

# **Proposal for Revising the IS&T Programs in the Computer and Information Sciences (CIS) Department**

## **Section 1: Detailed description of changes**

Students in the IS&T programs focus on the development and use of applications software and the technology underlying this software. More specifically, the core courses emphasize fundamental concepts in mathematics, programming, object-oriented modeling, databases, component-based software development, and operating systems and architecture. Students also take courses in software systems analysis and design, net-centric and client-server computing, web-based transaction and e-commerce systems, and networks and communications. A two-semester capstone project course is also required. This course is designed to help students integrate what they have learned in other courses and apply this knowledge in the design and implementation of a software application. Usually this is an application needed by an organization external to the University, often for a non-profit agency.

The expected outcomes of the IS&T programs are (1) development of analytic, problem solving skills, (2) acquisition/improvement of communication skills, and (3) the ability to program meaningful applications in an integrated state-of-the-art development environment (such as Microsoft's .NET environment) using languages supported by this environment. To accomplish these goals, substantial laboratory work is required. Students participate individually and in groups in the design, development, testing and documentation of information systems

A number of factors influenced the proposed changes to the IS&T Program.

1. The desire to emphasize the interdisciplinary nature of our program, allowing students to take high level courses (16 credits) in any domain knowledge that is of interest to them, through out the university. The BS Program has a required core in IS&T related courses followed by these high level electives that are presented in clusters. Clusters are intended to help students in making decisions as to where to focus their remaining study, in keeping with the career emphasis that might be best for them. A cluster could be selected in other departments at Temple to focus in a particular area of study. The possibility of building a knowledge domain is to be encouraged. See 'Proposed IS&T Program' Chart (Page 3) where 2 clusters are displayed: 'Applications Systems & Programming', and 'Domain-related'. Additional clusters could be added, such as 'Information Technology'<sup>2</sup>, depending on student enrollment and resources.

<sup>1</sup> Computing Curricula 2005, The overview report, joint task force for computing curricula 2005, ACM (Association for Computing Machinery), the AIS (Association for Information Systems), and the IEEE-CS (the computer society)  
[http://www.acm.org/education/curric\\_vols/CC2005\\_Final\\_Report2.pdf](http://www.acm.org/education/curric_vols/CC2005_Final_Report2.pdf)

<sup>2</sup> a. Bureau of Labor Statistics, Nov. 2005' Monthly Labor Report' .  
b. "IT Employment Reaches record High in U.S.", InformationWeek, April 18, 2006

2. The desire to make the program, optionally, less programming intensive from one hand and also maintain the same technical focus of the existing program.
3. To create a flexible program, including a Minor in IS&T that will appeal to a larger group of students, thus increasing enrollment in CIS/CST while helping students taking the Minor get better jobs. Also enable qualified junior and senior students to work with faculty to do research that will be counted toward the 16-credit domain-related (research) cluster. .
4. Add required courses and electives to make the program more compatible with the recommended ACM 2005 curriculum <sup>1</sup> .
5. Add flexibility to allow transfer students from other universities as well as Temple students to transfer into the IS&T Program.

The enhancements to the program, we believe, should serve to better prepare our students for the rapidly diverging job market, enable us to better compete with similar programs in other Universities and help attract more students to the CIS Department (without sacrificing key program components).

***a. Changes to admissions and related availability of students***

There are no changes to the admission requirements.  
Transfer students will find the new program more flexible and will allow them to graduate faster.

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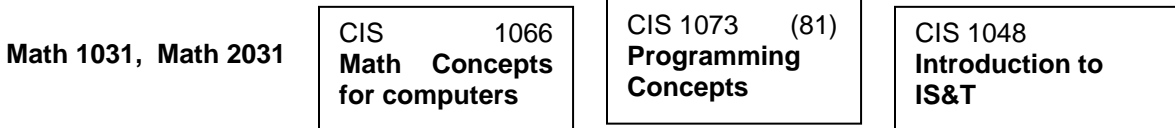
***b. Rationale for and Detailed description of the programs***

The following is the rationale and detailed description of the BA/BS and Minor in IS&T .

