

## SI204 Introduction to Computer Science

**Catalog:** **SI204 Introduction to Computer Science (3-2-4).** Introduction to algorithmic development, problem solving and software design. Principles and concepts to provide foundational knowledge and experience upon which later computer science courses will build. This is the first course for computer science majors. *Prereq: None.*

**Textbook:** Programming and Problem Solving with C++, Third Edition, Nell Dale, Chip Weems and Mark R. Headington, Jones and Bartlett Publishing, 2002.

**References:** C++ How to Program, Second Edition, Deitel & Deitel, Prentice Hall, 1998.

**Coordinator:** Chris Brown, Ph.D., Assistant Professor

### Program Outcomes:

1. Recognize and demonstrate critical thinking and problem solving.
2. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues

### Course Goals:

1. To introduce the concepts of structured programming utilizing a high level programming language.
2. To introduce problem solving methods and algorithmic development.
3. To teach the design, coding, debugging, and documenting of programs using structured programming techniques.

**Prerequisites by Topic:** None

### Major Topics Covered:

	<b>Hours</b>
1. SEIofC: Property rights (copyright, patent, fair use), privacy (snooping), password security, abuse (harassing e-mail, viruses)	1
2. Basic Computer operation. Becoming familiar with the environment	1
3. An introduction to a programming language: program structure	1
4. Documentation, design, and programming style	2
5. Basic language constructs: basic data types, variables, assignment, arithmetic expressions, String class	5
6. Control flow, conditionals, logical expressions, iteration	6
7. File I/O	1
8. Functions, function arguments, and basic recursion	7
9. Arrays, arrays of characters, and simple pointers	6
10. Debugging	2
11. Introduction to classes, data members, structured types	3
12. The structure of multi-file programs	1
13. Pointers to single objects, linked lists	4
14. Exams	2

15. Review, evaluations, course admin	2
<b>Total:</b>	<b>44</b>

**Laboratory Projects (specify number of weeks on each):** Approximately 28-30 hours of closed laboratory time will be used to reinforce the concepts discussed in class. Labs are as follows (2 lab hours = 1 week).

1. Lab Familiarization, "Hello World!" (2 hours)
2. Types, Expressions and Representation (2 hours)
3. Control Structures (2 hours)
4. Loops (2 hours)
5. More Loops (2 hours)
6. Debugging (2 hours)
7. Simple Functions: Top Down Programming (2 hours)
8. Complex Functions (2 hours)
9. Recursion (2 hours)
10. Arrays (2 hours)
11. Pointers (2 hours)
12. Combining What We Know: Data Structures and Algorithms (2 hours)
13. Classes without member functions (2 hours)
14. Linked lists (2 hours)

**Estimate CAC/ABET Category Content:**

**Area Core Advanced**

Data Structures	1
Algorithms	1
Software Design	1
Computer Organization and Architecture	0
Concepts of Programming Languages	1
<b>Total:</b>	<b>4 0</b>

**Oral and Written Communications:**

Every student is required to submit at least 0 written reports (not including exams, tests, quizzes, or commented programs) of typically 0 pages and to make 0 oral presentations of typically 0 minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

**Social and Ethical Issues:**

Please list the topics that address the social and ethical implications of computing covered in all course sections. Estimate the class time spent on each topic. In what ways are the students in this course graded on their understanding of these topics (e.g., test questions, essays, oral presentations, and so forth). Property rights (copyright, patent, fair use) with respect to software, software piracy including MP3 and Napster, password security, harassing e-mail (1 hour). These topics will be evaluated via a hypothetical question on an exam.

**Theoretical Content:**

Please list the types of theoretical material covered, and estimate the time devoted to such coverage. N/A.

**Analysis:**

Please describe the analysis experiences common to all course sections. Students are required on a continual basis to analyze English descriptions of computing problems. A certain degree of detail is purposely omitted as a method of forcing the students to gain a deeper appreciation for fully understanding a problem before developing a solution.

**Design:**

Please describe the design experiences common to all course sections. Students continually must design programs based on problem descriptions. Students are introduced to top-down, step-wise refinement, and stub programming.

## IT221 IT Data Structures

**Catalog:** IT221 IT Data Structures (2-2-3) Introduction to object-oriented programming and data structures including lists, stacks, queues, trees and graphs, and sorting, searching and hashing techniques. *Prereq: SI204*

**Textbook:** Data Structures Using C++, D. S. Malik, Thomson Course Technology, 2003.

**Coordinator:** LCDR Lori Delooze, USN

### Program Outcomes:

1. Explain and apply technical concepts and practices in the core informational technologies.
2. Recognize and demonstrate critical thinking and problem solving skills.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues

### Course Objectives:

1. Introduce Object-Oriented Programming and the Software Engineering process.
2. Apply the Object-Oriented principles of encapsulation, inheritance, and polymorphism.
3. Describe searching and sorting algorithms and evaluate the processing trade-offs between each.
4. Develop and implement programs to manipulate data using linked lists, stacks and queues, trees and graphs.
5. Discuss ethical issues relevant to the development and reliability of critical systems.

