hours-lecture-plus-2-hours-lab' modality – that is, for fully half the time that is spent in class students are actively engaged in working out assignments and projects directly on the student desktop workstations in the lab (one machine per student). Direct access to equipment, operating systems and applications is absolutely critical to students' success. We often state to students, 'Enough talk; it's time for you to wrap your fingers around the [software, equipment, operating system, etc.]' Only by working directly in the same kind of environments and on the same kinds of challenges they are likely to encounter in the workplace, can they truly internalize the skills they need to acquire to be successful once they leave school.

Online and hybrid courses lend themselves very well to the idea that students directly address learning challenges by working hands-on. There are circumstances, particularly in purely online courses, that present challenges for faculty. In computer language courses (such as Visual Basic and Java) learning how to navigate the user interface of modern, complex software development environments can be quite daunting for new students. We often advise students, even though their particular section is online, to make every effort to physically attend the instructor's office hours (especially in the first 3 weeks of the semester), and to make appointments with tutors in the College's Learning Center to help gain facility with the user interface of their development environment. Occasionally, we have also held workshops specifically to address user interface issues in such classes. Certain kinds of technical classes cannot be taught entirely online: our hardware class, for example, is taught entirely face-to-face, or as a hybrid course, but never entirely online. Certain of the high-level network administration courses are also taught only face-to-face or as hybrids. Generally, courses that require students to manipulate or adjust physical equipment and/or to work with specialty equipment (such as routers and switches) as a necessary component to learning the subject matter of the course, are NOT taught in a purely online environment but rely on face-to-face or hybrid modalities.

Nearly everything we do as a faculty is designed to foster a hands-on approach to learning. This approach extends well beyond instructional methods in the classroom: we encourage students, as they complete courses, to put to practical use what they have learned in those courses. So, for instance, after completing a low-level introductory course on computer hardware (INF-108), students can begin to work outside the classroom, helping family members, friends and others to upgrade their equipment.

In regard to hiring practices at all levels (tenure-track lines, lecturer lines and adjunct lines), we very much favor candidates who possess not only the requisite academic credentials but who have significant industry experience. Nothing causes students to engage and 'step up' more than when the instructor standing in front of them refers to a technical real-world issue they themselves had to solve that relates to the classroom topic at hand. Some of the more entrepreneurial students take this a step further and actually begin doing technical support work professionally right away. We have had similar experiences with students who learn how to develop web pages, even after completing only the introductory course (INF-146). In one, albeit exceptional, circumstance, a 19-year old student took ONLY our introductory

hardware class (INF-108), learned to become proficient with laptop upgrades and repairs, took NO other IT classes at Bergen, landed a full-time position with two former students who had formed a technical support company and was hired away from them after two months to do laptop support full-time for another company – all before turning 20!

There are a great number of INF courses the subject matter of which relate well to industry-standard certifications. Perhaps the best known of these is the so-called A+ Certification, offered by CompTIA (Computing Technology Industry Association). Successfully passing the A+ Certification examination indicates that the candidate has the equivalent working knowledge of a professional technician who has six months of full-time work experience. We do NOT offer ‘certification prep’ courses; our philosophy is that students need to learn technical computing skills in such a way that they can succeed in the workplace, adapting to rapidly changing environments and to the emergence of new technologies. However, we are not blind to the fact that quite a lot of the material we find valuable to cover in a number of courses aligns closely to some of the industry-standard certifications. Currently, students successfully completing any of the following courses (especially if they earn an A or a B+) are encouraged to pursue relevant industry certifications:

- INF-108 PC Maintenance and Repair
- INF-160 Networking and Data Communications
- INF-217 Database for Applications
- INF-218 PL/SQL
- INF-219 Database Administration
- INF-232 Windows Client
- INF-252 Windows Server
- INF-265 Network Configuration 1
- INF-266 Network Configuration 2
- INF-267 Network Security
- INF-272 Active Directory

Relevant certifications are: A+, Network+, Oracle’s OCA and Developer Certifications, 4 of the 6 tests that comprise Microsoft’s MCSE Certification, and Cisco’s CCNA Certification. Toward that end we have had the good fortune to have the support of publishers of the textbook for our most popular foundation course (INF-101 Introduction to Information Technology). They have provided funds that enable us to reimburse students for the certification testing fees when they successfully pass the exams.

Some faculty also involve Service Learning in their courses. Service Learning provides a learning experience that specifically relates a portion of the material covered in class to real-world experiences outside the classroom. Students involved in Service Learning have designed web sites for community libraries, for the INF Department itself, for individual faculty at the College (not necessarily just faculty within technical disciplines), have conducted computer workshops at local elementary schools, and have helped conduct hands-on computing workshops in an annual STEM Day event at the College which now attracts close to 1,000 high school-aged students in Science, Technology, Engineering and Math activities.

As of Fall 2014, INF/MED.INFO/GAM majors participate in student internships. Initially, 10 students work 12 hours per week in production environments gaining real-world experience with a variety of technical issues; current assignments include working with the College’s Networking Infrastructure and Desktop Support units. In future semesters, it is anticipated that as many as 25 interns can be accommodated each semester and assignments will also include Web Development and Application

Programming. What makes this particular internship opportunity especially attractive, is that the students work for the College's own Information Technology Services (ITS) Department which makes monitoring progress and resolving internship assignment issues quite easy to manage (this is not always the case with external placements).