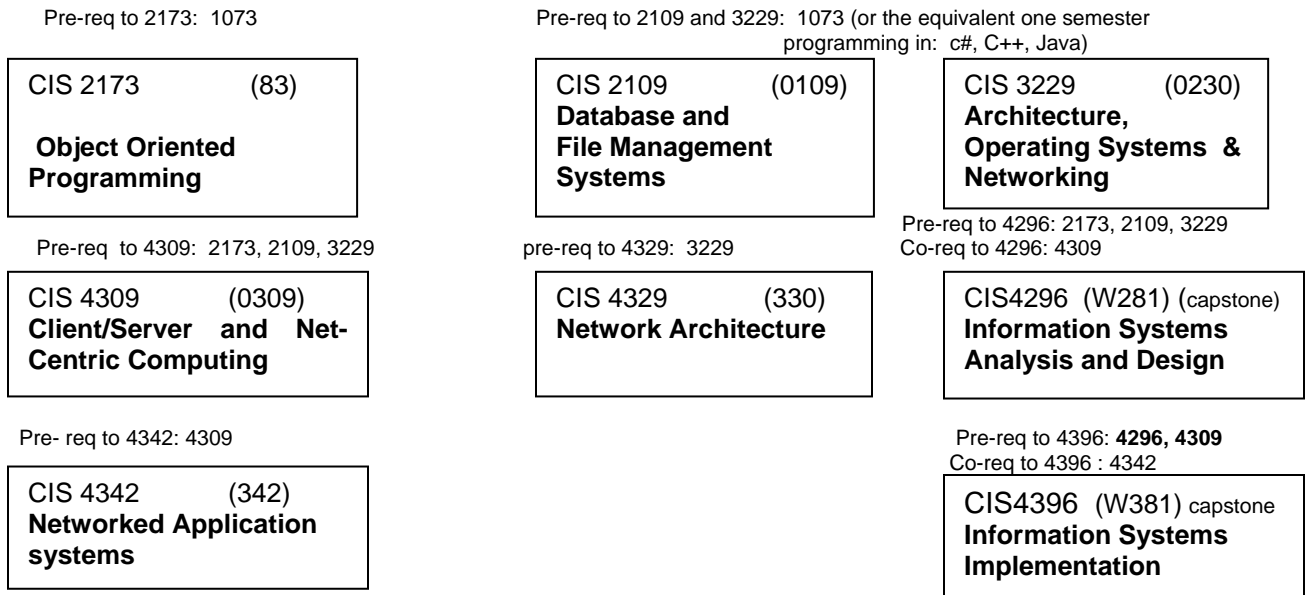
**Diagram of the Proposed IS&T Programs**

- Required courses for the BA Degree: Foundation + Core
- Required courses for the BS Degree: Foundation + Core + 16-credit Electives
- Required course for the Minor: Five (5) courses:
  - 1) CIS 1048, 2) CIS 1073, 3) CIS 2109, 4) one IS&T elective selected from CIS 2173, and CIS 3229. Other advanced IS&T courses may be substituted if prerequisites are met. 5) the 5<sup>th</sup> course, subject to approval by or higher ,may be selected from any department at TU.

**FOUNDATION:** (5 required courses – 19 credits)

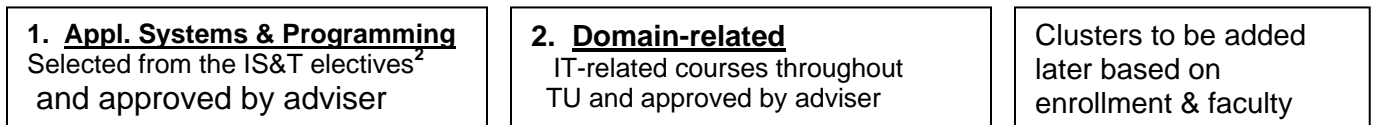


**CORE** (8 required courses – 31 credits)



**ELECTIVES** (16 required credits for the BS degree; total 66 credits in the major)

Proposed clusters <sup>1</sup>:



<sup>1</sup> Clusters only guide the student in course selection. Students may combine courses within different clusters.