### Prerequisites by Topic:

1. Data Types (SI204)
2. Control Structures (SI204)
3. Functions and Arrays (SI204)

### Major Topics Covered:

	Hours
1. Ethics: Development and Reliability of Critical Systems	1
2. Software Engineering Principles	1
3. C++ Classes	1
4. Object-Oriented Design	1
5. Inheritance	1
6. Polymorphism	1
7. Templates	1
8. Pointer Data Types and Variables	1
9. Linked Lists	2
10. Recursion	1
11. Stacks	2
12. Queues	2
13. Search Algorithms	2
14. Hashing	1

15. Sorting Algorithms	2
16. Binary Trees	2
17. Graphs	2
18. Sets, Maps	1
19. Exams	2
20. Exam Review, going over exams, course evaluations	2
<b>Total:</b>	<b>29</b>

**Oral and Written Communications:**

Every student is required to answer several analytical questions related to their projects and conduct a 10 minute presentation on a current issue, limitation, or trend in object oriented design and implementation.

**Laboratory Projects:**

1. UNIX, Compilation Environment
2. Program performance (Big O)
3. Operator overloading
4. Responsibility driven design
5. Linked lists - basic list construction, traversal
6. Linked lists - list insertion and deletion
7. Recursion - scope and activation records
8. Stacks
9. Queues
10. Binary search and analysis
11. Hashing
12. Maps and Sets
13. Sorting
14. Binary Trees
15. Shortest Path

**Social and Ethical Issues:** Items covered included discussions on building safe and reliable software in critical systems (pacemaker software). Discussion also focused on aircraft software as well as command and control simulation software. (1 hour). These topics will be evaluated via test questions.

**Theoretical Content:** Foundations of data representation and manipulation; analysis of algorithms; graph theory

**Analysis and Design:**

There are three assignments that require the student to design and develop an application using object oriented design principles.

## **HH220 Information Technology Revolutions, Past and Present**

### **Catalog: HH220 Information Technology Revolutions, Past and Present (3-0-3).**

Today, many cultural pundits state that we live in an "information age." In fact, every era in human history has been an "information age" because in each historical period different technologies were devised to gather, process, and disseminate information. Moreover, the prevailing technical medium on which information travels often has as much an impact on individuals and societies as the nature and content of the information itself. This course has three central objectives: to discuss the invention, development, and proliferation of the dominant information technologies from the printing press to the palm pilot, to assess the user-IT interface, and to analyze the effects of these technologies on modern political, social, and economic institutions. Special attention will be given to the military-IT nexus. Required for all IT majors. *Prereq: FP130 and HH104.*

**Coordinator:** Kurt Beyer, Ph.D., Assistant Professor

### **Program Outcomes:**

1. Communicate with clients, users and peers in verbal, visual, or written form.
2. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues.

## IT 300 Computer Architecture and Organization

**Catalog:** **IT300 Computer Architecture and Organization (3-0-3).** An in depth, non-engineering introduction to concepts and theories related to computer hardware, systems software, and data concepts including operating system design and peripheral connectivity. This course will build an understanding of the planning, design, use and performance of computer systems. *Prereq: IT221.*

**Textbook:** The Architecture of Computer Hardware and Systems Software: An Information Technology Approach, Irv Englander, Wiley, Third Edition, 2003.

**Coordinator:** LCDR Lori Delooze, USN

### Program Outcomes:

1. Explain and apply technical concepts and practices in the core informational technologies.
2. Recognize and demonstrate critical thinking and problem solving skills.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues.

### Course Goals:

1. To introduce strategies needed to critically match computer systems to system requirements.
2. To present concepts and theories related to general-purpose computer systems, and to build an understanding of the components, design, performance, and use of such systems.
3. To introduce the fundamentals of the operating system as the user's interface to hardware.
4. To instruct midshipmen in the ethical issues relevant to information systems.

### Prerequisites by Topic:

1. Elementary Programming
2. Simple data structures

### Major Topics Covered:

	Hours
1. Introduction to Computer Architecture	1
2. Structure of a Computer	1
3. Number Systems and Data Formats (ASCII, image, audio, data compression)	3
4. Floating Point and Integer Representation	1
5. Computer Hardware	5
6. CPU Components	1
7. CPU Design and Implementation	3
8. Introduction to and Use of Memory	2
9. Input and Output, Peripherals	2
10. Grouping Computer Systems	3
11. Programming Tools	1
12. Digital Algebra and Logic Gates	1
13. Peripherals and Connectivity	3

14. Operating Systems Overview	3
15. User's View of Operating Systems	4
16. Open Source vs. Proprietary Operating Systems	3
17. Evaluation of Computer System Performance	1
18. Configuration Control	1
19. Ethics: Reverse Engineering	1
20. Exams	2
21. Exam Review, going over exams, course evaluations	
<b>Total:</b>	<b>44</b>

**Laboratory Projects:**

One laboratory assignment will be required. It will utilize the Logic Works circuit prototyping software application. This assignment will be of approximately two weeks in length.