### **Student Learning and Outcomes Assessment**

The Department is engaged in an ongoing process of assessment, primarily at two levels. At a more elemental level, for some time now we have conducted pre- and post- surveys of our students in selected courses to determine the degree to which they have succeeded with the material in those courses. Perhaps the most interesting result of these surveys is the differences they expose in terms of the extent to which evening students improve their skills compared to day students. It appears that day students tend to nearly double their performance on post-tests (average improvement was 87%), compared to the baseline established in their pre-tests. This was fairly consistent across two courses in three sections taught by two different instructors. Evening students improved their performance by an average of nearly 190% (close to triple the performance on the pre-tests!). This bore out, in a very quantitative way, something faculty have informally agreed upon for quite some time: that evening students, as a cohort, tend to be quite a bit stronger than day students. A general consensus as to why this may be so is that evening students tend to be older, more employed and often have more extensive family care obligations – that, in general, they are more invested in their own success than their younger, often less-mature, counterparts during day. This conjecture has not yet been formally tested. If the conjecture is true, it leads to another idea: that success in school is heavily correlated with maturity and growing responsibility. A number of questions arise: how can we modify the ways in which we engage younger students so that they are more likely to improve their level of success? Is success in the classroom largely a matter of age, maturity and responsibility? There is a rather overwhelming sense among the faculty that 'the business at hand' (learning of technical skills) is serious business and that other people's lives and welfare are at stake when IT professionals do their work. Though many of us 'have fun' in the classroom, there is something of a 'no nonsense' ethos that suggests to students that learning in the classroom is never very far removed from what they will experience in the workplace. The evening students seem to accommodate to this ethos more readily than do the day students, as a whole. Do we adopt a rather harsh outlook which is to say, do we simply wait for younger students to 'grow up' (meaning, probably, accepting some initial failures) or do we hold ourselves responsible for helping them to 'grow more quickly'? If we pursue the latter course, how do we proceed? At this point, we have not identified any specific strategies, but the question is surely on the table.

In the last year, we have become involved with an institution-wide initiative to engage in a higher-level assessment of program learning goals. We have developed a comprehensive set of program learning goals for each of our Degrees, Certificates and Certificate of Achievement (detailed information is available at: <http://www.bergen.edu/programreview>). We are developing assessment tools that, initially, will focus on a specific program learning goal in each program. The objective is to provide a quantifiable way to measure student outcomes relative to the chosen goal. Over time, as we develop assessment tools for all program goals in all programs, we should have quantifiable and comprehensive measures of success for all of our programs. Our goal at present is to collect our initial datasets in Spring 2015.

It is important to realize that this will be an ongoing effort; the challenge is to make sure that the measures we choose are valid and reliable (not always easily determined!) and that they are reasonable

to implement. Faculty should feel that formal assessment tasks are a natural component of the teaching that they do; if the process is perceived as onerous then it will not get done well (or at all).

### **Student Satisfaction with Academic Preparation**

The section of this report titled '*How do students perceive the quality of their educational experiences with the INF programs?*' (p. 25) presents summary information from our annual surveys of graduates and answers this question in more detail (available in InformationTechnologyPacket.pdf available at <http://www.bergen.edu/programreview>). Summarizing (from the paragraph following the bullets, top of p. 26): for the great majority of students, their engagement with the INF/MED.INFO/GAM programs has been largely beneficial: nearly two-thirds went on for additional education; nearly two-thirds were successful in transferring significant amounts of credit on to their next school; most were employed (though a third of them were employed only part-time or temporarily, which is a concern); 80% felt their education was helpful in obtaining employment; nearly all were employed (though a fifth of them took over half a year to gain employment – again a concern); and over 80% felt that their education had a positive impact on their employment.

### **Special Recognitions**

These are more fully described (citing four specific examples) in the section on p. 27 of this report outlining '*Special Accomplishments*' of our students. In addition to the items included in that sections, we also give special recognition each May at Commencement to the students graduating from each of our degrees and certificates who performed at the very highest academic levels throughout their time with us. These recognitions are largely based on outstanding GPAs maintained over the entire length of the students' time at the school. It is not unusual for us to recognize the outstanding academic achievements of students who may have begun at Bergen years before as students enrolled in our American Language Program, Foundations Level (meaning individuals who have no ability to work in English at all) and who proceeded through all four levels of that Program before moving on to our regular college-level programs and who then succeeded in our often rigorous programs, the whole time sustaining GPAs at the highest levels. We are in the process of setting up a web page on the department web site to recognize these achievements.

## Focus on Support

In this section we investigate three topics:

- How well do college resources support the program?
- What additional support is needed?
- How can we involve our students (and graduates) more in the College's institution-wide technical support infra-structure?

### How well do college resources support the program?

**Technology, facilities and equipment.** With respect to technical infrastructure and technical support, the College's support for the INF/MED.INFO/GAM programs is quite extensive. The Information Technology Services (ITS) staff works diligently to make sure that the computer laboratories used by our various programs are set up, imaged and configured appropriately to meet our needs. Often, courses on computing technology require that we teach students about the inner workings of the very technologies that ITS maintains and supports. This presents particular challenges for ITS since their primary responsibility is to make sure laboratory computers are always working properly and securely. Our efforts as instructors are often to upset the status quo, specifically because our students need to see what happens when systems are NOT working correctly or when there is a specific technical problem to solve. Necessarily, this means working very closely with the ITS staff throughout each semester to make sure necessary institutional security and integrity are maintained, but that our students can still 'get in and experiment' with equipment as part of their learning.

