

## **Information Science and Technology (IST)**

**Professor Engebretson**

**Associate Professor Meysenburg**

Numerous career and graduate school opportunities exist for students who have completed a major in the area of information science and technology, whether it be in computer science or information systems. The opportunities available span many industries and disciplines, making a computer science or information systems major quite valuable, whether alone or in combination with majors or minors from other disciplines at Doane.

The information science and technology program at Doane includes experiences both inside and outside the classroom to provide students with a clear understanding of information science and technology concepts; the confidence and skills to work with existing and emerging information technology; the confidence and skills to efficiently research and learn an unknown topic or solve an unknown problem; and the confidence and skills to effectively communicate, including writing, speaking, reading, and listening.

As there are many areas of interest in the information science and technology field, reflected by the electives available at Doane, students are strongly encouraged to work with an information science and technology faculty member in developing a course of study most beneficial to each individual student's interests. Students planning to seek a major in computer science, a major in information systems, a teaching endorsement in computer science, a minor in computer studies, or those who would like to explore any of these options, should contact a member of the information science and technology faculty as early as possible.

### **Requirements for the Computer Science Major:**

The computer science major is designed for individuals interested in pursuing graduate school and/or a career related to the research and engineering of computer technology.

1. Complete the following 35 credits in information science and technology:
  - a. Information Science and Technology 140, 145, 146, 246, 252, three credits of 421, and two semesters of 495.
  - b. Nine additional credits chosen from Information Science and Technology 314, 315, 352, 353.
  - c. Six additional information science and technology credits above 246, excluding Information Science and Technology 326, 401, 421, and 495.
2. Complete the following cognates:
  - a. Mathematics 235, 250, 303, 330.
  - b. Philosophy-Religion 231.
  - c. One credit of Activity 137.

### **Requirements for the Information Systems Major:**

The information systems major is designed for individuals interested in pursuing careers related to the analysis, design, development, implementation, and support of computer information systems and technology in organizations.

1. Complete the following 35 credits in information science and technology:
  - a. Information Science and Technology 140, 145, 146, 217, 252, three credits of 421 and two semesters of 495.
  - b. Nine additional credits from Information Science and Technology 307, 312, 322, 407, 412, 422.
  - c. Six additional information science and technology credits at or above 246, excluding Information Science and Technology 326, 401, 421, and 495.
2. Complete the following cognates:
  - a. Accounting 103.
  - b. One credit of Activity 137.
  - c. Business 242, 315.
  - d. Economics 203 (or 204).
  - e. Mathematics 115 (or 235).
  - f. Philosophy-Religion 231.

### **Requirements for the Honors Program in Information Science and Technology:**

Qualified students interested in further extending their studies of computer science or information systems beyond the requirements for the major are encouraged to enter the Information Science and Technology Honors Program. Students apply for the Information Science and Technology Honors Program during Activity 137, typically completed in the sophomore year. To be accepted into the program, students must have at least a 3.30 GPA in information science and technology courses, have at least a 3.00 overall GPA, successfully complete a significant research paper in Activity 137, and unanimously be approved for the program by full-time members of the Information Science and Technology faculty.

To successfully complete the program and graduate with honors in the computer science or information systems major, students accepted into the Information Science and Technology Honors Program must:

1. Successfully complete a computer science or information systems major with at least a 3.50 GPA in information science and technology courses.
2. Graduate with at least a 3.00 overall GPA.
3. Successfully complete Information Science and Technology 401.
4. Successfully complete nine additional information science and technology credits beyond those required for the computer science or information systems major at or above Information Science and

Technology 246, excluding Information Science and Technology 326, 401, 421, and 495.

### **Requirements for the Computer Studies Minor:**

Complete the following 21 credits in information science and technology:

1. Information Science and Technology 140, 145, 146, and 252.
2. Nine additional information science and technology credits at the 200 level or above, excluding Information Science and Technology 326 and 495 (a maximum of three credits of Information Science and Technology 421 can be counted toward this requirement).

### **Requirements for the Information Technology Teaching Endorsement:**

Complete the following 20 credits in information science and technology:

1. Information Science and Technology 140, 145, 146, 252, and 326.
2. Six additional information science and technology credits at the 200 level or above, excluding Information Science and Technology 201.

#### **140 Introduction to Information Science and Technology (3)**

An introduction to information science and technology by exploring a breadth of topics in the areas of computer science and information systems. Upon successful completion of the course, students will be able to articulate the similarities and differences of the majors in information science and technology, identify and generally discuss the major topics in each major and their relationships, and discuss differing views on several ethical questions related to the computing industry. Through examination of the disciplines and research of computing careers, this course will provide information that will assist students in deciding whether or not to pursue an information science and technology major and career.

