# SCIENCE MATHEMATICS AND TECHNOLOGY - INFORMATION SYSTEMS CONCENTRATION - FOR STUDENTS MATRICULATED BEFORE JULY 1, 2011

## What Is "Information Systems?"

Information is data that has been given meaning through some process, and therefore has added value. Systems are the ways in which we develop that information, including through models, as well as the use of processes that will help us implement those models.

For the student who wishes to develop a degree program in information systems, definition is the initial challenge; as the definition develops, the degree program will take shape.

There are many ways to approach information systems. Many professionals and educators have tried to identify different approaches with modifiers, which has led to terms such as "management information systems" (MIS) and "computer information systems" (CIS). The general understanding was that MIS would be more focused on management aspects, while CIS focused on the technical aspects.

However, as the area has developed, the differentiation between the managerial and the technical has blurred. These guidelines use the more general title of information systems

At Empire State College, in addition to the common core, there are three primary areas of study which accommodate a degree in information systems:

- Business, management and economics.
- Science, mathematics and technology.
- Interdisciplinary studies.

Separate guidelines are provided for each of these areas of study. However, a common core of knowledge has been identified as appropriate for any and all of them.

Students can consider other possibilities than IS for their concentration titles. For example:

- In the SMT area, a student who comes to the college with substantial experience and/or transcript credit in computer technology may want to build on that background to develop a degree program in information technology. An SMT student who wishes to have a more theoretical approach, including extensive study of mathematics and algorithms, may want to pursue a degree in computer science.
- In the BME area, a student pursuing a degree in information systems management may consider studies such as accounting information systems, human-resource information systems, and so on, depending on his/her interests and needs.

## Common Core of Knowledge for Information Systems

In any degree program, progression and integration are important. Progression is important because one needs to move from a foundation to a deeper level of understanding. Integration occurs when links exist among the degree program studies. Both are addressed in the common core of knowledge for information systems. To begin, the foundation is defined, which is important for any degree program. Then, the essential links are presented. From these essential links, the rest of the degree program will differ, depending on student goals and interests.

The core areas that relevant area of study faculty have agreed upon as essential for a degree in information systems include:

### Computer Fundamentals
This area comprises three subareas, all of which need to be addressed: applications, programming and introductory IS concepts.

- **Applications** include word processing, use of spreadsheets, database management and telecommunications; knowledge of telecommunications includes a basic understanding of networks and the Internet.
- **Programming** is introductory and can be in any language.
- **Introductory IS concepts** would provide an overview of the area, including basic hardware and software, as well as common applications of IS, including, but not restricted to, the use of IS for decision-making support.

### Business, Management and Economics Fundamentals
Information systems exist within organizations. In many cases, the organization is involved in business transactions. Therefore, some basic understanding of business and management fundamentals is important. This could be chosen from one or more of the areas of economics, behavior/ management and/or finance/accounting.

### Quantitative Reasoning
All students should already have (or develop) skill and confidence with the interpretation of material containing quantitative information and mathematical symbols, and they should have (or develop) an ability to express ideas using mathematical symbols and language. It is important to be able to articulate an understanding of mathematics, not simply perform calculations. The choice of mathematical subject matter for development of quantitative reasoning will depend on the student's background and interest. Subjects such as algebra, statistics, finite math or technical math are all good choices. In addition, students would greatly benefit from an understanding of basic statistical concepts.

### Systems Analysis and Design (advanced level)
Key to understanding information systems is an understanding of systems analysis and design. This includes an understanding of the systems lifecycle as well as systems and network models.

### Information Technology (advanced level)
Information technology concerns the hardware aspects of information systems. Many students come to Empire State College with background in information technology. This may include training in networks or the underlying technology of the World Wide Web or advanced understanding of programming languages. In this area, currency is important and students should be considered in the learning contract, possibly through study of

data communications and networking or advanced programming languages.

### Information Systems (advanced level)
In addition to systems analysis and design, which was already identified as a core subject, and an understanding of systems and information technology, a student should have an advanced level of understanding in databases, MIS or project management in information systems. Any advanced-level IS study should include some aspect of decision making.

### Understanding of the Work Environment
Information systems always exists in some context, within which there is wide variability. Often, but not always, the environment is a business organization. Studies that would provide this perspective include technology and society, technology management, cross-cultural management, organizational behavior, computer ethics, human-computer interaction or e-commerce.

In this common core, the student has investigated information technology and information systems at the advanced level. He or she has studied systems analysis and design. The content of the rest of the concentration will depend on the specific area of study. Three of the most common possibilities are discussed below.

## An IS Degree Within the Business, Management and Economics Area of Study

In addition to satisfying the general BME guidelines, students wishing to develop an IS degree within BME are advised to take business, management, and economics studies that include IS components or that complement the IS studies in the core area. The following are suggested topic areas. The list below is by no means exhaustive. These studies should be beyond the introductory level and address competencies, learning and knowledge areas such as the following:

- **Telecommunications management:** responsibility for the operations and performance of the communication network within the organization, including project management, computer operations and computer security
- **Database management and administration:** combination of data-management and data-administration roles and responsibilities, including studies such as relational databases, enterprise data modeling, client interface and management information systems
- **Accounting and financial management:** responsibilities such as dealing with investments in vertical information systems, procurement, operations management and implementation of an information systems' financial strategy within the organization; cost accounting is an integral part of this area
- **Planning:** positioning of IS within other organizational functions to support business strategies and goals through studies such as business planning, strategic planning, strategic control systems and systems development.

## An IS Degree Within the Science, Mathematics and Technology Area of Study

The general SMT guidelines are met through the core studies for a degree in IS. One additional area that needs to be included in an IS degree under SMT would be further study in mathematics. This should be beyond the introductory level and could include areas such as discrete math or advanced quantitative methods in business.

- **Discrete mathematics** would cover logic, the concept of complexity, methods of proof and graph theory.
- **Advanced quantitative methods** would include topics such as decision making under uncertainty and linear programming.

Beyond the core, students in SMT likely will have an area they would like to focus on in their additional advanced-level studies. The following are some suggested areas. This list is by no means exhaustive:

- **Programming:** integrative studies such as object oriented programming, theory of programming languages and artificial intelligence
- **Networks:** data communications, voice systems, computer security and network administration
- **Web design:** web programming, web design and web development
- **Databases:** study of databases, data modeling, database management, relational databases, decision support systems, enterprise data modeling, artificial intelligence and expert systems
- **Telecommunications:** study of the integrated nature of telecommunications, where voice, data and graphics are united.

Studies should not focus on specific commercial packages, since these narrow approaches will not serve the student's long-range goals. Specific titles may go out of date, or the manufacturer may change its name or go out of business. It is also important to strike the proper balance between study of general concepts and of specific software tools and packages.

While students can and should gain hands-on experience with software in their studies, at least equal emphasis must be placed on mastery of the concepts and principles. The concepts and principles are the key to successful lifelong learning and to mastering the use of new software tools and techniques as they become available. A specific example of this principle would be developing a study in "web design," rather than a study titled "Microsoft Frontpage."

## An IS Degree Within the Interdisciplinary Studies Area of Study

Separate guidelines are given for the interdisciplinary studies area of study and these are the best source for any student developing a degree within this AOS. However, it is assumed that a student with an interdisciplinary studies degree in IS would have the common core identified above. For the additional studies in the information systems area, several of the studies at the advanced level should integrate viewpoints and applications. An example may be a degree that looks at the technical and implementation aspects of e-commerce.