Computing equipment in computer laboratories is maintained on an institution-wide 4-year life-cycle replacement plan. For most technical courses this is adequate, though in some of the more resource-intensive courses it has been helpful to have additional resources periodically made available through infusions of technical computing equipment through Perkins Grants. In at least one laboratory, equipment has been abused (we strongly suspect by non-major students who share the use of the laboratory) to the point that replacement ahead of the usual 4-year life cycle will be necessary. One recommendation would be to limit access to this lab to students majoring in INF-related courses. One of our recommendations (Goal #2) will be to set aside dedicated space for use by students taking INF-related courses.

Classroom furniture has suffered somewhat. Our two most heavily-used computer labs have chairs that largely need to be replaced. Another lab has carpeting that is in very poor shape and needs to be replaced. It appears that as chairs wear out, they are replaced by other, less worn chairs, but there does not appear to be any comprehensive plan (such as our 4-year life-cycle plan for computing equipment) that applies to furnishings.

Our programs make use of three regular 'classroom' labs where settings/configurations do not change (but where software images are particularly complex because of the extensive technical requirements a number of our courses have). We also have access to two 'fabrication labs' where students are allowed to configure and 'tear down' equipment. These two labs require especially close attention and monitoring by both ITS staff and INF/MED.INFO/GAM faculty since we have to occasionally re-image machines if students (or faculty) make particularly deleterious 'mistakes'. Our GAM programs also have access to a very high-end computer laboratory primarily used by the ART department (for various digital art classes). Our GAM majors use the lab for high-end 3-D Video Game Development using industry-standard high-end development environments that require particularly powerful computers. The

College also maintains a set of 'free-time' labs where students can go during most the hours of operation of the school and work on their own. Two of the free-time labs have been designated as 'INF-Priority' labs and contain especially complex software images to meet the technical demands of INF/MED.INFO/GAM courses. Going forward we have some specific recommendations concerning computing laboratory facilities for INF/MED.INFO/GAM programs (see Section below entitled: Needs and Goals).

Resources and support are also available through the College's Center for Innovation in Teaching and Learning (CITL) department, which provides general instructional support services and which has been particularly helpful with technical online course support and with creative ideas for how to best use technology (both as an end and as a means) in the classroom. Additionally, publishers of online content used in a number of our courses have been extremely helpful with training sessions for faculty and with generally very timely technical support for their products.

**Learning Resources.** The library maintains collections of IT-related books. These tend to be of limited value since anything in print already tends to be dated at the time of publication. Far more useful are online resources. The library maintains a limited set of accounts that provide access to some privileged electronic resources and our students make occasional use of this material. Generally, of course, access to the internet is of extreme value to our students and we, as a faculty, are constantly pushing students to evaluate and use as many of these resources as possible. A number of extremely valuable web repositories of class-leading commercial software products are freely available to students (who can authenticate themselves instantly, as long as they possess a valid 'edu' email address. Among the repositories we regularly refer students to include: Microsoft's Dreamspark web site, Autodesk's Academic web site and Oracle's web site.

**Marketing and Public Relations.** The department has worked in the past with the Public Relations department to produce printed brochures for its various programs, though most such publications are outdated at this point and need attention. The department attends every Admissions Open House (both at the Meadowlands Campus and in Paramus) and participated in a recent Division-wide Open House. It also conducts group advising sessions for majors every semester. The department conducts hands-on technology workshops targeted to high school students (and occasionally younger). All of these events have been important in the recruitment and maintenance of our student populations.

**Support Services.** All tenured and tenure-track faculty are required to perform 14 hours of advising per semester. Additionally, a number of faculty are particularly active above and beyond the institutional requirement. Profs. Gary Correa, Raymond Touma and Emily Touma regularly advise in the Advising Center during the summer months. Prof. Correa additionally advises during breaks between semesters. Prof. Madden, as department chair, regularly advises walk-ins and appointments throughout the year.

An important career services component is emerging with the institution of internships. The Career Services Department is an active partner in the internships, providing regular weekly meetings on career development issues during the 15 weeks that interns are active in the program. It is hoped that, as the internship program expands, more students will be able to avail themselves of this important opportunity.

**Resources and Budget.** Staffing the department is a primary concern. As described elsewhere, the department consists of five tenured and tenure-track faculty, two full-time lecturers and 12-14 adjuncts (depending on semester). We have had a part-time stipend that pays for the Department Chair position



and, at one time, had money to support a part-time Coordinator for our two most popular foundation courses (combined total of approximately 17-18 sections running each semester). We also have shared access to two administrative assistants (shared with all departments within the division). Our operating budget does not appear to undergo formal review, at least not at the department chair level. Very few items seem subject to the regular, close scrutiny of administration. Chief among these are expenses related to conference travel, food for special events and membership in professional organizations. More significant budget items (most importantly staffing) have never been a discussion item, other than approvals (or not) of individual searches for full-time positions (tenure-track and lecturer).