**Oral and Written Communications:**

Every student is required to submit at least one written report of typically three-five pages covering an advanced topic in current issues, limitations, and trends in computer architecture.

**Social and Ethical Issues:**

Students are evaluated on their understanding of reverse engineering by a short essay homework assignment and a final exam question.

**Theoretical Content:**

Number representation, as well as performance metrics and system tradeoffs are addressed in both the CPU design and implementation and the peripheral and connectivity topics.

**Analysis and Design:**

There is one major assignment that requires the student to analyze the logic design of a computer.

## IT320 Systems Analysis and Design

**Catalog:** **IT320 Systems Analysis and Design (3-0-3).** Introduction to concepts and methods used in analyzing and designing information technology systems. Topics include: assessing system requirements; interviewing/testing techniques; introduction to Computer Aided Software Engineering (CASE) tools and methodologies; Systems Development Life Cycle, which is a systematic and orderly approach to solving organizational problems through the implementation of technology and developing Information Systems Analysis and Design documents. Students will gain real-life experience in analyzing and designing systems, as well as working in teams.

*Prereq:* IT300, IT350

**Textbook:** Systems Analysis and Design, Second Edition, John Satzinger, Robert Jackson, and Stephen Burd; Thompson Learning, 2002.

**Coordinator:** LCDR Lori DeLooze, USN

### **Program Outcomes:**

1. Examine system requirements and create and maintain a project plan with respect to a second discipline.
2. Assimilate personal initiative, group cooperation, and team leadership.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues

### **Course Objectives:**

1. Demonstrate translation of IT system requirements to IT system specifications.
2. Apply system analysis and design tasks to real world problem.
3. Integrate accepted Project Management best practices into comprehensive project plan.
4. Evaluate the tradeoffs involved in planning and designing IT systems.
5. Construct complete project plan, including analysis, design, implementation and maintenance using the Systems Development Life Cycle as a model.
6. Create Information Systems Analysis and Design Documentation.
7. Formulate object oriented models using the Unified Modeling Language.
8. Participate actively in team membership and team building in an analysis and design context.

### **Prerequisites by Topic:**

1. The role of Information Technology in large organizations such as the DoD. (IT310)
2. The role of computer hardware and software in constructing intelligent and coherent IT systems to give competitive, tactical, and strategic advantage to an organization. (IT300)

<b>Major Topics Covered:</b>	<b>Hours</b>
1. Ethics: Social and Ethical Implications of Software Engineering	1
2. Managing the Information Systems Project	6
3. System Development Life Cycle	2
4. Approaches to Systems Development	2
5. CASE Tools and Modeling	5
6. Analyzing System Requirements	7
7. Analyzing Alternatives	2
8. Designing User and System Interfaces	7
9. Designing Databases	2
10. Systems Implementation and Maintenance	4
11. Development Processes	2
12. Course Administration, Reviews	2
13. Exams	2
<b>Total:</b>	<b>44</b>

### **Laboratory Projects:**

While no specific lab is associated with this course, there will be some lab work required. Introduction to CASE tools and modeling techniques will be presented in a laboratory environment. Because almost all IT projects are done in groups or teams, the class will be divided into groups of three or four to independently work on different phases of the process. As a culminating project, each team will present a both a written and oral presentation.

### **Oral and Written Communications:**

As part of the final project, each student will submit a group research paper on their development project. Each group will make a formal presentation of this project to the class. Additionally, each student will make three shorter presentations to the class on their project during the development process.

### **Social and Ethical Issues:**

One hour will be spent on the social and ethical implications of project development and software reuse.

## IT340 Introduction to Networks

**Catalog:** **IT340 Introduction to Networks (2-2-3).** Analyze and explain the development and use of computer and telecommunications networks in modern society. Evaluate the strengths and weaknesses of network solutions. Identify new and emerging technologies and communications concepts applied in the contemporary network industry and illustrate their application to the delivery of information services. Examine the management implications of networks. A student may not receive credit for both IT340 and SI454. *Prereq: IT221, IT300.*

**Textbook:** Computer Networking and Technologies, Gallo and Hancock, Brooks/Cole, 2002.

**Coordinator:** Margaret McMahon, Ph.D., Assistant Professor

### Program Outcomes:

1. Explain and apply technical concepts and practices in the core informational technologies.
2. Employ emerging technology to satisfy challenges or opportunities faced by organizations or individuals.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues.

### Course Objectives:

1. Present high-level concepts and major topics of computer communications and computer networks.
2. Introduce networking principles, hardware, software, management of, concepts and techniques.
3. Introduce dimensions of analysis of network architectures and protocols.
4. Develop an awareness of the characteristics of networks and network hardware.

