# Terminology Used in CSE Course Intended Learning Outcomes

In CSE syllabi, course intended learning outcomes are stated in terms of *intended student learning outcomes* ; i.e., each outcome is implicitly prefaced by "The student is expected to...". We use the following terminology to describe *familiarity level* (most to least) with respect to various kinds of material and procedures. A student who receives an "A" in a course should have met substantially all the intended learning outcomes as stated, and a student who merely passes the course should have met all the intended learning outcomes at least at the next lower familiarity level.

- *Master* means the student will be able to exhibit knowledge of the material and/or skill with the procedure in a new context or novel situation, even when not instructed to do so.
- *Be competent with* means that the student will be able to exhibit knowledge of the material and/or skill with the procedure in a routine situation such as those covered in the course, even when not instructed to do so.
- *Be familiar with* means the student will be able to answer questions about the material and/or to use the procedure in a routine situation such as those covered in the course, when instructed to do so.
- *Be exposed to* means the student will have heard the term and/or seen the procedure, but may not be able to discuss or use it effectively without further instruction.

The above is a revision of the following original three-level version that still appears in most of our syllabi. The revision was a result of extensive discussions in the Curriculum Committee of our experiences using the three-level version:

- *Master* means the student will be able to exhibit knowledge of the material and/or skill with the procedure, even in a new context, and even when not instructed to do so.
- *Be familiar with* means the student will be able to answer questions about the material and/or to use the procedure, even in a new context, when instructed to do so.
- *Be exposed to* means the student will have heard the term and/or seen the procedure, but may not be able to discuss or use it effectively without further instruction.

Computer science and engineering deals with the general problem of making precise descriptions of "things": static situations, dynamic behaviors, procedures, processes, relationships, assertions, proofs--just about anything. The languages and notations used in these descriptions are themselves objects of attention in many courses. Therefore, many course intended learning outcomes use the following terminology for *skill level* (least to most) to describe a student's facility in dealing with various languages and notations.

- *Reading* means the student will be able to recognize a syntactically and semantically well-formed instance of the notation, and to understand its meaning.
- *Using* means the student will be able to read the notation, and will be able to apply the understanding to perform some task.
- *Writing* means the student will be able to use the notation, and will be able to create new instances of it to perform some task.

# CSE 100: Introduction to Computing Technology

### Description

A course of general interest giving experience with personal computer software, e.g., word processors and spreadsheets; provides fundamental computer literacy; neither teaches nor requires programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 cl | none |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Not open to students with 101 or 200.
- A distance-learning version of this course (numbered CSE 100D) is also offered.

### Intended Learning Outcomes

- Master understanding the role of computers in our society.
- Master using computer hardware through understanding how instructions are carried out, how data is input and information output, what the binary number system is, what kinds of storage devices are available for computers, what is meant by telecommunications.
- Master using four of the most popular kinds of software on the market: spreadsheets, database managers, presentation graphics, and word-processing.
- Be familiar with using the computer as a tool for problem solving in many areas: business, manufacturing, medicine, art, education, the military, government, etc.
- Be familiar with how computers have evolved, the history of the computer industry, and the dramatic speed at which computer technology has evolved and continues to do so.
- Be familiar with security issues, computer crime, the implications of natural disasters on computers, inadvertent tampering, and what can be done about each.
- Be exposed to social and ethical issues, including new social and ethical questions that need to be addressed because of computer technology.
- Be exposed to language issues, syntax and semantics, difficulties in using spoken languages for computers, what programming languages are, and what steps are involved in creating computer software.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Discovering Computers 2008 (Introductory)* - Shelly, Cashman, Vermaat
- *Office 2007: Brief Concepts and Techniques* - Shelly, Cashman, Vermaat

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Introduction to computers in society; word processing |
| 2 | Application software |
| 4 | The components of the system unit; spreadsheet application |
| 2 | Operating systems and utility programs |
| 2 | Computing input devices |
| 2 | Computing output devices |
| 4 | Storage technology; database software |
| 3 | Database management; communications and networks |
| 4 | Computers and society, security, privacy, and ethics; presentation software |
| 3 | Review and exams |

## Representative Lab Assignments

- MS Word tutorial and project
- MS Excel tutorial and project
- MS Access tutorial and project
- MS PowerPoint tutorial and project

## Representative Grading Plan

| | |
|---|---|
| Homework/Quizzes | 20% |
| Labs | 30% |
| Midterm Exam | 25% |
| Final Exam | 25% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Significant contribution (7+ hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software |

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|---|---|---|
| | | systems of varying complexity. |

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Course Coordinator: Michael Compton

Last modified: 2011-04-08 13:41:49

# CSE 101: Computer-Assisted Problem Solving

### Description

Problem solving techniques using productivity software; spreadsheets, formulas, conditional logic; relational databases, relational algebra; word processing; data presentation; graphics.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 2-hr lab | Mathematics placement level R or higher; or Math 075 or higher |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Not open to students who have credit for CSE 200.
- GEC course (quantitative and logical skills category)

### Intended Learning Outcomes

- Be familiar with computer basics - hardware, software, OS, and communications.
- Be familiar with using spreadsheets to solve problems - including relative/absolute cell referencing, boolean logic, reference functions and financial functions.
- Be familiar with basic concepts of a relational database and use querying tools to obtain needed data.
- Be familiar with using and integrating word processing and presentation graphics tools.
- Be familiar with basic concepts about how the internet works.
- Be familiar with applying computational skills to problems involving algebra and geometry in practical situations (i.e., direct contribution to the learning goals and objectives in the GEC quantitative and logical skills category).

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Shelly Cashman Series for Microsoft Office Bundle Including SAM Software* - Shelly Cashman
- *Course Notes* - Debra Gross (available from COP-EZ/Tuttle)

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Intro topics - computer basics |
| 3 | Excel - writing formulas using simple functions and relative/absolute cell addressing |
| 4 | Excel - using Boolean logical functions - AND,OR, NOT, IF |
| 2 | Excel - Solving problems using multiple worksheets |
| 3 | Excel - using a LOOKUP function |
| 3 | Excel - using financial functions |
| 2 | Excel - charts |
| 2 | Understanding relational database concepts; introduction to MS Access |
| 4 | Access - Writing queries |
| 4 | Access - Writing queries with inner joins |
| 2 | PowerPoint and object linking concepts |
| 2 | Word - including mail merge |
| 1 | Database features of MS Excel |
| 2 | How the internet works and how to create a simple webpage |

## Representative Lab Assignments

- Logging into the system, file managment, email and web browsing
- Solving problems using simple Excel functions and relative/absolute cell referencing
- Solving problems in Excel using Boolean logic functions
- Solving problems using multiple worksheets and financial functions
- Designing your own worksheet solutions to problems - including reference functions

- Creating tables in MS Access
- Querying an Access database
- Using MS Word and MS PowerPoint
- Final project: integrating all tools to solve a business related problem

### Representative Grading Plan

| | |
|---|---|
| Lab Assignments | 20% |
| Homework | 12% |
| Class Participation | 2% |
| Pop Quizzes | 6% |
| Midterm | 20% |
| Final Project (hands-on lab) | 10% |
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |

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| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Debra Gross

Last modified: 2008-09-23 17:40:49

# CSE 102: Introduction to the Internet and the World-Wide Web

### Description

Course of general interest giving experience with accessing and providing information on the World-Wide Web; neither teaches nor requires computer programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 cl. | None |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Taught at OSU Lima

### Intended Learning Outcomes

- Master use of the Internet and World-Wide Web for information access and exchange;
- Be familiar with HTML and creation and placement of hypertext documents on the World-Wide Web;
- Be exposed to the protocols and data formats underlying the use of the World-Wide Web.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Web 101* - Wendy Lehnert
- *Course Notes and Material Available On The World-Wide Web* - B Bair, et al.

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 11 | HTML (text, graphics, links, frames, forms) |
| 12 | General Internet topics (security, architecture) |
| 5 | E-business (website design, marketing, copyrights, regulation) |
| 2 | Exams & Exam Review |

### Representative Lab Assignments

- Find a website host and create a webpage shell

- Add formatted text to webpage
- Add images and links to webpage
- Add javascript to webpage
- Add tables to webpage
- Add frames to webpage
- Add response form to webpage

### Representative Grading Plan

| | |
|---|---|
| Homework Assignments (9) | 45% |
| Midterm | 25% |
| Final | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

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| hours) | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bettina Bair

Last modified: 2011-05-06 13:12:30

# CSE 105: Computer-Assisted Problem Solving for Construction Management

### Description

Using productivity software, especially spreadsheets and databases, to solve problems for construction management; relative/absolute cell referencing, logic, functions; relational databases, querying, project integration.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 2 1-1/2-hr lec, 1 2-hr lab | Math 148 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

- Not open to students with credit for CSE 101 or CSE 200

### Intended Learning Outcomes

- Be familiar with computer basics: hardware, software, OS, and communications, including how the internet works.
- Be familiar with designing and testing spreadsheets to aid in estimating construction costs, including cost breakdown summary and detail sheets, making bid comparisons, evaluating development and financing alternatives, and tracking and reporting construction variables of interest such as costs, logistics, labor, etc., all by using spreadsheet features including relative/absolute cell referencing, boolean logic, reference functions, and financial functions.
- Be familiar with basic concepts of a relational database, with setting up a basic relational database including input and output forms, with writing queries to obtain needed information, and with developing reports.
- Be familiar with linking of spreadsheets, databases, word processing, and presentation software to automate the development of reports and presentations.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Shelly Cashman Series for Microsoft Office Bundle Including SAM Software* - Shelly Cashman
- *Course Notes* - Debra Gross (available from Uniprint/Tuttle)

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Intro topics - computer basics |
| 3 | Excel - writing formulas using simple functions and relative/absolute cell addressing |
| 4 | Excel - using Boolean logical functions - AND,OR, NOT, IF |
| 2 | Excel - Solving problems using multiple worksheets |

| | |
|---|---|
| 3 | Excel - using a LOOKUP function |
| 3 | Excel - using financial functions |
| 2 | Excel - charts |
| 2 | Understanding relational database concepts; introduction to MS Access |
| 4 | Access - Writing queries |
| 4 | Access - Writing queries with inner joins |
| 2 | PowerPoint and object linking concepts |
| 2 | Word - including mail merge |
| 1 | Database features of MS Excel |
| 2 | How the internet works and how to create a simple webpage |

### Representative Lab Assignments

- Logging into the system, file managment, email and web browsing
- Solving problems using simple Excel functions and relative/absolute cell referencing
- Solving problems in Excel using Boolean logic functions
- Solving problems using multiple worksheets and financial functions
- Designing your own worksheet solutions to problems - including reference functions
- Creating tables in MS Access
- Querying an Access database
- Using MS Word and MS PowerPoint
- Final project: integrating all tools to solve a construction management problem

### Representative Grading Plan

| | |
|---|---|
| Lab Assignments | 20% |
| Homework | 12% |
| Class Participation | 2% |
| Pop Quizzes | 6% |
| Midterm | 20% |
| Final Project (hands-on lab) | 10% |

| | |
|---|---|
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice |

| | | |
|---|---|---|
| hours) | | as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

| a | b | c | d | e | f | g | h | i | j | k |
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Course Coordinator: Debra Gross

Last modified: 2008-07-29 16:14:59

# CSE 200: Computer Assisted Problem Solving for Business

### Description

Solving business related problems using and integrating productivity software tools. Emphasis on designing spreadsheet solutions to solve problems and using database queries to extract information.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 5 | 2 2-hr lec, 1 2-hr lab | Mathematics placement level L or higher; Math 116 or higher |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Not open to students who have credit for CSE 101

## Intended Learning Outcomes

- Be familiar with computer basics - hardware, software, OS, and communications.
- Master solving problems using simple spreadsheet formulas, functions and relative/absolute cell referencing.
- Be familiar with using Boolean logical functions and constructions - AND, OR, NOT, none-of and only constructs, IF's and nested IF's - in a spreadsheet.
- Be familiar with using reference functions (VLookup, HLookup) in a spreadsheet.
- Be familiar with using financial functions (FV,PV,RATE,PMT,NPER) in a spreadsheet.
- Be familiar with relational databases and database tables.
- Be familiar with querying a database using Access QBE grids to select/filter records, sort, aggregate fields, calculate fields.
- Be familiar with querying a database with multiple tables using inner and outer joins.
- Be familiar with how the internet works, protocol layers, and a setting up a simple webpage.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Course Technology Bundle (includes Excel New Perspectives, Shelly Cashman Access & PowerPoint and SAM CD)*
- *Course Notes* - Debra Gross (available from COP-EZ/Tuttle)

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Computer basics |
| 5 | Spreadsheet basics - formulas, functions, cell addressing |
| 5 | Boolean logic functions |
| 2 | Solving more complex problems including unit conversions and multiple worksheet solutions |
| 3 | Using financial functions |
| 3 | Using reference functions |
| 2 | Introduction to relational databases and database tables |
| 4 | Simple queries |
| 3 | Using queries with inner joins |
| 3 | Solving problems requiring multiple queries and outer joins |

| | |
|---|---|
| 1 | Database features of Excel |
| 3 | Internet topics - protocols and setting up a webpage |
| 2 | Using MS PowerPoint; object linking |

## Representative Lab Assignments

- Lab 1 - Logging on the system, using e-mail and web browsers
- Lab 2- Writing formulas in Excel - relative/absolute cell referencing and simple functions
- Lab 3 - Relational operators and Boolean logical functions
- Lab 4 - Using multiple worksheets in a workbook, solving problems with units
- Lab 5 - Solving large problems - spreadsheet design, reference functions, financial functions
- Lab 6 - PowerPoint
- Lab 7 - Using MS Access tables and simple queries
- Lab 8 - Writing queries with joins
- Lab 9 - Project integration
- Lab 10 - Creating a simple webpage

## Representative Grading Plan

| | |
|---|---|
| Labs | 20% |
| Quizzes | 20% |
| Midterm | 25% |
| Final Exam | 35% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |

| | | |
|---|---|---|
| | | considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

| a | b | c | d | e | f | g | h | i | j | k |
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Course Coordinator: Debra Gross

Last modified: 2011-05-06 13:12:46

# CSE 201: Elementary Computer Programming

### Description

Introduction to computer programming and to problem solving techniques using computer programs; programming lab experience.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | None. |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Java is taught.

### Intended Learning Outcomes

- Master using basic coding features provided by high-level imperative programming languages.
- Master writing computer programs to implement given simple algorithms.
- Be familiar with analyzing simple real-life problems and choosing appropriate algorithms for their solution.
- Be familiar with using basic data structures such as arrays in simple programs.
- Be familiar with using methods and classes to help produce well-structured programs.
- Be familiar with reading and programming for APIÂ’s.
- Be familiar with designing simple text-oriented user interfaces.
- Be familiar with working in a window-based computing environment.
- Be exposed to the services provided by an operating system.
- Be exposed to the virtual machine model of modern computer systems.
- Be exposed to data abstraction concepts and other more advanced programming ideas.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Java: An Introduction to Computer Science & Programming (3rd Edition), Pearson Prentice Hall, 2004, ISBN 0-13-101378-5.* - Savitch, W.,
- *CSE 201 Course Notes, OSU Reprographics, 2005.*

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Course introduction and basic concepts |
| 4 | Primitive types and expressions; String; basic I/O |
| 8 | Flow of control and Boolean expressions |
| 5 | Defining methods |
| 4 | Arrays |
| 4 | Basic exception handling and standard Java I/O |
| 7 | Classes and objects |
| 4 | Midterm and exam reviews |

## Representative Lab Assignments

- Environment walkthrough
- Primitive types, assignment, arithmetic expressions, simple I/O
- Control structures
- Methods
- Arrays
- Standard I/O
- Classes and objects

## Representative Grading Plan

| | |
|---|---|
| Midterm Exam | 20% |
| Final Exam | 30% |
| Homework Assignments | 10% |
| Lab Assignments | 35% |
| Class Participation | 5% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|

| | | |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paolo Bucci

Last modified: 2008-07-29 16:21:13

# CSE 202: Introduction to Programming and Algorithms for Engineers and Scientists

### Description

Introduction to computer programming and to problem solving techniques using computer programs with applications in engineering and the physical sciences; algorithm development; programming lab experience.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | Math 151 |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- C++ is taught

### Intended Learning Outcomes

- Be familiar with using basic C++ constructs: declarations and various statements including loops and conditionals.
- Be familiar with using C++ functions.
- Be familiar with using C++ arrays.
- Be exposed to using C++ structures and classes.
- Be exposed to using pointers.
- Be exposed to using file input/output.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *C++ for Engineers and Scientists* - Bronson, Gary J.

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Structure of simple C++ programs |
| 7 | Control structures: conditionals and loops |
| 7 | C++ functions |
| 6 | Arrays |
| 6 | Structures and classes |
| 3 | Pointers |
| 3 | File I/O |
| 3 | Midterm and review |

### Representative Lab Assignments

- Using Unix
- Writing a simple C++ program using conditionals and (non-nested) loops
- Writing a C++ program using arrays for solving a simple scientific problem
- Program using multiple functions
- Simple program using a simple class

### Representative Grading Plan

| | |
|---|---|
| Programming assignments | 30% |
| Midterm | 30% |
| Finals | 30% |
| Labs (closed labs) | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as |

| | | |
|---|---|---|
| hours) | | well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |

| | | |
|---|---|---|
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Rephael Wenger

Last modified: 2008-07-29 16:22:08

# CSE 203: Computational Thinking in Context: Interactive Animations and Games

### Description

Introduction to computational thinking, focusing on problem solving and programming concepts and skills needed to create interactive graphics, animations, and games; creativity and imagination encouraged.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 1 1-hr lec, 3 1-hr lab | none |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent using basic constructs provided by high-level imperative programming languages: sequencing, selection, and iteration.
- Be familiar with algorithmic thinking.
- Be familiar with procedural composition.
- Be familiar with many of the possibilities available for creative combination in programmed interactive animations.
- Be familiar with using a modern interactive program development environment.
- Be exposed to the virtual machine model of modern computer systems.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Course Notes*

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Course introduction, software installation, first program, and window coordinate system |
| 2 | Basic iteration and movement of sprites |
| 4 | Sequencing and drawing |
| 4 | Continuation conditions and collision detection |
| 3 | User interaction, polled input, and selection |
| 4 | Managing sprite velocities |
| 14 | Course project: discussion and evaluation of preliminary ideas; discussion of problems encountered and possible solutions; presentation and evaluation of final projects |
| 3 | Quizzes on computing fundamentals |
| 3 | Midterm and exam reviews |

## Representative Lab Assignments

- "Create an interesting scene" (placement of sprites and words in the window using its coordinate system; program-controlled drawing using sequencing).
- "Create an interesting animation" (movement of sprites by iterative relocation).
- "Create an interesting animation where something bounces" (collision detection using continuation conditions).
- "Create an interesting interactive situation" (user-influenced movement of sprites using selection).
- Course project: "create an interactive education/information environment or a game".

## Representative Grading Plan

| | |
|---|---|
| Midterm Exam | 10% |
| Quizzes | 10% |

| | |
|---|---|
| Final Exam | 20% |
| Homework Assignments | 10% |
| Lab Assignments | 20% |
| Course Project | 20% |
| Attendance | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| hours) | | professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Wayne Heym

Last modified: 2011-05-06 13:13:04

# CSE 204: Computational Thinking in Context: Digital Images and Sound

### Description

Introduction to computational thinking, focusing on problem solving and programming concepts and skills needed to manipulate digital images and sound; creativity and imagination encouraged.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 2 1-hr lec, 2 1-hr lab | none |

## Quarters Offered

- Wi, Sp

## General Information, Exclusions, Cross-listings, etc.

- Recommended for students with little or no computer programming experience or who are not confident in their programming background.

## Intended Learning Outcomes

- Master using basic constructs provided by high-level imperative programming languages: sequencing, selection, and iteration.
- Be familiar with algorithmic thinking.
- Be familiar with simple media manipulation algorithms and how to apply them to solve interesting media manipulation problems.
- Be familiar with using basic data structures such as arrays in simple programs.
- Be familiar with procedural composition.
- Be familiar with working in a window-based computing environment.
- Be exposed to the virtual machine model of modern computer systems.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Computing and Programming in Python: A Multimedia Approach, Pearson Prentice Hall, 2005, ISBN 0-13-117655-2.* - Mark Guzdial

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Course introduction and basic concepts |
| 4 | Introduction to programming with media, images, colors, encodings |
| 4 | Loops, new definitions, simple image manipulations |
| 10 | Nested loops, conditionals, Boolean expressions, advanced image manipulations |
| 8 | Arrays, sound encoding, manipulation, and synthesis |
| 5 | Movies, animations |
| 3 | Topics in computer science |
| 4 | Midterm, quizzes, and exam reviews |

### Representative Lab Assignments

- Make a collage of several pictures using various transformations
- Compose an audio collage from natural and synthesized sounds
- Generate an animation, e.g., using digital image techniques learned earlier
- Reproduce an interesting digital image effect from Photoshop/Gimp

### Representative Grading Plan

| | |
|---|---|
| Quizzes | 10% |
| Midterm Exam | 15% |
| Final Exam | 25% |
| Homeworks | 10% |
| Closed Lab | 20% |
| Projects | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |

| | | |
|---|---|---|
| hours) | | |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paolo Bucci

Last modified: 2008-07-29 16:23:14

# CSE 205: Computational Thinking in Context: Science and Engineering

### Description

Introduction to computational thinking, focusing on problem solving and programming concepts and skills using examples from science and engineering.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | Math 151 or equivalent |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

- Recommended for students with little or no computer programming experience.
- Primarily targeted at undergraduate students majoring in science/engineering disciplines.
- MATLAB is taught.

## Intended Learning Outcomes

- Master using basic constructs provided by high-level imperative programming languages: sequencing, selection, and iteration.
- Be familiar with algorithmic thinking.
- Be familiar with use of computational approaches to solving problems in science and engineering.
- Be familiar with using basic data structures such as arrays.
- Be familiar with procedural composition.
- Be exposed to computational science concepts, including simulation, optimization, and data analysis.
- Be exposed to computational complexity and performance issues.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Scientific Computation and Programming* - Daniel T. Kaplan

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Course introduction and basic concepts |
| 5 | Introduction to MATLAB; vectors and matrices; variables and assignment |
| 10 | Sequencing, iteration, selection, simple algorithms |
| 6 | Compound selection, nested iteration, composition of constructs |
| 6 | Sound encoding, manipulation, and synthesis |

| | |
|---|---|
| 4 | Data visualization |
| 3 | Topics in computational complexity and performance optimization |
| 4 | Midterm, quizzes, and exam reviews |

### Representative Lab Assignments

- Conditionals and Loops: N-Body Simulation
- Digital Audio: Simulate Plucking of a Guitar String
- Arrays: DNA Sequence Alignment
- Data Analysis and Vizualization: US Election Voting Trends

### Representative Grading Plan

| | |
|---|---|
| Quizzes | 10% |
| Midterm Exam | 15% |
| Final Exam | 25% |
| Homeworks | 10% |
| Closed Labs | 20% |
| Open Lab Assignments | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: P Sadayappan

Last modified: 2010-02-25 22:21:02

# CSE 214: Data Structures for Information Systems

## Description

Subroutines and modular programming; searching; basic data structures; recursion; introduction to sequential files.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 cl, 1 3-hr lab | 201 |

## Quarters Offered

- Au, Wi, Sp

## General Information, Exclusions, Cross-listings, etc.

- Java is used.