The department has never been asked to participate in preparation of capital budgets. This could perhaps change if we achieve one of our goals (#2) to secure dedicated laboratory space for the entire set of INF programs. The INF programs have benefitted from two special infusions of computing equipment from Perkins Grants (a third one is underway this academic year) since the last program review. These have presented us opportunities to make sure faculty have access to, and can share, emerging technologies with their students, especially since most existing laboratory equipment (rightly) represents somewhat conservative 'tried-and-true' technologies.

### **What additional support is needed?**

Where additional support is needed is in the area of staffing. A fundamental concern of the faculty in the INF/MED.INFO/GAM programs is having the necessary faculty to carry forward the mission of the department. From 2004 to 2012 the number of tenured and tenure-track positions remained flat at 6. In 2012 we lost two tenured positions due to retirements of two of the most senior members of the department (Prof. Webster at 38 years and Prof. McNerney at 44 years). Meanwhile, the number of declared majors has increased each year since 2008 from 270 to 324 to 348 to 426 to 448, dropping to 422 last year (an average 5.3% annual growth rate). The trend-line is clear: projecting forward, declared majors are estimated to number 547 by 2018 (again, a 5.3% annual growth rate). This is not only what our own statistics show, but is right in line with what the Bureau of Labor Statistics projects in terms of job growth in the IT sector as far out as 2022. In Summer 2013 we were permitted to replace one of the lost tenured positions with a single tenure-track hire. However, we need much more. Having had 6 tenured/tenure-track faculty with 270 majors in 2008 and dropping to the current 5 tenured/tenure-track faculty with 422 majors does not bode well for such a robust program. Going forward, if the trend-lines continue to grow as expected, having so few tenured and tenure-track lines for a projected population of 547 by 2018 would be quite disastrous.

The INF/MED.INFO/GAM programs continue to diversify, but the tenured/tenure-track faculty available to teach the constantly evolving curriculum has not grown in a way that can match increased demand. More importantly, the group of faculty who are most active in curriculum development is stretched very thin. We have recently (only in the last year) been permitted to hire adjuncts to do as much as 12 hours of teaching per semester, but this certainly is no long term solution; in fact, this approach will weaken the program. Adjuncts and lecturers, even the very best of them, are simply not involved in curriculum development with anything approaching the zeal and depth of the tenured and tenure-track faculty.

Another aspect of staffing concerns the pay-scale we do have in place for lecturers and adjuncts. Bergen's pay-scale for these two groups is notably low. Because of this, both groups of instructors are constantly looking for other opportunities and we have even been faced with having to replace faculty in the middle of a semester when more favorable opportunities became available. While such opportunism runs counter to the ethos of academic engagement, it is hard to find much fault with a

faculty member who can double or triple his/her salary with a sudden opportunity elsewhere. We should AT LEAST be competitive with other institutions in Northern New Jersey.

**How can we involve our students (and graduates) more in the College's institution-wide technical support infra-structure?**

We are doing just that. Beginning with the Fall 2014 semester, student internships on campus, working with the Information Technology Services staff have become available to students. As in the past, students may still also be recommended to work as Student Technology Consultants for the ITS Department. It is anticipated that the Internships will replace at least a portion of the STC appointments. Although this is not WHY we are doing the internships, it does manage to save the College some \$180,000 annually in technical support salaries and does also earn the College some additional \$37,000 annually in tuition revenue.

We anticipate wider involvement of students in internship assignments going forward (one of our five-year goals will address this issue – see 'Needs and Goals' below).

## **Focus on Community**

In this section we investigate three topics:

- How can we increase exchanges between community partners and INF students/faculty? What bridges have already been built?
- What bridges have been built with the K-12 community in particular? How can we strengthen the pathways available for high-school students who want to pursue STEM educations and opportunities?
- What more can we do?

### **How can we increase exchanges between community partners and INF/MED.INFO/GAM students/faculty? What bridges have already been built?**

The INF/MED.INFO/GAM programs are already active in this regard. Currently, some faculty participate in Service Learning which partners their students with non-profit community organizations. The students engage in well-defined, limited-scope technical computing activities related to particular technical topics they are covering in their course with the faculty member. One particularly memorable Service Learning activity involved a 22-year-old student who taught a class of second-graders at a local elementary school about how to work with HTML tags in a web page, by providing a poster board where the young children could literally hang their tags and see, on a Smart Board nearby, how the addition of the tags actually transformed the appearance of text on a web page.

INF faculty also participate about twice a year in enrichment workshops for students from local primary and/or secondary schools and/or civic groups (such as the girl scouts). We bring the groups onto campus and involve them in a series of hands-on workshops, showing them (and their teachers and supervising adults) how accessible and engaging computing technology can be. Workshops have included computer programming, web page creation, game development, and hardware tear-downs. We have also involved our own students in helping conduct these workshops, earning them some Service Learning credit.

Several INF faculty have become heavily involved in academic advising (there is a general contractual 14-hour/semester advising requirement for all tenured and tenure-track faculty – what is described here goes WELL beyond that requirement), some of them advising as many as 20 hours per week during summer months. This, perhaps more than any other activity we do, contributes very heavily to the success we have in filling INF/MED.INFO/GAM classes. Once a semester we also hold a group advising session for majors and have representatives from New Jersey Institute of Technology and Kean University (with both of whom we now have articulation agreements) on hand to answer questions about transfer and about their potential educational experiences beyond Bergen. Faculty members also participate in Admissions Open Houses held each semester on our campus in Lyndhurst as well as our Paramus campus. These events provide an opportunity for us to showcase our programs for interested high-school seniors and their parents.