### Prerequisites by Topics:

1. Computer Components and Functions (IT300)
2. Graphs (IT221)
3. Trees (IT221)
4. Queues (IT221)
5. Computer Program Performance (IT221)

### Major Topics Covered:

	<b>Hours</b>
1. Ethics: Malevolent software	1
2. Intro to Networking	1
3. Analog and Digital Communications	2
4. Transmission Media (wires, fibers, radio, satellites)	2
5. Data Link Concepts and Standards: Logical Link Control (LLC), Media Access Control (MAC), Quality of Service (QoS), random access, error	2

6. Network Hardware Components: Transceivers, Repeaters, Network Interface Cards (NICs), Bridges, Switches	1
7. Internetworking Concepts, Protocols, Routers	3
8. Transmission Control Protocol/Internet Protocol (TCP/IP)	3
9. Ethernet and Local Area Networks (LANs)	3
10. Networking Technologies: Integrated Services Digital Network (ISDN), Frame Relay, Switched Multimegabit Data Services (SMDS), Asynchronous Transfer Mode (ATM)	2
11. Network Design and Implementation	1
12. Network Security	2
13. Network Integrity and Availability	2
14. Exams, reviews, administrative info	4
<b>Total:</b>	<b>29</b>

### **Laboratory Projects:**

1. Create peer-to-peer network
2. Network protocols
3. Media Characteristics
4. Building Networks
5. Routers and bridges
6. Virtual Private Networks
7. Operating Systems and Networking
8. Dynamic Host Configuration Protocol (DHCP)
9. Domain Name Server (DNS)
10. Use of port numbers
11. Use of servers
12. Troubleshooting
13. System reliability and backups
14. System auditing
15. Network Security

### **Oral and Written Communications:**

Every student is required to submit at least one written report of typically three-five pages covering an advanced topic in current issues, limitations, and trends in management of networked systems.

### **Social and Ethical Issues:**

One hour is spent in class discussing relevant issues and current cases involving the ethical issues in the proliferation of malevolent software, such as viruses and worms. A short paper or question on an exam may be assigned addressing current issues in the field.

### **Theoretical Content:**

This course is an introduction to the technologies, techniques, and issues in current military and civilian network systems.

**Analysis:**

Students participate in assignments and group discussions of advantages and disadvantages of network technology choices when managing a network. These analyses are reinforced with class work and homework assignments.

**Design:**

Design issues are highlighted in the course as we progress from network components to common implementations of networks. Consequences of design decisions are explored as network components are pieced together. Exercises in class and homework assignments reinforce students' development of skills to critique choices in network infrastructure and technologies.

**Project:**

Projects will be assigned to reinforce the concepts of local area networking and internetworking. There will be an introduction to network hardware components such as transceivers, repeaters, network interface cards (NICs), bridges, and switches.

## IT350 Web and Internet Programming

**Catalog:** **Web & Internet Programming (2-2-3).** Web site design and management, scripting languages for web development, servers and clients, webs with database support. *Prereq:* IT221, IT300.

**Textbook:** Internet & World Wide Web: How to Program, Second Edition, H. M. Deitel, P. J. Deitel, T. R. Nieto; Prentice Hall, 2002.

**Coordinator:** LCDR Scott Book, USN

### Program Outcomes:

1. Employ emerging technology to satisfy challenges or opportunities faced by organizations or individuals.
2. Design and create integrated IT-based solutions following standards and best practices.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues.

### Course Objectives:

1. Explain how the client-server model of Internet programming works.
2. Design and develop interactive, client-side, executable web applications.
3. Demonstrate how Internet programming tasks are accomplished.
4. Build tools that assist in automating data transfer over the Internet.
4. Compare the advantages and disadvantages of the core Internet protocols.

### Prerequisites by Topic:

1. A solid foundation in programming of fourth generation languages. (SI/IT 221)
2. An understanding of variables, structures, functions, and arrays. (IT300)
3. Comprehension of Client/server paradigm. (IT300)

### Major Topics Covered:

	<b>Hours</b>
1. Introduction to the Internet and Browsers	1
2. Extensible Hypertext Markup Language (XHTML)	6
3. Client-side Scripting	6
4. Dynamic HTML (DHTML)	3
5. Extensible Markup Language (XML)	1
6. Web Servers and Server-side Scripting	3
7. Advanced Web Page Design	5
8. Ethics – Internet privacy	1
9. Course Administration, Reviews	1
10 Exams	2
<b>Total:</b>	<b>29</b>

### Laboratory Projects:

1. Web Site Design I: Introduction
2. Web Site Design II

3. Web Site Design III
4. Web Site Design IV
5. Web Site Design V
6. Web Site Design VI
7. Client-side Scripting I: Introduction
8. Client-side Scripting II
9. Client-side Scripting III
10. Client-side Scripting IV
11. DHTML I: Introduction
12. DHTML II
13. Visualization I
14. Visualization II
15. Form Processing: Introduction to Common Gateway Interface (CGI)

**Oral and Written Communications:**

Students will present both oral and written presentations during class time. The oral presentations will be topic-based.

**Social and Ethical Issues:**

Because the issues of systems development are both global and sensitive in nature, two hours are spent on the topics of Internet privacy and ethics.