<sup>2</sup> IS&T Electives normally are selected from: CIS 3281, 4340/4350, 4344, 4362, 4372, 4376, 4738, 4308, 4282 and other new IS&T courses. Students may also take 3000-level or higher, IT-related electives from other departments with permission of the IS&T Adviser.

## II. Rationale for the Changes to the IS&T Program

The diagram above shows the structure of courses and prerequisites courses of the proposed IS&T Program. The program is broken down into: Foundation, Core, and Advanced Electives courses. In general, students working toward the BA Degree will take all the requires Foundation and Core courses; Students working toward the BS Degree will take the same courses as for the BA plus 16 additional credits in Advanced Electives. The Minor requires 5 courses.

### 1. Changes to the Foundation and Mathematics Requirements

Two new course: CIS 1048 - "Introduction to IS&T" and CIS 1066 - "Mathematics Concepts for Computers" are added to the program.. These courses are recommended by the ACM Report and are taught in most universities offering IS&T Degree.

Syllabi for the two courses are in the Appendix of this document.

In the current program students are required to take CIS55, MATH 0077 (Differential and Integral Calculus), MATH 0133 (Probability and Statistics), and MATH 0163 (Sophomore Problem Solving).

In the new program we are proposing to replace CIS55 with CIS1048. The reason for the change is not because CIS55 is an unimportant course, but because we want to make room for another course ("CIS1048 -IT concepts"). Furthermore we are expecting that incoming students to the program will have at least some knowledge of the material covered in CIS55. Additional material of the course is covered in other courses in the program (for example databases are covered in CIS2109) and the rest they will learn by themselves, as needed.

MATH 163 will be replaced by CIS 1066. The main reason for the exchange is that this course will strengthen student background in Discrete Mathematics concepts, that are used in the programming courses (1073, 2173) as well as in the database (CIS2109) and system architecture, operating systems and networking (CIS3229) courses. (Another reason for dropping MATH 163 is the loss of control of the material covered in it).

### 2 Changes to the Core

All courses in the Core are required for all BA and BS students. Several changes were made to the Core.

- a) The 3-programming course sequence (formerly: CIS81-83-209), is reduced to a 2- course sequence, CIS 1073- 2173
- b) The 3-course sequence: (formerly CIS209-309-342) is restructured by

dropping the dedicated VB programming course CIS209, and redistributing the material between CIS 4309 and 4342.

- c) No revisions to CIS 3296/4296) (formerly: CIS W281/381)  
The capstone courses W281 and W381 are undoubtedly the most important courses in the program, helping our students get jobs upon graduation. Therefore they are kept unchanged in the new program and are required by all our students (BA and BS) regardless of the concentration they will select. To further strengthen these courses, the new sequence 4309-4342 will be slightly revised in terms of prerequisites, allowing students to take CIS4309 concurrent with 4296 and a prerequisite to 4396. Second, the faculty responsible for these courses will ensure that some of the material that is crucial for developing internet based systems in CIS 4396 will be taught in CIS 4309 and early in 4342.

### 3. Adding Clusters (Advanced Electives)

In the current program, the BS students were required to take the Foundation and Core courses followed by 4 electives (16 credits). Although the list of electives was rather extensive (CIS 0288, 0345/0350, 0344, 0362, 0372, 382 386, 308, and 398), students were unsure as to which courses to take and the overall structure didn't offer students much flexibility. The IS&T Committee felt strongly that the CIS Department should get away from our current one size fits all program, to one in which there is a fixed core plus either a (a) predetermined set of clusters, or (b) a customizable cluster either in the CIS Department or in any Department in Temple. The possibility of 'domain-related' clusters (like minors in other departments) is to be encouraged as it allows students to build their 'domain knowledge'. Acquiring 'domain knowledge' makes the students more marketable upon graduation, and allows them to specialize in a field that is of interest to them.