Sometimes ‘wider community’ can refer to colleagues in disciplines other than our technical computing disciplines. From time to time INF faculty participate in the teaching of workshops for the on-campus Center for Innovation in Teaching and Learning (CITL). CITL often leads the way with innovative uses of technology in the classroom, in managing and planning what takes place in the classroom (or in online venues), and for office staff and administrators who work at the College. INF faculty have participated in teaching a number of these workshops.

The INF department also has an Information Technology Community Advisory Committee that meets once or twice a year. This body, composed of representatives from local small, medium and large companies, local 4-year colleges and even the College's own Information Technology Services Department, has a crucial role in providing us very targeted and timely feedback regarding our curriculum. They often will 'point the way' in terms of emerging trends in computing technology and are a continual source of great ideas for new programs and courses. Our last meeting, in May, 2014 helped identify the computer language Python as a possible candidate for a new introductory course on computer programming and, in fact, could provide part of a new paradigm for how we move students from novice programmers to skilled application programmers. Another suggestion, from our own ITS Department, has us looking at the feasibility of teaching a course in virtualization, particularly the virtualization of data-center servers.

**What bridges have been built with the K-12 community in particular? How can we strengthen the pathways available for high-school students who want to pursue STEM educations and opportunities?**

Annually, the department conducts a 'Compute@BCC' conference targeted at high school technology coordinators, technology faculty, computer science faculty, and high school administrators, as well as colleagues at our sister institutions (New Jersey community colleges) and 4-year institutions. These half-day events, presented in conjunction with the Computer Science Teachers Association (a national professional organization primarily composed of high school science teachers) and the Community College Computer Consortium, provide sessions where participants can gain insight into how to make what they do with computing technology at the high school level more compelling and engaging for students, can learn about some practical, easy-to-use (and mostly free) tools they can use right away in their classrooms, as well as learn about the latest developments in K-12 Computer Science educational standards being developed nationwide (more on this in the next paragraph). We have averaged about 70-80 attendees at these events, representing some 40-45 institutions across NJ, PA, NY and CT.

A senior member of the INF faculty (Anita Verno) has been very active over a number of years in helping draft and develop national standards for K-12 Computer Science education. She was a founding member of the Computer Science Teachers Association and is still active with the group. This important initiative has important implications for the place of Computer Science in K-12 education, not only here in the US, but internationally as well.

Each year in March we participate in an annual campus-wide Teen STEM Day at the College (last year's attendance was the largest ever at approximately 1000). High School students from across the county converge at our Paramus campus and move around throughout the day through a series of hands-on workshops designed to show how interesting and accessible Science, Technology, Engineering and Math are as disciplines and to possibly stir them to consider a STEM-oriented education beyond high school.

**What more can we do?**

There is more that could be done to develop even more vibrant partnerships with the wider community and to strengthen pathways for high school students to move on to community college and/or 4-year schools, particularly in STEM disciplines; and this is where a larger tenured and tenure-track faculty becomes critical. Those of us who are tenured and tenure-track are 'stretched thin' with very heavy teaching loads, leaving little time for other pursuits that would enrich the lives of our students. A larger tenured/tenure-track faculty would 'deepen our bench' and provide more opportunities for faculty members to participate more deeply in community service.

## **Summary**

### **Program Achievements, Progress Made Since Last Review**

The INF Department offers 11 degrees, certificates and a certificate of achievement spanning 'traditional' areas of information technology (application programming, web development, networking technology, technical support, and office technology) as well as embracing networking security, medical informatics, game programming and game testing. The last four named programs have been added to the curriculum since the last program review. The number of declared majors in the various INF degrees, certificates and certificate of achievement has increased from 261 to 422 (an average annual increase of 5.3% sustained over 8 years. Every indication seems to point to continued robust growth in the IT-related fields well into the 2020s. The department has introduced 11 new courses and made major revisions (requiring curriculum committee/Senate approval) to 17 other courses since the last program review. A number of courses have been submitted for major revisions more than once during that time. It is in the nature of IT-related curricula that substantial review and change are an ongoing necessity. The department has undergone at least one major change in terms of college-wide administrative organization and is poised to embark on another in January 2015. What has remained relatively constant through all the changes is a core of highly-dedicated and very forward-looking faculty who have sought to reshape and re-tool themselves at every turn, keeping curriculum relevant and itself forward-looking. The Department is working on an ongoing internal formal program assessment process. We have been performing a successful set of individual course assessments (beyond what is captured in the student course evaluations) with pre- and post-test course assessments to determine the extent of the learning that goes on in each course. These will be expanded to include all INF courses over coming semesters.

### **Mission/Goals/Objectives**

Please refer to the bulleted list of core values listed on p. 7 of this report. The department strives very hard to deliver to all constituents (students, faculty, colleagues, partners at 4-year schools and to the community at large) educational experiences that are reflective of all these values. The great bulk of evidence suggests we are succeeding well. The largest question-mark in this regard pertains to transfer and graduation rates which we will investigate more closely in the coming year. Anecdotal evidence, particularly from our partners at New Jersey Institute of Technology, indicates our programs is perhaps the best available in the state for transfer to that institution. We will collect data in coming semesters to determine the validity of this assertion.