## IT420 Database Management & Organization

**Catalog:** **IT420 Database Management and Organization (2-2-3).** This course will introduce the principles underlying Database Management Systems (DBMS) with a special emphasis on database management system structure and function when integrated with web-based database applications. A student may not receive credit for both IT420 and SI440. *Prereq: IT221 or SI221.*

**Textbooks:** Database Processing, David M. Kroenke, Prentice Hall, 2004.

**Coordinator:** LCDR Lori DeLooze, USN

### Program Outcomes:

1. Design and create integrated IT-based solutions following standards and best practices.
2. Communicate with clients, users and peers in verbal, visual, or written form.
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues.

### Course Objectives:

1. Recognizes the nature and importance of relational databases.
2. Explain the three functions that a DBMS should provide, namely transaction management, concurrency control, and recovery control.
3. Implement data access control mechanisms for database security management.
4. Contrast the architecture of distributed database systems with centralized systems.
5. Illustrate and explain the use of client-server architecture for distributed database Systems.
6. Compare the basic concepts, data modeling and architectures between relational and object-oriented databases.
7. Appraise the importance of data warehouse and data mining technologies.

### Prerequisites by Topic:

1. Binary Search Trees (SI221/IT221)
2. Basic Graph Concepts (SI221/IT221)
3. Elementary Search Algorithms (SI221/IT221)

### Major Topics Covered:

	<b>Hours</b>
1. Ethics: Records Management – Risk and Responsibilities	1
2. Data Modeling	3
3. Database Design and Normalization	2
4. Data Manipulation using Structured Query Language (SQL)	5
5. Database Administration	2
6. Commercial Database Management Systems – Products Overview	3
7. Web Interaction and Database Connections	4
8. Extensible Mark-up Language (XML) Applications	3
9. Data Warehousing and Data Mining	2
10. Administration and Exam Review	2

11. Exams

2

**Total:**

**29**

**Laboratory Projects:**

Lab1: Introduction to Access Lab - Access

Lab 2: Entity-Relationship (E-R) Models Lab – Access

Lab 3: Normal Forms Lab – Access

Lab 4: SQL Manipulation Lab – MySQL

Lab 5: SQL Views and Triggers Lab – MySQL

Lab 6: Database Modifications Lab – MySQL

Lab 7: Database Applications Lab – MySQL

Lab 8: Database Administration Lab – MySQL

Lab 9: SQL Server 2000 Lab – SQL 2000

Lab 10: Database Connectivity Lab – SQL 2000

Lab 11: Active Server Pages (ASP) Lab – SQL 2000

Lab 12: More with ASP Lab – SQL 2000

Lab 13: XML Lab – SQL 2000

Lab 14: Java Server Pages (JSP) Lab – SQL 2000

Lab 15: Online Analytical Processing Lab – SQL 2000

**Oral and Written Communications:**

Students will present oral presentations during class time. The oral presentations will be topic-based.

**Social and Ethical Issues:**

Students will examine the social and ethical issues in organizations as they strive to comply with legal requirements to collect and maintain digital communications records.

**Projects:**

One database project will be assigned for the semester.

## IT430 Introduction to Information Assurance

**Catalog:** IT430 Introduction to Information Assurance (2-2-3). This course is an introduction to the theoretical and practical facets of Information Assurance (IA) to include: Department of Defense (DoD)/Department of the Navy (DoN) policies and directives, Trusted systems, Access mediation, Cryptography, Public Key Infrastructure (PKI), Information Warfare, Network security and Database security. *Prereq: IT340.*

**Textbook:** Computer Security: Art and Science, Matt Bishop, Addison Wesley, 2003.

**Coordinator:** Major William James, USMC

### Prerequisites by Topic:

1. Network Protocols Transmission Control Protocol/Internet Protocol (TCP/IP) (IT340).
2. Network Topologies (IT340).

### Program Outcomes:

1. Employ emerging technology to satisfy challenges or opportunities faced by organizations or individuals
2. Design and create integrated IT-based solutions following standards and best practices
3. Analyze the impact of technology on individuals, organizations and society, including ethical, legal and policy issues

### Course Goals:

1. Apply principles of computer and communications security.
2. Understand privacy concerns, data secrecy, integrity and information assurance, DoD and DoN policies.
3. Apply security mechanisms.
4. Assess security concerns.
5. Introduce principles of computer and communications security.
6. Demonstrate principles and concepts in integrated approach.
7. Demonstrate practical application of some subject topics.

### Major Topics Covered:

	<b>Hours:</b>
1. Introduction to Information Assurance: computer security and information security terminology, definition, laws, regulations, Common Criteria, Trusted Computer Systems Evaluation Criteria.	2
2. Ethical Issues: Individual responsibility, legal issues, data privacy, implications of unauthorized access and hacking, and ethical case studies.	1
3. Access Control: Identification and authentication, discretionary and mandatory access controls, and system administration.	3
4. Malicious Software: Intrusion detection and auditing: Viruses, Trojan Horses, and other threats, and their countermeasures.	1
5. Physical Security and Disaster Planning: various DoD and DoN policies,	5

Risk analysis, Threat system vulnerabilities, Development of cost Effective solutions, Configuration control, available information security (INFOSEC) resources.