## Intended Learning Outcomes

- Be familiar with modular design and structured programming techniques.
- Be familiar with commonly used data structures.
- Be familiar with how to design and implement abstract data types.
- Be familiar with sequential file I/O.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Lecture Notes* - Instructor

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 8 | Object-oriented programming |
| 4 | Recursion |

| | |
|---|---|
| 8 | Sorting and binary search |
| 6 | Linked lists |
| 3 | Stacks |
| 3 | Queues |
| 4 | Binary trees |
| 4 | Quizzes, exams, and review |

### Representative Lab Assignments

- Manipulating strings and file I/O
- Towers of Hanoi using recursion
- Sorting and recursion
- Linked lists and databases
- Trees and traversals

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 10% |
| Labs | 25% |
| Quizzes | 10% |
| Midterm Exam | 20% |
| Final Exam | 35% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, |

| | | |
|---|---|---|
| hours) | | social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Jeremy John Morris

Last modified: 2008-07-29 16:24:41

# CSE 221: Software Development Using Components

### Description

Component-based software from client programmer's perspective; intellectual foundations of software engineering; mathematical modeling; specification of object-oriented components; layering; testing and debugging layered operations.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 cl, 1 1-hr lab | Math 151/H151 or 161/H161 or H190; 201 or 202 or 203 or 204 or 205 or En Graph 167 or Eng H192 or CS&E Placement Level A |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with using basic C++ control structures and statements, the basic classes Boolean, Character, Integer, Real, Text, Character_IStream, Character_OStream, and related RESOLVE/C++ principles for clients, to write simple main programs and layered implementations of operations.
- Be familiar with using the computing environment (operating system, tools, language system, etc.) to complete lab assignments and to communicate electronically with others.
- Be familiar with using the Id_Name_Table and Natural_Number classes to write simple main programs and layered implementations of operations.
- Be familiar with using simple recursion to write layered implementations of operations.
- Be familiar with using simple predicate calculus assertions involving mathematical integer, string, and tuple models to understand and reason about an operation's behavior.
- Be familiar with using simple techniques to test layered implementations of operations, including developing and carrying out simple specification-based test plans.
- Be familiar with using simple techniques to debug layered implementations of operations.
- Be exposed to writing simple predicate calculus assertions involving mathematical integer, string, and tuple models to describe the intended behavior of an operation.
- Be exposed to using induction arguments to establish the correctness of recursive implementations of operations.
- Be exposed to using templates for generalization of component functionality.
- Be exposed to using basic algorithm analysis techniques and notations to analyze and express execution time of operations whose implementations involve straight-line code and simple loops.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *CSE 221: Software Development Using Components: Getting Started* - Timothy J. Long

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Introductory material and computing environment |
| 6 | Component descriptions from client perspective |
| 8 | Specification and use of Text, Id_Name_Table, and Natural_Number components |
| 3 | Extensions and checking components |
| 2 | Testing |
| 2 | Debugging |
| 2 | Performance analysis |
| 2 | Iteration |
| 2 | Recursion |
| 3 | Fundamental algorithms such as fast powering and binary search/interval halving |
| 2 | Templates for generalization |
| 4 | Exams and review |

## Representative Lab Assignments

- Home page
- Text operations
- Remove first word from a Text string
- Id_Name_Table client: Enigma machine
- Recursive implementation of Text operations
- Natural Number power, root, and calculator display

## Representative Grading Plan

| | |
|---|---|
| Midterm exam | 18% |

| | |
|---|---|
| Final exam | 30% |
| Homework assignments | 5% |
| Closed lab assignments | 8% |
| Lab assignments | 23% |
| In-class activities | 16% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

| a | b | c | d | e | f | g | h | i | j | k | l | m | n |
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Course Coordinator: Bettina Bair

Last modified: 2011-07-18 09:43:03

# CSE H222: Development of Software Components

### Description

Templates for generalization and decoupling; container components; component-based software from implementer's perspective; data representation using layering and using pointers.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | 221 |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master using the computing environment (operating system, tools, language system, etc.) to complete lab assignments.
- Master using C++ class templates and classes, and related RESOLVE/C++ principles for clients, to write layered implementations of operations.
- Master using simple recursion to write layered implementations of operations.
- Master using simple techniques to test layered implementations of operations, including developing and carrying out simple specification-based test plans.
- Master using simple techniques to debug layered implementations of operations.
- Be familiar with using the Array, Binary_Tree, List, Partial_Map, Queue, Record, Representation, Sequence, Set, Sorting_Machine, and Stack templates to write application programs and/or component implementations.
- Be familiar with using basic C++ control structures and statements, RESOLVE/C++ class templates and classes, and related RESOLVE/C++ principles for clients and implementers, to write bodies of component realizations with layered data representations.
- Be familiar with writing code that uses dynamic storage management and pointers for components that define new types with simple "raw C++" linked data representations.
- Be familiar with using basic algorithm analysis techniques and notations to analyze and express execution time of operations whose implementations involve straight-line code and simple loops.
- Be familiar with using simple formal logic assertions involving mathematical set models to understand and reason about an operation's behavior.
- Be familiar with using simple techniques to test implementations of class templates that define new types, including developing and carrying out simple specification-based test plans.
- Be familiar with using simple techniques to debug implementations of class templates that define new types.
- Be exposed to using data representation conventions ("representation invariants") and correspondences ("abstraction relations") to reason about correctness of data representations.
- Be exposed to using the RESOLVE/C++ principles for interface designers to guide the choice of mathematical model and operation behavior of a new software component.
- Be exposed to using loop invariants to reason about loop behavior [not achieved during 9-week quarters].

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Software Component Engineering with Resolve/C++, volumes 2 and 3* - Weide, B.W., OSU UniPrint, 2007.

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Review of generalization using templates and template instantiation |
| 3 | Decoupling using templates; utility classes |
| 3 | How recursion works; Partial_Map and its many uses |
| 6 | Implementer's view; data representation using other objects; representation invariant and abstraction relation; commutative diagram and correctness of data representation |
| 3 | Hashing |
| 3 | Binary trees; binary search trees |
| 6 | Pointers and dynamic storage allocation and deallocation; singly linked and doubly linked list data structures |
| 3 | Review and exams |

### Representative Lab Assignments

- E-mail classifier
- Automated glossary generation
- Partial_Map represented using Array of Queues of Records and hashing
- Partial_Map represented using binary search tree
- List represented using "raw C++" pointers

### Representative Grading Plan

| | |
|---|---|
| Midterm Exam | 20% |
| Final Exam | 30% |
| Homework Assignments | 10% |
| Closed Lab Assignments | 8% |
| Lab Assignments | 30% |
| Class Participation | 2% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice |

| | | |
|---|---|---|
| hours) | | as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bruce Weide

Last modified: 2011-05-06 13:14:00

# CSE 222: Development of Software Components

### Description

Templates for generalization and decoupling; container components; component-based software from implementer's perspective; data representation using layering and using pointers.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | 221 |

### Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using the computing environment (operating system, tools, language system, etc.) to complete lab assignments.
- Be competent with using C++ class templates and classes, and related RESOLVE/C++ principles for clients, to write layered implementations of operations.
- Be competent with using simple recursion to write layered implementations of operations.
- Be competent with using simple techniques to test layered implementations of operations, including developing and carrying out simple specification-based test plans.
- Be competent with using simple techniques to debug layered implementations of operations.
- Be familiar with using the Array, Binary_Tree, List, Partial_Map, Queue, Record, Representation, Sequence, Set, Sorting_Machine, and Stack templates to write application programs and/or component implementations.
- Be familiar with using basic C++ control structures and statements, RESOLVE/C++ class templates and classes, and related RESOLVE/C++ principles for clients and implementers, to write bodies of component realizations with layered data representations.
- Be familiar with writing code that uses dynamic storage management and pointers for components that define new types with simple "raw C++" linked data representations.
- Be familiar with using basic algorithm analysis techniques and notations to analyze and express execution time of operations whose implementations involve straight-line code and simple loops.
- Be familiar with using simple formal logic assertions involving mathematical set models to understand and reason about an operation's behavior.
- Be familiar with using simple techniques to test implementations of class templates that define new types, including developing and carrying out simple specification-based test plans.
- Be familiar with using simple techniques to debug implementations of class templates that define new types.
- Be exposed to using data representation conventions ("representation invariants") and correspondences ("abstraction relations") to reason about correctness of data representations.
- Be exposed to using the RESOLVE/C++ principles for interface designers to guide the choice of mathematical model and operation behavior of a new software component.
- Be exposed to using loop invariants to reason about loop behavior [not achieved during 9-week quarters].

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Software Component Engineering with Resolve/C++, volumes 2 and 3* - Weide, B.W., OSU UniPrint, 2007.

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Review of generalization using templates and template instantiation |
| 3 | Decoupling using templates; utility classes |

| | |
|---|---|
| 3 | How recursion works; Partial_Map and its many uses |
| 6 | Implementer's view; data representation using other objects; representation invariant and abstraction relation; commutative diagram and correctness of data representation |
| 3 | Hashing |
| 3 | Binary trees; binary search trees |
| 6 | Pointers and dynamic storage allocation and deallocation; singly linked and doubly linked list data structures |
| 3 | Review and exams |

### Representative Lab Assignments

- E-mail classifier
- Automated glossary generation
- Partial_Map represented using Array of Queues of Records and hashing
- Partial_Map represented using binary search tree
- List represented using "raw C++" pointers

### Representative Grading Plan

| | |
|---|---|
| Midterm Exam | 20% |
| Final Exam | 30% |
| Homework Assignments | 10% |
| Closed Lab Assignments | 8% |
| Lab Assignments | 30% |
| Class Participation | 2% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |

| | | |
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| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates |

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| hours) | | comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bruce Weide

Last modified: 2011-05-06 13:14:15

# CSE 230: Introduction to C++ Programming

### Description

Introduction to programming in C++ and object-oriented programming; encapsulation using classes, inheritance, etc.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 cl, 1 3-hr lab | 201, 202, or En Graph 167 or equiv |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be familiar with concepts of object-oriented programming and abstraction mechanisms.
- Master the concepts of classes, member functions and variables, constructors, destrctors, inheritence, and access mechanisms.
- Master the concepts of prototype functions, functions, parameters, return values, overloading, and operators.
- Be familiar with control structures, dynamic memory allocation, arrays, and pointers.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Problem Solving with C++* - Walter Savitch

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Introduction to course computing environment |
| 4 | Basic features, getting started, basic data types |
| 4 | Advanced data types, functions without returned values |
| 4 | Classes, members, constructors |
| 4 | Friends, destructors, returned values in functions |
| 4 | Operators |
| 4 | Inheritance |
| 8 | Flow of control, dynamic memory allocation, arrays and pointers |
| 4 | Reviews and midterm exam |

## Representative Lab Assignments

- Arrays and functions
- Classes
- Projects
- I/O streams
- Inheritance

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 30% |
| Midterm | 30% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

| | | |
|---|---|---|
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Gojko Babic

Last modified: 2005-04-08 08:07:25

# CSE 294: Group Studies

### Description

This course is designed to give the student an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1-5 | Arr. | |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

### Representative Topics List

| Number of Hours | Topic |
|---|---|

### Representative Lab Assignments

### Representative Grading Plan

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| | d | an ability to function on multi-disciplinary teams; |
| | e | an ability to identify, formulate, and solve engineering problems; |
| | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| | g | an ability to communicate effectively with a range of audiences; |
| | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| | j | a knowledge of contemporary issues; |
| | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |

| | | |
|---|---|---|
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

Course Coordinator:

Last modified: 2005-04-06 10:37:58

# CSE 294P: Computational Thinking in Context: Science and Engineering

### Description

Introduction to computational thinking, focusing on problem solving and programming concepts and skills using examples from science and engineering.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | Math 151 or equivalent |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Recommended for students with little or no computer programming experience.
- Primarily targeted at undergraduate students majoring in science/engineering disciplines.
- MATLAB is taught.

### Intended Learning Outcomes

- Master using basic constructs provided by high-level imperative programming languages: sequencing, selection, and iteration.
- Be familiar with algorithmic thinking.
- Be familiar with use of computational approaches to solving problems in science and engineering.
- Be familiar with using basic data structures such as arrays.
- Be familiar with procedural composition.
- Be exposed to computational science concepts, including simulation, optimization, and data analysis.
- Be exposed to computational complexity and performance issues.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Scientific Computation and Programming* - Daniel T. Kaplan

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Course introduction and basic concepts |
| 5 | Introduction to MATLAB; vectors and matrices; variables and assignment |
| 10 | Sequencing, iteration, selection, simple algorithms |
| 6 | Compound selection, nested iteration, composition of constructs |
| 6 | Sound encoding, manipulation, and synthesis |
| 4 | Data visualization |
| 3 | Topics in computational complexity and performance optimization |
| 4 | Midterm, quizzes, and exam reviews |

### Representative Lab Assignments

- Conditionals and Loops: N-Body Simulation
- Digital Audio: Simulate Plucking of a Guitar String
- Arrays: DNA Sequence Alignment
- Data Analysis and Vizualization: US Election Voting Trends

### Representative Grading Plan

| | |
|---|---|
| Quizzes | 10% |
| Midterm Exam | 15% |
| Final Exam | 25% |
| Homeworks | 10% |
| Closed Labs | 20% |
| Open Lab Assignments | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice |

| | | |
|---|---|---|
| hours) | | as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: P Sadayappan

Last modified: 2008-07-29 16:25:31

# CSE 314: Business Programming with File Processing

### Description

Business data processing principles and programming: sequential file processing algorithms, sorting, data validation. COBOL is taught.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 cl | 214 |

### Quarters Offered

- Au, Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master the following algorithms: single and multiple control breaks; matching, verification, and merge/purge; 1- and 2-dimensional tables.

- Master the designing and coding of well-structured COBOL programs and subprograms to process sequential files using any or all of the following program design tools: system flowcharts, hierarchy (structure) charts, flowcharts, pseudocode, print or screen charts.
- Be familiar with the COBOL reference card.
- Be familiar with debugging techniques including using the COBOL debugger.
- Be exposed to testing and data validation techniques.
- Be exposed to the definition, use and creation of makefiles.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *COBOL for the 21st Century* - Stern, Stern & Ley

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Vocabulary; columns; margins; basic coding rules; typing in, compiling and running a COBOL program |
| 3 | Identification and environment division; data names; symbols; data division - file section; working storage; picture clauses; value clauses; group items; literals; constants; figurative constants; non-numeric literals; procedure division statements w/ file I/O (open, close, read, write); move statement (simple) |
| 3 | Perform statement (simple); putting it together; display; accept omitted; stop run; move statement rules; edited I/O |
| 3 | Compute and other arithmetic statements; accept time and date; scope terminators |
| 3 | Control structures; relational operators and relational expressions, sign and class tests; logical operators (AND,OR, NOT); implied conditions; condition names; evaluate statement |
| 6 | Single control break algorithm; string, unstring; double control break algorithm; debugging techniques; perform statement variations |
| 3 | Redefines; initialize; 2-dimensional tables; sort logic |
| 6 | Subprograms; sort/merge files; makefiles; testing and data validation techniques; additional sequential processing issues |

## Representative Lab Assignments

- Lab1 - Type in, compile and run a given COBOL program
- Lab2 - Simple report style COBOL program
- Lab3 - Arithmetic statements and Edited I/O

- Lab4 - Single Control Break
- Lab5 - Double Control Break
- Lab6 - Table (i.e., Array) processing
- Lab7 - Sort, Search, Merge and Makefiles

### Representative Grading Plan

| | |
|---|---|
| Participation | 5% |
| Quizzes | 10% |
| Midterm Exam | 25% |
| Projects | 30% |
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Kathryn Reeves

Last modified: 2008-07-29 16:26:03

# CSE 321: Case Studies in Component-Based Software

### Description

Case studies using: tree and binary tree components and binary search trees; context-free grammars; tokenizing, parsing, and code generating components; sorting components and sorting algorithms.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 1-hr lec, 1 1-hr lab | 222/H222. Prereq or concur: Math 366 or Math 345 |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master using the computing environment (operating system, tools, language system, etc.) to complete programming projects and to communicate electronically with others.
- Be competent with using RESOLVE/C++ class templates and classes, and related RESOLVE/C++ principles for clients and implementers, to build new components with layered data representations.
- Master using simple techniques to debug implementations of class templates.
- Be competent with using layering of software components to implement a large programming project.
- Be familiar with using conventions ("representation invariants") and correspondences ("abstraction relations") to reason about layered data representations.
- Be familiar with using the RESOLVE/C++ principles for interface designers to guide the choice of mathematical model and operation behavior of a new software component.
- Be familiar with using simple techniques to test implementations of class templates including developing and carrying out simple specification-based and code-based test plans.
- Be familiar with using context-free grammars and languages to specify syntax.
- Be familiar with using recursive descent to process context-free languages.
- Be familiar with using state-transition diagrams to tokenize languages.
- Be familiar with using tokenizing software components and their implementations.
- Be familiar with implementing insert, delete, and search algorithms for binary search trees.
- Be familiar with using Tree template as a client.
- Be familiar with using Sorting_Machine template as a client and as an implementer.
- Be familiar with important classical sorting algorithms as implementations of Sorting_Machine template.
- Be familiar with using basic algorithm analysis techniques and notations to analyze and express execution time.
- Be familiar with working as part of a team to implement a large programming project.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Software Component Engineering, McGraw-Hill, 2000.* - Weide, B.W.
- *CSE 321 Course Packet, OSU Uniprint, 2011.*

## Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 1 | Course introduction (The course description is somewhat outdated but is not being updated due to calendar constraints. The correct description is: Case studies using tree, tokenizing, parsing, and code generating components; context-free grammars; sorting components and sorting algorithms; design of software components. RESOLVE/C++ is used.) |
| 5 | Sorting and Sorting_Machine component |
| 4 | Project intro; Convention/Correspondence; Tree component |
| 6 | Statement and Program components |
| 5 | Context-free grammars; Recursive descent parsers |
| 4 | BL ("Bugs Language") program execution; Code generation |
| 4 | BL_Tokenizing_Machine component |
| 7 | Resolve/C++ model of software; design and implementation of a new component family |
| 2 | Performance analysis |
| 2 | Exams and review |

### Representative Lab Assignments

- Heapsort implementation of Sorting_Machine
- Implementation of Statement and Pretty_Print
- Parser for Program/Statement
- Code generator for Program
- Implementation of BL_Tokenizing_Machine
- Design/implementation of new component family and tag cloud generator

### Representative Grading Plan

| | |
|---|---|
| Midterm Exam | 20% |
| Final Exam | 30% |
| Homework Assignments | 10% |
| Closed Lab Assignments | 8% |
| Lab Assignments | 30% |
| Class Activities/Participation | 2% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice |

| | | |
|---|---|---|
| hours) | | as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paolo Bucci

Last modified: 2011-05-06 13:14:49

# CSE 360: Introduction to Computer Systems

### Description

Introduction to computer architecture at the machine language and assembler language level; assembler language programming and lab.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 4 | 3 cl, 1 3-hr lab | 214 or 222/H222 |

### Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using the fundamentals of computer instruction set architectures, including registers and RISC addressing modes.
- Be competent with using basic machine representations of data structures, including signed integers, character strings, stacks, records, and linked lists.
- Be familiar with using register transfer language (RTL) to describe an implementation, in the CPU's Timing and Control subunit, of a machine instruction.
- Be familiar with using machine language instruction encoding.
- Be familiar with input and output techniques at the I/O driver level.
- Be familiar with using low level algorithms for data manipulation and conversion.
- Be familiar with using parameter passing techniques at the assembly language level.
- Be exposed to using CISC addressing modes and instruction encodings of varying lengths, gleaning such information from a published table of instructions.
- Be exposed to using concepts of interrupt processing.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Systems: Architecture, Organization, and Programming* - Arthur B. Maccabe
- *A Laboratory Manual for the SPARC* - Arthur B. Maccabe, Jeff Vandyke, Wayne D. Heym
- *M68HC11 E Series: HCMOS Microcontroller Unit, Section 3 Central Processing Unit* - Motorola, Inc.

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Course introduction; A Little computer hardware history; Positional number systems; Base conversion |
| 2 | Signed integers; Signed arithmetic |
| 2 | Characters and strings; ASCII; Unicode; Variable-length encoding (Huffman); Expected code length; Parity; Hamming distance |
| 1 | Instructional SPARC emulator |
| 1 | Basic components; Addition in hardware; DEC PDP-11 video |
| 2 | von Neumann architecture; Memory subsystem |
| 4 | A simple instruction set; Data paths and control points; Instruction fetch/execute; Register transfer language (RTL); Implementing new instructions |

| | |
|---|---|
| 2 | Instruction formats: 0,1,2,3-address machines, registers; CISC vs. RISC; Load/store architectures; pipelining |
| 3 | SPARC assembly language; synthetic instructions; operands; extended operations (traps); flow of control; conditional branch; condition codes; ALU hardware; High level control; loops; complex condition expressions |
| 2 | SPARC instruction encoding; Bit manipulation: masks, shifts, arithmetic shifts; SPARC smul, sdiv, %y register |
| 3 | Midterm exam; pre-exam review; post-exam recap |
| 4 | Addressing modes: immediate, register direct, memory direct, memory indirect, register indexed (array mapping functions), register displaced (records), pre- and post- increment and decrement |
| 5 | Subroutines: terminology (linkage, parameters, conventions), register-based linkage, pass by value/reference/value-result, stack -based linkage (nested calls, recursion) |
| 2 | Motorola M68HC11 (used in ECE 567): compared with SPARC, addressing modes, example program |
| 3 | OS extended operations and exceptions (traps); programmed vs. interrupt-driven I/O; isolated vs. memory-mapped I/O; UARTs; interrupt handlers; DMA transfers |
| 1 | Pre-final exam review |
| 1 | University holiday during most terms |

## Representative Lab Assignments

- Simulate in SPARC (with only sequential control flow) a specific program for the simple accumulator machine (SAM), according to the RTL in SAM's timing and control
- Simulate in SPARC, via instruction and operand decoding, any given SAM program
- Refactor student's own previous program, placing key parts of the code into leaf subroutines, which use register-based linkage

## Representative Grading Plan

| | |
|---|---|
| Homeworks (6) | 25% |
| Labs (3) | 25% |
| Midterm examination | 20% |
| Final examination | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

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| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bettina Bair

Last modified: 2011-05-06 13:15:00

# CSE 421: Software Development in Java

### Description

Introduction to professional software development in Java; tools for coding, testing, version control, documentation; language-specific best practices stemming from principles of component-based design.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 1-hr lectures | 321 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master core Java language features including: objects, classes, interfaces, inheritance, and exceptions
- Be competent with core SDK packages including: collections framework, logging, and IO

- Be competent with core best practices for component-based development including: separation of abstract state and concrete representation and coding to the interface
- Be competent with the use of a modern IDE, such as Eclipse
- Be familiar with advanced language features including: iterators, generics, and assertions
- Be familiar with foundations of an object-oriented paradigm, in particular: encapsulation, inheritance, and polymorphism
- Be familiar with the application of design patterns including: immutable objects, factories, and singleton objects
- Be familiar with best practices with regards to object equality, object cloning, and checked/unchecked exceptions
- Be familiar with CVS, JUnit, and Javadoc
- Be exposed to advanced SDK packages including: Swing for GUIs and network programming
- Be exposed to exotic language features including: nested classes, nested interfaces, and annotations

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Big Java* - Cay Horstmann
- *Effective Java Programming Language Guide* - Bloch

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Overview: compilation, primitive types, reference semantics |
| 9 | Language: Objects and classes, packages, generics, inheritance, interfaces, exceptions, reflection, garbage collection, nested classes, annotations. |
| 5 | Packages: Collections, Logging, IO, Swing, Network Programming |
| 5 | Best Practices: equality, cloning, immutable objects, exceptions |
| 2 | Patterns: factories, singletons |
| 6 | Tools: Eclipse, CVS, Junit, Javadoc |

## Representative Lab Assignments

- Implementing, testing, and documenting an arbitrary-sized natural number type (BigNatural)
- GUI for data mining using Swing
- N-gram generator using the collections framework

### Representative Grading Plan

| | |
|---|---|
| Individual assignments | 50% |
| Team assignments | 20% |
| Exam | 25% |
| Participation | 5% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

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| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paul Sivilotti

Last modified: 2011-05-06 13:15:11

# CSE 459: Programming Languages for Programmers

### Description

Elementary language constructs of various programming languages for students who are well versed in programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

## Quarters Offered

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## General Information, Exclusions, Cross-listings, etc.