### **Strengths and Challenges**

The greatest strength of the INF/MED.INFO/GAM programs is also the area where our greatest needs are. We have a very devoted, highly professional team of educators who are passionate about the work they do. We believe we do an excellent job in the classroom. Our partner at New Jersey Institute of Technology has told us that our students typically transfer 75 to 80 credits of our technical courses to NJIT and that they maintain grade point averages that are a full half point higher than transfers from other community colleges. He has told us that in some respects the programs we offer compare favorably with NJIT in terms of their rigor. There is a high degree of synergy among all the faculty in the department: tenured faculty, tenure-track faculty, lecturers and adjuncts alike. We don't always agree on everything we do as a department, but we do agree on an awful lot, and the areas of disagreement

are never an impediment to our work as a group; rather, they enrich our discourse. We have worked hard over 15 years to build the team we have – it just needs to grow more so the department can continue to grow and so that we can better serve our growing student body. Because of hiring slow-downs and freezes, we have had to cap our offerings so that we can carry the loads that we have.

More than anything else we need to be able to increase the ranks of our tenure-track and tenured faculty. These are the folks who are the life-blood of an institution. They will carry the curriculum forward and will build it in ways and in directions that are hard to imagine. They need to be folks who are even more highly technically skilled than the folks who run the program currently, just as we are more technically skilled than those who preceded us. Part of the goal here is to think long-term in this respect and begin to lay the groundwork for our own succession. The three senior faculty members are closer to the ends of their careers than they are to the start of their careers.

We also need to provide more hands-on internship experiences for more of our students. They thrive on working in production environments. One of the proposals we have among our five-year goals is to establish a 'sandbox' data-center environment where students have the opportunity to work first-hand with data-center equipment and learn how to manage a technical support infra-structure for other students.

## Needs and Goals for 2014 – 2018

As mentioned elsewhere, some of this is very hard to predict with any certainty. For instance, trying to envision what the technology landscape might look like in 5 years is very difficult. Companies like Apple and Microsoft have trouble themselves with this and they are prime movers in inventing much of the stuff of new technology. Specifically, determining what courses should be new in 2019, what courses will be old and not particularly useful anymore, and which ones will still be tried and true in five years is no easy task, and perhaps not even particularly useful. We have tended to listen very closely to our industry and academic partners and to watch trends ourselves to gauge when it is time to move ahead with newer courses. Typically, this allows us to peer ahead perhaps 2-3 years and we have been extraordinarily prescient in that regard. Nearly all of our choices have been spot-on in terms of being what students need, when they need it. We have tended to be somewhat slower to drop older courses.

What is perhaps more useful is to champion the framework that has seen us through much of the past 15 years and that is to do as we ask our own students to do: be prepared to adapt at almost every turn. So, for instance, it is obvious to us that, in terms of mainstream business applications it is hard to do better than to teach students Microsoft Office 2013 (Microsoft's current flagship application product) and to teach it in a Windows 7 environment. It is less obvious that we should prepare students for Windows 8.1; nonetheless, since quite a number of entering students this semester specifically went out and bought laptops this past summer to be ready for school, and the GREAT majority of those laptops run Windows 8.1 (NOT Windows 7), we used funds from a Perkins Grant to purchase Windows 8.1 laptops for our full-time faculty (tenured, tenure-track and lecturers) specifically because there are a host of questions coming from students about the new operating system. Similarly, we are seeing students in increasing numbers show up with MacBook Pro machines (using an entirely different operating system). At what point do we change over and officially teach using the new technology, and what new technology do we choose? And yet we must, just as we did when switching from Windows XP to Windows 7 (skipping Vista!) and when switching from Windows 98 before that to Windows XP. Similarly, we have switched from Office 97, to Office XP, to Office 2003, to Office 2007, to Office 2010 and last year to Office 2013. As the features grow and change with each new iteration of an application or an operating system, what features do we teach (what new features do we ourselves have to first learn so that we can turn around and pass them on to students)? And that is a set of decisions that affects just two of our foundation courses (INF-101 and INF-114). Similar decisions and changes have occurred with many other product lines that relate to the myriad courses offered in the INF/MED.INFO/GAM programs. Adaptability is the key. In order for us to be as adaptable as possible, we need to be able to avail ourselves of opportunities to grow our own skillsets. Ongoing support for professional skills development is a MUST for INF/MED.INFO/GAM faculty.

Crucial to ensuring that adaptability will work over the long term are the hiring decisions we make. We MUST attract faculty who are forward-thinking, who themselves embrace change and who are not cowed by the fact that the teaching environment they inherit will be more technically complex than the one we presently inhabit.

With these challenges in mind, below we identify a set of five guiding principles for the development of the INF/MED.INFO/GAM programs over the next five years.

1. **Increase our tenure-track and tenured faculty to meet growing demand and rebuild student-faculty ratios to 2006 levels.** We have been 'falling behind' in terms of student-faculty ratios for several years now and really suffered with the loss of two senior faculty two years ago due to

retirement. Having had only one replacement tenure-track line against a backdrop where the programs have been growing and will continue to grow significantly for AT LEAST the next five years, is nowhere near adequate to ensure the programs' continued health. **Our recommendation in the immediate term is to permit INF/MED.INFO/GAM to do three tenure-track searches in Spring 2015 and, if the programs continue to grow as projected into 2016, to do 1-2 additional tenure-track searches in Spring 2016.** Depending on the future projected growth of the programs, additional searches may be needed after that as well.