6. Cryptography: General theory, applications, example implementations, private key, public key, electronic signatures, key management, key escrow, and hashing schemes.	5
7. Network Security: applied cryptography, Firewalls, Kerberos, Internet Protocol Security (IPSEC), Virtual Private Network (VPN), Secure Sockets Layer (SSL), and PKI. Information warfare, computer crime, Network centric warfare, defensive and offensive measures.	7
8. Current events and issues, recent technological breakthroughs and Security relevant events.	1
9. Exams.	2
10. Reviews and Administrative Info	2
<b>Total:</b>	<b>29</b>

**Laboratory Projects:** (There is one lab session per Topic. A proposed software product name is shown in parentheses.)

<b>Laboratory Topics Covered:</b>	<b>Hours:</b>
1. Information Criticality Analysis	2
2. Network Monitoring (Ethereal)	2
3. Network Mapping (nmap)	2
4. Password Cracking	2
5. Firewall Setup (ipchains/pf)	2
6. E-mail Security (GPG & PKI)	4
7. Secure Shell and Tunneling (SSH)	2
8. Intrusion Detection Systems (Snort)	2
9. Log File Analysis (AWStats)	2
10. Intranets (example: Navy Marine Corps Intranet (NMCI))	2
11. Network-centric systems (example: Blue Force Tracker)	2
12. Cyber Defense Exercise	4
13. IA Research	2
<b>Total:</b>	<b>30</b>

**Laboratory Projects:** This course is an introduction to information assurance. In the laboratory projects, students will be exposed to the practical issues in the field. They will employ examples of typical technical solutions.

#### **Oral and Written Communications:**

There will be short written assignments based on several of the laboratory projects. Additionally, a paper describing vulnerabilities in modern networks will be assigned.

#### **Social and Ethical Issues:**

One hour will be spent on the social and ethical implications of individual responsibility, legal issues, data privacy, and unauthorized access and hacking.

**IT4XX IT Major Elective**

**Coming Spring AY06**

## FE480 IT Research Seminar (IFEA and IFEI)

**Catalog:** FE480 Information Technology Research Seminar (Macroeconomic Applications, and Microeconomic Applications) (3-0-3). This is a capstone course that ties together information technology and both economics second-disciplines. Each student will design and develop an information technology system involving economic modeling and empirical estimation using databases, econometric packages, web delivery and easy to use interfaces. *Prereq: 1/C IFEA or IFEI major.*

**Textbook:** None.

**Coordinator:** Thomas Zak, Ph.D., Associate Professor

### Prerequisites by Topic:

1. System Analysis and Design
2. Database Development
3. Web Deployment
4. A completed Project Plan specific to the capstone project

### Course Goals:

1. Tie together information technology and information management.
2. Design and develop an information technology system concerning information management using databases and web delivery.
3. Model macro- and microeconomic processes.
4. Forecast economic conditions.
5. Simulate economic processes.
6. Delivery of written documentation that satisfies that school-wide capstone requirement.

### Major Milestones:

1. Week 2: Project Plan
2. Week 4: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
3. Week 7: Design Document including:
  - a. Database Schema
  - b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
4. Week 15: Implementation Specific to Second Discipline including:
  - a. Working System
  - b. User Documentation
  - c. Test Results
5. Final Exam: Oral Presentation and System Demonstration

## **Sample Example of an FE480 Capstone Project**

FE480 will contain students from both the IFEA and IFEI majors. While each are exposed to basic economics in FE210, the two then explore different economic issues and models. The following example of a capstone project will have individuals from the separate tracks working in teams to develop a more complete understanding of economic processes.

Students in the IFEI major learn about the theoretical and empirical aspects of search models. Simply put, individuals will continue to search until the marginal benefit of additional search equals the marginal cost of additional search. This notion can easily be applied to both factor and output markets. For example, when should an unemployed individual accept a job, or continue to search? The decision will depend on both individual characteristics (education, wealth, prior experience, duration of unemployment, marital status, etc.) and labor market conditions.

Students in the IFEA major study business cycles and macroeconomic forecasting. Since job search models depend on present and expected future labor market conditions, it is important to forecast the future in job search models.

Students in this capstone course will integrate their economic and IT experiences by a) modeling the economic processes in search models, b) creating macroeconomic forecasts, and c) simulating the search process using Monte Carlo methods. They then combine the simulation model with an easy to use interface that allows one to provide a specific individual's information and outputs a probability that a better offer will be forthcoming.

## **FL480 IT Research Seminar (IM)**

**Catalog:** **FL480 Language Studies Research Seminar (3-0-3).** This is a capstone course that ties together information technology and a foreign language. Each student will design and develop an information technology system involving information management using databases, web delivery and integration of two or more subsystems.  
*Prereq: 1/C IFA, IFC, IFF, IFG, IFJ, IFR, or IFS major.*

### **Textbook:**

**Coordinator:** Gladys Rivera-La Scala, Ph.D., Professor

### **Prerequisites by Topic:**

1. System Analysis and Design
2. Database Development
3. Web Deployment
4. A completed Project Plan specific to the capstone project

### **Course Goals:**

1. Tie together information technology and a foreign language.
2. Design and develop an information technology system concerning foreign language using databases and web delivery.
3. Assess the tradeoffs in information hardware, software and architecture.
4. Delivery of written documentation that satisfies that school-wide capstone requirement.