- Generic course number; see decimal subdivisions for offering details.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |

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| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

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# CSE 459.11: The UNIX Programming Environment

### Description

Introduction to the UNIX programming environment including: shell programming (csh); regular expressions; makefiles; grep, sed, and awk programming languages.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
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### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be familiar with csh programming.
- Be familiar with UNIX regular expressions.
- Be familiar with using basic sed commands.
- Be familiar with using awk commands to filter through data files.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Recommended: UNIX in a Nutshell, A Desktop Quick Reference for SVR4 and Solaris 7, 3rd Edition* - Arnold Robbins
- *Recommended: UNIX SHELLS by Example, 3rd Edition* - Ellie Quigley

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction |
| 2 | C Shell: filename metacharacters, i/o redirection, command history, building complex command, job/process control, directory control |
| 3 | C Shell programming: script introduction, script examples, debugging scripts |
| 2 | Regular expressions in Unix (grep) |
| 2 | make, sed, awk |

### Representative Lab Assignments

- Working with environment variables, command history
- Simulating the "trash" basket of Windows/Mac
- Cleaning up the "trash basket"
- Use grep, sed and awk to process some text files
- Lab using make

### Representative Grading Plan

| | |
|---|---|
| Labs: 5 at 20% each; 65% required to pass the course). | 100% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 | l | an ability to analyze a problem, and identify and define the computing requirements |

| | | |
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| hours) | | appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Some contribution (1-2 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Prasun Sinha

Last modified: 2011-05-06 13:15:29

# CSE 459.21: Programming in C

### Description

Elementary language constructs of C for students well versed in programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | 314 or 321 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with using the most common C language constructs.
- Be competent with using some techniques for avoiding typical C programming errors.
- Be exposed to useful system-level functions provided by the C library.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *The C Programming Language* - B. Kernighan and D. Ritchie

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Overview and introduction |
| 2 | Functions and program structure; external variables; .h/.c files; pre-processor directives. |
| 2 | Structures and arrays |
| 2 | Pointers, memory allocation, deallocation |
| 2 | I/O, system calls |

## Representative Lab Assignments

- C control structures
- Processing strings
- Header files, splitting program into multiple files
- More complex data structures (structs, linked lists, etc.)

## Representative Grading Plan

| | |
|---|---|
| Programming labs | 85% |
| Class attendance | 15% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |

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| | | considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Significant contribution (7+ hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Neelam Soundarajan

Last modified: 2011-05-06 13:15:38

# CSE 459.22: Programming in C++

## Description

Elementary language constructs of C++ for students well versed in programming.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | 321 |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using C++ classes, member functions, constructors, destructors etc.
- Be competent with using templates and the C++ standard template library (STL).
- Be familiar with using inheritance.
- Be exposed to using virtual functions, dynamic dispatch.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *The C++ Programming Language* - B. Stroustrup

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction: compiling and running C++ programs (including use of .h and .cpp files) using g++; brief overview of simple types in C++, arrays, classes, address types (pointers and references) |
| 1 | Distinction between objects and classes; compile-time picture vs. runtime; data members are per object; member functions are invoked on objects; special case: static members (both data and functions) |

| | |
|---|---|
| 2 | Stack versus heap objects; automatic vs. explicit creation; constructors and destructors; creation and deletion; examples with constructors, destructors, static members, using new, delete; "this" pointer; example of a class using pointers (such as doubly linked lists or trees, etc.) |
| 3 | Inheritance, public versus private versus protected; overriding, vitual methods, pure virtual methods, abstract classes; virtual vs. non-virtual methods |
| 1 | Function and operator overloading; friends? |
| 1 | Exceptions; namespaces |
| 1 | Templates, using example from STL |

### Representative Lab Assignments

- Simple example involving a few simple classes
- Example involving use of constructors, destructors
- Example involving pointers, new, delete, "this" variable
- Simple example involving inheritance, virtual methods

### Representative Grading Plan

| | |
|---|---|
| Programming labs | 85% |
| Class attendance/participation | 15% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some | e | an ability to identify, formulate, and solve engineering problems; |

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|---|---|---|
| contribution (1-2 hours) | | |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Neelam Soundarajan

Last modified: 2011-05-06 13:15:46

# CSE 459.23: Programming in Java

## Description

Elementary language constructs of Java for students who are well versed in programming.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | 321 |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using basic Java constructs.
- Be familiar with using simple parts of the Java core packages.
- Be familiar with using interfaces, inheritance.
- Be familiar with using Java collections (sets, lists, maps).
- Be exposed to nested classes; garbage collection.
- Be exposed to exceptions, Swing, and Java networking facilities.
- Be exposed to Java documentation.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *The Java Programming Language* - Arnold, Gosling, and Holmes

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Overview |
| 2 | Classes and objects; garbage collection |
| 2 | Extending classes; interfaces |
| 1 | Collections (sets, lists, maps) |
| 1 | Exceptions, I/O |
| 1 | Swing (GUI classes) |

| | |
|---|---|
| 1 | Networking |
| 1 | Java documentation; nested classes |

### Representative Lab Assignments

- Simple lab involving a few simple classes
- Lab involving interfaces, extending classes
- Lab involving collection classes
- Simple lab involving networking

### Representative Grading Plan

| | |
|---|---|
| Programming labs | 85% |
| Class attendance/participation | 15% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| | | and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paul Sivilotti

Last modified: 2011-05-06 13:15:58

# CSE 459.24: Programming in C#

### Description

Elementary language constructs of C# for students who are well versed in programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| U | 1 | 1 cl | 321 |

## Quarters Offered

- Wi

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using basic C# constructs.
- Be competent with using C# delegates and events.
- Be familiar with using language interfaces, and inheritance in C#.
- Be familiar with using .NET collections (sets, lists, dictionaries).
- Be exposed to the Common Language Runtime (CLR), garbage collection, and assemblies.
- Be familiar with GUI programming on Windows.
- Be exposed to C# documentation and community web sites.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *C# 3.0 in a Nutshell* - Albahari

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Overview |
| 2 | Classes and objects; garbage collection |
| 2 | Extending classes; programming to interfaces |
| 1 | Generics; Collections (sets, lists, maps). |
| 1 | Iterators; Exceptions |
| 1 | Forms (GUI classes) |
| 1 | Lambda expressions and LINQ |
| 1 | C# documentation and resources |

### Representative Lab Assignments

- Simple lab involving a few simple classes
- Lab involving interfaces, extending classes
- Lab involving generic collection classes
- Simple lab involving a GUI.

### Representative Grading Plan

| | |
|---|---|
| Programming labs | 45% |
| Quizes | 45% |
| Class attendance/participation | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| contribution (3-6 hours) | | professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Roger Crawfis

Last modified: 2011-05-06 13:16:08

# CSE 459.31: Programming in Lisp

### Description

Elementary language constructs of Lisp for students well versed in programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | 314 or 321 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with basic components of Common Lisp, such as s-expressions, data structures, and program flow.
- Be familiar with the Lisp family of programming languages, with particular emphasis on ANSI Common Lisp.
- Be familiar with the Lisp top-level and debugger.
- Be exposed to the functional programming paradigm.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *ANSI Common Lisp* - Paul Graham

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction |
| 2 | Data structures |
| 2 | Program control and structure |
| 1 | Functions |
| 1 | I/O and symbols |
| 1 | Numbers and macros |
| 2 | Advanced topics, style, tricks, and review. |

### Representative Lab Assignments

- Write a recursive function which will collapse a list, accepting a list of atoms or lists of arbitrary depth as a parameter and returning a list of atoms, e.g., (collapse '(a b (c (d) ((e) f))) should return (a b c d e f).
- Write a function find equivalents, e.g., (equiv-classes '((a b) (b c) (d e))) should return ((a b c) (d e)), without using iteration or assignment.
- Write a program useful for some real application demonstrating understanding of data structures. Past examples include a wine catalog and food pairing program, a video game, and a graphics manipulation program.

### Representative Grading Plan

| | |
|---|---|
| Introductory and basic skill-building labs | 60% |
| Labs for solving real problems with Lisp as the implementation language | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

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|---|---|---|
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: James William Davis

Last modified: 2011-05-06 13:16:18

# CSE 459.41: Programming in COBOL

### Description

Elementary language constructs of COBOL for students well versed in programming.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | 321 |

### Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with the syntax involved in writing simple COBOL programs.
- Be familiar with the reasons for implementing and using COBOL code.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *COBOL for the 21st Century* - Stern, Stern & Ley

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | COBOL history and overview; divisions, sections, paragraphs, column coding rules, data names, select statement |
| 1 | Data division, data types, figurative and literal constants, file section, working storage section, fd, pic clauses, value clauses |
| 3 | Procedure division, open/close statements, read/write/move statements, arithmetic statements, simple conditions, perform statement, stop run statement, arithmetic operations, display and accept statements, if/evaluate statements, complex conditions, data validation |
| 2 | Edited input and output, tables, subscripts, perform/varying, indexes, set statement |
| 2 | Sort, search, merge and subprograms |
| 1 | Advanced file processing issues |

## Representative Lab Assignments

- Lab1 - Type in, compile and run given program
- Lab2 - Report style output including arithmetic operations
- Lab3 - Tables, data validation and data editing
- Lab4 - Sort/Search techniques and subprograms

## Representative Grading Plan

| | |
|---|---|
| Programming assignments | 80% |
| Final Exam | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |

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| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Kathryn Reeves

Last modified: 2011-05-06 13:16:27

# CSE 459.51: Programming in Perl

### Description

Basic syntax of the Perl programming language; several common applications including text and file processing.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
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### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with Perl's data types.
- Be competent with text and file manipulations using Perl.
- Be competent with combining Perl's mechanisms and techniques to solve complex, practical problems.
- Be familiar with using DBI to access a database.
- Be familiar with basic CGI scripts written in Perl.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Learning Perl, 3rd Edition* - Randal L. Schwartz and Tom Phoenix

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction to Perl, basic skeleton, scalar variables |
| 1 | Arrays, lists, subroutines |
| 1 | Hashes, basic I/O |
| 1 | Regular expressions |
| 1 | Control structures |
| 1 | File and directory manipulations |
| 1 | Process orchestration |
| 1 | String manipulations and sorting |
| 1 | Perl DBI; CGI scripting |
| 1 | Other common Perl modules |

## Representative Lab Assignments

- Basic Perl skeleton, basic input/output commands and control structures
- Use of hashes for storing and presenting reports on a set of data
- Read in a configuration file and write a simulation program to use that configuration data
- Fetch data from a database using DBI, and produce simple reports
- Use of several advanced sorting methods

## Representative Grading Plan

| | |
|---|---|
| Labs | 100% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

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| hours) | | |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Han-Wei Shen

Last modified: 2011-05-06 13:16:34

# CSE 488: Entrepreneurship Seminar

### Description

Comprehensive report on research into IT entrepreneurship; discussion of and feedback on other students' reports; brainstorming about IT entrepreneurship opportunities.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1 | 1 cl | Admission to NEWPATH entrepreneurship program |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

- Graded S/U
- Repeatable up to 12 cr-hrs

### Intended Learning Outcomes

- Be familiar with essential issues and ideas related to creating, launching and running successful IT ventures;
- Be familiar with key principles of IT entrepreneurship by learning from other students' experiences and ideas and by interacting with local entrepreneurs.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

### Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 10 | Presentation and discussion of student research reports, local entrepreneurs' experiences, and brainstorming sessions |

### Representative Lab Assignments

### Representative Grading Plan

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|---|---|
| Attendance and participation, including providing written feedback to other presenters | 100% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2011-05-06 13:16:48

# CSE 489: Professional Practice in Industry

### Description

Preparation and submission of a comprehensive report based on actual employment experience in a co-op job in industry.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 2 | | Admission to co-op program in CS&E |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2005-04-06 14:33:16

# CSE 493: Individual Studies

### Description

Planning, conducting, and reporting a special study appropriate to the needs of the student.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 0 | | Written permission of instructor |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
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| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
| --- | --- | --- |
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2005-04-06 14:35:29

# CSE 494: Group Studies

### Description

Designed to give the student an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 0 | | Permission of instructor |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Roger Crawfis

Last modified: 2005-04-06 14:36:04

# CSE 502: Object-Oriented Programming for Engineers and Scientists

### Description

Introduction to object-oriented programming for experienced procedural programmers, with applications from engineering and science; interfaces, classes, packages; implements and extends relationships; design patterns.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | Math 152 or equiv; En Graph 167 or 202 or equiv; additional programming experience |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

- Java is learned.
- May not be used as a technical elective by CSE or CIS majors or minors.

## Intended Learning Outcomes

- Master using control structures, built-in data types, and object-oriented program units of Java (interface, class, and package), and inter-unit relationships (implements and extends), to write programs for representative applications that are important in engineering and science.
- Be familiar with using object variables (references/pointers), and with handling the problems they create compared to normal variables in procedural languages.
- Be familiar with designing and developing new interfaces, classes, and packages of the kind that might arise in engineering and science applications.
- Be familiar with using some of the most important object-oriented design patterns.
- Be familiar with using UML class diagrams.
- Be familiar with using formal specifications in interfaces.
- Be exposed to the virtual machine model of modern computer systems.
- Be exposed to software engineering issues.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Core Java 2: Volume I - Fundamentals* - C.S. Horstmann and G. Cornell

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 9 | Introduction to the course; component-based software and component relationships; UML class diagrams; Java control structures, built-in types, I/O; specifications with preconditions and postconditions; reasoning about program behavior; testing |
| 12 | Interfaces, classes, and packages; object variables and the problems they cause vis-a-vis value variables; template method pattern; abstract factory pattern; engineering and scientific computing problems from an object-oriented viewpoint |

| | |
|---|---|
| 6 | Graphical user interfaces; event handling; observer pattern |
| 3 | Reviews and exams |

### Representative Lab Assignments

- Write a program (using a language and programming style you already know) to find the area of a simple polygon, and test it
- Write a program in Java to compute the n-th root of a real number using a numerical algorithm of choice, and test it
- Extend a natural number component family, and test it
- Implement a natural number calculator with graphical user interface, and test it
- Implement a natural number component, and test it
- Implement a numerical integration component in two different ways, and test it

### Representative Grading Plan

| | |
|---|---|
| Lab assignments | 42% |
| Homeworks | 4% |
| Class participation | 4% |
| Midterm exam | 25% |
| Final exam | 25% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bruce Weide

Last modified: 2005-04-06 14:41:48

# CSE 541: Elementary Numerical Methods

## Description

Survey of numerical methods: number systems, errors of finite representation, solution of single non-linear equation, interpolation, numerical integration, solution of linear systems.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 221/H221 or 230 or 502; Math153 |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master using the bisection method, Newton's method, and the secant method in single variable root finding.
- Master central difference formula and Richardson extrapolation for numerical differentiation.
- Master trapezoid rule, recursive trapezoid formula and Romberg algorithm for numerical integration.
- Master Gaussian elimination with scaled partial pivoting.
- Be competent with using IEEE single precision floating point arithmetic standard.
- Be competent with loss of significant digits in numerical calculations.
- Be competent with polynomial interpolation and Lagrange and Newton form.
- Be competent with numerical computation of second derivative.
- Be familiar with Simpson's and adaptive Simpson's algorithm.
- Be exposed to Gaussian quadrature formulas.
- Be exposed to calculating errors in polynomial interpolation.
- Be exposed to solving linear systems using matrix factorization.
- Be exposed to iterative solutions of linear systems.
- Be exposed to method of least squares.
- Be exposed to Monte Carlo simulation.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Numerical Mathematics and Computing* - Cheney and Kincaid

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Review of Taylor Series |
| 3 | Computer arithmetic; rounding errors, machine precision, machine representation |
| 3 | Root finding; bisection, Newton and secant method |
| 3 | Polynomial interpolation; Lagrange and Newton form of the interpolating polynomial |
| 3 | Numerical differentiation; central differnce formula; Richardson extrapolation; second derivative |
| 6 | Numerical integration; trapezoid and recursive trapezoid rule; Romberg algorithm; Simpson and adaptive Simpson's algorithm; Gaussian quadrature |
| 7 | Systems of linear equations; Gaussian elimination with scaled partial pivoting; matrix factorization; iterative solutions |
| 2 | Method of least squares |
| 2 | Monte Carlo simulation |

## Representative Lab Assignments

- Root finding using bisection, Newton and secant method.
- Implementation of Gaussian elimination.

## Representative Grading Plan

| | |
|---|---|
| Homeworks and labs | 30% |
| Midterm | 30% |
| Final | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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| hours) | | |

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Course Coordinator: Yusu Wang

Last modified: 2011-05-06 13:17:56

# CSE 551: Introduction to Information Security

### Description

Introduction to security of digital information including: threats, regulations, risk management, attack detection and response, cryptography, forensics, and technical training and certification.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 cl | 314 or 321 or 502 or AMIS 531 or equivalent, and second writing course; or permission of instructor |

### Quarters Offered

- Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with information security governance, and related legal and regulatory issues.
- Be competent with understanding of external and internal information security threats to an organization.
- Be competent with information security awareness and a clear understanding of its importance.
- Be competent with how threats to an organization are discovered, analyzed, and dealt with.
- Be familiar with a high-level understanding of how information security functions in an organization.
- Be familiar with the structure of policies, standards and guidelines.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Principles of Information Security, Thomson/Course Technology, ISBN 0-619-21625-5, Second Edition, 2005* - Michael E. Whitman and Herbert J. Mattord

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Primer: information security and network basics; information security and its role in an organization; legal and regulatory issues; government homeland security initiatives and how they impact business and individuals |
| 3 | Threats; internal threats: employees, contractors, third parties; external threats: criminals, corporate espionage, hackers, cyber warfare, cyber terrorism; psychology of computer criminals and info-terrorists and associated ethical issues |
| 6 | Governance, policies, standards, and guidelines; architecture; awareness |
| 10 | Risk management, vulnerability assessment and intrusion detection; malicious code protection; content filtering; internet DMZ and related components; incident response; application security |
| 3 | Cryptography; forensics |
| 3 | Information security directions; technical training and certifications; whatÂ‘s next |
| 2 | Review and exam |

## Representative Lab Assignments

- None

## Representative Grading Plan

| | |
|---|---|
| Homework Assignments | 15% |
| Survey and Presentation | 35% |
| Exam | 50% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |

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|---|---|---|
| hours) | | |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Some contribution (1-2 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Some contribution (1-2 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Dong Xuan

Last modified: 2011-05-06 13:18:08

# CSE 560: Systems Software Design, Development, and Documentation

### Description

Software engineering as applied to various classical computer systems programs; assemblers, macroprocessors, loaders; major group project involving the implementation of systems software; communication skills emphasized.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 5 | 4 cl, 1 3-hr lab | 314 or 321 and 360 or ECE 265, and a second writing course |

### Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using and implementing each component of the the assemble-link-load-relocate-execute process.
- Be competent with using bit manipulation of integers and ascii characters to be able to emulate a simple computer that handles both integer and character I/O.
- Be competent with analyzing the intended audience for a written document and to write an audience profile.
- Be familiar with group project organization techniques including conducting group meetings, recording minutes, and tracking project progress.
- Be familiar with writing a relocating linking loader.
- Be familiar with using different addressing modes.
- Be familiar with subroutine linkage at the assembly level.
- Be familiar with using compilers, debuggers, word processors, editors, diagram drawing programs, and profilers to design, build, and document a large software project.
- Be familiar with using macros, including recursive and nested macros.
- Be familiar with defining the purpose (persuade, inform, etc.) of a written document and select the appropriate rhetorical devices; and to write several pieces of documentation that have different purposes and to use appropriate organization to tie them together.
- Be familiar with proof-reading own and others' writing.
- Be familiar with emulating in software, the fetch-decode-execute cycle of a CPU.
- Be familiar with the concept of a `machine' and its implementation via either translation or interpreation on lower level machines.
- Be familiar with making engineering decisions involving tradeoffs (e.g., space-time tradeoffs in choosing a symbol table implementation).
- Be familiar with the importance of communication skills, including oral, email, and other written documents such as meeting minutes.
- Be familiar with software testing strategies including black-box versus white-box, unit testing, integration testing, top-down versus bottom-up testing, and construction and implementation of a test plan.
- Be familiar with the economic and social forces that often drive technology to explain developments in system software.
- Be familiar with using one structured approach to large software design to carry out a large group project.
- Be exposed to issues in systems programming as opposed to applications programming.
- Be exposed to memory management issues including caching, virtual memory, etc.
- Be exposed to one-pass macro processing techniques.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *System Software - An Introduction to Systems Programming* - Leland Beck
- *The Practice of Programming* - Brian Kernighan and Rob Pike
- *A Writer's Reference* - Diana Hacker

## Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 4 | Architecture |
| 4 | Software engineering |
| 3 | Technical writing |
| 2 | System software |
| 8 | Assemblers: algorithm, pseudo operations, expressions |
| 3 | Searching and sorting |
| 1 | Midterm exam |
| 3 | Tools: makefiles, CVS, lex and yacc |
| 4 | Linking and loading |
| 4 | Macro processors |
| 4 | Compilers: tokenizing, parsing, code generation |

### Representative Lab Assignments

- Basic absolute loader and simulator
- Assembler
- Relocating, direct linking loader (and modified assembler)

### Representative Grading Plan

| | |
|---|---|
| Lab 1 | 20% |
| Lab 2 | 20% |
| Lab 3 | 15% |
| Midterm | 20% |
| Final | 25% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|

| | | |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ | l | an ability to analyze a problem, and identify and define the computing requirements |

| | | |
|---|---|---|
| hours) | | appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paul Sivilotti

Last modified: 2011-05-06 13:18:18

# CSE 581: Interactive Computer Graphics

### Description

Introduction to interactive graphics programming, Graphics APIs, display hardware, graphics processing pipeline (geometry processing, rasterization, texture mapping, etc.), geometric modeling, image formats, color theories.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 222 or 230 or 502 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with graphics programming using an API (OpenGL).
- Be familiar with the state-of-the-art in graphics hardware and display technology.
- Be familiar with 2D and 3D graphics algorithms.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Interactive Computer Graphics: A Top-down Approach with OpenGL* - Edward Angel

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Course overview; introduction to graphics hardware |
| 3 | OpenGL overview; window-based programming and GLUT; OpenGL primitives and attributes; OpenGL/GLUT input processing |
| 3 | 2D display pipeline; transformation and coordinate systems |
| 5 | OpenGL matrix modes and orthographic viewing; introduction to 3D graphics; 3D coordinate systems |
| 4 | OpenGL 3D primitives and attributes; hierarchical transformation using OpenGL matrix stack |
| 5 | 3D rendering pipeline; 3D viewing; clipping, scan conversion; simple hidden surface removal algorithms |
| 4 | Illumination; shading; OpenGL lighting and material properties |
| 3 | Texture mapping; OpenGL blending and compositing |

## Representative Lab Assignments

- 2D OpenGL drawing
- 3D wireframe construction, hierarchical transformation
- OpenGL lighting and camera control
- OpenGL illumination

## Representative Grading Plan

| | |
|---|---|
| Labs | 50% |
| Midterm Exam | 20% |
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Some contribution (1-2 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Han-Wei Shen

Last modified: 2011-05-06 13:18:33

# CSE 601: Social and Ethical Issues in Computing

### Description

Social, ethical, and legal issues facing computing professionals; ethical principles; discussion of case studies.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 1 | 1 1.5-hr cl | 560 |

### Quarters Offered

- Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be familiar with social implications of decisions and actions of computing professionals.
- Be familiar with the analysis of ethical issues facing computing professionals.