One issue we are addressing with this strategy has to do with building greater resiliency at the faculty level. In Fall 2013 we were driven into something of a tailspin when a full-time instructor had to be replaced the second week of the semester due to a sudden, serious medical condition. Again, in Fall 2014 our full-time faculty resources were pressed to the limit providing coverage for another full-time instructor who missed 2/3rds of the semester, again for medical reasons. As it is, even when we are at full strength, most our full-time faculty are too unique in terms of their qualifications; there are serious limitations in our abilities to cover for one another, or for us to be able to offer MORE sections of particular technical courses. Having greater depth in terms of 'who is able to teach what' would allow us much more flexibility and greater opportunities to offer multiple sections of courses and to grow programs.

In 2006 we had 261 declared majors with 6 tenured/tenure-track faculty (a student-faculty ratio of 44:1). In 2013 we had 422 declared majors with 5 tenured/tenure-track faculty (student-faculty ratio of 84:1). Adding three more tenure-track faculty (and assuming a continuation of our average annual growth rate of 5.3% (based on 8 years of historical data), would bring us to a ratio of 56:1, not as favorable as the 2006 ratio, but certainly a step in the right direction. These numbers are compelling, but even they do not tell the whole story: from 2006-2012, the 6 tenured faculty included two members who had MANY years of seniority, both were at the very top of our salary scale. They have since retired. The replacements and additions we are seeking now will be at the low end of the salary scale, which is less than 40% of the high-end salaries. Put another way, we could today hire 5+ new tenure-track lines and STILL not cost the College a penny more than what we were paying out for 2 high-end salaries two years ago.

2. **Consolidate the INF/MED.INFO/GAM programs in the third-floor of the C-Wing in the Pitkin Education Center.** With the construction of the new Health Sciences Building, it is anticipated that a number of classroom and lab spaces, as well as a number of faculty offices, currently occupied by Health Sciences programs and faculty, will become available. The classroom/lab spaces (the contiguous spaces east of C-351) are nearly ideal as a set of spaces that could well meet the technical needs and anticipated growth of the INF/MED.INFO/GAM programs. Because of the unique layout of the spaces, it would be possible, among other things, to configure a secure data center that could also be used as a hands-on lab for interns.

If, at the same time, INF/MED.INFO/GAM faculty could be relocated to offices nearby, this would have the beneficial effect of bringing this already highly-cohesive faculty into even closer, more continuous contact with one another. This, in turn, would provide an even more fertile environment for the generation and development of new curriculum and program ideas.

The proposed configuration would also facilitate more engaged interaction with students during office hours and at other non-class times. Currently, many of the faculty find that, in order to help students with particular technical tasks it is useful to have access to computing facilities.



This often means trying to find space in a free-time lab, where, unless the lab has the specialized software often required in INF/MED.INFO/GAM courses true, full hands-on solutions are not quite possible. A set of dedicated labs adjacent to faculty offices would greatly facilitate these kinds of interactions. Another 'spin-off' possibility would be to make a portion of the lab facilities available to Tutors (a limitation of the current Learning Center is that it does not include computing facilities or platforms that meet the needs of our more highly technical student population. If technical tutors could meet with students in specialized lab facilities, their work could become much more effective and efficient.

3. **Expand the role of internships across all the INF/MED.INFO/GAM programs.** Adding a guided work-oriented component to students' education is extremely valuable in all computing technology fields. Employers become MUCH more interested in candidates who have significant work experience. There are a great many opportunities, right at Bergen itself, for students to exercise their computing technology skills and many times the opportunities are very open-ended, providing students the chance to really extend themselves. In the short term, the goal is to have 25-30 interns working for Information Technology Services each semester. In five years, this could expand to the point where a successful internship could become a requirement for all INF/MED.INFO/GAM majors.
4. **Develop more articulations agreements.** A key ingredient in students' future success is the opportunity for them to move on with their educations, beyond what is possible at Bergen. It has not been lost upon us that both a technical university and a liberal arts college are now willing to transfer in most or all of our programs, AS and AAS alike. The relationship with New Jersey Institute of Technology is one of long-standing and is certainly very healthy. We will make every effort to build the nascent relationship with Kean University so that it is just as robust an alternative as is NJIT, but geared for students who want to enjoy the benefits of a 4-year Liberal Arts education. If we can do that, it is conceivable that we could develop other 4-year partners as well. It is an area we will seek to expand over the next five years.
5. **Restructure the GAM programs.** There is a groundswell of interest, at least among students who are new to Bergen, in game development. We have been trying to do two things with the two GAM programs (currently Game Programming and Game Testing): (1) bring them together into a single program that is simply a game development degree (without so much emphasis specifically on game programming or game testing) and (2) find truly viable options for students who complete the program to continue their education and/or use their game development skills in flexible ways in the workplace.