In the proposed program, students working toward the BS Degree will be required to take 16 additional credits in Advanced Elective courses beyond those courses in the BA Degree. The advanced electives are grouped in clusters of 16-credit courses, enabling students to choose a cluster based on their interest. They will make their choice through recommendations of the advisor and the courses available through the scheduling process. In this way, they will get a core program that is a good IS&T base and can then fully customize the remainder of their program.

The chart above shows, for illustration purposes, 2 clusters: 1) "Applications Systems and Programming", 2). "Domain-Related" in other departments and 3) "Other clusters" to be determined based on student enrollment and faculty resources. The labeling of clusters such as "Application System Programming" or "Domain-Related" is only a convenience. It has no standing

in terms of what will be its required content.

Cluster 1 – “Application Systems & Programming”

This cluster is similar to the existing IS&T Program (with the exception of the listed changes). Once students complete the core, they will take 4 courses that are mostly programming oriented.

The courses in this cluster could include: Advanced Databases, and Advanced Programming.

Cluster 2: “Domain-Related” (or Interdisciplinary Study in other departments).

One of the highlights of the proposed BA/BS in IS&T program is the potential interdisciplinary study. This is achieved by allowing, in fact encouraging, students to select a cluster of sequenced (4 or more) courses with a total of 16 credits in a specialty area either in CIS or outside, in any other department or college in the University. Course clusters in specialty areas outside CIS may be selected based on student interest with the approval of the undergraduate CST and CIS advisors and, where appropriate, with an advisor or mentor in the selected specialty area. This feature of the BS in IS&T will allow students to take up to 4 courses and build upon their knowledge and interest in another fields.

Cluster 3: “Additional Clusters”

Other clusters could be added at a later time based on student enrollment and faculty resources. A possible cluster could be in the area of IT. Recent reports by the Bureau of labor indicate a growing need for IT workers<sup>2</sup>. Furthermore, the ACM has recently developed a model curriculum<sup>1</sup> for IT. This curriculum has a reduced emphasis on programming and more emphasis on technology, broader development and organizational issues, systems, management, security, and professional ethics. Furthermore, many universities, in our area and nation wide have developed successful IT programs (such as George Mason and Penn State universities).

4. Making the program more transferable

Several changes were made to the prerequisites of several courses to make the program more flexible to transferring students and to students with prior background in programming. The affected courses are: CIS1073 and CIS2173, CIS 2109, and 3229.

CIS1073 and CIS2173: These 2 courses will be waived for students that completed a sequence of 2-programming courses in object oriented programming such as in C++ and C#.

CIS2109 and 3229: Students that completed any programming course in another institution will be allowed to take CIS2109 and 3229 concurrently with CIS1073.

These changes in prerequisites will make the transfer of students from other universities to Temple smoother, and will allow students to complete the program faster.

Furthermore, students in the CS program that transfer into the IS&T Program, will receive credits for the following courses that they completed successfully: programming, discrete mathematics, calculus and statistics.

### 5. The Minor Program

The current Minor in IS&T requires 7 courses, and we have about zero students taking the Minor. We surveyed non-CIS majors in the CIS55 classes and the students showed great interest in a smaller size minor. Thus we revised the Minor to be smaller yet meaningful and useful to students through out the university.

The Minor we are proposing is as follows:

IS&T Minor

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The Minor in IS&T consists of five (5) courses, as follows:

1. CIS 1048 – Introduction to IS&T
2. CIS 1073 – Programming Concepts
3. CIS 2109 – Database and File management Systems
4. One elective selected from CIS 2173 and 3229.  
Other advanced IS&T courses may be substituted if prerequisites are met.
5. The 5th course is selected from any department, 3000-level, IT- relevant, subject to approval by the IS&T Adviser.

In fact, we can't think of any major at the university that can't benefit from some knowledge of IT. Any professional needs to know how to build a database, talk intelligently about hardware, software, WWW, etc. After completing the IS&T Minor, students will be able to better compete and get better jobs in their respective fields.

## **Syllabi of CIS 1048 and CIS 1066**

### **CIS 1048 - Introduction to IS&T**

(4 credits)

Prerequisite : No prerequisites are required. It is recommended that students take the course as early as possible.