- Be familiar with writing papers involving legal, ethical, and professional issues in computing.
- Be familiar with making oral presentations, participating in formal debates, and in critically observing others' presentations and debates.
- Be exposed to legal issues facing computing professionals.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Ethics and Computing (optional)* - Kevin W. Bowyer
- *How to Get Your Point Across in 30 Seconds or Less (optional)* - Milo O. Frank

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Orientation, choice of topics, privacy |
| 1 | Presentation assignments, what makes a good presentation, debate format, ACM code of ethics |
| 1 | Privacy, censorship |
| 1 | National security and personal privacy |
| 1 | Intellectual property |
| 1 | General ethics, professional ethics |
| 1 | Ethics in work and business |
| 1 | How much artificial intelligence is possible? |
| 1 | Anticipating technological change |
| 1 | Digital democracy, Internet governance |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Class participation | 34% |
| Paper | 33% |
| Presentation | 33% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| Significant contribution (7+ hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Significant contribution (7+ hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| No contribution | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

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|---|---|---|
| No contribution | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| No contribution | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ken Supowit

Last modified: 2011-10-06 14:08:15

# CSE 612: Introduction to Cognitive Science

### Description

Cognitive science is an interdisciplinary study of the nature of human thought psychological, philosophical, linguistic, and artificial intelligence approaches to knowledge representation.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 2 1.5-hr cl. | Permission of instructor and a total of 12 cr hrs from at least two of the following areas: computer science, linguistics, philosophy, and psychology. |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

- Cross-listed with Linguistics, Philosophy, Psychology.

### Intended Learning Outcomes

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2011-05-06 13:18:56

# CSE 616: Object-Oriented Systems Analysis

### Description

Information systems analysis; object-oriented analysis models and tools; use cases, system modeling using UML; requirements specification development; term project.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 670 and Math 366; or grad standing in CS&E. |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master applying an object-oriented methodology to the analysis of a real-world problem.
- Be competent with writing use cases to model functional requirements.

- Be competent with using UML use case, class, sequence and collaboration diagrams to model data and behavior requirements.
- Be competent with organizational dynamics as it applies to projects.
- Be familiar with the system lifecycle approach and its phases.
- Be familiar with software engineering issues such as correctness, reliability, productivity.
- Be familiar with the distiction between analysis and design activities and skills.
- Be familiar with working with a team to produce requirements specification document.
- Be familiar with the purpose, structure and contents of a requirements specification document.
- Be familiar with non-functional requirements such as security, integrity, response time and reliability.
- Be familiar with using a UML tool.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Systems Analysis and Design in a Changing World , 3rd edition* - Satzinger, et al.
- *The Object Oriented Approach: Concepts, System Development and Modeling with UML, 2nd edition* - Satzinger, et al.

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Exams |
| 6 | Software engineering, software development life cycle, traditional vs object-oriented analysis |
| 2 | Teamwork and organizational dynamics |
| 4 | Data flow diagramming (as context model) |
| 16 | UML (use case diagram, sequence diagram, collaboration diagram, state chart diagram, class diagram) |
| 8 | Requirements elicitation (face-to-face meetings and presentations to real-world client) |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework (4) | 20% |
| Quizzes (2) | 20% |
| Team Project (incl wkly reports, presentation, drafts, final document) | 35% |

| | |
|---|---|
| Final Exam | 25% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Significant contribution (7+ hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| hours) | | |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Bettina Bair

Last modified: 2011-05-06 13:19:06

# CSE 621: Introduction to High-Performance Computing

### Description

Parallel programming models; sequential and parallel performance issues; high-performance computer architecture; design, analysis, implementation and performance evaluation of parallel algorithms.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 541; Math 568 or Math 571 or Math 601 |

### Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with the fundamental factors affecting the performance of sequential programs.
- Be competent with program transformations to enhance data locality and improve performance.
- Be familiar with the prevalent parallel programming models.
- Be familiar with design, implementation and analysis performance analysis of parallel programs.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *An Introduction to Parallel Computing: Design and Analysis of Algorithms, Second Edition* - A. Grama, A. Gupta, G. Karypis and V. Kumar

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Fundamental performance issues |
| 8 | Techniques for improving single-processor performance |
| 3 | Overview of parallel computer architecture |
| 6 | Parallel programming: message passing |
| 6 | Parallel programming: shared-memory (Pthreads, OpenMP, UPC, GA) |
| 2 | Review and exam |

## Representative Lab Assignments

## Representative Grading Plan

| | |
|---|---|
| Assignments | 40% |
| Midterm Exam | 25% |
| Final Exam | 35% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
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| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

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| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: P Sadayappan

Last modified: 2011-05-06 13:19:17

# CSE 622: Project in High-Performance Computing

### Description

Guided project in high-performance computing.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | Arranged | CSE 621 or equivalent; and permission of instructor |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

- Satisfies capstone research/internship experience requirement of Computational Science minor.
- This course is graded S/U.

### Intended Learning Outcomes

- Be familiar with application of design/analysis/implementation/optimization techniques to software for high-performance computing.
- Be familiar with the interactions between domain-specific computational requirements in at least one computational science domain, and high-performance computing issues.

- Be familiar with installing (as necessary) and learning to use high-performance computing technologies.
- Be familiar with documenting a developed system and your experiences orally and in writing.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 7 | Requirements analysis, technology exploration |
| 15 | Design, implementation, analysis |
| 8 | Documentation and writing |

## Representative Lab Assignments

- Typical project involves working with an expert in an application domain to develop a high-performance computing solution to a computational science problem in that domain.

## Representative Grading Plan

| | |
|---|---|
| Requirements/technology exploration report | 15% |
| Interim project report | 25% |
| Final project report and presentation | 60% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |

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| | | considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2011-05-06 13:19:26

# CSE H625: Introduction to Automata and Formal Languages

### Description

Machine-based and grammatical models of computation: finite automata and regular languages, pushdown automata context free languages, Turing machines.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 321 and Math 366 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Not restricted to honors students. See instructor for advice on whether to choose the honors or the regular section.
- This course is a core course in the Cognitive Science minor. Information regarding the minor and its requirements may be found online at http://artsandsciences.osu.edu/interdisciplinary.

### Intended Learning Outcomes

- Master using regular expressions, and finite state machines.
- Master using context-free languages, and push-down automata.
- Master using regular and context-free grammars.
- Be familiar with using Turing machines as a general computational model.
- Be exposed to decision problems, including the halting problem.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Languages and the Theory of Computation (3rd edition)* - J. C. Martin

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | General concepts |
| 9 | Finite state machines and regular expressions |
| 8 | Pushdown automata and context-free languages |
| 4 | Regular and context-free grammars |
| 3 | Pumping lemmas |
| 3 | Turing machines |
| 1 | Decision problems |
| 1 | Exams and reviews |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Classroom participation | 15% |
| Homeworks | 15% |
| Midterm | 30% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, |

| | | |
|---|---|---|
| | | social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ken Supowit

Last modified: 2008-11-25 08:50:41

# CSE 625: Introduction to Automata and Formal Languages

## Description

Machine-based and grammatical models of computation: finite automata and regular languages, pushdown automata and context-free languages.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 321 and Math 366 |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using regular expressions, and finite state machines.
- Be competent with using context-free languages, and push-down automata.
- Be exposed to the theory of parsing.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Languages and the Theory of Computation (3rd edition)* - J. C. Martin

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | General concepts |
| 12 | Finite state machines and regular expressions |
| 8 | Pushdown automata and context-free languages |
| 4 | Regular and context-free grammars |

| | |
|---|---|
| 3 | Pumping lemmas |
| 1 | Exams and reviews |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Classroom participation | 15% |
| Homeworks | 15% |
| Midterm | 30% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ken Supowit

Last modified: 2011-05-06 13:19:41

# CSE 630: Survey of Artificial Intelligence I: Basic Techniques

### Description

A survey of the basic concepts and techniques, problem solving, and knowledge representation, including an introduction to expert systems.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 222/H222 or 230 or 502; Math 366 |

## Quarters Offered

- Au, Wi, Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with basic search techniques for problem-solving, including systematic blind search, heuristically-guided search, and optimal search.
- Be familiar with logic and proof as a basis for knowledge representation and automated reasoning.
- Be familiar with multiple knowledge-representation formulisms.
- Be familiar with game tree search methods and the requirements for expert-level game play.
- Be exposed to problems in common sense reasoning.
- Be exposed to machine learning techniques and the kinds of problem they solve.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Artificial Intelligence, A Modern Approach (2nd edition), Prentice Hall, 2002* - Stuart Russell and Peter Norvig

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Basic representation and problem solving methods |
| 6 | Search techniques and game playing |
| 6 | Knowledge representation using logic, automated proof techniques |
| 6 | Machine learning or probabilistic inference |
| 3 | Planning and common sense reasoning |
| 2 | Perception and communication |
| 1 | Exam |

### Representative Lab Assignments

- Compare breadth-first, depth-first, and A* search on a problem domain
- Apply reinforcement learning to maze navigation
- Construct STRIPS-style planning operators for a domain

### Representative Grading Plan

| | |
|---|---|
| Homeworks and Labs | 40% |
| Midterm | 30% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Some | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| contribution (1-2 hours) | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: James William Davis

Last modified: 2011-05-06 13:19:50

# CSE 634: Computer Vision for Human-Computer Interaction

### Description

Computer vision algorithms for use in human-computer interactive systems. Topics include image formation, image features, segmentation, shape analysis, object tracking, motion calculation, and applications.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 630 or ECE 352; Math 568 or Math 571; or permission of instructor. |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with fundamental computer vision algorithms.
- Be familiar with Matlab programming environment.
- Be exposed to original research and applications in computer vision.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Vision: A Modern Approach* - Forsyth and Ponce
- *Computer Vision* - Shapiro and Stockman

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction |
| 2 | Image formation |
| 2 | Noise removal |
| 2 | Edge detection |
| 1 | Laplacian pyramids |
| 2 | Region segmentation |
| 2 | 2-D shape |
| 4 | Motion |
| 2 | Trajectories |

| | |
|---|---|
| 2 | Kalman filtering |
| 2 | 2-D/3-D geometry |
| 1 | New frontiers in computer vision |
| 2 | Applications |
| 3 | Motion capture |
| 1 | Current research: Human activity analysis |
| 1 | Exam |

### Representative Lab Assignments

- Various programming assignments in Matlab based on topics in class.
- Term project to give students an opportunity to expand on the ideas presented in class and explore interesting computer vision applications.

### Representative Grading Plan

| | |
|---|---|
| Homework assignments | 40% |
| Midterm exam | 20% |
| Research project | 30% |
| Class participation | 10% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, |

| | | |
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| hours) | | runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: James William Davis

Last modified: 2011-05-06 13:20:01

# CSE 650: Applied Information Security Project

### Description

Team-based projects: solve information security challenges (host/network hardening, intrusion detection and vulnerability scanning, forensics) in virtual server environment; results communicated through report writing and presentation.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 2 1.5-hr cl; 1 1-hr group meeting | 560; 551 or 677; or grad standing |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master the use of VMWare to create flexible, complex virtual computer networks.
- Master techniques for hardening various operating systems (Linux and Windows) and services running on these systems (web, database, others).
- Be familiar with issues involved in the configuration and use of firewalls, intrusion detection/prevention, and vulnerability scanning/exploit tools.
- Be familiar with common software vulnerabilities and techniques for finding and fixing them.
- Be familiar with host security standards and laws such as HIPAA, PCI, Ohio House Bill 104, OWASP, NSA, CSI and so on.
- Be familiar with general goals of and issues pertaining to computer forensic analysis and incident response.
- Be exposed to a wide variety of computer security tools, especially forensics and investigation tools and scanning tools.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Course overview |
| 2 | Network security basics and ethics |
| 2 | VMWare management and other basic skills |
| 3 | Project briefs and guidelines |
| 7 | Project A: Host/Network Hardening - solving challenges, team presentations |
| 7 | Project B: Intrusion Detection, and Vulnerability Scanning - solving challenges, team presentations |
| 7 | Project C: Computer Forensics - solving challenges, team presentations |
| 1 | Course summary |

## Representative Lab Assignments

- Project A: Host/Network Hardening
- Project B: Intrusion Detection and Vulnerability Scanning
- Project C: Computer Forensics

## Representative Grading Plan

| | |
|---|---|
| Project A Report | 12% |
| Project A Presentation | 11% |
| Project A Lab Notebook | 10% |
| Project B Report | 12% |
| Project B Presentation | 11% |
| Project B Lab Notebook | 10% |
| Project C Report | 12% |
| Project C Presentation | 12% |

| | |
|---|---|
| Project C Lab Notebook | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Significant contribution (7+ hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Significant contribution (7+ hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

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| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2011-05-06 13:20:25

# CSE 651: Network Security

### Description

An introduction to network security; security threats, services, protocols, verification and design, architectures, technologies, testing advances; elements of cryptography; securing network systems and applications.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 677 |

### Quarters Offered

- Au, Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with some protocols for security services.
- Be competent with network security threats and countermeasures.
- Be familiar with fundamentals of cryptography.
- Be familiar with network security designs using available secure solutions (such as PGP, SSL, IPSec, and firewalls).
- Be familiar with advanced security issues and technologies (such as DDoS attack detection and containment, anonymous communications, and security properties testing, verification and design).
- Be exposed to original research in network security.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Cryptography and Network Security: Principles and Practice, Third Edition, Prentice Hall, 2002. ISBN: 0-13-091429-0 (text book)* - William Stallings
- *Applied Cryptography, (2nd Edition), Wiley 1996 ISBN 0-471-11709-9* - Bruce Schneier,
- *Security + Guide to Network Security Fundamentals, Thomson, ISBN 0-619-12017-7* - Paul Campbell, Ben Calvert, Steven Boswell,
- *Network Security Â– Private Communication in a Public World, Prentice Hall, 1995. ISBN 0-13-061466-1* - Charlie Kaufman, Radia Perlman and Mike Speciner

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Security principles and security threats: (1) Security services: privacy, confidentiality, authentication, integrity, availability, non-repudiation, access control, etc (2) Security threats: traffic analysis, IP spoofing, denial of service, routing attacks, information leakage, remote arbitrary code execution, viruses, etc. (3) Social, ethical, policy and legal issues (4) What we will teach and will not teach |
| 3 | Elements of cryptography: (1) Classic ciphers, modern ciphers and stream ciphers and one-way functions (2) Secret key (symmetric): DES/AES and public key (asymmetric): RSA |
| 9 | Protocols for Security Services: (1) Key distribution and management, Diffie-Hellman key exchange and certificate (2) Non-repudiation and digital signatures, ElGamal signature (3) Authentication and its protocols: Kerberos and Needham-Schroeder (4) Integrity (5) Privacy (6) Authorization |
| 7 | Securing network systems and applications: (1) Email security: Pretty Good Privacy (PGP) (2) Web security: Secure Sockets Layer (SSL) (3) IP security and VPN: IPSec (4) Security in routing: OSPF and BGP (5) Firewalls: intrusion detection |
| 6 | Advanced security issues and technologies: (1) Large scale attacks on the Internet and their defense (2) DDoS attack and its defense: types of DoS and DDoS attacks, trace-back and attack containment (3) |

| | |
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| | Active worm defense (4) Anonymous communication (5) Wireless security |
| 3 | Security with constrained resources: case studies in sensor networks |
| 1 | Exam |

## Representative Lab Assignments

- Implementation of a key exchange protocol in wireless sessor networks
- Modification of a protocol for Logical Grid Routing
- Implementation of the strong hop-by-hop integrity protocol
- E-commerce security protocol

## Representative Grading Plan

| | |
|---|---|
| Homework assignments and lab exercises | 35% |
| Midterm exam | 35% |
| Research project | 30% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| hours) | | |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Anish Arora

Last modified: 2011-05-06 13:20:35

# CSE 652: Applied Information Security Project

### Description

Team-based projects: solve information security challenges (host/network hardening, intrusion detection and vulnerability scanning, forensics) in virtual server environment; results communicated through report writing and presentation.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 2 1.5-hr cl; 1 1-hr group meeting | 560; 551 or 677; or grad standing |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with the use of VMWare to create flexible, complex virtual computer networks.
- Be competent with techniques for hardening various operating systems (Linux and Windows) and services running on these systems (web, database, others).
- Be familiar with issues involved in the configuration and use of firewalls, intrusion detection/prevention, and vulnerability scanning/exploit tools.
- Be familiar with common software vulnerabilities and techniques for finding and fixing them.
- Be familiar with host security standards and laws such as HIPAA, PCI, Ohio House Bill 104, OWASP, NSA, CSI and so on.
- Be familiar with general goals of and issues pertaining to computer forensic analysis and incident response.
- Be exposed to a wide variety of computer security tools, especially forensics and investigation tools and scanning tools.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

### Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 1 | Course overview |
| 2 | Network security basics and ethics |
| 2 | VMWare management and other basic skills |
| 3 | Project briefs and guidelines |
| 7 | Project A: Host/Network Hardening - solving challenges, team presentations |
| 7 | Project B: Intrusion Detection, and Vulnerability Scanning - solving challenges, team presentations |
| 7 | Project C: Computer Forensics - solving challenges, team presentations |
| 1 | Course summary |

### Representative Lab Assignments

- Project A: Host/Network Hardening
- Project B: Intrusion Detection and Vulnerability Scanning
- Project C: Computer Forensics

### Representative Grading Plan

| | |
|---|---|
| Project A Report | 12% |
| Project A Presentation | 11% |
| Project A Lab Notebook | 10% |
| Project B Report | 12% |
| Project B Presentation | 11% |
| Project B Lab Notebook | 10% |
| Project C Report | 12% |
| Project C Presentation | 12% |
| Project C Lab Notebook | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Significant contribution (7+ hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Significant contribution (7+ hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| hours) | | |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Dong Xuan

Last modified: 2011-04-08 13:54:25

# CSE 655: Introduction to the Principles of Programming Languages

### Description

Programming language concepts such as grammars and parse trees; interpretation versus compilation, binding, and scope rules; and language constructs for control and data abstraction.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl, 1 3-hr lab | 560 and 625 |

### Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master using syntax-directed parsing, printing, execution, and compilation for simple imperative language constructs.
- Master distinguishing between compile-time and run-time activities.
- Be competent with using syntax-related concepts including regular expressions and context-free grammars to describe the structure of languages.
- Be competent with analyzing programming language design issues related to data types, expressions and control structures, parameter passing.
- Be competent with principles of object-oriented languages.
- Be familiar with implementing object-oriented languages.
- Be familiar with analyzing parameter passing methods.
- Be familiar with memory management techniques for imperative languages, including object-oriented languages.
- Be familiar with using functional programming languages.
- Be exposed to analyzing variable binding and scope rules.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Concepts of Programming Languages* - R. Sebesta

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Overview of types of languages; language design and evaluation criteria |
| 2 | Syntax, grammars, and parsing |
| 5 | Recursive descent approach to parsing, execution, code generation, etc. |
| 5 | OO languages and implementations; data abstraction-related issues |
| 8 | Functional programming; implementation of functional languages |
| 2 | Scope and lifetime; parameter-passing methods |
| 2 | Subprogram implementation |
| 3 | Midterms and review |

## Representative Lab Assignments

- Implement a complete recursive descent interpreter for a simple (but complete) imperative language

- Implement a set of functions in Scheme to manipulate lists in a variety of ways

### Representative Grading Plan

| | |
|---|---|
| Homework assignments | 10% |
| Programming labs | 20% |
| Midterms (2) | 35% |
| Final exam | 35% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
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| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Neelam Soundarajan

Last modified: 2011-05-06 13:20:55

# CSE 660: Introduction to Operating Systems

### Description

Operating system concepts: memory management, process management, and file management; sample operating systems.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 560; 675 or ECE 662; Stat 427 |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with functions and structures of operating systems and issues in the design of operating systems.
- Be competent with process management.
- Be competent with concepts of process synchronization and communication.
- Be competent with memory management.
- Be familiar with disk allocation and disk arm scheduling algorithms.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Operating System Concepts* - Silberschatz, Galvin & Gagne

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction to operating systems, overview of related computer architecture concepts (CPU modes of operation, exceptions/interrupts, clock) |
| 6 | Process concepts, file system (Unix-like) related system calls, process control block, memory and CPU protection, process (Unix-like) related system calls, process hierarchy, shell, process interactions in general |
| 3 | Process (CPU) scheduling |
| 6 | Process synchronization (critical section problem, synchronization problems, etc.), and inter-process communication, threads |
| 1 | Deadlocks |
| 7 | Memory management (contiguous allocation, paging, segmentation, virtual memory) |

| | |
|---|---|
| 2 | Disk allocation and disk arm scheduling |
| 2 | Midterm exam, review for the final exam |

## Representative Lab Assignments

- File manipulation using Unix system calls
- Process creation and manipulation using Unix system calls
- Process synchronization using semaphores
- Message exchange through Unix pipe

## Representative Grading Plan

| | |
|---|---|
| Lab assignments | 25% |
| Homework assignments | 10% |
| Midterm exam | 25% |
| Final exam | 40% |

## Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| hours) | | |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Feng Qin

Last modified: 2011-05-06 13:21:06

# CSE 662: Operating Systems Laboratory

## Description

Construction of operating system components: scheduling, context switching, progress management, message passing, memory management, interrupt processing.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 cl, 1 3-hr lab | 459.21 and 660 |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master compilation and configuration of building an OS.
- Master internals of OS system call implementation.
- Be competent with CPU scheduling and process management.
- Be competent with memory management systems.
- Be familiar with file system design.
- Be exposed to device interrupts and how they are used in an operating system implementation.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *OSP: An Environment for Operating System Projects* - Kifer and Smolka

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction and OSP |
| 6 | Process scheduling |
| 6 | Memory management and paging |
| 6 | Disk scheduling algorithms |
| 9 | File system implementations |

### Representative Lab Assignments

- Simple CPU Scheduling
- Advanced CPU Scheduling
- Page faults
- Disk management
- File systems

### Representative Grading Plan

| | |
|---|---|
| 5 labs, 20% each | 100% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| hours) | | professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Feng Qin

Last modified: 2011-05-06 13:21:17

# CSE 668: Applied Component-Based Programming for Engineers and Scientists

### Description

Application of component-based software engineering technology to design and implementation of software systems in engineering and science.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 502 or 560 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Cross-listed with ECE 668
- Not open to students with credit for 694T/ECE694T or 768/ECE768

### Intended Learning Outcomes

- Be familiar with applying industry-standard software engineering technologies and tools to engineering and scientific software systems.
- Be familiar with how to build a software system by "wiring together" software components
- Be familiar with the efficiency issues connected with building software for engineering and scientific applications, and with how to use object orientation in the software without sacrificing efficiency.
- Be familiar with the software design techniques needed to build such systems, such as using a standard modeling language, loosely coupled layered software architectures, event-driven programming, multithreading, design-for-reuse, and associated design patterns.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *The Java Tutorial Continued, The Rest of the JDK* - M. Campoine, K. Walrath, and A. Humel
- *UML Distilled, 2nd Edition* - M. Fowler and K. Scott

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Review of basics of object orientation |
| 3 | UML class diagrams and interaction diagrams |
| 3 | Building efficient object-oriented software components |
| 5 | Events and the Java Event Model as the basis for "wiring together" software components into a larger software system |
| 3 | Introduction to JavaBeans |
| 3 | Multithreading and its importance for correctness of engineering and scientific software systems |
| 5 | Building a sample engineering and/or scientific software system |

| | |
|---|---|
| 2 | Review and exams |

### Representative Lab Assignments

- Components of an event-based multithreaded software simulation
- Single-threaded and multi-threaded versions of components

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Lab Assignments | 40% |
| Exams (2) | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Roger Crawfis

Last modified: 2006-08-02 09:45:04

# CSE 670: Introduction to Database Systems I

### Description

Database systems use, logical database design, entity-relationship model, database normalization, query languages and SQL, relational algebra, and relational calculus; database design project.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | 314 or 222 or 230 or 502; Math 366 or Math 345 |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master using relational databases.
- Master writing queries in relational data languages including SQL and relational algebra.
- Master using mechanisms for data independence, including data models, languages and views.
- Be competent with logical database design.
- Be competent with conceptual database design.
- Be familiar with object relational database technology.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Fundamentals of Database Systems, Addison-Wesley, 5th edition* - Ramez Elmasri and Shamkant Navathe

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Introduction; Entity-Relationship (ER) Model |
| 1 | The Structure of the Relational Data Model |
| 5 | Relational Algebra and Relational Calculus |
| 9 | Functional Dependencies and Normalization |
| 1 | ER-to-Relational Data Model |
| 5 | SQL |
| 1 | Graphical User Interfaces |
| 2 | Embedded SQL |
| 2 | Review and Exam |

## Representative Lab Assignments

- Provide SQL code which declares, populates, and queries a database
- Define and use a database with MS Access
- Write a Java program with embedded SQL code

## Representative Grading Plan

| | |
|---|---|
| Homework | 30% |
| Project | 20% |
| Midterm Exam | 20% |
| Final Exam | 30% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Jeremy John Morris

Last modified: 2011-05-06 13:21:40

# CSE 671: Introduction to Database Systems II

## Description

Object-oriented and extended relational database systems; data warehousing; active databases; GUI interface to a relational database system; introduction to data and file storage.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 670 |

## Quarters Offered

- Au, Wi

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with data and file storage, and indexing.
- Be competent with data warehousing.
- Be familiar with multimedia and temporal databases.
- Be familiar with object-relational databases.
- Be familiar with active databases.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Fundamentals of Database Systems* - Ramez Elmasri and Shamkant B. Navathe

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Review of relational database design |
| 4 | Data and file storage |
| 8 | Retrieval and indexing |
| 5 | Data warehousing |
| 4 | Object-oriented and extended relational database technology |
| 2 | Multimedia databases |

| | |
|---|---|
| 1 | Temporal databases |
| 2 | Active databases |
| 1 | Midterm |

### Representative Lab Assignments

- Design and implementation of an index selection tool through mining of query access patterns

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Project | 10% |
| Midterm | 30% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Srinivasan Parthasarathy

Last modified: 2011-05-06 13:21:54

# CSE 674: Introduction to Data Mining

## Description

Introduction to the knowledge discovery process, key data mining techniques, efficient high performance mining algorithms, exposure to applications of data mining.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1.5-hr cl | 670; 680; or grad standing or permission of instructor. |

## Quarters Offered

- Wi

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with the knowledge discovery process.
- Be competent with key data mining techniques: frequent pattern, classification, clustering.
- Be familiar with underlying data structures and efficient (parallel) implementations that are used to make tasks scalable.
- Be familiar with applying said techniques on real-world application domains.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Data Mining: Introductory and Advanced Topics* - M. Dunham, Prentice Hall 2002
- *Data Mining: Concepts and Techniques* - J. Han & M. Kamber, Morgan Kaufmann 2001

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Introduction to the KDD process and basic statistics |
| 7 | Frequent pattern algorithms: association rule mining, sequential pattern mining, mining frequent structures |
| 7 | Classification algorithms: decision tree classification, naive Bayesian classification, a brief introduction to other classifiers |
| 7 | Clustering algorithms: methods to cluster continuous data, methods to cluster categorical data |

| | |
|---|---|
| 2 | Scalable data mining algorithms and systems support, parallel algorithms, database integration, data locality issues |
| 2 | Applications: bioinformatics, intrusion detection (a brief overview) |
| 1 | Exam |

## Representative Lab Assignments

- Data preprocessing (text, image data)
- Classification (automated text categorization)
- Clustering and characterization (image/text data)
- Association rules (market basket data)
- Critical review of literature/paper

## Representative Grading Plan

| | |
|---|---|
| Lab assignments | 60% |
| Midterm | 20% |
| Final | 20% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Srinivasan Parthasarathy

Last modified: 2011-05-06 13:22:08

# CSE 675: Introduction to Computer Architecture

## Description

Computer system components, instruction set design, hardwired control units, arithmetic algorithms/circuits, floating-point operations, introduction to memory and I/O interfaces.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

## Quarters Offered

-

## General Information, Exclusions, Cross-listings, etc.

- Generic course number; see 675.01 and 675.02 for offering details.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as |

| | | |
|---|---|---|
| contribution | | well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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| | | | | | | | | | | |

Course Coordinator:

Last modified: 2005-06-10 09:59:18

# CSE 675.01: Introduction to Computer Architecture

### Description

Computer system components, instruction set design, hardwired control units, arithmetic algorithms/circuits, floating-point operations, introduction to memory and I/O interfaces.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 360 or ECE 265; Math 366; ECE 261 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with performance tradeoffs in computer architecture, especially as they relate to processor and memory design.
- Be competent with the architectural components of a computer, especially the memory hierarchy and processor.
- Be familiar with the design principles underlying modern instruction sets.
- Be familiar with the RISC/MIPS programming.
- Be exposed to the structure of a processor cache.
- Be exposed to the architectures underlying modern computer systems.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Organization and Design* - Patterson & Hennessy

### Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 3 | MIPS processor/memory instruction set architecture |
| 2 | Processor/memory performance metrics |
| 1 | Overview of basics of digital logic design |
| 1 | Register file design |
| 4 | Main memory (SRAM and DRAM) design |
| 3 | Design of integer arithmetic logic unit (ALU) |
| 2 | Floating point representation and arithmetic |
| 5 | Design of datapath and hard-wired control (single-cycle case) |
| 3 | Design of datapath and hard-wired control (multi-cycle case) |
| 4 | Cache |
| 2 | Midterm exam and review for the final exam |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework assignments | 35% |
| Midterm exam | 25% |
| Final exam | 40% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Christopher Stewart

Last modified: 2011-05-06 13:22:26

# CSE 675.02: Introduction to Computer Architecture

### Description

Computer system components, instruction set design, hardwired control units, arithmetic algorithms/circuits, floating-point operations, introduction to memory and I/O interfaces.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 4 cl | 360 or ECE 265; Math 366 |

### Quarters Offered

- Au, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Not open to students with credit for 675 or 675.01. Intended for students without previous knowledge of Digital Logic Design.

### Intended Learning Outcomes

- Master cost-performance issues and design trade-offs in building a computer system, in general, and processor/memory, in particular.
- Master the hardware components of a computer, in general, and processor/memory, in particular.
- Master issues, principles, and building blocks required to design a processor and main memory.
- Be familiar with instruction set design.
- Be familiar with cache subsystem.
- Be familiar with basics of digital logic design.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Organization and Design* - Patterson & Hennessy

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | MIPS processor/memory instruction set architecture |
| 2 | Processor/memory performance metrics |
| 7 | Basics of digital logic design |
| 1 | Register file design |
| 6 | Main memory (SRAM and DRAM) design |
| 3 | Design of integer arithmetic logic unit (ALU) |
| 2 | Floating point representation and arithmetic |
| 7 | Design of datapath and hard-wired control (single-cycle case) |
| 3 | Design of datapath and hard-wired control (multi-cycle case) |
| 4 | Cache |
| 2 | Midterm exam and review for the final exam |

## Representative Lab Assignments

## Representative Grading Plan

| | |
|---|---|
| Homework assignments | 35% |
| Midterm exam | 25% |
| Final exam | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

| | | |
|---|---|---|
| contribution (1-2 hours) | | |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Christopher Stewart

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# CSE 676: Microcomputer Systems

### Description

Bus structure; memory, interrupt, and I/O design; case studies on microprocessors and systems with emphasis on selection, evaluation, and applications based on their architectural features.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 675 or ECE 662 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master harware-software interface issues in CISC architectures.
- Master privileged instructions and protected mode instructions and the associated architectural support in CISC machines.
- Be familiar with memory management and the associated hardware/software support.
- Be familiar with how interrupts are executed, and how the I/O subsystem functions.
- Be familiar with standards for interfacing and bus design.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *The Personal Computer from the Inside Out* - M. Sargent and R. Shoemaker

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Basic instruction set; floating point instructions; MMX instructions |
| 4 | Memory management |
| 4 | Protected mode and real address-mode in Intel processors |
| 5 | Intel processor and its signals; interfacing II/O ports and memory; interrupt controller |
| 5 | I/O programming, DMA controller |
| 4 | Parallel port interface, serial communications, various communication standards |
| 2 | Midterm, review |

## Representative Lab Assignments

## Representative Grading Plan

| | |
|---|---|
| Homeworks (5-7 assignments) | 35% |
| Midterm | 25% |
| Final | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Gojko Babic

Last modified: 2005-06-18 20:12:32

# CSE 677: Introduction to Computer Networking

### Description

Data communications, network architectures, communication protocols, data link control; introduction to local area networks, metropolitan and wide area networks; introduction to Internet and TCP/IP.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | Physics 112 or 132; 360 or ECE 265; 459.21 |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with the basics of data communications and network architecture.
- Be familiar with network layer control and protocols.
- Be familiar with link layer control and protocols.
- Be exposed to the TCP/IP suite.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Networking: A Top-Down Approach Featuring the Internet, Addison Wesley, 2003 (Second Edition)* - James Kurose and Keith Ross

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction: Internet and protocols; protocol layers and their service models; a brief history of computer networking and the Internet |
| 6 | The transport layer: services and [rinciples; connectionless transport: UDP; TCP case study; TCP congestion control |
| 11 | The network layer: network service model;routing principles; hierarchical routing; IP: the Internet Protocol; routing in the Internet; inside a router; IPv6 |

| | |
|---|---|
| 9 | The data link layer and local area networks; services; error detection and correction; multiple access protocols and LANs; LAN addresses and ARP; Ethernet; hubs, bridges and switches; wireless LANs: IEEE 802.11; PPP: the Point-to-Point Protocol; ATM |
| 1 | Exam |

### Representative Lab Assignments

- Program a multiple servers/clients file system using TCP/IP unicast communication on SUN workstations in C or C++.

### Representative Grading Plan

| | |
|---|---|
| Lab Exercise | 15% |
| Project | 20% |
| Midterm Exam | 25% |
| Final Exam | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Gojko Babic

Last modified: 2011-05-06 13:22:47

# CSE 678: Internetworking

## Description

High-speed local area networks, metropolitan area networks, bridges, routers, gateways, TCP/IP, application services, network management.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 660 and 677 |

## Quarters Offered

- Wi

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with using the TCP/IP protocol suite.
- Be familiar with using high speed LANs.
- Be familiar with various internetworking technologies.
- Be exposed to designing advanced communication protocols.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Internetworking With TCP/IP, Volume 1* - D. Comer

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction |
| 6 | Internetworking and IP addressing |
| 6 | IP forwarding, encapsulation, fragmentation |
| 6 | Transmission control, DNS |
| 6 | Network management, security |
| 3 | Midterm, review |

### Representative Lab Assignments

- Implement alternating bit protocol
- Implement distributed routing

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Labs | 30% |
| Exams | 50% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Prasun Sinha

Last modified: 2011-05-06 13:22:56

# CSE 679: Introduction to Multimedia Networking

### Description

Introduction to multimedia data types, multimedia compression technologies World-Wide-Web architectures, proxies, streaming video technologies, and network adaptation to multimedia.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | 677 or permission of instructor |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with the basics of multimedia data types and compression technologies.
- Be familiar with World-Wide-Web architecture, proxy, and streaming video technologies.
- Be familiar with networking technologies and evolving the best-effort service of the Internet to better support multimedia.
- Be exposed to new networking technologies beyond the best-effort service to better support mulitmedia.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Multimedia Communications: Protocols and Applications, Prentice Hall, 1998 (optional textbook).* - Franklin Kuo, J.J Luna-Aceves, and Wolfgan Effelsberg
- *Multimedia Communications: Applications, Networks, Protocols and Standards, Addison Wesley, 2001 (reference).* - Fred Halsall
- *Computer Networking: A Top-Down Approach Featuring the Internet, Addison Wesley, 2003 (reference)* - James Kurose and Keith Ross

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 8 | Introduction to multimedia: basics of multimedia data types; basics of multimedia compression technologies; JPEG, MPEG |
| 15 | Evolving best-effort service to better support multimedia: computer network overview; TCP/UDP, HTTP, RTP and RTCP; best-effort service for audio and video streams; voice over IP, multicast, video conferencing, anycast, service redirection, proxies |
| 7 | Beyond the best-effort service to better support multimedia: network scheduling, integrated services, differentiated services, network security |

### Representative Lab Assignments

- Program 7-steps of encoding in JPEG in C or C++.

## Representative Grading Plan

| | |
|---|---|
| Homework | 15% |
| Lab Project | 15% |
| Paper Reading and Presentation | 15% |
| Quiz | 20% |
| Final Exam | 35% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Some contribution (1-2 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Dong Xuan

Last modified: 2011-05-06 13:23:05

# CSE 680: Introduction to Analysis of Algorithms and Data Structures

### Description

Performance analysis considerations in design of algorithms and data structures; asymptotic analysis, recurrence relations, probabilistic analysis, divide and conquer; searching, sorting, and graph processing algorithms.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 560 or 668 or ECE 668; Stat 427; Math 566 |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master analyzing running time of "for" and "while" loops.
- Be competent with analyzing running time of simple recursive algorithms.
- Be competent with solving simple recurrence relations.
- Be competent with using asymptotic notation.
- Be familiar with designing divide-and-conquer algorithms.
- Be familiar with designing graph algorithms.
- Be familiar with designing backtracking algorithms (optional).
- Be familiar with designing branch-and-bound algorithms (optional).
- Be exposed to analyzing probabilistic algorithms (optional).
- Be exposed to NP-completeness (time permitting).
- Be exposed to lower bound arguments (optional).

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Algorithms* - Cormen, Leiserson, Rivest and Stein

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Mathematical review |
| 3 | Introduction to analysis of algorithms |
| 3 | Use of asymptotic notation |
| 3 | Analysis of iterative algorithms |
| 3 | Analysis of recursive algorithms |

| | |
|---|---|
| 3 | Definition of a non-trivial problem and analysis of algorithms that solve that problem (e.g., median finding) |
| 3 | Divide-and-conquer |
| 4 | Graphs and graph algorithms |
| 3 | Selected optional topics |
| 2 | Exams and review |

### Representative Lab Assignments

- Empirical comparison of algorithms with different asymptotic complexity
- Empirical comparison of deterministic and randomized algorithms

### Representative Grading Plan

| | |
|---|---|
| Homework | 20% |
| Midterm Exam I | 20% |
| Midterm Exam II | 20% |
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ten-Hwang Lai

Last modified: 2011-05-06 13:23:15

# CSE H680: Introduction to Analysis of Algorithms and Data Structures

### Description

Performance analysis considerations in design of algorithms and data structures; asymptotic analysis, recurrence relations, probabilistic analysis, divide and conquer; searching, sorting, and graph processing algorithms.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 cl | 560 or 668 or ECE 668; Stat 427; Math 366 |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master analyzing running time of "for" and "while" loops.
- Master analyzing running time of iterative algorithms.
- Master analyzing running time of recursive algorithms.
- Master solving simple recurrence relations.
- Master using asymptotic notation.
- Master designing divide-and-conquer algorithms.
- Master designing elementary graph algorithms.
- Be familiar with probabilistic data structures.
- Be familiar with lower-bound arguments.
- Be familiar with NP-completeness.
- Be familiar with approximation algorithms.
- Be familiar with randomized algorithms.
- Be familiar with amortized analysis.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Algorithms* - Cormen, Leiserson, Rivest and Stein

### Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 1 | Mathematical review |
| 2 | Introduction to analysis of algorithms |
| 1 | Use of asymptotic notation |
| 3 | Analysis of iterative algorithms |
| 3 | Analysis of recursive algorithms |
| 2 | Definition of a non-trivial problem and analysis of algorithms that solve that problem (search: skip lists) |
| 2 | Divide-and-conquer, backtracking, branch-and-bound |
| 2 | Randomized algorithms |
| 4 | Graphs and graph algorithms |
| 2 | Exams and review |
| 4 | In-class activities |
| 3 | NP-completeness |
| 2 | Approximation algorithms |
| 1 | Amortized analysis |

## Representative Lab Assignments

- Empirical comparison of algorithms with different asymptotic complexity
- Empirical comparison of deterministic and randomized algorithms

## Representative Grading Plan

| | |
|---|---|
| Homework | 32% |
| Programming | 8% |
| Midterm Exam | 30% |
| Final Exam | 30% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

| | | |
|---|---|---|
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ten-Hwang Lai

Last modified: 2008-11-18 08:20:04

# CSE 681: Foundations of Computer Graphics

### Description

Introduction to display hardware and applications, interactive techniques, 2D scan conversion, 2D and 3D transformations, clipping, 3D viewing, visible surface algorithms, and illumination models.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 560; 581; or grad standing |

### Quarters Offered

- Au, Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master the basic algorithms of computer graphics.
- Be competent with ray tracing algorithms.
- Be familiar with distributed ray tracing.
- Be familiar with sampling.
- Be familiar with solid texturing.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Fundamentals of Computer Graphics* - Peter Shirley

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Basic algorithms of computer graphics - ray tracing vs. scan conversion |
| 5 | Ray tracing algorithms |
| 2 | Local Illumination - Phong illumination |
| 4 | Solid texturing |
| 3 | Anti-aliasing |
| 4 | Distributed ray tracing |
| 2 | Ray tracing for complex objects |
| 2 | Optimizing ray tracing |
| 3 | Review and exam |

## Representative Lab Assignments

- A non recursive simple ray caster for spherical objects and flat shading
- A recursive raytracer (reflections and refractions) for spherical objects and with Phong illumination
- Triangulated objects and solid texturing
- Distributed ray tracing

## Representative Grading Plan

| | |
|---|---|
| Laboratory assignments | 50% |
| Quizzes and homeworks | 15% |
| Midterm exam | 15% |
| Final exam | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Raghu Machiraju

Last modified: 2011-05-06 13:23:26

# CSE 682: Computer Animation Design and Development Project

### Description

Team-based project: conceptual and technical design and implementation of computer animation; emphasizes teamwork, integrating visual design and technical custom code; written and oral communication skills.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 2 2-hr cl. | 560; 581 or 681; 601 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Be competent in evaluating design alternatives.
- Be competent with design and development practices and standards.
- Be competent with animation design using storyboard and animatics.
- Be competent with generating test images and motion studies of animation.
- Be competent with implementing procedural animation algorithms using a scripting language or graphics API.Be exposed to the computer animation production process including generating a soundtrack, compositing, editing, and publishing.
- Be familiar with researching and evaluating computing tools and practices for solving given problems.
- Be competent with deadline driven projects in a team setting.
- Be competent with issues of project management, such as teamwork, project scheduling, individual and group time management.
- Be competent with presenting work to a group of peers.
- Be familiar with presenting work to a range of audiences.
- Be competent with techniques for effective written communication for a range of purposes (user guides, design documentation, storyboards etc.)
- Be familiar with analyzing professional issues, including ethical, legal and security issues, related to computing projects, such as copyright protection.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Animation: Algorithms and Techniques* - Rick Parent

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Course overview and survey of procedural animation technqiues. |
| 2 | Review of the computer animation production process |
| 2 | Project team responsibilities and class expectations |
| 4 | Essentials of interpolation and path following including orientation representations. |
| 4 | Essentials of physically based animation including use of forces and numerical integration |
| 6 | Review of historical and contemporary animations. |
| 12 | In-class group project reports |

| | |
|---|---|
| 8 | In-class group technology research time |
| 0 | |
| 0 | |

### Representative Lab Assignments

- Progress Report #1: concept; storyboard
- Progress Report #2: refined storyboard; animatic
- Progress Report #3: refined animatic, sample models and lighting; motion studies
- Progress Report #4: refined models, layout, and motion studies

### Representative Grading Plan

| | |
|---|---|
| Progress Report #1 (Group) | 5% |
| Progress Report #2 (Group) | 5% |
| Progress Report #3 (Group) | 5% |
| Progress Report #4 (Group) | 5% |
| Final Presentation (Group) | 10% |
| Documentation of Project (Group) | 10% |
| Animation Project (Group) | 20% |
| Individual's Presentations | 10% |
| Individual's Contribution to Project | 20% |
| Individual's Documentation | 10% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

| | | |
|---|---|---|
| contribution (7+ hours) | | |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

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|---|---|---|
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Richard Parent

Last modified: 2011-05-06 13:23:35

# CSE 683: Computer Animation - Algorithms and Techniques

### Description

Survey of various algorithms and techniques used in computer animation, including interpolation-based techniques, forward and inverse kinematics, physics-based simulation, motion capture, and behavioral animation.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3-cl | 541; 581 or 681; Math 568 or Math 571 |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master using basic interpolation techniques including speed control and path following.
- Be competent with forward and inverse kinematics or articulated linkages
- Be competent with physics-based animation.
- Be competent with behavioral animation.
- Be competent with computational issues associated with computer animation
- Be exposed to the history of animation and computer animation

- Be exposed to computer animation production technology
- Be exposed to motion capture technology and its use in computer animation.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Animation: Algorithms and Techniques* - R. Parent

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction, history, technical background review, orientation representation |
| 4 | time-space Interpolation: ease-in/ease-out, orientation representation and interpolation, path following, shape interpolation |
| 2 | Hierarchical structures and forward kinematics |
| 3 | Inverse kinematics for articulated figure animation |
| 2 | Motion Capture: capturing, cleaning, editing, blending, retargeting |
| 4 | Basic physical simulation: forces, Newtonian motion; numerical integration |
| 4 | Rigid bodies: including moment of intertia, rotational dynamic |
| 4 | Fluid Dynamics: water, smoke, clouds, fir, Smooth Particle Hydrodynamics |
| 2 | Autonomous behavior of simulated agents; randomized crowd behavior; simulated vision and memory |
| 2 | Special models for animation: L-systems, Subdivision surfaces, Implicit surfaces |

## Representative Lab Assignments

- Path following
- Inverse kinematics
- Particle system
- Spring-mass-damper system
- 2D computational fluid dynamics
- Behavioral animation

## Representative Grading Plan

| | |
|---|---|
| Midterm | 15% |
| Final | 35% |
| Lab assignments | 50% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

| | | |
|---|---|---|
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Richard Parent

Last modified: 2011-05-06 13:23:45

# CSE 693: Individual Studies

### Description

Designed to give the student an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 1-5 | Arr | Permission of instructor |

### Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

| | | |
|---|---|---|
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

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# CSE 694: Introduction to Network Science

## Description

Introduction to Network Science; Global/Local Network Measures; PageRank; Community Discovery Algorithms; Network Models; Web and Social network role analysis and applications.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 hours per week | 680 |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Mastery over major macro- and micro- metrics used to describe various networks.
- Mastery over key community discovery algorithms
- Mastery of the role of network science in WWW and social network applications.
- Familiarity with network science as a discipline
- Familiarity with generative models for networks and various network analysis tools.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Networks, An Introduction , Oxford University Press* - Mark Newman
- *Networks, Crowds, and Markets, Cambridge University Press* - D. Easley and J. Kleinberg

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Motivation and Introduction to Basic Concepts |
| 7 | Fundamentals of Network Theory: Representation, Measures and Metrics |
| 10 | Graph Algorithms, Page Rank and Community Discovery |
| 4 | Network Models |
| 6 | The Web and Social Network Analysis: Putting It All Together |

## Representative Lab Assignments

- Extracting and Constructing a Network from Raw Data
- Understanding and Experimenting with various Network Measures
- Understanding, Implementing, and Exploring Community Discovery Algorithms and PageRank
- Understanding Network Models of Evaluation
- Application Case Study Project

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Project/Programming | 25% |
| Midterm Exam | 25% |

| | |
|---|---|
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Some contribution (1-2 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2011-05-06 13:24:04

# CSE 694L: Introduction to Visualization

### Description

Principles and methods for visualizing data from measurements and calculations in physical sciences and life sciences. Emphasis on 3D computer-graphics providing insight into multi-dimensional data-sets.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 541; 581; or grad standing |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master mappings from abstract spaces to visual representations
- Be familiar with common scalar field visualization techniques
- Be familiar with common vector field visualization techniques
- Be familiar with common data sources and formats
- Be familiar with toolkits and APIs
- Be familiar with brushing and other interaction techniques in Information Visualization
- Be exposed to common Information Visualization techniques

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
| --- | --- |
| 3 | Knowledge of toolkits and APIs Exposure to common Information Visualization techniques |
| 3 | Introduction to tools and APIs |
| 3 | Foundations of visualization |
| 7 | Scientific visualization methods |
| 3 | Scientific visualization applications |
| 7 | InfoViz methods |
| 3 | InfoViz application |
| 1 | Exam |

## Representative Lab Assignments

- Scientific Exploration using Vtk
- Advanced Exploration of Scientific and/or Medical data
- Exploration of high-dimensional data using InfoViz tools
- Group Projects

### Representative Grading Plan

| | |
|---|---|
| Programming assignments | 50% |
| Homework | 10% |
| Exams | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Some contribution (1-2 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Raghu Machiraju

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# CSE 699: Undergraduate Research in Computer Science and Engineering

### Description

Designed to give the student an opportunity to pursue undergraduate research in computer science and engineering.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| U | 1-5 | | |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

- Repeatable to a maximum of 15 cr hrs.
- This course is graded S/U.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-10-12 13:55:45

# CSE 721: Introduction to Parallel Computing

### Description

Principles and practice of parallel computing; design, implementation, and evaluation of parallel programs for shared-memory architectures, local-memory architectures, and vector processors.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl, 1-3 hr lab | 621 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master basic concepts of parallel computing.
- Master parallel algorithm design and analysis.
- Be familiar with performance evaluation for parallel programs.
- Be familiar with problem solving on parallel computers.
- Be exposed to several advanced parallel computers, such as, Cray T94, SGI Origin 2000, and cluster of PCs.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Parallel Computing, 2nd edition* - A. Grama, A. Gupta, G. Karypis

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Models of parallel computers |
| 6 | Basic communication operations |
| 3 | Performance and scalability of parallel systems |
| 3 | Principles of parallel program design |
| 3 | Dense matrix algorithms |
| 3 | Sparse matrix algorithms |
| 3 | Sorting algorithms |
| 3 | Parallel I/O concepts |

| | |
|---|---|
| 1 | Exam |

### Representative Lab Assignments

- Design an algorithm that determines whether two given routes on an Omega network are blocking or not.
- Prove that a certain algorithm for all-to-all collective operation on hypercube is free of link contention.
- Characterize the performance of collective communication operations on one of the OSC supercomputers.
- Describe the communication required to implement matrix-vector multiplication for a given partitioning of the data.

### Representative Grading Plan

| | |
|---|---|
| Homework and programming lab assignments | 30% |
| Term project | 40% |
| Midterm exam | 30% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |

| | | |
|---|---|---|
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: P Sadayappan

Last modified: 2005-06-16 09:09:46

# CSE 723: Introduction to Cryptography

## Description

Symmetric-key encryption, cryptographic hash functions, message authentication, public-key cryptography, discrete logarithm-based cryptography, elliptic curve cryptography, digital signatures, elementary cryptographic protocols.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | Stat 427 or Math 530; CSE 625 or CSE 651 or CSE 680 or Math 573; or permission of instructor. |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

- Some mathematical maturity will be expected.

## Intended Learning Outcomes

- Master the principles of symmetric-key and public-key cryptography and their use for encryption and digital signatures.
- Master RSA and ElGamal's methods, and the digital signature standard.
- Be familiar with Data Encryption Standard and Advanced Encryption Standard.
- Be familiar with message authentication and cryptographic hash functions.
- Be familiar with some important cryptographic protocols such as key exchange, identification, and commitment schemes.
- Be familiar with provable security of cryptographic schemes.
- Be exposed to elliptic curve cryptography.
- Be exposed to zero-knowledge interactive proof systems.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Modern Cryptography* - Jonathan Katz and Yehuda Lindell

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction |

| | |
|---|---|
| 3 | Mathematical background: modular arithmetic, Chinese remainder theorem, finite fields, primality tests |
| 6 | Symmetric-key encryption: theory and practical constructions |
| 3 | Message authentication and cryptographic hash functions |
| 5 | Public-key cryptography: trapdoor one-way functions, RSA encryption, attacks against RSA, probabilistic RSA encryption, optimal asymmetric encryption padding, RSA signatures |
| 3 | Cryptography based on discrete logarithm: discrete logarithm problems, Diffie-Hellman, ElGamal's encryption, ElGamal's signature scheme, Digital Signature Standard |
| 3 | Elliptic curve cryptography: introduction to elliptic curves, elliptic curve cryptography |
| 5 | Basic cryptographic protocols: key exchange, entity authentication, identification schemes, commitment schemes, zero-knowledge interactive proof systems |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework | 25% |
| Midterm exam | 35% |
| Final exam | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Significant contribution (7+ hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Significant contribution (7+ hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ten-Hwang Lai

Last modified: 2011-05-06 13:24:45

# CSE 725: Computability and Unsolvability

### Description

Time and space measures; Turing machine variants and RAM's; universal Turing machines; undecidable language problems; development of efficient algorithms.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 625 |

### Quarters Offered

- Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master the use of Turing reductions to prove certain problems undecidable.
- Master the use of polynomial time Turing reductions to prove certain problems NP-complete.
- Be familiar with diagonalization.
- Be familiar with Church's Thesis.
- Be familiar with various complexity classes.
- Be exposed to theory of cardinalities.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to the Theory of Computation* - M. Sipser

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Turing machines and Church's Thesis |
| 4 | Theory of cardinalitiesÂ |
| 6 | DecidabilityÂ |

| | |
|---|---|
| 8 | NP-completeness |
| 1 | Space complexityÂ |
| 3 | Hierarchy theoremsÂ |
| 1 | Exams |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Midterm exams | 50% |
| Final exam | 40% |
| Homework | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| contribution (3-6 hours) | | |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Luis Rademacher

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# CSE 730: Survey of Artificial Intelligence II: Advanced Topics

### Description

A survey of advanced concepts, techniques, and applications of artificial intelligence, including knowledge-based systems, learning, natural language understanding, and vision.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 630 |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

- There are programming projects and prior programming experience is assumed.

## Intended Learning Outcomes

- Master advanced AI concepts, theories, and terminology.
- Master computational techniques in typical AI subareas.
- Master knowledge representation and reasoning methods in AI.
- Be exposed to current research topics in AI.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Artificial Intelligence: A Modern Approach, 2nd Edition* - Stuard Russell and Peter Norvig

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Introduction, probability theory |
| 6 | Probabilistic inference |
| 4 | Machine learning |
| 2 | Computer vision |
| 2 | Computer audition |
| 2 | Automatic speech recognition |
| 2 | Spoken dialogue systems |
| 3 | Natural language processing |

| | |
|---|---|
| 2 | Abstract reasoning |
| 2 | Information retreival |
| 3 | Exams, exam review |

### Representative Lab Assignments

- Probability theory -- pencil and paper problems, computing likelihood from distributions
- Markov models and machine learning -- pencil and paper, perceptron learning rule, expectation-maximization
- Computer vision -- edge detection
- Speech recognition and natural language processing -- pencil and paper problems

### Representative Grading Plan

| | |
|---|---|
| Quizzes (2 x 10%) | 20% |
| Final exam | 20% |
| Final project (including proposal and presentation) | 25% |
| Homeworks | 30% |
| Participation | 5% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |

| | | |
|---|---|---|
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Eric Fosler-Lussier

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# CSE 731: Knowledge-Based Systems

### Description

Theory and practice of expert systems and knowledge-based systems; use of current knowledge-based systems software tools.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl, 1 3-hr lab | 560; 601; 630 or grad standing |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master task-level analysis and problem solving methods for both configuration (design) and classification problems.
- Be competent with methods for representing and reasoning with uncertain knowledge.
- Be familiar with the analysis and methods of diagnosis problems.
- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Be competent in evaluating design alternatives.
- Be competent with software design and development practices and standards.
- Be familiar with researching and evaluating computing tools and practices for solving given problems.
- Be competent with deadline driven projects in a team setting.
- Be competent with issues of project management, such as teamwork, project scheduling, individual and group time management.
- Be competent with presenting work to a group of peers.
- Be familiar with presenting work to a range of audiences.
- Be competent with techniques for effective written communication for a range of purposes (user guides, design documentation, storyboards etc.)
- Be familiar with analyzing professional issues, including ethical, legal and security issues, related to computing projects.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Knowledge Systems. San Francisco: Morgan Kaufmann. (1995)* - Stefik, M

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction and overview |
| 3 | Production system languages, CLIPS |
| 6 | Classification and diagnosis |
| 6 | Configuration and design |
| 3 | Reasoning with uncertain knowledge |
| 6 | Generic tasks and architectures; abduction methods |
| 3 | Expert systems in industry |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework | 30% |
| Midterm exam | 35% |
| Final project | 35% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, |

| | | |
|---|---|---|
| | | social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

| | | |
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| hours) | | |

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Course Coordinator: Eric Fosler-Lussier

Last modified: 2011-05-06 13:25:15

# CSE 732: Computational Linguistics

### Description

Computational techniques for understanding and producing natural language, investigating the structure and meaning of sentences and connected discourse. Symbolic and probabilistic techniques are discussed.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 630, 625 or Linguist 684.01, Linguist 201, or permission of instructor |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Offered in odd-numbered years.

### Intended Learning Outcomes

- Master some current techniques for language processing.
- Master the fundamentals of symbolic and statistical learning in language processing tasks.
- Be familiar with building interoperable components for a small language processing agent.
- Be familiar with the impact of context on language processing.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Speech and Language Processing* - Daniel Jurafsky and James Martin

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 9 | Course intro, part-of-speech tagging and parsing |
| 8 | Semantic analysis, logical forms |
| 6 | Pragmatics : speech acts, rhetorical relations, contextual effects on interpretation |
| 6 | Generation |
| 3 | Exams and review |

### Representative Lab Assignments

- Part-of-speech labeling using a transformation-based tagger
- Build a bottom-up chart parser
- Build a natural language generator
- Generate logical forms from the output of a chart parser
- Perform agreement checking in a chart parser

### Representative Grading Plan

| | |
|---|---|
| Labs | 40% |
| Midterm | 25% |
| Final | 25% |
| Class Participation | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Eric Fosler-Lussier

Last modified: 2009-07-07 14:01:23

# CSE 733: Foundations of Spoken Language Processing

### Description

Fundamentals of automatic speech recognition and speech synthesis; lab projects concentrating on building systems to process speech.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1.5-hr cl | 625 or Ling 484.01; 630; 730 or Stat 428 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Class time is divided between lectures and group practicals.
- Offered in even-numbered years.

### Intended Learning Outcomes

For details of terminology see http://www.cse.ohio-state.edu/cgi-bin/syllabus-view.cgi?cgi_state=loexpl

- Master fundamental concepts in automatic speech recognition, such as "hidden Markov models", acoustic modeling, language modeling.
- Master fundamental concepts in text-to-speech synthesis, such as concatenative synthesis and text analysis.
- Be familiar with a finite state framework integrating all of speech processing.
- Be familiar with methods of constructing speech recognition and synthesis systems.
- Be exposed to current speech processing research.
- Be exposed to toolkits for both speech recognition and speech synthesis.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Speech Synthesis and Recognition, 2nd edition* - J. Holmes and W. Holmes
- *Spoken Language Processing: A guide to theory, algorithms, and system development* - X. Huang, A. Acero, and H.-W. Hon

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Human hearing, acoustics, and phonetics |
| 3 | Finite state transducers |
| 2 | ASR toolkits |
| 3 | Dynamic time warping and acoustic modeling |
| 4 | HMMs, expectation-maximization, and search |
| 3 | Language modeling |
| 3 | Text analysis |
| 2 | Speech synthesis |
| 1 | Speech processing in context (systems) |
| 2 | Quizzes |
| 4 | Project presentations |

## Representative Lab Assignments

- Exercises using the AT&T FSM toolkit, building pronunciation models for a FSM recognizer
- Train an acoustic model for the FSM recognizer
- Rescore word hypothesis lattice using different language models
- Text normalization using FSMs

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 40% |
| Final Project | 30% |

| | |
|---|---|
| Exams (2 x 10%) | 20% |
| Participation | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Eric Fosler-Lussier

Last modified: 2009-07-07 14:02:20

# CSE 735: Machine Learning and Statistical Pattern Recognition

### Description

Basic concepts of machine learning and statistical pattern recognition; techniques for classification, clustering and data representation and their analysis.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1.5-hr cl | 630 or 674; 730 or Stat 428 or Stat 520; or permission of the instructor. |

### Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master basic techniques of machine learning, including linear methods, prototype-based methods, and kernel methods.
- Master the statistical framework of machine learning and basic concepts, such as Bayes optimal classifier.
- Be familiar with theoretical analysis of complexity and other properties of statistical learning techniques.
- Be exposed to the spectrum of methods for classification, regression and clustering, including boosting, spectral clustering, and other methods.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Pattern Classification* - Richard O. Duda, Peter E. Hart, David G. Stork

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Basics of statistical pattern recognition. Probability and statistical inference. |
| 7 | Overview of techniques for regression and classification, parametric and non-parametric methods including prototype-based methods, linear and kernel methods. |
| 5 | Analysis of statistical algorithms |
| 6 | Supervised and unsupervised learning, methods for unsupervised learning, e.g., PCA and k-means clustering, and Expectation-maximization algorithm. |
| 2 | Advanced topics in machine learning |
| 2 | Discussion of applications, e.g. speech, language, and vision. |
| 2 | Exam review, exam. |

## Representative Lab Assignments

- Image classification using support vector machines
- Unsupervised learning for document clustering

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 25% |

| | |
|---|---|
| Project | 40% |
| Exam | 30% |
| Participation | 5% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| hours) | | professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Misha Belkin

Last modified: 2009-07-07 14:03:13

# CSE 737: Proseminar in Cognitive Science

### Description

An in-depth examination of the interdisciplinary field of Cognitive Science; emphasizes fundamental issues of each discipline, provides illustrations of representative research being conducted at OSU.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 2 | 1 2-hr cl. | Prereq: 612, Linguist 612, Psych 612, or Philos 612, or permission of instructor. |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| | d | an ability to function on multi-disciplinary teams; |
| | e | an ability to identify, formulate, and solve engineering problems; |
| | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| | g | an ability to communicate effectively with a range of audiences; |
| | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| | | professional development; |
| | j | a knowledge of contemporary issues; |
| | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

Course Coordinator: Deliang Wang

Last modified: 2008-04-09 09:23:30

# CSE 741: Comparative Operating Systems

### Description

A careful examination of a number of representative computer operating systems.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl. | Prereq: 660 or equiv. |

### Quarters Offered

- Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| | d | an ability to function on multi-disciplinary teams; |
| | e | an ability to identify, formulate, and solve engineering problems; |
| | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| | g | an ability to communicate effectively with a range of audiences; |
| | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

Course Coordinator: John Heimaster

Last modified: 2008-04-09 09:23:53

# CSE 755: Programming Languages

### Description

Procedural abstraction, data abstraction, control abstraction (nondeterminism, concurrency, etc.), operational semantics, denotational semantics, specification, and verification of programs.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 655 and Math 366 |

### Quarters Offered

- Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master using attribute grammars for specifying context-sensitive grammars.
- Master using the meta-circular approach to defining operational semantics of Lisp.
- Master using the axiomatic approach to reasoning about the behavior of imperative programs.
- Be familiar with using structured operational semantics.
- Be exposed to using denotational semantics.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Lisp 1.5 Programming Manual (for reference)* - J. McCarthy, et al.
- *Formal Specifications of Programming Languages* - F. Pagan

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Attribute grammars |
| 6 | Lisp, the Lisp interpreter in Lisp; implementing a Lisp interpreter |
| 8 | Axiomatic semantics |
| 3 | Structured operational semantics |
| 4 | Denotational semantics |
| 3 | Midterms, review |

## Representative Lab Assignments

- Implementing a pure Lisp interpreter in C++ (or Java, ...)

## Representative Grading Plan

| | |
|---|---|
| Homework assignments | 10% |
| Programming lab | 20% |
| Midterms | 35% |
| Final exam | 35% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Atanas Rountev

Last modified: 2005-06-11 10:58:42

# CSE 756: Compiler Design and Implementation

## Description

Syntactic and semantic analysis using formal models, automatic programming, generation of optimal code, synthesis of messages, design of incremental programming environments; students write a translator.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 459.21, 625, 655, and 680 |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master using lexical analyzer and parser generator tools.
- Master building symbol tables and generating intermediate code.
- Be competent with generating assembly code for a RISC machine.
- Be competent with control-flow and dataflow analysis;
- Be competent with compiler architecture.
- Be familiar with type checking.
- Be exposed to register allocation.
- Be exposed to compiler optimizations.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Compilers: Principles, Techniques, and Tools* - Alfred Aho, Monica Lam, Ravi Sethi, Jeffrey Ullman

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Compiler structure |
| 3 | Lexical analysis |
| 4 | Parsing |
| 4 | Semantic analysis |
| 1 | Review for midterm exam |
| 1 | Midterm exam |
| 4 | Activation records |
| 4 | Intermediate code |
| 3 | Instruction selection |
| 1 | Liveness analysis |
| 2 | Register allocation |

## Representative Lab Assignments

- Implement a lexical analyzer
- Implement a parser
- Implement type checking
- Implement activation record
- Implement translation to intermediate code
- Implement instruction selection

## Representative Grading Plan

| | |
|---|---|
| Lab assignments | 42% |
| Homework assignments | 8% |
| Midterm exam | 20% |
| Final exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Atanas Rountev

Last modified: 2011-05-06 13:25:59

# CSE 757: Software Engineering

### Description

Principles of design, implementation, validation, and management of computer software; emphasis on reading and discussing papers from relevant journals and proceedings; term project required.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 560 or equiv and sr or grad standing or permission of instructor |

### Quarters Offered

- Au, Wi, Su

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master design principles and patterns.

- Be competent with structured and agile software engineering frameworks; specifically structured and agile software engineering methodologies for requirements identification, analysis, architecture, design, testing, deployment and project management.
- Be familiar with the characterization of enterprise software systems.
- Be familiar with frameworks for analyzing the business context of enterprise IT systems, the concept of Business-IT alignment and related issues, and Enterprise Architecture.
- Be exposed to the trends impacting enterprise systems.
- Be exposed to the need for frameworks for software engineering.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Applying UML and Patterns, 2nd edition* - Craig Larman
- *Design Patterns: Elements of Reusable Object-Oriented Software* - Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
- *Software Engineering, A Practitioner's Approach,* - Roger Pressman
- *Software Engineering* - Sommerville

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction to software engineering |
| 3 | The business context of software engineering |
| 3 | Software Process - Structured and Agile Processes |
| 6 | Requirements identification. Requirements analysis - domain, problem and solution analysis. |
| 3 | Software Architecture |
| 4 | Responsibility-Driven Software Design |
| 3 | Software Project Management. Agile and Structured Project Management |
| 1 | Midterm |
| 1 | Midterm Review |
| 2 | In-class simulations |
| 3 | Software Engineering Case Studies |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Class participation | 10% |
| Quizzes | 30% |
| Final exam | 30% |
| Small-Team Project | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| contribution (1-2 hours) | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Rajiv Ramnath

Last modified: 2011-05-06 13:26:10

# CSE 758: Software Engineering Project

### Description

Principles and applications of programming team organization, cost estimation, scheduling, requirements analysis, design, documentation, programming-in-the-large, group reviews, testing, and debugging.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl, 3-hr lab. | 757; 601 |

### Quarters Offered

- Au, Wi, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Master deadline driven software design and development in a team setting for an open-ended problem.
- Be competent in evaluating design alternatives.
- Be competent with issues of teamwork, project scheduling, individual and group time management.
- Be competent with presenting work to an audience of peers.
- Be competent with techniques for effective oral and written communication for a range of purposes.
- Master principles of structured and agile software eng. frameworks, specifically methodologies for requirements identification, analysis, architecture, design, deployment, testing, and project management.
- Be competent with application of structured & agile software eng. frameworks, specifically methodologies for requirements identification, analysis, architecture, design, deployment, testing, and project management.
- Be familiar with frameworks for analyzing the business context of enterprise IT systems, the concept of Business-IT alignment and related issues, and Enterprise Architecture frameworks for analyzing and achieving Business-IT alignment.
- Be competent with the application of at least one industry-standard technology framework.
- Be competent with professional and formal presentations and communications to a varied set of stakeholders – customers, peers and superiors.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *UML Distilled: Applying the Standard Object Modeling Language (Addison-Wesley Object Technology Series)* - Martin Fowler, Kendall Scott
- *Software Engineering: An Introduction to Plan Driven & Agile Processes* - Gian-Carlo Succi, et al.
- *Developing Object-Oriented Software, An Experience-Based Approach, Object-Oriented Technology Center* - IBM (several), 1997
- *J2EE Developer's Handbook* - Paul Perrone, Venkata S.R., Tom Schwenk
- *Software Engineering: A PractitionerÂ's Approach* - Roger Pressman
- *Quality Web Systems Â– Performance, Security, Usability* - Dustin, et al.

### Representative Topics List

| Number of Hours | Topic |
|---|---|

| | |
|---|---|
| 1 | Course expectations - focus on design and software engineering process |
| 2 | Selection of appropriate software engineering methodology - based on project characteristics |
| 27 | Project presentations and feedback |

### Representative Lab Assignments

- Sensor-based system for traffic management.
- A public-access client assistance web site.
- A testing framework for PHP and C++ based cable-network dimensioning tools.
- A referee scheduling web site for the Mid-Ohio Select Soccer League.
- A smart card access device.
- A PDA-based system for Realtor applications.

### Representative Grading Plan

| | |
|---|---|
| Group project final presentation | 60% |
| Group project interim presentation | 15% |
| Continuous weekly progress | 15% |
| Final report | 10% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ | d | an ability to function on multi-disciplinary teams; |

| | | |
|---|---|---|
| hours) | | |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Rajiv Ramnath

Last modified: 2011-05-06 13:26:20

# CSE 760: Operating Systems

### Description

Advanced operating system concepts: process synchronization, process deadlock, security and access control, distributed operating system principles and prototypes.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 660 or equiv. |

### Quarters Offered

- Au, Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master language and operating system constructs such as semaphores and monitors designed for process synchronization, mutual exclusion, interprocess communication.
- Master principles and algorithms for distributed mutual exclusion security in distributed systems.
- Be familiar with the principles and approaches to deadlock and fault tolerance in distributed systems.
- Be familiar with the issues of security and access control in distributed systems and with techniques used to address these issues.
- Be exposed to the basic concepts of data consistency and data consistency models.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Distributed Systems* - A. Tanenbaum, M. van Steen
- *Advanced Concepts in Operating Systems* - M. Singhal, N. Shivaratri

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Intro to distributed systems |
| 3 | Process synchronization |
| 3 | Mutual exclusion |
| 3 | Interprocess communication |
| 3 | Distributed mutual exclusion |
| 1 | Midterm |
| 3 | Concurrency control |
| 3 | Deadlock |
| 3 | Fault-tolerance |
| 3 | Security |
| 2 | Data consistency models |

## Representative Lab Assignments

- Producers/consumers problem using semaphores and monitors
- Readers/writers problem in Ada
- Analysis of an algorithm for distributed mutual exclusion
- Deadlock detection using General Resource Graph theorems
- Design of an authentication protocol

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Midterm Exam | 40% |
| Final Exam | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

| | | |
|---|---|---|
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Gagan Agrawal

Last modified: 2005-06-11 11:08:38

# CSE 762: Web-Services-Based Distributed Systems Project

### Description

Construction of a significant distributed software system using web services; team-based implementation of non-trivial algorithm(s) and realistic user interface.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 601; 660; 662 or 677 or 760 |

### Quarters Offered

- Au, Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Be competent with implementing distributed software using current software technologies including web-services.
- Be familiar with making a variety of design decisions, including those that impact the performance and scalability of the implemented service.
- Be familiar with installing and learning to use new technologies on your own (possibly with the help of others in your group).

- Be competent with documenting the developed system and your experiences orally and in writing.
- Be competent with working successfully in groups.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *None*

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction to the class and web-services |
| 6 | WSDL, SOAP, .NET, J2EE, UDDI |
| 6 | Project proposal presentations |
| 6 | Sharing experiences in learning new technologies |
| 6 | Intermediate progress presentations |
| 3 | Final project presentations |

## Representative Lab Assignments

- A single project that involves the implementation of a web-service, giving consideration to open design, registration, use of sophisticated distributed algorithms, and scalability considerations.

## Representative Grading Plan

| | |
|---|---|
| Class attendence and participation | 10% |
| Project proposal | 10% |
| Technology learning experience presentation | 15% |
| Intermediate progress presentation | 10% |
| Project report | 15% |
| Project implementation and demonstration | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| hours) | | |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Rajiv Ramnath

Last modified: 2011-05-06 13:26:35

# CSE 763: Introduction to Distributed Computing

### Description

Concepts and mechanisms in design of distributed systems; process synchronization, global state: reliability; distributed resource management; deadlock, performance evaluation; representative distributed operating systems.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 760 |

### Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master the principles behind several specific classes of distributed algorithms for solving particular problems.
- Master reading and understanding distributed algorithms.
- Be competent with writing and designing distributed programs.
- Be competent with the analysis and verification of distributed programs.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Elements of Distributed Computing* - Vijay Garg

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Predicate calculus |
| 3 | Model of computation and fairness |
| 5 | Reasoning about programs: safety and progress |
| 4 | Time, clocks, and synchronization |
| 5 | Dining philosophers, global state, snapshots |
| 5 | Termination detection, garbage collections, discrete event simulation |
| 2 | Self-stabilization |
| 2 | Midterms |

## Representative Lab Assignments

## Representative Grading Plan

| | |
|---|---|
| Minute Quizzes | 10% |
| Midterms | 30% |
| Final | 40% |
| Problem Sets | 20% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Anish Arora

Last modified: 2011-05-06 13:26:47

# CSE 767: Applied Use-Case-Driven Object-Oriented Analysis and Design for Engineers and Scientists

### Description

Case study using incremental and iterative use-case-driven process of building object-oriented scientific and engineering software systems; analysis, design, UML modeling, design patterns.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 3 | 3 cl | 668 or ECE 668 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Offered in odd-numbered years.
- Cross-listed with ECE 767.

### Intended Learning Outcomes

- Be familiar with using UML-based industry-standard CASE tools.
- Be familiar with following a process that is driven by the requirements of the users of the system.

- Be familiar with model building, at the level of use cases, analysis, and design.
- Be familiar with the important step of bridging the gap between analysis and design.
- Be familiar with using objected-oriented design patterns.
- Be familiar with the implications of building real-time software systems.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Use Case Driven Object Modeling with UML, A Practical Approach* - Rosenberg and Scott

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Review of elementary UML and intermediate concepts |
| 4 | What is good software? |
| 1 | Introduction to the case study problem |
| 4 | Requirements capture, and use case analysis |
| 2 | Introduction to use case driven iterative and incremental processes |
| 3 | Analysis and problem domain models |
| 3 | Robustness diagrams |
| 3 | Bridging the gap between analysis and design; GRASP patterns. |
| 3 | Design and design patterns |
| 4 | Review and exams |

## Representative Lab Assignments

- Use case analysis of a scientific or engineering problem, e.g., in automotive software systems

## Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Midterm exam | 20% |
| Project | 30% |

| | |
|---|---|
| Final exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |

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| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Furrukh Khan

Last modified: 2008-04-08 10:01:58

# CSE 769: Applied Enterprise Distributed Computing for Engineers and Scientists

### Description

Industry-standard technologies for enterprise distributed computing, especially in engineering and scientific contexts; Java-based technologies, XML, Web Services.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1-1/2 hr cl | 660; 668 or ECE 668 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with the technologies of enterprise computing that are most important in the software industry.

- Be competent with the advantages of architectures, specifically three tier architectures over two tier architectures.
- Be competent with how to build scalable distributed systems.
- Be competent with standards in describing data.
- Be familiar with how to apply enterprise computing to scientific problems.
- Be familiar with the importance of distributed computing through hands on experience.
- Be familiar with the issues involved in enterprise mission critical applications.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Java Enterprise in a Nutshell (1999)* - David Flanagan, Jim Farley, William Crawford, Paula Ferguson, O'Reilly and Associates
- *Class Notes and the following References for supplemental reading*
- *Java and XML, 2nd Edition (2001)* - Brett McLaughlin, O'Reilly
- *Core Jini (1999)* - W. Keith Edwards, Prentice Hall
- *JavaSpaces(TM) Principles, Patterns, and Practice (the Jini technology series) (1999)* - Eric Freeman, Suasanne Hupfer and Ken Arnold
- *Enterprise JavaBeans (1999)* - Richard Monson-Haefel, O'Reilly and Associates
- *XML Specification Guide (1999)* - Ian S. Graham and Liam Quin, Wiley
- *XML in a Nutshell (2001)* - Elliotte Rusty Harold and W. Scott Means, O'Reilly
- *Java Report, C++ Report (SIGS Publishing)* - Java Developer's Journal (sys.com publications)

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Evolution of distributed systems technologies |
| 1 | Remote class loading with Java |
| 1 | Java sockets |
| 3 | RMI (Remote Method Invocation) |
| 3 | Jini and JavaSpaces and applications to embedded systems |
| 1 | Layered architectures, 3-tier, n-tier architectures |
| 2 | EJB (Enterprise Java Beans) |
| 1 | JSP (Java Server Pages) |
| 1 | JDBC |
| 2 | XML (eXtensible Markup Language) |

| | |
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| 1 | XML DOM (Document Object Model) standardized by the W3C |
| 1 | XSL (eXtensible Style sheet Language) |
| 1 | XML Schemas |
| 1 | WSDL (Web Services Description Language) |
| 10 | Project discussion, exams, etc. |

### Representative Lab Assignments

- Gather performance data for Java RMI invocations and analyze the effect of co-location, parameter types , and parameter sizes on this performance
- Use JavaSpaces to build a concurrent, dynamic, and failure-resistant scientific application for protein sequencing
- Use various XML technologies (DTD, XSLT, and SAX) to manage various tasks in a telecommunications application

### Representative Grading Plan

| | |
|---|---|
| Homework (5) | 40% |
| Peer evaluation | 5% |
| Minute quizzes | 10% |
| Midterm (2) | 20% |
| Final Exam | 25% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |

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| | | considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Paul Sivilotti

Last modified: 2011-05-06 13:27:18

# CSE 770: Database System Implementation

## Description

Fundamental design considerations, system principles and machine organizations of database systems; performance analysis of design alternatives, system configurations and hardware organizations; query and transaction processing.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 660; 670; 671 or grad standing |

## Quarters Offered

- Wi

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master database systems design and implementation principles
- Master query processing techniques
- Be competent with database performance analysis methods
- Be competent with transaction processing techniques
- Be familiar with database tuning
- Be familiar with concurrency control and crash recovery
- Be familiar with distributed databases

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Database Systems: The Complete Book, Prentice-Hall* - Hector Garcia-Molina, Jeffrey Ullman, & Jennifer Widom
- *Concurrency Control and Recovery in Database Systems, Addison-Wesley Pub. Co* - Philip A. Bernstein, Vassos Hadzilacos, and Nathan Goodman
- *Fundamentals of Database Systems, Addison-Wesley* - Ramez Elmasri and Shamkant B. Navathe

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 4 | Query Processing and Optimization |
| 4 | Advanced Data Storage and Retrieval |
| 3 | Database System Architectures |
| 3 | Distributed Databases |
| 2 | Transactions |
| 3 | Concurrency Control and Recovery |
| 3 | Database Tuning |
| 3 | Database Performance Evaluation |
| 4 | Database System Implementation Project |
| 1 | Midterm |

### Representative Lab Assignments

- Design and implementation of an automated and online database performance tuner for selection queries

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 20% |
| Project | 40% |
| Final | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Substantial contribution (3-6 hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates |

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| hours) | | comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Srinivasan Parthasarathy

Last modified: 2011-05-06 13:27:28

# CSE 772: Information System Project

### Description

Information system design and development principles: requirement analysis, database design methods and tools, process design, application development tools, testing, evaluation and documentation. Group term project.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 560; 616 or 757; 601; 670 |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Master design and implementation of an information systems project.
- Master using database design methods and tools.
- Be competent in evaluating design alternatives.
- Be competent with software design and development practices and standards.
- Be competent with deadline driven projects in a team setting.

- Be competent with issues of project management, such as teamwork, project scheduling, individual and group time management.
- Be competent with presenting work to a range of audiences and peers.
- Be competent with techniques for effective written communication for a range of purposes.
- Be familiar with researching and evaluating computing tools and practices for solving given problems.
- Be familiar with analyzing professional issues, including ethical, legal and security issues, related to computing projects.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Fundamentals of Database Systems* - Ramez Elmasri and Shamkant B. Navathe
- *Practical Analysis & Design for Client/Server & GUI Systems* - D. A. Ruble
- *Principles of Multimedia Database Systems* - V.S. Subrahmanian

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Principles of information systems projects; descriptions of projects |
| 2 | Image, audio, video, and text databases |
| 2 | Biological databases |
| 2 | Web-based information systems |
| 3 | Requirement analysis, initial design, project proposals |
| 6 | Project design and implementation progress |
| 3 | User-interface design, initial demonstrations |
| 6 | Project implementations, testing |
| 3 | Final demonstrations |

## Representative Lab Assignments

- Design and implementation of an image database and a web-based search engine
- Design and implementation of a database management system and a user-friendly interface for an online community where doctors and patients can interact and communicate important health issues
- Design and implementation of a search engine for biosequences, i.e., DNA and protein sequences

## Representative Grading Plan

| | |
|---|---|
| Progress reports | 15% |
| Presentations | 15% |
| Midterm Demo | 15% |
| Final Demo and Report | 45% |
| Participation | 10% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Srinivasan Parthasarathy

Last modified: 2011-05-06 13:27:40

# CSE 775: Computer Architecture

### Description

The principles and tradeoffs behind the design of modern computer architectures including instruction set design, pipelining and memory hierarchy design.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 660; 675.01 or 675.02 |

## Quarters Offered

- Au, Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master quantitative and qualitative design issues in modern architectures.
- Master instruction set architecture design principles.
- Master basic and advanced pipelining principles.
- Be familiar with quantitative and qualitative issues related to hierarchical memory and I/O system designs.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Computer Architecture: A Quantitative Approach* - John Hennessy and David Patterson, Morgan Kauffman, 2007 (Fourth edition).

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Quantiative and qualitative design principles and introduction to modern computer architectures |
| 5 | Instruction set design principles |
| 11 | Basic and advanced pipelining issues |
| 8 | Memory system and I/O design principles |
| 1 | Exam |

## Representative Lab Assignments

- Instruction set design (simplescalar simulator)
- Pipelining design (simplescalar simulator)

- Cache system design (simplescalar simulator)

### Representative Grading Plan

| | |
|---|---|
| Homework assignments | 20% |
| Laboratory assignments | 20% |
| Midterm | 25% |
| Final | 35% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Radu Teodorescu

Last modified: 2008-09-29 09:53:44

# CSE 777: Telecommunication Networks

### Description

Broadband integrated services digital networks, asynchronous transfer mode, gigabit networks, wireless networks, multimedia networks, all-optical networks, synchronous optical network.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl. | 677 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Offered in odd-numbered years.

### Intended Learning Outcomes

- Master the networking principles for circuit switching networks
- Master the concepts on medium access control protocols and local area networks
- Master the key protocols for routing in the Internet
- Be familiar with network traffic management
- Be exposed to advanced network architectures such as RSVP, MPLS and Diffserv

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Â“Communication NetworksÂ”, Second Edition, McGraw Hill* - Alberto Leon-Garcia and Indra Widjaja

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Circuit Switching Networks |
| 5 | Medium Access Control Protocols |
| 5 | Local Area Networks |
| 5 | Routing in the Internet |
| 5 | Network Traffic Management |
| 4 | Advanced Networking: RSVP, MPLS and Diffserv. |
| 1 | Midterm |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homeworks | 40% |
| Midterm | 30% |
| Final Exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Prasun Sinha

Last modified: 2009-07-07 14:09:04

# CSE 778: Computer-Aided Design and Analysis of VLSI Circuits

### Description

VLSI design methodology; specification of VLSI circuits at various levels of abstraction; design, layout, and computer simulation of circuits; high-level systhesis; design projects.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 560; ECE 561; 601; 675 or ECE 662. |

### Quarters Offered

- 

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Be competent with fundamentals of CMOS digital circuits.
- Be competent with CAD tools for the design and verification of digital VLSI circuits.
- Be competent with low-level (circuit/layout) as well as high-level (Hardware Description Languages) design methodology for VLSI.
- Be competent in evaluating design alternatives.
- Be competent with design and development practices and standards.
- Be competent with deadline driven projects in a team setting.
- Be competent with presenting work to a range of audiences and peers.
- Be familiar with researching and evaluating computing tools and practices for solving given problems.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *CMOS VLSI Design - A Circuits and Systems Perspective, 3rd Edition* - Neil Weste and David Harris

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | CMOS circuits |
| 2 | Switch-level logic simulation |
| 3 | CMOS device characteristics |
| 4 | CMOS layout; layout editing |
| 3 | First-order timing models; Transistor sizing |
| 3 | CMOS storage elements; Clocked circuits |
| 6 | Hardware description languages; Verilog |
| 3 | CMOS sub-system examples |
| 3 | Student presentations |

## Representative Lab Assignments

## Representative Grading Plan

| | |
|---|---|
| Laboratory assignments and homework | 20% |

| | |
|---|---|
| Midterm examination | 30% |
| Design projects | 40% |
| Oral presentation | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Significant contribution (7+ hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: P Sadayappan

Last modified: 2011-05-06 13:31:59

# CSE 779: Introduction to Neural Networks

### Description

Survey of fundamental methods and techniques of artificial neural networks: single and multi-layer networks; associative memory and statistical networks; supervised and unsupervised learning.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | 630 or ECE 600 or 662 or permission of instructor |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with basic neural network methods
- Be competent with solving problems using neural network techniques
- Be familiar with background material about neural networks to take other specialty courses on neural networks

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Neural and Adaptive Systems* - J.C. Principe, N.R. Euliano, and W.C. Lefebvre

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Introduction and McCulloch-Pitts networks |
| 3 | Perceptrons |
| 3 | Regression and least mean square algorithm |
| 7 | Multilayer perceptrons |
| 5 | Radial basis function networks |
| 3 | Support vector machines |
| 2 | Recurrent networks |
| 2 | Unsupervised learning and self-organization |
| 2 | Applications |

### Representative Lab Assignments

- Implement a two-layer perceptron with the backpropagation algorithm to solve the parity problem

- Implement a radial basis function network for one input variable, one output variable and Gaussian basis function; the function to be approximated is a sine function with added noise

## Representative Grading Plan

| | |
|---|---|
| Homework | 18% |
| Projects | 30% |
| Midterm | 22% |
| Final | 30% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Substantial contribution (3-6 hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Substantial contribution (3-6 hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Deliang Wang

Last modified: 2011-07-07 19:46:40

# CSE 780: Analysis of Algorithms

## Description

Algorithm design paradigms; mathematical analysis of algorithms; NP-completeness.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | 680 or grad standing and equiv of 680 |

### Quarters Offered

- Au, Wi

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be competent with a comprehensive "tool box'' of algorithm design techniques.
- Master a few of these techniques.
- Master how to analyze the efficiency of algorithms.
- Be competent with designing and analyzing graph algorithms.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Algorithms* - T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Mathematical foundations |
| 6 | Divide-and-conquer |
| 6 | Dynamic programming |
| 5 | Greedy algorithms |
| 6 | Graph algorithms |
| 2 | Exams |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework | 20% |
| Midterm Exams | 40% |
| Final Exam | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ | l | an ability to analyze a problem, and identify and define the computing requirements |

| | | |
|---|---|---|
| hours) | | appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ten-Hwang Lai

Last modified: 2011-05-06 13:28:39

# CSE 781: Real-time Rendering

### Description

3D viewing algorithms, advanced illumination models, smooth shading, shadows, transparency, ray tracing, and color models.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 3 cl | 581 or 681; 560 or grad standing |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Lab assignments are programmed in C.

### Intended Learning Outcomes

- Master advanced graphics programming and the theory of real time rendering.
- Be familiar with various techniques for creating 3D realism.

- Be exposed to the state of the art in graphics hardware API.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Real-Time Rendering* - Tomas Akenine-Moller and Eric Haines

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Course overview; graphics rendering pipeline; overview of graphics hardware |
| 3 | Special topics on transformation, projection, rasterization, and clipping |
| 3 | Alias and anti-aliasing; advanced texture mapping Â– filtering, parameterization, multi-texturing |
| 3 | Texture mapping continued Â– bump mapping, reflection and environment mapping, procedural textures |
| 6 | Shadow algorithms Â– planar shadows, shadow volumes, shadow maps |
| 6 | Advanced lighting and shading Â– multi-pass rendering, programmable graphics hardware, shading languages, real time shaders, special effects |
| 3 | Spatial data structures; culling techniques Â– frustum culling, portal culling, hierarchical methods, hardware techniques |
| 3 | Occlusion culling techniques continued; advanced topics Â– image based rendering, LOD rendering, non-photorealistic rendering |

## Representative Lab Assignments

- OpenGL 3D scene renderer with virtual trackball interface
- Implementation of shadow algorithms
- Texture mapping and culling
- GPU based programming

## Representative Grading Plan

| | |
|---|---|
| Four labs | 50% |
| Midterm exam | 20% |

| | |
|---|---|
| Final exam | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Han-Wei Shen

Last modified: 2011-05-06 13:28:49

# CSE 782: Advanced 3D Image Generation

## Description

Rendering 3D realistic imagery, including texture mapping, sampling theory, advanced ray tracing, radiosity, 3D rendering hardware, introduction to surfaces, animation, and volume graphics.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 681 |

## Quarters Offered

- Au

## General Information, Exclusions, Cross-listings, etc.

- Lab assignments are programmed in C.

## Intended Learning Outcomes

- Master path tracing, ray tracing and photon mapping, sub-surface transport and tone mapping algorithms.
- Be familiar with 3D global illumination.
- Be familiar with algorithms for handling various scenes of differing complexity.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Design and Implementation of a Physically-based Rendering System* - Matt Phar, Greg Humphreys

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Physically based rendering |
| 3 | Optimizing ray tracing |
| 3 | Color, radiometry and tone mapping operators |
| 2 | Reflection models, transparency and bi-directional reflection models |
| 5 | Monte-Carlo Methods, sampling techniques |
| 6 | Light transport |
| 4 | Sub-surface light transport, participating media and volume rendering |
| 2 | Radiosity |
| 3 | Review and exam |

## Representative Lab Assignments

- Getting familiar with software pbrt (phyiscally based ray tracer)
- Computing ray intersections with implicit surfaces
- Tone mapping technques
- Choice of many algorithms - including sampling pattern generators, path integrators, BRDFs and special effects
- Final project

### Representative Grading Plan

| | |
|---|---|
| Laboratory assignments | 40% |
| Homeworks | 5% |
| Midterm | 20% |
| Project | 35% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Some contribution (1-2 hours) | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| hours) | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Raghu Machiraju

Last modified: 2005-06-20 08:39:24

# CSE H783: Honors Research

### Description

Supervised research and project work arranged individually for honors students.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| U | 1-5 | Arr | Honors standing; permission of instructor |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

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|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Rephael Wenger

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# CSE 784: Geometric Modeling

### Description

Common mathematical techniques for modeling geometric objects in computer graphics and CAD applications. Sample based modeling and hierarchical representations.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | 681 or permission of instructor |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Offered in even-numbered years.

### Intended Learning Outcomes

- Master modeling curves (B-splines and Bezier).
- Master modeling surfaces (B-splines, Bezier, subdivision).
- Master techniques for object creation, manipulation with extrusion, revolution, lofting.
- Be familiar with curve reconstruction.
- Be familiar with surface simplification.
- Be exposed to surface reconstruction.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Geometric Modeling* - Mortenson
- *Course Notes* - Tamal K. Dey

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 6 | Curve modeling (B-splines and Bezier) |
| 3 | Subdivision curves |
| 3 | Surface geometry and topology |
| 4 | Surface modeling (B-splines and Bezier) |
| 4 | Subdivision surfaces |
| 3 | B-rep, CSG, boolean operations, Euler operations for solids |
| 3 | Curve reconstruction |
| 2 | Surface simplification |
| 2 | Midterm examination, review, discussions |

## Representative Lab Assignments

- Model Bezier and B-spline curves with various methods and user interfaces
- Generate control polyhedra from the curves in Lab 1 above and several object generation techniques
- Use the control polyhedra generated in Lab 2 above to generate subdivision surfaces

## Representative Grading Plan

| | |
|---|---|
| Lab assignments | 35% |
| Midterm | 25% |
| Final | 30% |
| Class participation | 10% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Some contribution (1-2 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Some contribution (1-2 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Tamal Dey

Last modified: 2008-04-08 10:03:25

# CSE 786: Game Design and Development Project

### Description

Team-based project: conceptual design, technical design, and implementation of an interactive game, integrating custom code and toolkits; emphasizes teamwork, written and oral communication skills.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 4 | 2-1.5 hr cl, 1 2-hr lab | 560; 581; 601; 630 |

## Quarters Offered

- Sp

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

- Master synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.
- Master design and implementation of a game design and development project.
- Be competent with toolkits used in gameplay control, world simulation, and audio/visual rendering for interactive media and games, such as particle systems, special effects, shaders, physics, and three-dimensional sound.
- Be competent with AI techniques as they apply to interactive media applications.
- Be familiar with standard tools and techniques used in interactive media and AI programming.
- Be competent in evaluating design alternatives.
- Be competent with game design and development practices and standards.
- Be familiar with the control of input devices and reconfigurable bindings.
- Be familar with networking and concurrency issues for multi-player games.
- Be competent with deadline driven projects in a team setting.
- Be competent with issues of project management, such as teamwork, project scheduling, individual and group time management.
- Be competent with presenting work to a range of audiences and peers.
- Be competent with techniques for effective written communication for a range of purposes.
- Be familiar with researching and evaluating computing tools and practices for solving given problems.
- Be familiar with analyzing professional issues, including ethical, legal and security issues, related to computing projects.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Programming Game AI by Example* - Mat Buckland

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Course overview and project guidelines |

| | |
|---|---|
| 4 | Software engineering for games, basic game structure, source code control, project management |
| 2 | Introduction to graphics toolkit and advanced graphics issues for games |
| 3 | Review of artificial intelligence techniques for games and simulations, and corresponding toolkits |
| 12 | Student presentations of team research on toolkits used in game programming such as three-dimensional sound, physics, scripting, networking, input controllers, etc. |
| 6 | Student team project presentations |
| 16 | In-class team game project design and development time |
| 6 | In-class group technology research time |

## Representative Lab Assignments

- Timebox 1: Basic game structure and overall finite-state machine, including loading content, menu system, play start-up and cleanly terminating.
- Timebox 2: Basic gameplay including 3D sound and interactivity. Packaging, compression and installation packages.
- Timebox 3: Adding richness through better graphical models, shaders, sound system, AI behaviors and physics.
- Final Project: Continued development, forecast for the future and game post-mortem.

## Representative Grading Plan

| | |
|---|---|
| Quizzes | 10% |
| Timebox #1 | 10% |
| Timebox #2 | 10% |
| Timebox #3 | 10% |
| Game Design Document | 10% |
| Final Game | 10% |
| Game Team Presentations | 10% |
| Technology research and Presentations | 20% |
| Homeworks | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Significant contribution (7+ hours) | g | an ability to communicate effectively with a range of audiences; |
| Some contribution (1-2 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Significant contribution (7+ hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Significant contribution (7+ | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| hours) | | |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| Significant contribution (7+ hours) | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| Significant contribution (7+ hours) | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| Significant contribution (7+ hours) | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Roger Crawfis

Last modified: 2011-05-06 13:29:16

# CSE 788: Intermediate Studies in Computer and Information Science

### Description

Intermediate work in one of the specialized areas of computer and information science is offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 1-5 | | Grad standing or permission of instructor. |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |

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|---|---|---|
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

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# CSE 793: Individual Studies

### Description

Designed to give the individual student an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 1-5 | | Grad standing or permission of instructor |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

- Repeatable to a maximum of 12 cr hrs for undergraduate and 24 cr hrs for grad students.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |

| | | |
|---|---|---|
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

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# CSE 794: Group Studies

### Description

Designed to give students an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 1-5 | | |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

- Repeatable to a maximum of 15 cr hrs.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |

| | | |
|---|---|---|
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

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# CSE 794A: Advanced Algorithms

### Description

Advanced graph algorithms, string algorithms, linear programming, matrix operations, Fourier transforms, randomized algorithms, approximation algorithms, geometric algorithms.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| UG | 3 | 3 cl | 780 or permission of instructor |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Offered in odd-numbered years.

### Intended Learning Outcomes

- Be familiar with advanced topics in algorithms such as advanced graph algorithms, string algorithms, linear programming, matrix operations, Fourier transforms, randomized algorithms, approximation algorithms, geometric algorithms
- Master a subset of algorithms : Linear programming, advanced graph algorithms, approximation algorithms.
- Be familiar with how to design algorithms for problems in applications.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Algorithms* - T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein
- *Course notes, papers* - supplied by the instructor

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 5 | Advanced graph algorithms |
| 3 | Linear programming |
| 6 | Fourier transforms, Matrix operations |
| 5 | String algorithms |
| 6 | Approximation algorithms |
| 3 | Geometric algorithms |
| 2 | Exams |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework | 30% |
| Midterm Exams | 30% |
| Final Exam | 40% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Significant | i | a recognition of the need for, and an ability to engage in life-long learning and continuing |

| | | |
|---|---|---|
| contribution (7+ hours) | | professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2009-07-07 14:10:49

# CSE 794J: Applied Enterprise Services Architectures

### Description

Interdisciplinary frameworks for enterprise Information Technology (IT) architectures; applications to transformation and innovation within the enterprise and creating solutions to real-world problems.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1.5-hr cl | 682 or 731 or 758 or 762 or 772 or 778 or permission of instructor |

### Quarters Offered

- Wi

## General Information, Exclusions, Cross-listings, etc.

- Classroom as work experience comparable to a CSE capstone design course, or significant depth in another discipline with considerable IT focus, suggested for instructor permission.

## Intended Learning Outcomes

- Master techniques for representing and analyzing enterprise architectures in order to more effectively manage complex systems of business processes, organizations, and technologies.
- Be familiar with the practice of applying architecture knowledge for developing strategic options for decision making and developing IT solution approaches for industry-sponsored problems.
- Be familiar with communication and program management skills through making presentations that consider all stakeholder perspectives and techniques for identifing areas of IT innovation and requirements relevant to a particular organization.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Selected Readings* - to be provided in class
- *The Visible OPS Handbook* - Kevin Behr, Gene Kim, George Spafford
- *UML Distilled: Applying the Standard Object Modeling Language (Addison-Wesley Object Technology Series)* - Martin Fowler, Kendall Scott

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Enterprise Services and Architectures: trends, modeling and conceptualizing of macro-to-micro linkages, concepts of enterprise services composition and workflow integration. Overview of common architecture-related frameworks - ITIL (IT Infrastructure Libraries), TOGAF (The Open Group Architectural Framework), Architecture Tradeoff Analysis Method (ATAM), and Component Business Modeling. Introduction to business processes, supply chains, and enterprise systems. |
| 3 | Adaptive Complex Enterprise: performance linkages between in-the-large and in-the-small, life-cycle and continuous improvement concepts, performance analysis and portfolio development. Introduction to policy formulation, implementation and evaluation. Discussion of traceability to meet regulations and requirements (such as Sarbanes-Oxley, HIPA and other security related) and their impact on complex systems. |
| 3 | Patterns and principles for co-engineering Adaptive Complex Systems to achieve behaviors like Lean, Chargeback and Capacity alignment, Accountability, Competitiveness, and Innovation. |
| 3 | Defining and deploying an IT solution using current and emerging technologies (sensor networks, mobile computing, service-oriented architectures) and related enterprise architecture patterns. |

| | |
|---|---|
| 3 | Portfolio development and program management. Project specific presentations of research and best practices. Related guest lecturers from industry representing IT operations management and middleware technologies. |
| 15 | Team project methodology and research presentations. |

### Representative Lab Assignments

- New middleware requirements arising from the changing roles of media and knowledge companies such as Dispatch and McGraw Hill.
- Design of sustaining web environments to promote growth of communities of interest at the City of Columbus.
- Architecture enhancements for knowledge management within the help desk environment at Ohio Health.
- The configuration management of complex IT installations for effective problem resolution at NCR.
- Chargeback model for IT services at the City of Columbus.

### Representative Grading Plan

| | |
|---|---|
| Risk checkpoint (5th week) | 10% |
| Continuous progress by week | 15% |
| Interim presentation (6th week) | 10% |
| Project work-products | 40% |
| Project workbook | 5% |
| Final presentation | 5% |
| Poster | 5% |
| Individual report | 10% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Substantial contribution (3-6 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Significant contribution (7+ hours) | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Significant contribution (7+ hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |

| | | |
|---|---|---|
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Jayashree Ramanathan

Last modified: 2009-01-07 10:13:06

# CSE 794K: Applied Enterprise IT Architectures II

### Description

Continuation of CSE 794J.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 2 1.5-hr cl | 794J |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Master techniques for representing and analyzing enterprise architectures in order to more effectively manage complex systems of business processes, organizations, and technologies.
- Be familiar with the practice of applying architecture knowledge for developing strategic options for decision making and developing IT solution approaches for industry-sponsored problems.
- Be familiar with communication and program management skills through making presentations that consider all stakeholder perspectives and techniques for identifing areas of IT innovation and requirements relevant to a particular organization.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Selected Readings - to be provided in class*

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Review of technologies available for enterprise integration. |
| 3 | Project implementation plan and prioritization |
| 3 | Development of non-functional requirements and request for proposals. Discussion of regulations (such as Sarbanes-Oxley, HIPA) and their impact on IT. |
| 3 | Project implementations and review of work products. Application of architecture Tradeoff Analysis Method (ATAM), and Zachman Architecture. Case studies covering the creation of an architecture representation and its use for analysis and identification of opportunities for enhancements. |
| 3 | Project presentations. |
| 3 | Guest lectures from industry representatives in IT operations management and middleware technologies. |
| 3 | Innovation frameworks. |
| 3 | Enterprise architecture patterns. |
| 3 | Final team project presentations. |
| 3 | Related research papers. |

## Representative Lab Assignments

- New middleware requirements arising from the changing roles of media and knowledge companies such as Columbus Dispatch and McGraw Hill.
- Design of sustaining web environments to promote growth of communities of interest at the City of Columbus.
- Architecture enhancements for knowledge management within the help desk environment at Ohio Health.
- The configuration management of complex IT installations for effective problem resolution at NCR.
- Chargeback model for IT services at the City of Columbus.

## Representative Grading Plan

| | |
|---|---|
| Team lab assignment | 40% |
| Midterm | 30% |

| | |
|---|---|
| Individual assignments | 30% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Some contribution (1-2 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| Substantial contribution (3-6 hours) | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Substantial contribution (3-6 hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Substantial contribution (3-6 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |

| | | |
|---|---|---|
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Substantial contribution (3-6 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

| a | b | c | d | e | f | g | h | i | j | k |
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Course Coordinator: Jayashree Ramanathan

Last modified: 2008-11-18 08:28:49

# CSE 794Q: Introduction to Cryptography

### Description

Symmetric-key encryption, cryptographic hash functions, message authentication, public-key cryptography, discrete logarithm-based cryptography, elliptic curve cryptography, digital signatures, elementary cryptographic protocols.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| UG | 3 | 3 cl | Stat 427 or Math 530; CSE 625 or CSE 651 or CSE 680 or Math 573; or permission of instructor. |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Some mathematical maturity will be expected.

### Intended Learning Outcomes

- Master the principles of symmetric-key and public-key cryptography and their use for encryption and digital signatures.
- Master RSA and ElGamal's methods, and the digital signature standard.
- Be familiar with Data Encryption Standard and Advanced Encryption Standard.
- Be familiar with message authentication and cryptographic hash functions.
- Be familiar with some important cryptographic protocols such as key exchange, identification, and commitment schemes.
- Be familiar with provable security of cryptographic schemes.
- Be exposed to elliptic curve cryptography.
- Be exposed to zero-knowledge interactive proof systems.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Introduction to Modern Cryptography* - Jonathan Katz and Yehuda Lindell

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Introduction |
| 3 | Mathematical background: modular arithmetic, Chinese remainder theorem, finite fields, primality tests |
| 6 | Symmetric-key encryption: theory and practical constructions |
| 3 | Message authentication and cryptographic hash functions |
| 5 | Public-key cryptography: trapdoor one-way functions, RSA encryption, attacks against RSA, probabilistic RSA encryption, optimal asymmetric encryption padding, RSA signatures |
| 3 | Cryptography based on discrete logarithm: discrete logarithm problems, Diffie-Hellman, ElGamal's encryption, ElGamal's signature scheme, Digital Signature Standard |

| | |
|---|---|
| 3 | Elliptic curve cryptography: introduction to elliptic curves, elliptic curve cryptography |
| 5 | Basic cryptographic protocols: key exchange, entity authentication, identification schemes, commitment schemes, zero-knowledge interactive proof systems |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homework | 25% |
| Midterm exam | 35% |
| Final exam | 40% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Substantial contribution (3-6 hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Substantial contribution (3-6 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| Substantial | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| contribution (3-6 hours) | | and society; |
| Significant contribution (7+ hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Significant contribution (7+ hours) | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2009-07-07 14:12:42

# CSE 861: Computer Communication Networks I

### Description

A foundational and analytical understanding of network architecture, error control, queuing analysis, and network dimensioning.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 3 | 3 cl. | Math 530 or Stat 428 or Stat 520 or ECE 804 or permission of instructor. |

### Quarters Offered

- Wi

### General Information, Exclusions, Cross-listings, etc.

- Cross-listed with ECE.
- Background in probability theory expected.

### Intended Learning Outcomes

- Be exposed to a basic history of networking;
- Be familiar with architectural concepts of layering and circuit and packet switching;
- Master various error control techniques and their analyses;
- Be familiar with different queuing models and their application to networking;
- Master elementary Markov chain analysis and be able to use them to model network systems;
- Be familiar with M/G/1 queues, residual lifetime, and priority queuing;
- Be familiar with Jackson's Theorem and product form analyses;
- Be familiar with Little's Law and use it in different network scenarios;
- Master concepts of shortest path routing and use Dijkstra and Bellman Ford on different network graphs;
- Be familiar with issues of convergence, looping, and overhead in routing.

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Communication Networks, Fundamental Concepts and Key Architectures, 2nd ed.* - A. Leon-Garcia and I. Widjaja
- *Telecommunication Networks: Protocols, Modeling, and Analysis* - M. Schwartz

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 2 | Historical perspective in networking |
| 1 | Circuit/packet switching and statistical multiplexing |
| 2 | Importance of layering for network architecture |
| 1 | Important problems in networking |

| | |
|---|---|
| 2 | Description of error detection, correction, and recovery mechanisms |
| 3 | Analysis of error recovery mechanisms |
| 1 | Causes of network delay and queuing nomenclature |
| 3 | Arrival processes: properties of Poisson Processes |
| 3 | Elementary Markov Chain analysis |
| 1 | Applications of Markov Chain to telecommunication and data networks |
| 2 | M/G/1 analysis |
| 2 | Residual lifetime and priority queuing |
| 2 | Jackson's Theorem and product form analysis |
| 1 | Applications to network dimensioning, statistical multiplexing, and admission control |
| 1 | Shortest path and distance vector based routing |
| 1 | Bellman Ford and Dijkstra's algorithms |
| 2 | Relationship to dynamic programming and analysis |

### Representative Lab Assignments

- n/a

### Representative Grading Plan

| | |
|---|---|
| Homework assignments | 25% |
| Project | 25% |
| Final exam | 50% |

### Relationship to BS-CSE Program Outcomes

| **Course Contribution** | | **Aspect of Criterion 3** |
|---|---|---|
| Significant contribution (7+ | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as |

| | | |
|---|---|---|
| hours) | | well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software |

| | | |
|---|---|---|
| | | systems of varying complexity. |

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Course Coordinator: Ness Shroff

Last modified: 2009-05-18 14:56:08

# CSE 862: Computer Communication Networks II

### Description

Foundational understanding of network analysis, routing, control, multi-access, and their examples in the context of the existing communication networks.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 3 | 3 cl. | 861 or ECE 861 or permission of instructor. |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Cross-listed with ECE.

### Intended Learning Outcomes

- Master concepts in shortest path routing including analysis of correctness, convergence, and complexity;
- Be familiar with asynchronous routing protocols, routing on the Internet, and routing on other historical networks;
- Be familiar with window-based flow control and its analysis using closed queueing networks;
- Be familiar with TCP congestion control and its advantages and disadvantages;
- Be exposed to a simplified analysis of TCP/IP window control;
- Be familiar with the concepts of multi-access communications;
- Be familiar with polling and analyses of polled systems;
- Master simplified analysis of Aloha and slotted Aloha;
- Be exposed to other historical and current random-access techniques;
- Be familiar with P2P networks and their analysis;

- Be exposed to some of the open research problems in networking.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Communication Networks, Fundamental Concepts and Key Architectures, 2nd ed.* - A. Leon-Garcia and I. Widjaja
- *Telecommunication Networks: Protocols, Modeling, and Analysis* - M. Schwartz

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| 1 | Review of routing fundamentals |
| 2 | Convergence of asynchronous routing protocols |
| 3 | Routing on the Internet |
| 1 | Window based versus rate based flow control |
| 2 | Analysis of fixed window flow control Norton's Theorem |
| 2 | Engineering analysis of SNA and other historical window flow control mechanisms |
| 2 | TCP/IP congestion control description |
| 1 | Advantages and limitations of TCP congestion control |
| 2 | Simplified analysis of TCP/IP window control |
| 3 | Polling and scheduling description and analysis |
| 3 | Random access description and analysis |
| 2 | Applications of random access |
| 1 | Motivation and functionality |
| 1 | Classification of P2P networks |
| 2 | Description on simplified analysis of Bit Torrent |
| 2 | Open research problems |

## Representative Lab Assignments

- n/a

## Representative Grading Plan

| | |
|---|---|
| Homework assignments | 20% |
| Simulation project | 20% |
| Paper reading project | 20% |
| Final exam | 40% |

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Significant contribution (7+ hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| Substantial contribution (3-6 hours) | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Substantial contribution (3-6 hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, |

| | | |
|---|---|---|
| | | and society; |
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| Significant contribution (7+ hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Ness Shroff

Last modified: 2009-05-18 14:57:18

# CSE 875: Advanced Computer Architecture

### Description

Fundamental design issues in parallel architectures, design of scalable shared memory and distributed memory systems, interconnection network design principles, multi-core architectures, high-performance and high-productivity computing.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| G | 3 | 3 cl | 721 |

### Quarters Offered

- Sp

### General Information, Exclusions, Cross-listings, etc.

- Offered in even-numbered years.

### Intended Learning Outcomes

- Master the principles of advanced computer architecture
- Master the implications of different ways of using hardware parallelism
- Master the architectural design issues in shared memory, distributed-memory, distributed shared memory, and massively-parallel systems
- Be familiar with the architectural designs in past and present (state-of-the-art) computer systems
- Be familiar with analyzing and solving architectural design problems
- Be exposed to the future trends in parallel computer architectures

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *Parallel Computer Architecture: A Hardware/Software Approach* - David Culler, Jaswinder Pal Singh and Anoop Gupta
- *Interconnection Networks: An Engineering Approach* - Jose Duato, Sudhakar Yalamanchili and Lionel Ni
- *Papers from recent literature*

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 3 | Design issues of Parallel Architectures |
| 9 | Interconnection Network Design Issues and Principles (Classification, Switching Techniques, Routing Algorithms, Hardware/Software Support for Point-to-point and Collective Communication) |
| 9 | Design of Shared Memory Multiprocessors (Coherency, Consistency, Snooping Protocols, Trade-offs in Designing Cache Coherency Protocols, Multi-level Caches and Split Transaction Buses) |
| 3 | Designing Scalable DSM Systems with Directory-based Coherence |
| 6 | Trends in Designing Next Generation Systems (Multi-core Architecture, On-chip Interconnect, High-Productivity Computing and Peta-Flop Computing) |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Homeworks (three) | 15% |
| Final | 35% |
| Project | 40% |
| Class Participation and Discussion | 10% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| Some contribution (1-2 hours) | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| Significant contribution (7+ hours) | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| Significant contribution (7+ hours) | e | an ability to identify, formulate, and solve engineering problems; |
| Some contribution (1-2 hours) | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| Some contribution (1-2 hours) | g | an ability to communicate effectively with a range of audiences; |
| Substantial contribution (3-6 hours) | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |

| | | |
|---|---|---|
| Some contribution (1-2 hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| Some contribution (1-2 hours) | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Dhabaleswar Panda

Last modified: 2008-04-08 10:05:38

# CSE 885: Seminar on Research Topics in Computer Science and Engineering

### Description

Lectures on current research by faculty members in the department.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 1 | 2 cl | 1st yr grad student in CS&E |

### Quarters Offered

- Au

### General Information, Exclusions, Cross-listings, etc.

### Intended Learning Outcomes

- Be familiar with areas of active research being conducted by the graduate faculty of the CSE Department
- Ability to make good choice of faculty advisors for the student's research program

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

- *None*

### Representative Topics List

| Number of Hours | Topic |
|---|---|
| 20 | Introduction to area of research by a CSE faculty member (1 hour each) |

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Regular attendance and completion of daily feedback form | 100% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |

| | | |
|---|---|---|
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| Significant contribution (7+ hours) | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| Substantial contribution (3-6 hours) | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator: Xiaodong Zhang

Last modified: 2005-10-03 15:06:11

# CSE 888: Advanced Studies in Computer and Information Science

## Description

Advanced work in one of the specialized areas of computer and information science.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 1-5 | | Grad standing or permission of instructor. |

## Quarters Offered

- Au, Wi, Sp, Su

## General Information, Exclusions, Cross-listings, etc.

## Intended Learning Outcomes

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No | d | an ability to function on multi-disciplinary teams; |

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|---|---|---|
| contribution | | |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-10-12 13:31:47

# CSE 891: Interdisciplinary Seminar

### Description

Graduate seminars for graduate interdisciplinary studies.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | | | |

### Quarters Offered

- 

### General Information, Exclusions, Cross-listings, etc.

- Cross-listed with ECE, BME, Statistics, Vision Science, IBGP, Biophysics, Pathology, Radiology, Biomedical Informatics.

### Intended Learning Outcomes

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

### Representative Topics List

| Number of Hours | Topic |
|---|---|

### Representative Lab Assignments

### Representative Grading Plan

| | |
|---|---|
| Class participation, etc. (course grade is S/U) | 100% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, |

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| contribution | | runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-01-30 09:55:28

# CSE 891.01: Interdisciplinary Seminar on Biomedical Images

## Description

Graduate seminars for Graduate Interdisciplinary Specialization in Comprehensive Engineering and Science of Medical Images.

## Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
| --- | --- | --- | --- |
| G | 1-2 | 1 cl. | Grad standing |

## Quarters Offered

- Au, Wi, Sp

## General Information, Exclusions, Cross-listings, etc.

- Repeatable to 3 credit hours.
- Cross-listed with BME, ECE, Statistics, Vision Science, IBGP, Biophysics, Pathology, Radiology and Biomedical Informatics.

## Intended Learning Outcomes

- Be familiar with presenting graduate research.
- Be familiar with related work at OSU.

## Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
| --- | --- |
| 10 | Current research at OSU on biomedical images. |

## Representative Lab Assignments

## Representative Grading Plan

| | |
| --- | --- |
| Class participation | 20% |
| Presentation summaries | 80% |

### Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates |

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| | | comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-01-30 09:58:22

# CSE 894: Group Studies

### Description

Designed to give graduate students an opportunity to pursue special studies not otherwise offered.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 1-5 | | Permission of instructor. |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Repeatable to a maximum of 15 cr hrs.

### Intended Learning Outcomes

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

### Representative Topics List

| Number of Hours | Topic |
|---|---|

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements |

| | | |
|---|---|---|
| | | appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-10-12 14:00:34

# CSE 999: Research

### Description

Research for thesis or dissertation purposes only.

### Level, Credits, Class Time Distribution, Prerequisites

| Level | Credits | Class Time Distribution | Prerequisites |
|---|---|---|---|
| G | 1-18 | | |

### Quarters Offered

- Au, Wi, Sp, Su

### General Information, Exclusions, Cross-listings, etc.

- Repeatable.
- This course is graded S/U.

### Intended Learning Outcomes

### Representative Texts and Other Course Materials

**Textbook(s) and other materials listed are representative only. Please visit or contact a campus-area bookstore before the term starts to determine the textbook(s) to be used in a particular section of the course.**

## Representative Topics List

| Number of Hours | Topic |
|---|---|
| | |

## Representative Lab Assignments

## Representative Grading Plan

## Relationship to BS-CSE Program Outcomes

| Course Contribution | | Aspect of Criterion 3 |
|---|---|---|
| No contribution | a | an ability to apply knowledge of computing, mathematics including discrete mathematics as well as probability and statistics, science, and engineering; |
| No contribution | b | an ability to design and conduct experiments, as well as to analyze and interpret data; |
| No contribution | c | an ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as appropriate constraints related to economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability considerations; |
| No contribution | d | an ability to function on multi-disciplinary teams; |
| No contribution | e | an ability to identify, formulate, and solve engineering problems; |
| No contribution | f | an understanding of professional, ethical, legal, security and social issues and responsibilities; |
| No contribution | g | an ability to communicate effectively with a range of audiences; |
| No contribution | h | an ability to analyze the local and global impact of computing on individuals, organizations, and society; |
| No contribution | i | a recognition of the need for, and an ability to engage in life-long learning and continuing professional development; |
| No contribution | j | a knowledge of contemporary issues; |

| | | |
|---|---|---|
| No contribution | k | an ability to use the techniques, skills, and modern engineering tools necessary for practice as a CSE professional; |
| | l | an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution; |
| | m | an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices; |
| | n | an ability to apply design and development principles in the construction of software systems of varying complexity. |

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Course Coordinator:

Last modified: 2007-10-12 13:28:28