Regarding the first objective, when we originally designed the degrees, we skewed things in the direction of programming and testing simply because for all of the principals involved (from Information Technology, Computer Science and Physics), programming and testing were 'comfortable' fits. (Music and Art faculty who had been involved initially, had to step away at a critical point in the planning/design of the programs because of the untimely death of a key faculty member and because they were in the midst of a major move into their present quarters in West Hall). Once we moved ahead with the programs we realized immediately that adjustments needed to be made to 'rebalance' the offerings and introduce more media-oriented courses. **One of the goals in this regard is to propose the necessary curriculum changes to create one program which is a more straightforward game development degree – that is, a degree that puts the emphasis on all the component skills needed for successful game**

design: (engaging and compelling game-play, good graphical design, good story-telling, good audio-design components, good programming, and ample testing).

The second objective is somewhat more elusive. One of the issues that majors face is that, typically, they enter the program with a rather narrow and unsophisticated view of what they will do with the degree – that is, they typically imagine they will develop video games for large, established companies (such as Sony, Microsoft, Nintendo and Electronic Arts). The problem is that ALL of these companies typically only hire seasoned professional specialists and there is little to no room for inexperienced entry-level workers who are still mostly ‘generalists’.

Dr. Michael Halper and Prof. Marc Sequiera, from New Jersey Institute of Technology, have suggested to us a possible ‘re-orientation of our priorities’. They offer a Bachelors in Information Technology, with a concentration in Game Development. Their over-arching concept is that game developers should see themselves as technologists first, able to deal with a range of computing technology challenges and that their particular strength is to be able to produce solutions that emphasize skills such as visualization and simulation. Expanding the notion of game development to include the ability to produce visualizations and simulations (which are certainly skills at the heart of game development) provides majors with expanded opportunities for employment, including corporate training, education, manufacturing, business applications, social applications, and military applications, as well as more traditional video game development. With this in mind, **we propose to work to ‘re-brand’ the game development curriculum to embrace this broader view of what ‘game development’ can mean.**

The five goals outlined above provide a framework that will enable the INF/MED.INFO/GAM programs to extend what they have done so well in the past: continually reinvent themselves, while maintaining the highest academic standards possible. Additionally, they position the programs to manage an anticipated steady growth in the number of declared majors, well into the 2020s.

## Action Plan

**Goal 1:** Increase our tenure-track and tenured faculty to meet growing demand and rebuild student-faculty ratios to 2006 levels.

Objective 1: Conduct 3 tenure-track searches in Spring 2015

Timeframe: 2015

Responsible Parties: INF Search Committee, Dean PJ Ricatto, VPAA William Mullaney

Resource Implications: the College must be willing to support three additional entry-level salaries (which, together total less than 60% of the top-tier salaries paid to two full professors who retired two years ago)

Objective 2: Conduct tenure-track searches in Spring 2016, 2017, 2018 to restore student:faculty ratios to 2006 levels

Timeframe: Spring 2016 - Spring 2018

Responsible Parties: INF Search Committee, Dean PJ Ricatto, VPAA William Mullaney

Resource Implications: the College must be willing to support additional entry-level salaries (we project 2 are needed beyond the 3 outlined in Objective 1). Again, the additional salaries together with those outlined in Objective 1 are about equal to the top-tier salaries paid to the two full professors who retired 2 years ago. Meanwhile, declared majors are projected to be at 547 in 2018 (more than double our 2006 numbers)

**Goal 2:** Consolidate the INF/MED.INFO/GAM programs on the third-floor of the C-Wing in the Pitkin Education Center. Action on this goal cannot take place until the Health Sciences Building is completed (anticipated: 2016)

Timeframe: 2016 – 2017

Responsible Parties: INF Department, Dean PJ Ricatto, VPAA William Mullaney

Resource Implications: Fairly minimal space allocation issues following the move of the Health Sciences programs to the new Health Sciences Building. In the near term (1-2 years) very little additional classroom/lab space will be needed (enough to accommodate projected growth of 5% – 11% in declared majors and 3-4 office spaces for new faculty). If the programs grow to a total of 547 declared majors by 2018, 2-3 additional classroom/lab spaces will be needed.

**Goal 3:** Expand the role of internships across all the INF/MED.INFO/GAM programs.

Objective 1: increase number of internships with Information Technology Services (ITS) to 25 per semester by Fall 2015.

Timeframe: 2015

Responsible Parties: INF Department faculty, Bill Smith, ITS Department; Sharyne Miller, CIO

Resource Implications: It is anticipated that the Internships will replace at least a portion of current Student Technology Consultant appointments. Although this is not WHY we are doing the internships, it does manage to save the College some \$180,000 annually in technical support salaries and does also earn the College some additional \$37,000 annually in tuition revenue.

Our hope is that the internships can be granted on a tuition-free basis since the College will be saving so much money in technical support salaries.

**Goal 4:** Develop more articulations agreements.

Timeframe: 2015 – 2108

Responsible Parties: INF faculty, Dean PJ Ricatto, VPAA William Mullaney, President B. Kaye Walter

Resource Implications: more informed and careful advisement will be needed going forward. It is recommended that the College provide additional support for transfer counseling (which in our view is currently understaffed).

**Goal 5:** Restructure the GAM programs.

Timeframe: 2015 - 2016

Responsible Parties: INF/GAM faculty, Curriculum Committee, Senate, Dean PJ Ricattor, VPAA William Mullaney

Resource Implications: addition of a second computer laboratory (currently we use W-317) to house specialized platforms and software for high-end game development.