### **Major Milestones:**

1. Week 2: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
2. Week 5: Design Document including:
  - a. Database Schema
  - b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
3. Week 15: Implementation Specific to Second Discipline including:
  - a. Working System
  - b. User Documentation
  - c. Test Results
4. Final Exam: Oral Presentation and System Demonstration

### **Sample Example of an FL480 Capstone Project**

The midshipmen will construct a model for cross-cultural understanding and behavior. It will be a browser-based reference work in which selected cultural topics will be presented and illustrated to an audience of speakers of English as a Second Language (ESL), unfamiliar with American culture. For this purpose midshipmen will create a multimedia database and software for generating web pages in response to queries directed to the database. This project will serve as a prototype that can be used for other cultures and languages in the future, for example as a resource for midshipmen planning travel abroad. Possible avenues for further development: use of non-Western writing systems, inclusion of self-assessment quizzes.

## **FP480 IT Research Seminar (National Security)**

**Catalog:** **FP480 Information Technology Research Seminar (National Security) (3-0-3).** This is a capstone course that ties together information technology and national security studies. Each student will design and develop an information technology system involving national security using databases and web delivery. *Prereq: 1/C IFP major.*

**Textbook:** None

**Coordinator:** Arthur Rachwald, Ph.D., Professor and LT Chris Mandernach

### **Prerequisites by Topic:**

1. System Analysis and Design
2. Database Development
3. Web Deployment
4. International Relations Theory and Application
5. International and National Security
6. A completed Project Plan specific to the capstone project

### **Course Goals:**

1. Tie together information technology and information management and national security.
2. Design and develop an information technology system concerning information management using databases and web delivery.
3. Access, manipulate, and display data.
4. Conduct primary and secondary source research and current literature review.
5. Delivery of written documentation that satisfies that school-wide capstone requirement.

### **Major Milestones:**

1. Week 2: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
2. Week 4: Design Document including:
  - a. Database Schema
  - b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
3. Week 15: National Security Implementation including:
  - a. Working System
  - b. User Documentation
  - c. Test Results
4. Final Exam: Oral Presentation and System Demonstration

## **Sample Example of an FP480 Capstone Project**

Terrorism, especially cyber-enabled terrorism, is an evolving threat in today's security environment. An instructor teaching a course in Information Technology and International Security or Low Intensity Conflict or U.S. Foreign Policy wants an interactive approach to access and display the impact of various individual terrorists or terrorist groups over a given time period.

Working together in teams, each Midshipman in the team will research individual terrorist organizations. Each Midshipman will compile information about the group, its known operating locations, its leadership and major operatives, major operations and acts executed globally, the types of weapons or tactics the group employs, their known political affiliations, and so on. This research will become the data set for their database.

In tandem with the security-related research, each Midshipman on the team will design the display and the database interface for their respective data set. Starting with a map of the globe, the customer will click on the country of interest, leading them to a list of known groups within that country. Clicking on a group leads to more specific information about the organization, including pictures, documents, and Midshipman-created data displays.

## HH480 IT Research Seminar (HH)

### **Catalog: HH480 Information Technology Research Seminar (History) (3-0-3).**

This is a capstone course that ties together information technology and information management. Each student will design and develop an information technology system involving history using databases, web delivery and integration of two or more subsystems. *Prereq: 1/C IHH major.*

**Textbook:** Bibliography based on historical field relevant to project.

**Coordinator:** Kurt Beyer, Ph.D., Assistant Professor

### **Prerequisites by Topic:**

1. System Analysis and Design
2. Database Development
3. Web Development
4. A completed Project Plan specific to the capstone project
5. Core background in historical field of interest

### **Course Goals:**

1. Tie together information technology and history.
2. Design and develop an information technology system that serves as a pedagogical or research tool for historians.
3. Delivery of written documentation that satisfies that school-wide capstone requirement.

### **Major Milestones:**

1. Week 2: Project Plan
  - a. Define the problem
  - b. Produce the project schedule
  - c. Confirm project feasibility
2. Week 4: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
3. Week 7: Design Document including:
  - a. Database Schema
  - b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
4. Week 15: Implementation Specific to Second Discipline including:
  - a. Working System
  - b. User Documentation
  - c. Test Results

## 5. Final Exam: Oral Presentation and System Demonstration

## **Sample Example of an HH480 Capstone Project**

The core courses taught in the history department, namely HH104 American Naval History, HH205 Western Civilization to 1776, and HH206 Civilization and the Atlantic Community since 1776, encompass broad swaths of history that must be covered by professors and military instructors in a limited amount of time. Typically the instructor is challenged with the task of introducing the student to the economic, social, political, and cultural forces behind historical events, weaving them into a seamless fabric that captures the texture and complexity of the historical process. These teachers of the past would be greatly aided by a searchable database that helps them reconstruct the past.

During the knowledge-building phase, the IT student would identify a chronological timeframe (The Enlightenment), event (Spanish-American War), or theme (18<sup>th</sup> Century Romanticism) that coincides with a topic or topics covered in HH104, HH205, or HH206. The student would then research and compile information about the topic, locate seminal documents, pictures, film segments, and maps, construct useful charts and diagrams, and write short biographies on key individuals. This research will serve as the data for the database.

Coupled with the knowledge-building phase, the student will design a display and database interface that can be accessed by professors and instructors via the history department's server and displayed on flat screens and projectors within history classrooms. Displays should intuitively interweave the data, allowing for as much interaction as possible, with the chief purpose of helping the instructor reconstruct a multi-layered history.

## IM480 IT Research Seminar (IM)

**Catalog:** **IM480 Information Technology Research Seminar (Information Management) (3-0-3).** This is a capstone course that ties together information technology and information management. Each student will design and develop an information technology system involving information management using databases, web delivery and integration of two or more subsystems. *Prereq: 1/C ISI major.*

**Textbook:** Enterprise Integration, Fred Cummings, Wiley Publishing, 2002

**Coordinator:** LCDR Lori DeLooze, USN

### **Program Outcomes:**

1. Recognize and demonstrate critical thinking and problem solving skills.
2. Employ emerging technology to satisfy challenges or opportunities faced by Organizations or individuals.
3. Design and create integrated IT-based solutions following standards and best practices.
4. Examine system requirements and create a project plan.
5. Apply IT concepts and practices to a second domain.
6. Assimilate personal initiative, group cooperation, and team leadership.
7. Communicate with clients, users and peers in verbal, visual, or written form.
8. Support the need for continued learning throughout a career.

### **Prerequisites by Topic:**

1. System Analysis and Design
2. Database Development
3. Web Deployment
4. A completed Project Plan specific to the capstone project
5. Use of transaction systems and management processing reporting systems

### **Course Goals:**

1. Tie together information technology and information management.
2. Design and develop an information technology system concerning information management using databases and web delivery.
3. Assess the tradeoffs in information hardware, software and architecture.
4. Delivery of written documentation that satisfies that school-wide capstone requirement.

### **Major Milestones:**

1. Week 2: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
2. Week 5: Design Document including:
  - a. Database Schema

- b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
- 3. Week 15: Implementation Specific to Second Discipline including:
  - a. Working System
  - b. User Documentation
  - c. Test Results
- 4. Final Exam: Oral Presentation and System Demonstration

## **Sample Example of an IM480 Capstone Project**

The Chemistry Exam Construction (CEC) Project provides a mechanism for the Chemistry Department at the United States Naval Academy to manually or automatically create mid-term and final exams using a common body of questions. Each question will be associated with one or more topics or subtopics. In addition, the CEC Project will take input automatically from the SCANTRON device, currently used to grade exams, and dynamically update the question's statistics and student records based on the most recent exam results. Appropriate security features will be used to protect access control to the question base and midshipmen records.

## **SO480 IT Research Seminar (Environmental Applications)**

**Catalog:** **SO480 Information Technology Research Seminar (Environmental Applications) (3-0-3).** This is a capstone course that ties together information technology and environmental applications. Each student will design and develop an information technology system involving environmental applications using databases, web delivery and remote sensing or GIS. *Prereq: 1/C ISO major.*

**Textbook:** None.

**Coordinator:** Peter Guth, Ph.D., Professor

### **Prerequisites by Topic:**

1. System Analysis and Design
2. Database Development
3. Web Deployment
4. A completed Project Plan specific to the capstone project
5. Environmental and GIS databases and data formats

### **Course Goals:**

1. Tie together information technology and information management.
2. Design and develop an information technology system concerning information management using databases and web delivery.
3. Access, manipulate, and display environmental data.
4. Delivery of written documentation that satisfies that school-wide capstone requirement.

### **Major Milestones:**

1. Week 2: Analysis Document including:
  - a. Use Case Diagram
  - b. Class Diagram
  - c. Sequence Diagram
  - d. Entity-Relationship Diagram
2. Week 5: Design Document including:
  - a. Database Schema
  - b. Interface Prototype
  - c. Extended Class Diagrams
  - d. Packages
  - e. Test Plans
3. Week 15: Environmental Applications Implementation including:
  - a. Working System
  - b. User Documentation
  - c. Test Results
4. Final Exam: Oral Presentation and System Demonstration

## **Sample Example of an SO480 Capstone Project**

PocketPanorama, an original client-server application, provides mapping data and 3D terrain visualizations to a handheld Pocket PC. The Pocket PC acts as a client to a server PC, which contains all data and performs all display manipulations. The terrain visualization displayed on the client uses the GPS positions transmitted by the Pocket PC. All exchanges use the http protocol and remain independent of the network connection used. Within the United States, a networked Pocket PC can automatically obtain high resolution maps or aerial photography around its position with a single click of the stylus from the Terraserver web site.