#### **145 Introduction to Programming and Problem-Solving (3)**

An introduction to the science and art of implementing solutions to problems using a high-level programming language. Upon completion of this course, the student will be able to design solutions to a variety of problems using top-down and structured design techniques and implement those solutions using programming constructs such as branching, loops, arrays, and functions or procedures. *Prerequisite: Mathematics 105 or equivalent.*

#### **146 Programming and Problem-Solving II (3)**

A continuation of Information Science and Technology 145. This course further examines data and procedural abstraction and the design, implementation and analysis of algorithms. Upon completion of this course, the student will have gained experience with the object-oriented paradigm, a more modern program design technique, as an alternative to top-down and structured design. In addition, students will learn basic searching and sorting algorithms, sequential and random access file algorithms, dynamic memory allocation techniques, and basic data structures such as linked lists and binary trees. *Prerequisite: Information Science and Technology 145.*

**201 Instructional Technology (3)**

A course consisting of a series of experiences related to using educational technology in the classroom. Teaching about technology, teaching with technology, and integrating technology in the classroom are topics of this course. Course experiences provide an awareness of the educational uses of technology and the skills necessary to use and integrate technology in the classroom. Competency will be demonstrated in the use of application software relevant to the classroom. *Prerequisite: Major in Elementary Education, Special Education, or completing secondary certificate.*

**217 Information Systems Theory and Practice (3)**

Provides an introduction to the field of information systems and an understanding of the decision process and how information is used for decision support in organizations. Students will develop an understanding of decision theory and practice essential for providing viable information to the organization and will be able to identify the various types of information systems. *Prerequisite: Information Science and Technology 145. Offered spring terms.*

**246 Data Structures and Algorithms (3)**

A course focusing on abstract data types, such as linear lists, linked lists, stacks, queues, graphs, and trees, and the design, implementation, and efficiency of the algorithms for processing these structures. More advanced searching and sorting techniques will be introduced and analyzed. Upon completion of this course, the student will be able to utilize data abstraction to solve a wide variety of computational problems using various data structures and to analyze the efficiency of their solutions. *Prerequisite: Information Science and Technology 146. Offered fall terms.*

**252 Principles of Digital Logic & Computer Organization (3)**

A study of the computer as a physical device. Upon completion of the course, students will understand the basic principles of digital logic and how it is used to build useful hardware components, understand the basic organization of a computer system in terms of digital hardware components and how instructions are executed using those components, and have the knowledge and skills necessary to implement high-level language constructs in assembly language. *Prerequisite: Information Science and Technology 146 or permission.*

**271, 371, 471 Selected Topics (1-3) (1-3) (1-3)**

An investigation of topics not offered in other courses, selected on the basis of student interest and available instruction. *Prerequisite: Permission.*

**290, 390, 490 Directed Study (1-3) (1-3) (1-3)**

An opportunity for supervised, independent study of a particular topic based on interest of the student, and availability and approval of the faculty.

**307 Database Application Design and Development (3)**

A study of the methods of organizing and accessing data on peripheral devices using database management systems (DBMS). Upon completion of this course, students will understand the relationship between file systems and database systems, and will design and implement a database application with a web interface using a DBMS. *Prerequisite: Information Science and Technology 145. Offered alternate spring terms.*

**312 Software Engineering I (3)**

An investigation of the application of engineering principles to the development of software systems. Students will gain a better understanding of these principles through the completion of a software engineering project.

*Prerequisite: Information Science and Technology 146. Offered alternate fall terms.*

**314 Design and Analysis of Algorithms (3)**

An introduction to complexity theory, searching and sorting, and techniques of algorithm design, including greedy, divide and conquer, dynamic programming, and backtracking methods. Upon completion of this course, the student will be able to apply these methods in designing algorithms and be able to analyze the efficiency of these algorithms. *Prerequisite: Information Science and Technology 146, Mathematics 330. Offered alternate spring terms.*

**315 Theory of Computation (3)**

A study of the basic theoretical principles embodied in formal languages and automata. Topics include finite automata, context-free grammars, Turing machines, computability, and the halting problem. Upon completion of this course, the student will be able to apply theoretical models to the solution of computational problems. *Prerequisite: Information Science and Technology 145, Mathematics 250. Offered alternate spring terms.*

**322 Computer Networking I (3)**

Provides students with the knowledge of data communications and networking concepts, including telecommunications architectures, protocols, hardware, and software. In addition, the analysis, design, and implementation of networks in organizations such as businesses and schools will be examined and experienced. *Prerequisite: Information Science and Technology 146. Offered alternate fall terms.*

**324 Digital Electronics (4)**

An introduction to digital logic devices, microcontrollers (programming and operation), analog-to-digital and digital-to-analog converters, and basic input/output methods. Emphasis is given to controlling a process using these devices. Completing the course allows the student to identify and develop digital solutions to selected real world data acquisition and control problems. *Prerequisite: Physics 107, 108. (Cross-referenced with Physics 324.)*