#### Course Description.

This course introduces students to the field of Information Systems Technology and outlines the material covered through out the entire IS&T Program at Temple. The course addresses the three core issues: 1) Information (the basic science of data encoding, transmission and storage); 2) People (the interactions among technologies, users, institutions, and regulations; and 3) Technology (the design and operation of basic information technology devices.)

The course will be conducted as lectures and case studies where the students will learn how information flows in organizations, how data is stored and process, and how can we use technology to help people and organizations to perform efficiently. Students will work in teams to analyze scenarios and propose solutions by applying analytic techniques and theories covered in the course. Examples and cases will be drawn from a range of domains including: high tech, medical and business and government. Emphasis will be placed on writing proper reports and presentations.

This is a required course for all students majoring in IS&T. It is also recommended for undecided students looking for a major.

#### Course Outline:

1. Understanding Information systems technology
  - 1.1 Introduction to information technology
  - 1.2 Computer hardware technologies
  - 1.3 Software technologies
  - 1.4 Database technologies
  - 1.5 Networking Technologies
  - 1.6 Internet and the World Wide Web Technologies
  
2. Using Information Systems
  - 2.1 The DP organization
  - 2.2 Examples of information systems
  - 2.3 The Enterprise Information system
    - 2.3.1 Information flow in various organizations
    - 2.3.2 Utilizing an enterprise system (such as SAP)
  
3. Building and managing Information Systems
  - 3.1 The DP organization
  - 3.2 The Systems Development Life Cycle (SDLC)
  - 3.3 Modeling and prototyping, developing vs. purchasing systems

- 3.4 managing security, disaster recovery
- 3.5 Ethics, privacy issues

Sample text:

Information Systems Technology  
Ross A. Malaga, Pearson publishing

Information, Systems and Information Systems - making sense of the field  
Peter Checkland, Sue Holwell, Wiley

Information Technology: Inside and Outside,  
David Cyganski, John A. Orr, Richard F. Vaz, Prentice Hall

### **CIS 1066 - Mathematics Concept for Computers**

(4 credits)

Prerequisite : Grade of C- or better in Mathematics 1021 (C073), or  
placement into Mathematics 1022 (C074)

Co-requisite: CIS 1073, CIS 1048

#### Course Description

Introduction to mathematical concepts fundamental to IS&T. Topics include: Number systems, logic, set theory and more. This is a required course for all students majoring in IS&T.

#### Course Outline:

1. Number Systems (bits, bytes, binary, octal, hexadecimal, decimal)
2. Data representation in computers
  - 2.1 Numeric (binary, integer, decimal, float)
    - 2.1.1 Scale, precision
  - 2.2 Text (fixed length, variable length, ASCII, UNICODE)
  - 2.3 Graphics, Video, Sound (GIF, JPEG, WAV, etc)
    - 2.3.1 Compression
3. Data Structures (arrays, stacks, queues, trees, graphs), applications
4. Logic (truth tables, and-or-not)
5. Set theory (union, intersection, complements)
6. Algorithms, algorithm complexity and running time

Sample Text:

Discrete Mathematics  
By: Douglas E. Ensly, J. Winston Crawly, Pub: Wiley, 2006

Discrete Mathematics  
By: Richard Johnsonbaugh, Pub: Prentice Hall

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**1c. Scheduling of courses**

Course scheduling will be the same as under the current IS&T programs. Required courses, including the new one, will be offered every semester; elective courses are offered in varying frequencies but at least once every year. , the scheduling of courses in fact becomes less crucial to program completion.

**1d. Scholarship**

Not applicable

**1e. Faculty qualifications**

All faculty teaching the IS&T programs are qualified, willing and able to teach their related courses. No additional faculty will be required in the next several years.

**1f. Special fees; support for students**

No special tuition or fees will be required for this program.

**1g. Projected enrollments, credit hours, etc.**

The revised IS&T programs, like the existing program, will only be available on main campus. We currently have about 200 students enrolled in our IS&T program (significantly less than the enrollment several years ago). As noted, the Bureau of Labor Statistics and others are predicting continued increase in demand for our graduates.

We would expect our enrollment to increase by 10% per year in the next three years. The credit hours generated should grow in proportion to the growth in the number of students.

**1h. Employment opportunities**

All graduates of this program will be exposed to the state-of-the technologies and software. They will work in teams to develop real life systems work, do extensive laboratory work and develop their analytical, problem solving and communications skills. As such they should be able to get IT related jobs with any type of employer.

**1i. Diversity.**

This is an ongoing issue with the CIS department. The diversity of the faculty is very limited, but addressing that issue has nothing to do with the proposed program. With respect to the students in the new program, we will continue to seek out and encourage students of both genders and all ethnicities to participate in this program.

**1J. Campuses where the program will be offered**

The programs will be offered on the main campus.

### **1k. Aspirations of excellence**

The CIS faculty feels that the restructured IS&T programs will be successful for students, the department, and the university. The program will be highly attractive because it offers the proper courses, it prepares students for the ever increasing IT jobs, it is flexible to transfer students and it is an interdisciplinary program. These facts will enable us to attract qualified students and in turn educate students that will sought by employers.

Similar programs are offered in many universities in the area (Penn State, Drexel and others). Because of the proposed changes to the program, we believe that our program is unique and will attract more students.

### **1. Campuses**

These program will only be offered on main campus.

### **Section 2. Effects on other university resources**

We see this program having minimal impact on any other university programs or resources. If, as anticipated, that program attracts increasing numbers of students, then additional office space and some computing resources will be needed. However, this should be gradual and can be dealt with on an “as-needed” basis.

### **Section 3. Impact on Class resources**

See section 2 and section 4

### **Section 4. Impact on faculty and staff**

The existing CIS faculty should be more than adequate to deal with the revised IS&T Programs for at least the first three years. Beyond that, we hope to be able to hire new faculty to deal with the expected numbers of students.

As noted, we are proposing several new courses (CIS 1048, CIS 1066 and possible additional electives) that can be taught by existing faculty who are showing great interest in the new programs. Furthermore, the classes we currently offer in the existing programs, that make up the majority of the proposed program, are running below capacity and could easily handle an increased enrollment.

### **Section 5. Budget**

It is expected that the enrollment will increase, leading to an increase in tuition revenues.

### **Section 6. Groups/individuals consulted**

As noted above, this proposal was partially based on the computing curricula developed by the ACM, AIS and IEEE task force in 2005. It is also based on the expertise of the faculty teaching in the IS&T Programs. The original proposal was approved by the CIS/IS&T undergraduate committee, the CIS department faculty, and the College of Science and Technology (CST) undergraduate committee.

### ***Section 7. Implementation plan***

If all needed approvals are received in a timely fashion, we would like to begin offering the revised IS&T programs in the Fall of 2008, in parallel with the existing IS&T programs.

Any incoming students will enter the new programs.

Students in the existing programs will continue with the old programs.

### ***Section 8. Impact on department(s)***

The IS&T Programs are taught for the most part by faculty from the CIS Department. Two courses are taught in the Math Department, and a few students may choose to do the clusters in other departments at temple.

Because the number of students in most CIS courses are below the capacity, no impact is anticipated .

### ***Section 9. Executive Summary***

Students in the IS&T programs focus on the development and use of applications software and the technology underlying this software

The expected outcomes of the IS&T programs are (1) development of analytic, problem solving skills, (2) acquisition/improvement of communication skills, and (3) the ability to program meaningful applications in an integrated state-of-the-art development environment . To accomplish these goals, substantial laboratory work is required. Students participate individually and in groups in the design, development, testing and documentation of information systems

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program.

- To create a flexible program, including a Minor in IS&T that will appeal to a larger group of students, thus increasing enrollment in CIS/CST while helping students taking the Minor get better jobs. Also enable qualified junior and senior students to work with faculty to do research that will be counted toward the 16-credit domain-related (research) cluster. .
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The enhancements to the program, we believe, should serve to better prepare our students for the rapidly diverging job market, enable us to better compete with similar programs in other Universities and help attract more students to the CIS Department (without sacrificing key program components).

No impact on existing programs is anticipated and no additional resources will be required.