**326 Roles of the Instructional Technologist (2)**

An examination of the roles that an individual with an instructional technology major and/or a computer science endorsement might fulfill at the secondary level. Upon successful completion of this course, students will have an understanding of the roles they may be asked to fulfill related to providing support in analyzing, designing, implementing, and maintaining administrative and instructional information systems and technology in schools, as well as training students, teachers, and administrators on its effective use. In addition, teaching methods and curriculum content of computer science and the teaching methods and curriculum content of computer applications will be discussed. Competency will be demonstrated in the use of application software relevant to the classroom. *Prerequisite: Information Science and Tech-*

*nology 145 and 252 and enrolled in the semester immediately prior to the professional term, or permission. Offered spring term.*

**352 Operating Systems (3)**

An introduction to operating systems. Students will leave the course with a better understanding of multiprogramming concepts such as CPU scheduling, deadlocks, memory management, virtual memory and protection, operating systems structures and distributed operating systems. Current operating systems will be surveyed and discussed as they relate to these concepts. *Prerequisite: Information Science and Technology 146. Offered alternate fall terms.*

**353 Computer Architecture (3)**

A study of the design principles for computing machinery components. Upon successful completion of the course, students will have an understanding of these design principles for the processing unit, input/output, arithmetic unit, memory, and for improving throughput, via pipelining, vector and parallel processing, RISC architecture and neural networks. *Prerequisite: Information Science and Technology 252. Offered alternate fall terms.*

**401 Information Science and Technology Honors Research (1)**

With the guidance of a faculty mentor, each student will identify a research area of interest, perform a literature review, identify a specific research project, perform the research, develop a paper, and present the results in a public forum. *Prerequisite: Acceptance into the IST Honors Program.*

**407 Web Application Design and Development (3)**

A continuation of Information Science and Technology 307, this course will further investigate techniques to develop applications designed for the web. Upon completion of this course, students will have the skills to design and develop web applications using a number of different techniques and tools and will design and develop a web application using these techniques and tools. *Prerequisite: Information Science and Technology 307 or permission. Offered alternate fall terms.*

**412 Software Engineering II (3)**

A continuation of Information Science and Technology 312, students will employ current software engineering methods to analyze, design, and implement a significant, modern software product. Emphasis will be placed on the utilization of a chosen software life cycle model from Information Science and Technology 312. Another area of emphasis will be the exploration of Graphical User Interface (GUI) programming. *Prerequisite: Information Science and Technology 312. Offered alternate spring terms.*

**421 Information Science and Technology Internship (0-12)**

Practical experience in an information systems environment (industry or research). *Prerequisite: Cooperative Education 205 or permission. (Pass/Fail)*

**422 Computer Networking II (3)**

A continuation of Information Science and Technology 322, students will examine how the fundamentals of computer networking are implemented in a modern network environment. Topics will include network architecture, con-

figuration, management, and security, among others. *Prerequisite: Information Science and Technology 322. Offered alternate spring terms.*

**495 Information Science and Technology Seminar (1)**

A research or experiential project developed under the guidance of a department faculty member to culminate a student's study of information science and technology. Completion of the project, including a written and oral presentation, demonstrates the skills expected of a Doane information science and technology student, including a solid understanding of information science and technology concepts; the confidence and skills to 1) work with existing and emerging computing technology; 2) efficiently research and learn an unknown topic or solve an unknown problem; and 3) effectively communicate, including writing, speaking, and listening. **This course may be taken twice.** *Prerequisite: Information Science and Technology student with junior or senior standing and permission.*

**ACTIVITIES**

**137 Doane Information Solutions Cadre (DISC) (0-1)**

Provides students with an experience that will allow them to apply their understanding of information systems and applications in creating an information system solution. Students will be assigned to a project team and given responsibilities as part of that team. The team will be given a project that will involve analyzing a user's needs, designing a solution, and implementing that solution. *Prerequisite: Permission. (Pass/Fail)*

**Interdisciplinary Studies (IDS)**

**102 The Community and Leadership (1)**

A freshman course focusing attention on aspects of the community which are important but not entirely academic. It consists primarily of two types of activity, each of which is designed to help students participate in and understand what it is to be part of a community: a series of public event programs and a limited community service project.

**International Studies (INT)**

**Associate Professor Franklin**  
**Associate Professor Reinkordt**

This major is a multi-disciplinary course of studies involving economics, history, modern languages, and political science. The emphasis is on Europe, incorporating many courses from the aforementioned fields. A major in International Studies creates the foundation for further studies in graduate school, here as well as abroad.

**Requirements for the International Studies Major  
(Emphasis in Contemporary Europe)**

Complete a minimum of 35 credits as follows: