UNIVERSITY OF HAWAI'I

SYSTEM ARTICULATION AGREEMENT

Information and Computer Science(s)
Computer Science

November 2005

By agreement of faculty in February 2010 of the nine participating campuses, this agreement is extended during the review process.

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT

Information and Computer Science(s) (ICS)
Computer Science (CS)

INTRODUCTION

The University of Hawai'i is comprised of ten campuses located on six islands in the State of Hawai'i. While each campus has a unique identity and mission, the ten campuses operate as one system.

Career Pathways
The State of Hawai'i and its educational systems are participating in Career Pathways with an overall theme of "Six pathways, one system." The six pathways are:
1. Arts and Communication
2. Business
3. Health Services
4. Industrial and Engineering Technology
5. Natural Resources
6. Public and Human Services

At the secondary and postsecondary levels, the goal of Career Pathways is to provide curriculum standards that meet business and industry requirements. Implementing these standards will ensure student attainment of a high level of academic and technical skills, a seamless transition from secondary to postsecondary educational programs and between postsecondary campuses, and a satisfying career for which the student is well prepared.

Hawai'i P-20 Initiative
The overarching goal of the P-20 initiative is to improve student achievement at all levels of education. To this end, two of the goals of P-20 are:
1. To align standards, curricula, and assessments across all components of the state's public education system.
2. To improve transition among the components of the education system, as well as from an educational setting to the workforce.

During the course of their education, students may decide to transfer from one campus to another in the University of Hawai'i (UH) system. The development of an articulated program of study supports the transfer of earned academic credits within the UH system.

PURPOSE

The primary purpose of this articulation agreement is to facilitate the matriculation of students and the transfer of courses across the university system. Moreover, it is intended to inform students whose program of study requires Information and Computer Science(s) or Computer Science courses as part of their degree requirements of the program opportunities that are available to them throughout the UH system.

AGREEMENTS AND PROCEDURES

1. **Scope of Agreement.** This Articulation Agreement applies among the UH Community Colleges, the University of Hawai'i at Hilo, and the University of Hawai'i at Mānoa.

2. **Number of Credits to be Awarded.** Transfer credit among University of Hawai'i campuses for the following courses:

   A. ICS 100 Computing Literacy and Applications (4 credits) at Hawai'i
   ICS 100 Computing Literacy and Applications (3 credits) at Honolulu, Kapi'olani, Kaua'i, Leeward, Maui, and Windward CC

   B. ICS 101 Tools for the Information Age (4 credits) at UH Mānoa and Kaua'i CC.
   Note: Kaua'i CC will modify the course credits to 3 credits.
   ICS 101 Tools for the Information Age (3 credits) at Honolulu, Kapi'olani, Leeward, and Windward CC

   Note: Maui CC will modify the course number, title, content, and outcomes of ICS 100 to align with ICS 101 (3 credits) effective no later than Fall 2007

   ICS 101 Microcomputer Application Software (4 credits) at Hawai'i CC
   CS 101 Microcomputer Applications Software (3 credits) at UH Hilo

   C. ICS 111 Introduction to Computer Science I (4 credits) at UH Mānoa, Honolulu, Kaua'i, Maui, and Windward CC
   ICS 111 Introduction to Computer Science I (3 credits) at Kapi'olani and Leeward CC
   CS 150 Introduction to Computer Science (3 credits) at UH Hilo

   D. ICS 211 Introduction to Computer Science II (3 credits) at UH Mānoa, Honolulu, Kapi'olani, Leeward, and Maui CC
   CS 151 Introduction to Software Development (3 credits) at UH Hilo
   Note: Kaua'i CC will propose a course, ICS 211 (3 credits), effective no later than Fall 2008

   E. ICS 141 Discrete Mathematics for Computer Science I (3 credits) at UH Mānoa, Honolulu, Kapi'olani, and Leeward CC
   CS 215, Discrete Mathematics (3 credits) at UH Hilo. **Note:** UHH will modify the course outcomes and content to align with ICS 141 (3 credits) among the campuses effective no later than Fall 2007

   F. ICS 241 Discrete Mathematics for Computer Science (3 credits) at UH Mānoa, Honolulu, Kapi'olani, and Leeward CC
   Note: UH Hilo will propose a course, CS 241 (3 credits), effective no later than Fall 2007

3. **General Guidelines for the Application and Award of Transfer Credits**

A. Student Eligibility: Students must be currently enrolled at a participating UH campus to be eligible for the award of any transfer credit.

B. Timeline for Application: Students should apply for transfer credits during their first year of attendance at the receiving campus.

C. Transferability: Credits awarded within the guidelines established in this Agreement will transfer between and among designated University of Hawai'i campuses. However, students should be informed by both "sending" and "receiving" campuses that transferred credits may **not** be applicable to programs outside of this Agreement.

D. Campus Procedures: Each UH campus that is a party to this Agreement will be responsible for establishing procedures that detail the timeline and deadlines for application, review of requests for award of transfer credit, and the appeals process for such credit.

The table in this document lists all 100 and 200-level Information and Computer Science (ICS at Hawai'i CC, Kapi'olani CC, Kaua'i CC, Leeward CC, Maui CC, and Windward CC), Information and Computer Sciences (ICS at UH Mānoa) and Computer Science (CS at UH Hilo) courses that are equivalent within the University of Hawai'i system. The **bold and blue** text within the tables indicate the new course numbers, titles, and credit hours being used effective the Fall 2007 semester. If a course is unique to a campus and, hence, does not have an equivalent course within the UH system, then it is not listed in the table. Also, the course outline(s) in this document have been approved by the faculty and administrations of all campuses represented in this signed agreement.

This Articulation Agreement will remain in effect until November 2009. It will be subject to review in November 2008, and may be continued, revised, or discontinued with the consent of all faculty members and administration of all campuses represented in this agreement. The Articulation Agreement remains in effect while review continues.

	UH Mānoa	UH Hilo	Hawai'i CC	Honolulu CC	Kapi'olani CC	Kaua'i CC	Leeward CC	Maui CC	Windward CC
Computing Literacy and Applications	N/A	N/A	ICS 100 (4)	ICS 100 (3)	ICS 100 (3)	ICS 100 (3)	ICS 100 (3)	ICS 100 (3) **Modify to ICS 101 (3) Fall 2007**	ICS 100 (3)
Tools for the Information Age Microcomputer Application Software	ICS 101 (4)		ICS 101 (4)	ICS 101 (3)	ICS 101 (3)	ICS 101 (4)	ICS 101 (3) **Fall 2007** content will change	**ICS 101 (3) Fall 2007** (editing the content to align with other campuses)	ICS 101 (3)

	UH Mānoa	UH Hilo	Hawai'i CC	Honolulu CC	Kapi'olani CC	Kaua'i CC	Leeward CC	Maui CC	Windward CC
Microcomputer Applications Software		CS 101 (3)							
Digital Tools for the Information World	**ICS 101 (4) Fall 2007**	**CS 101 (3) Fall 2007**	**ICS 101 (4) Fall 2007**	**ICS 101 (3) Fall 2007**	**ICS 101 (3) Fall 2007**	**ICS 101 (3) Fall 2007**	**ICS 101 (3) Fall 2007**	**ICS 101 (3) Fall 2007**	**ICS 101 (3) Fall 2007**
Introduction to Computer Science I	ICS 111 (4)			ICS 111 (4)	ICS 111 (3)	ICS 111 (4)	ICS 111 (3)	ICS 111 (4)	ICS 111 (4)
Introduction to Computer Science		CS 150 (3)							
Introduction to Computer Science I		**CS 150 (3) Fall 2007**							
Introduction to Computer Science II	ICS 211 (3)		N/A	ICS 211 (3)	ICS 211 (3)		ICS 211 (3)	ICS 211 (3)	N/A
Introduction to Software Development		CS 151 (3)							
Introduction to Computer Science II		**CS 151 (3) Fall 2007**				**ICS 211 (3) Fall 2008**			
Discrete Mathematics for Computer Science I	ICS 141 (3)	CS 215 (3)	N/A	ICS 141 (3)	ICS 141 (3)	N/A	ICS 141 (3)	N/A	N/A
Discrete Mathematics for Computer Science I		**CS 141 (3) Fall 2007,** will be developed equivalent to ICS 141							
Discrete Mathematics for Computer Science II	ICS 241 (3)	**CS 241 (3) Fall 2007** will be developed equivalent to ICS 241	N/A	ICS 241 (3)	ICS 241 (3)	N/A	ICS 241 (3)	N/A	N/A

Note: Course equivalency is not to be confused with approved General Education course designation. Campuses wanting approval for a UH Mānoa General Education designation must send a separate proposal to UH Mānoa to receive approval for a general education designation. Procedures for articulating courses to Mānoa are found at http://www.hawaii.edu/gened/articulation.htm. For information on courses approved to meet UH Mānoa's general education requirements, go to http://www.hawaii.edu/ovcaa/academics/articulation_courses.htm

Note: Students taking ICS 141 Discrete Mathematics for Computer Science I and ICS 241 Discrete Mathematics for Computer Science II from UH Mānoa, Honolulu CC, Kapi'olani and Leeward CC may have credits transferred among these campuses. Students transferring from UHM, HonCC, KapCC, and LeeCC to UH Hilo must complete **both** ICS 141 **and** ICS 241 to receive credit for CS 215 Discrete Mathematics (3 credits).

Students transferring from UH Hilo to UHM, HonCC, KapCC, or LeeCC must complete **both** CS 215 Discrete Mathematics (3 credits) **and** MATH 421 Probability (3 credits) to receive credit for **both** ICS 141 Discrete Mathematics for Computer Science I **and** ICS 241 Discrete Mathematics for Computer Science II.

Note: Effective Fall 2007, UH Hilo will replace CS 215 with CS 141 equivalent to ICS 141 courses system-wide and CS 241 equivalent to ICS 241 courses system-wide.

ICS 100 Computing Literacy and Applications (Hawaiʻi, Honolulu, Kapiʻolani, Kauaʻi, Leeward, Maui, and Windward Community Colleges)

Course Outline

Revised 11/22/05

A. *Course Description*

HawCC: (4 credits). This course is an introduction to computer science. Students will be introduced to a current microcomputer operating system, modern business applications (word processing and spreadsheets), a very brief introduction to how computers are programmed, and how the hardware operates. The course will also introduce different aspects of computer science such as numbering systems, algorithms, control structures, logic, and networking. Students will be introduced to basic computer concepts, computer terminology, computer current events and the programming process. The history, people, and technological developments behind many of these areas will be featured. Current social issues raised by advances in these areas will be discussed.

HonCC: (3 credits). This course is a computer literacy course. It provides those basic concepts and skills related to computers and computing that are needed in today's information age. The students will acquire an understanding of concepts in word processing, spreadsheet management, database management, elementary computer graphics, desk top publishing, electronic mail and telecommunications. They will also learn some of the history of computers and an awareness of the process of creating a computer program. (Credit may be received for only ICS 100, 100E, 100M or 100T). May be taken on a CR/N basis.

KapCC: (3 credits). ICS 100 is a nontechnical introduction to computers and their uses in society, in business, and in the home environment. ICS 100 provides the knowledge essential to a computer literate functioning member of society. Students will increase their understanding of the history of computers, basic information processing cycle, access and dissemination of information via the World Wide Web, and how computer technology affects the world in which we live. The course includes hands-on experience with computer and Internet applications such as word processing, spreadsheet, and e-mail. In addition, computer operating systems (OS) such as Windows 95/98/NT/ME/2000/XP will be covered to provide the student with the navigational skills required to be functional on the computer.

KauCC: (3 credits). An introduction to computers and their uses in today's society. The course is geared to developing basic skills and acquiring knowledge of computer concepts, terminology, and current events and trends. There will be "hands on" experience with word processing, spreadsheets, the Internet, and web pages. Electronic mail and the Internet will be used extensively. This course will also utilize online laboratory tutorials and computerized test banks. A similar course is offered at each of the community colleges system wide.

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LeeCC: (3 credits). An introductory survey of computers and their role in the modern world. Emphasis is on computer terminology and hardware and software. Opportunities for "hands-on" experience using microcomputer applications software may include spreadsheets, word processing, graphics and database management systems. (45 lecture hours).

MauCC: (3 credits). Introduces the role of computers in the evolution of an information-based society. Reviews the history and the need for information processing, the basic information processing cycle and functions, the processing capabilities of computers, system development, and program development. Provides students with experience working with an operating system and applications, such as word processing, database management, spreadsheets, and presentation software, as well as working with the Internet and creating simple web pages. **Note:** This course will be modified to change its course number and title to be correctly aligned with ICS 101.

WinCC: (3 credits). This course is an introduction to information technology. Upon completion of the course, the student should be able to:
  Describe the process of changing data into information.
  Identify the benefits of being computing literate and how computing
      competency will affect their future.
  Describe how computers have affected society.
  Discuss computer ethics.
  Demonstrate an understanding of computer terminology.
  Identify hardware components.
  Identify and describe a variety of software programs.
  Produce word processing, spreadsheet, and database documents.
  Manipulate graphical objects in the above.
  Demonstrate an understanding of online and multimedia communication.
  Manage assignments using the Web and the Internet.
  Master many of Computing Information & Literacy (CIL) objectives.

Effective Fall 2007, each community college campus offering this course has agreed to:

Course alpha and number: ICS 100 (3 and 4 credits)

Course title: Computing Literacy and Applications

Course description: An introductory survey of computers and their role in the information world emphasizing computer terminology, hardware, and software. Opportunities for "hands-on" experience using applications software may include spreadsheets, word processing, presentations, communications, and databases.

Note: ICS 100 Computing Literacy and Applications **is not** equivalent to CS 100 Principles of Computer Science at UH Hilo.

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ICS 100 Computing Literacy and Applications Core Outline

> MauCC will modify ICS 100 Computing Literacy and Applications, changing the course number, title, and description to ICS 101 Digital Tools for the Information World (3 credits) effective no later than Fall 2007.

B. **Hours Per Week**

HawCC: Lecture: <u>3 hours</u>   Lecture/Lab: <u>2 hours</u>
HonCC: Lecture: <u>3 hours</u>
KapCC: Lecture: <u>3 hours</u>
KauCC: Lecture: <u>3 hours</u>
LeeCC: Lecture: <u>3 hours</u>
MauCC: Lecture/Lab: <u>3 hours</u>
WinCC: Lecture: <u>3 hours</u>

C. **Prerequisites or Required Preparation**

HawCC: <u>Prerequisites</u>: MATH 50, or MATH 24X, or placement in MATH 26 or higher; and ENG 51, or ENG 20R, or placement in ENG 21 or higher. <u>Corequisites</u>: None. <u>Recommended preparation</u>: None.

HonCC: <u>Prerequisites</u>: None. <u>Recommended preparation</u>: ENG 22 or 60 OR placement in ENG 100

KapCC: <u>Prerequisites</u>: Credit or concurrent enrollment in ENG 22 or qualification for ENG 100 or higher level English; qualification for MATH 24 or higher level mathematics. <u>Recommended Preparation</u>: Keyboarding experience

KauCC: <u>Prerequisites</u>: None.

LeeCC: <u>Prerequisites</u>: Eng 21 or Eng 22 and MATH 24 or equivalent, all with a grade of C or better, or consent of instructor. <u>Corequisites</u>: None. <u>Recommended preparation</u>: None.

MauCC: <u>Prerequisites</u>: None. <u>Corequisites</u>: None. <u>Recommended preparation</u>: None.

WinCC: <u>Prerequisites</u>: Placement into Eng 100 & Math 24; Completed OAT 20B or equivalent

D. **Intended Student Learning Outcomes**

1. Utilize the basic features of computer applications to communicate effectively (major content area).

2. Utilize operating system interfaces to manage computer resources effectively.

3. Utilize online resources for research and communication.

4. Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications.

5. Describe ethical issues involved in the use of computer technology.

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E. **Course Content**

Concepts

1. **Utilize the basic features of computer applications to communicate effectively (major content area).**

   May include the following:

   a. Common Concepts
      1) Editing.
      2) Formatting.
      3) Graphics.
      4) Tools such as spell check.
      5) Tables
   b. Spreadsheets
      1) Simple spreadsheets.
      2) Components and functions of spreadsheets.
   c. Word processing
      1) Simple documents.
      2) Formatting and editing functions.
   d. Database
      1) Database use.
      2) Components and functions of databases.
   e. Presentation
      1) Simple presentations.
      2) Slide design and layout.
      3) Transitions.
   g. Application integration
      1) Cut/copy and paste between programs.
      2) Multitasking.

2. **Utilize operating system interfaces to manage computer resources effectively.**
   a. Operating system.
   b. File management.
   c. Relationship between system software and application software.
   d. User interface.

3. **Utilize online resources for research and communication.**
   a. Internet applications.
   b. Online resources.

4. **Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications.**
   a. Computer literacy concepts and terminology.
   b. Computer hardware components, their functions, and upgrades.
   c. Software and software updates.

5. **Describe ethical issues involved in the use of computer technology.**
   a. Ethical issues and behavior regarding computer usage.
   b. Copyright infringement.
   c. Security and safety online.

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d. Social issues in relationship to technology.
e. Piracy.
f. Security intrusion.
g. Electronic and other misuses.

<u>Skills</u>
1. **Utilize the basic features of computer applications to effectively communicate (major content area).**
   <u>May include the following:</u>
   a. Common Skills
      1) Create, edit, save, and print a product.
      2) Apply basic formatting to enhance the effectiveness of a product.
      3) Insert and manipulate graphic objects and tables.
      4) Utilize common tools such as spell check.
   b. Spreadsheet
      1) Create a simple worksheet within a workbook.
      2) Navigate through cells and rows.
   c. Word processing
      Produce simple documents such as memos, letters, reports, and flyers.
   d. Database
      1) Use a database to create a table, form, and/or report.
      2) Identify field names, data types, and field properties.
   e. Presentation
      Create a simple presentation using slide design and layout.
   g. Application integration
      Cut/copy and paste across applications.
2. **Utilize operating system interfaces to manage computer resources effectively.**
   a. Demonstrate use of an operating system to manage files.
   b. Differentiate the functions of system software versus application software.

3. **Utilize online resources for research and communication.**
   a. Navigate and search the Internet.
   b. Identify and/or use Internet communication programs (electronic mail, chat, bulletin boards, and discussion groups) to communicate effectively and send/receive attachments.
4. **Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications.**
   a. Explain fundamental computer literacy concepts and terminology.
   b. Use proper terminology to describe computer hardware components and their function in processing software instructions and input data.
   c. Explain the necessity for computer hardware and software updates.
   d. Differentiate between saving and backing up data.
5. **Describe ethical issues involved in the use of computer technology.**
   a. Discuss the ethical issues regarding computer usage including copyright infringement, security and safety online.

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b. Describe regulations and laws that affect computer technology.

F. **Text and Materials**
Varied

G. **Reference Materials**
Varied

H. **Auxiliary Materials and Content**
Varied

I. **Learning Assessment Tasks**
Required projects and activities; examinations and presentations optional.

J. **Methods of Instruction**
Varied

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ICS 101 Tools for the Information Age (UHM, HonCC, KapCC, KauCC, LeeCC, WinCC)
ICS 101 Microcomputer Application Software (HawCC)
CS 101 Microcomputer Applications Software (UHH)

Course Outline

Revised 11/22/05

A. ***Course Description***

UHH: CS 101 Microcomputer Applications Software (3 credits). Use of modern software applications, including e-mail, word processing, spreadsheets, presentations, database, and web page construction. Topics include creating and modifying documents, using formulas and charts in spreadsheets, creating presentations, and building tables, queries, forms, and reports in a database. Elementary programming concepts are introduced using VBA and HTML. Intended for business majors.

UHM: ICS 101: Tools for the Information Age (4 credits). Fundamental concepts and terms of computer technology, application software for problem solving, computer technology trends and impact on individuals and society.

HawCC: ICS 101 Microcomputer Applications Software (4 credits). Tools for the information age. Use of software packages for business problem solving B a microcomputer operating system, word processing, spreadsheet, graphics, database management system, and presentations programs. Hands-on experience is provided on the computer, out of class exercises required.

HonCC: ICS 101 Tools for the Information Age (3 credits). Fundamental concepts and terms of computer technology, application software for problem solving, computer technology trends and impact on individuals and society.

KapCC: ICS 101 Tools for the Information Age (3 credits). This course examines the utilization of major application packages as tools in business problem-solving. The following application tools will be covered: word processing, spreadsheets, charting, databases, presentations, email, FTP, Web browsers, and Web pages. In addition, computer operating systems (OS) such as Windows 95/98/NT/ME/2000/XP will be covered to provide the student with the navigational skills required to be functional on the computer. Students will use the OS and application tools to solve problems. Hands-on experience is provided on the computer. This course satisfies UH Mānoa's College of Business Administration's computer competency requirement. It is also a requirement for the Biology and Botany Department at UHM.

KauCC: ICS 101: Tools for the Information Age (4 credits). Fundamental concepts and terms of computer technology, basic hardware components,

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systems software, application software, computer technology trends, and impact on individuals and society. Extensive use of application software for problem solving. Applications covered: word processing, spreadsheets, database, presentation software, photo/image editing, computer graphics, web pages, and the Internet. Student will be required to do an assignment or project on each of these applications to show proficiency in that area.

LeeCC: ICS 101 Tools for the Information Age (3 credits). This course examines the fundamental concepts and terms of computer technology, major application packages as tools in problem-solving, and computer technology trends and impact on individuals and society. (45 lecture hours). (Formerly ICS 115)

MauCC: ICS 100 (will be modified to re-number and title to ICS 101). Introduces the role of computers in the evolution of an information-based society. Reviews the history and the need for information processing, the basic information processing cycle and functions, the processing capabilities of computers, system development, and program development. Provides students with experience working with an operating system and applications, such as word processing, database management, spreadsheets, and presentation software, as well as working with the Internet and creating simple web pages.

WinCC: ICS 101 Tools For The Information Age (3 credits). This course examines the major application programs and encourages students to incorporate technology in their work and lives. Upon completion of this course, the student should be able to:

- Understand computing terminology.
- Discuss current computing literacy concepts in class and via electronic bulletin boards and chats.
- Discuss and compare hardware and software changes and updates.
- Compare operating systems.
- Understand file management.
- Become proficient with electronic communications (electronic mail, bulletin board, and Web Page Display).
- Design spreadsheets that will solve a problem, compute and graph data, and present the information professionally.
- Design a digital presentation (Who, What, Where, When, Why, and How).
- Create, organize, and maintain a database.
- Utilize the Internet and World Wide Web.
- Display their work in a personal Webfolio.

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Effective Fall 2007, each university and community college campus offering this course has agreed to:

Course alpha and number: ICS 101 (3 or 4 credits) or CS 101 (3 credits)

Course title: Digital Tools for the Information World

Course description: Hands-on computer class with emphasis on producing professional-level documents, spreadsheets, presentations, databases, and web pages for problem solving. Includes concepts, terminology, and a contemporary operating system. Meets requirements for College of Business (UHM and UHH) and UHM's Biology program and Botany Department.

Note: Effective Fall 2007, the content of the Leeward Community College ICS 101 course will be equivalent to ICS 101 courses system-wide and the Maui Community College existing ICS 100 will be renumbered to ICS 101 and the content aligned.

Effective Fall 2007, the credits of the Kaua'i Community College ICS 101 will be modified to three (3) credits.

B. **Hours Per Week**

      UHH: Lecture: 3 hours
      UHM: Lecture/Online: 3 hours Lecture/Lab: 2.5 hours
      HawCC: Lecture: 3 hours Lecture/Lab: 2 hours
      HonCC: Lecture: 3 hours
      KapCC: Lecture: 3 hours
      KauCC: Lecture: 3 hours Lab: 3 hours
      LeeCC: Lecture: 3 hours
      MauCC: Lecture: 3 hours
      WinCC: Lecture: 3 hours

C. **Prerequisites or Required Preparation**

UHH: Prerequisites: University entry requirement.

UHM: Prerequisites: University entry requirement.

HawCC: Prerequisites: MATH 25X or MATH 26 or placement in MATH 100 or higher; and ENG 21 or placement in ENG 102; and ENG 20W/ESL 13 or placement in ENG 22/ESL 15 or higher. Corequisites: None. Recommended preparation: None.

KapCC: Prerequisites: Qualification for ENG 100 and MATH 103 or higher level mathematics. Recommended preparation: keyboarding experience.

KauCC: Prerequisites: "C" or better in Eng 22 and MATH 25, or ICS 100, or acceptable scores on placement tests.

LeeCC: Prerequisites: Eng 100 and MATH 100 or equivalent, all with a grade of C or better, or consent of instructor. Corequisites: None. Recommended preparation: ICS 100

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WinCC: Prerequisites: English 100; MATH 25 or 1 yr. High School Algebra.
Keyboarding/Basic Typing Skills

D. **Intended Student Learning Outcomes**
1. Utilize the appropriate computer applications to produce professional-level documents, spreadsheets, presentations, databases, and web pages for effective communication (major content area).
    a. Produce documents in a variety of formats.
    b. Create, edit, and format electronic spreadsheets using formulas, functions, and charts.
    c. Utilize a database with queries and reports that display required data.
    d. Create and organize a variety of electronic slides using templates, background styles, graphics, photos, and animation effects.
    e. Create web pages that contain hyperlinks and images that are suitable for publication.
2. Utilize operating system interfaces to manage computer resources effectively.
3. Extract and synthesize information from available Internet resources using intelligent search and discrimination.
4. Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications to effectively interact with other computer users and to prepare for higher-level computer courses.
5. Describe ethical issues involved in the use of computer technology.

E. **Course Content**
Concepts
1. **Utilize the appropriate computer applications to produce professional-level documents, spreadsheets, presentations, databases, and web pages for effective communication (major content area).**
    a. Common Concepts
        1) Editing.
        2) Formatting.
        3) Graphical objects.
        4) Tools such as spell check.
        5) Tables.
    b. Spreadsheets
        1) Mathematical or financial analysis.
        2) "What if" analysis.
        3) Formulas and functions.
        4) Charts.
    c. Word processing
        1) Documents such as memos, letters, reports, résumés, newsletters.
        2) Template documents.

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d. Database
  1) Database structure.
  2) Logical models with queries, forms, and reports.
  3) Database integrity.
e. Presentation
  1) Slides, templates, background styles, graphics, photos.
  2) Animation and transition effects.
f. Web page design
  1) HTML, hyperlinks, images.
  2) Web publishing.
g. Application integration such as:
  1) Copy/cut-and-paste.
  2) Object linking.
  3) Embedding.

2. **Utilize operating system interfaces to manage computer resources effectively.**
  a. Operating system.
  b. File management.
  c. Relationship between system software and application software.
  d. User interface.

3. **Extract and synthesize information from available Internet resources using intelligent search and discrimination.**
  a. Client/server.
  b. Internet applications.

4. **Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications to effectively interact with other computer users and to prepare for higher-level computer courses.**
  a. Computer literacy concepts and terminology.
  b. Computer hardware components, their functions, and upgrades.
  c. Software and software updates.

5. **Describe ethical issues involved in the use of computer technology.**
  a. Ethical issues and behavior regarding computer usage including copyright infringement, security and safety online.
  b. Social issues in relationship to technology use such as piracy, security intrusion, electronic and other misuses.

Skills

1. **Utilize the appropriate computer application(s) to produce professional-level documents, spreadsheets, presentations, databases, and web pages for effective communication (major content area).**
  a. Common Skills
    1) Create and edit a product.
    2) Apply formatting to enhance the effectiveness of a product.
    3) Solve problems using application programs.
    4) Choose the proper application software to solve a specific problem and/or produce a desired output.

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     5) Insert and manipulate graphic objects and tables.
     6) Utilize common tools such as spell check.
  b. Spreadsheet
     1) Create, edit, and format electronic spreadsheet using formulas and functions.
     2) Create charts to visually depict spreadsheet data.
     3) Utilize spreadsheet analysis to perform "what if" analysis.
  c. Word processing
     1) Produce documents in a variety of formats.
     2) Produce a document using a template.
  d. Database
     1) Utilize a database with queries and reports that display required data.
     2) Answer a question by querying and reporting data.
     3) Maintain (update) data currency.
  e. Presentation
     1) Create and organize a variety of electronic slides using templates, background styles, graphics, photos, and animation effects.
     2) Organize content into succinct slide presentations.
  f. Web page design
     1) Create web pages that contain hyperlinks and images that are suitable for publication.
     2) Describe web publishing requirements.
  g. Application integration: Copy, paste, and link content across applications.

2. **Utilize operating system interfaces to manage computer resources effectively.**
  a. Demonstrate use of an operating system to perform file management.
  b. Differentiate the functions of system software versus application software.

3. **Extract and synthesize information from available Internet resources using intelligent search and discrimination.**
  a. Use an Internet client to navigate and search the Internet.
  b. Refine online research techniques.
  c. Use and identify Internet communication programs (electronic mail, chat, bulletin boards, and discussion groups) to communicate effectively and send/receive attachments.
  d. Discriminate between web sites for reliability and validity of information.

4. **Define, explain, and demonstrate proper computer terminology usage in areas such as hardware, software, and communications to effectively interact with other computer users and to prepare for higher-level computer courses.**
  a. Explain fundamental computer literacy concepts and terminology.
  b. Use proper terminology to describe computer hardware components and their function in processing software instructions and input data.
  c. Explain the necessity for computer hardware and software updates.
  d. Differentiate between saving and backing up data.

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5. Describe ethical issues involved in the use of computer technology.
   a. Discuss the ethical issues regarding computer usage including copyright infringement, security and safety online.

B.   *Text and Materials*
Varied

C.   *Reference Materials*
Varied

D.   *Auxiliary Materials and Content*
Varied

Learning Assessment Tasks

Required projects and activities; examinations and presentations optional.

E.   *Methods of Instruction*
Varied

Per Attachment V, CCCM #6100 (Revised August 28, 1991)
and *The Outcomes Primer* by RuthStiehl, pp. 46-47 © 2002

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ICS 111 Introduction to Computer Science I (UHM, HonCC, KapCC, KauCC, LeeCC, MauCC)
CS 150 Introduction to Computer Science (UHH)

Course Outline

Revised 11/22/05

A. ***Course Description***
UHH: CS 150 Introduction to Computer Science (3 credits). First course for computer science majors. A breadth-first introduction to the field of computer science; touches on algorithms and their analysis, digital circuits, Boolean logic, computer architecture and languages, operating systems and theory of computing. Introduces algorithm design and computer programming using structured and object-oriented design techniques. Develops a foundation of basic knowledge and programming skills necessary for further study in the field.

UHM: ICS 111 Introduction to Computer Science I (4 credits). ICS 111 is an introductory course to computer programming. The course is designed for Computer Science, and Information and Computer Sciences majors as well as others who are interested in an object orientated approach to writing computer programs. Basic computer concepts are introduced to develop algorithms and design software. Use of an appropriate programming environment to design, code, compile, run, test and debug programs are also covered in this course.

HonCC: ICS 111 Introduction to Computer Science I (4 credits). This is an introductory course in computer programming. The emphasis is on a disciplined approach to writing computer programs. The understanding, reading, and writing of algorithms is a major portion of the course. An Object Oriented approach is used. An Object Oriented language, such as Java or C++, is used. The students will be expected to develop a number of increasingly complex programs during the course.

KapCC: ICS 111 Introduction to Computer Science I (3 credits). ICS 111 is an introductory course in computer programming utilizing the Java programming language. This course is designed for Computer Science majors and all others interested in a first course in programming. The goal of ICS 111 is to introduce the basic concepts of computer programming, such as algorithms, software design, object orientation, debugging, and testing. Algorithm development and structured programming techniques are emphasized. Basic constructs common to modern programming languages, such as constants, variables, conditionals, iteration, arrays, objects, methods, classes, and packages are covered.

KauCC: ICS 111 Introduction to Computer Science I (4 credits). This is an introductory course in computer programming. Emphasis is on object oriented programming, problem solving, algorithm development, computer language

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coding, implementation, and debugging/testing. The computer language JAVA is used to illustrate these concepts and to develop the programs. Laboratory is required.

LeeCC: ICS 111 Introduction to Computer Science I (3 credits). This is an introductory course in computer programming. Emphasis is on object oriented programming, problem solving, algorithm development, computer language coding, implementation, and debugging/testing. The computer language JAVA is used to illustrate these concepts and to develop the programs. Laboratory is required. (45 lecture hours).

MauCC: ICS 111 Introduction to Computer Science I (4 credits). Introduces students to problem solving using computers. Provides a background in computer programming for students entering computer science, engineering, or other fields. Teaches the basics of the computer hardware/software interfaces. Includes programs, applications, and compilers. Introduces programming concepts, algorithms, and problem solving techniques using high-level object-oriented programming languages. *Meets ACM CS1 course standards.*

WinCC: ICS 111 Introduction to Computer Science I (4 credits). This is an introductory course for students intending to major in computer science and requiring a computer programming course. Emphasis will be on problem solving, algorithm/pseudocode development, structured programming, computer language coding, implementation and debugging/testing. Students will develop application programs in an IBM microcomputer/DOS/Windows operating system environment. Students will be taught to develop appropriate programs using accepted standards and methodologies. Actual programming is a part of this course.

Effective Fall 2007, each university and community college campus offering this course has agreed to:

Course alpha and number: ICS 111 (3 or 4 credits) or CS 150 (3 credits)

Course title: Introduction to Computer Science I

Course description: Intended for Computer Science majors and all others interested in the first course in programming. An overview of the fundamentals of computer science emphasizing problem solving, algorithm development, implementation, and debugging/testing using an object-oriented programming language.

B. **Hours Per Week**
UHH: Lecture: 3 hours
UHM: Lecture: 3 hours   Lecture/Lab: 2.5 hours
HonCC: Lecture: 3 hours
KapCC: Lecture: 3 hours
KauCC: Lecture: 3 hours   Lab: 3 hours
LeeCC: Lecture: 3 hours
MauCC: Lecture/Lab: 4 hours

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WinCC: Lecture: 3 hours   Lab: 1 hour

C. ***Prerequisites or Required Preparation***

UHH: Co-requisite: MATH 104 or MATH 205

UHM: Prerequisites: ICS 101 or equivalent. Recommended preparation: computer experience.

HonCC: Prerequisites: MATH 27 or 58 or 103 or placement in MATH 135 or higher.

KapCC: Prerequisites: ICS 101 or equivalent.

KauCC: Prerequisites: "C" or higher in ICS 101 Comments: The laboratory is part of the class. Credit by exam is not an available option.

LeeCC: Prerequisites: ENG 21 or 22 and Math 103 or equivalent, all with a grade of C or better or consent of instructor.

MauCC: Prerequisites: ICS 110 with at least a "C", and placement at MATH 27 or 107, placement at ENG 22 or higher, or consent.

WinCC: Prerequisites: MATH 27 or MATH 103, or equivalent; or consent of instructor.

D. ***Intended Student Learning Outcomes***
1. Use an appropriate programming environment to design, code, compile, run and debug computer programs.
2. Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).
3. Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language
4. Identify relationships between computer systems, programming and programming languages.
5. Demonstrate working with primitive data types, strings and arrays.

E. ***Course Content***
Concepts
1. **Use an appropriate programming environment to design, code, compile, run and debug computer programs.**
   a. Programming-tools.
      1. Integrated Development Environment (IDE) or a text editor and command line-based compilation and execution.
   b. Coding a solution.
      1. Self-documenting programs.
      2. Good formatting.
   c. Compile and run programs.

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d. Debug programs.

2. **Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).**
   a. Analysis of a problem by identifying objects and classifying them.
   b. Design a solution to the problem by defining the messages objects send each other, the parameters the messages carry and the inheritance among object classes.
   c. Classes, objects, and methods.
      1) Classes objects, and methods described.
         a) Classes.
         b) Objects.
         c) Method declarations and method calls
         d) Overloaded methods.
      2) Incorporate parameter passing.
         a) Formal and actual parameters.
         b) Returning values from methods
         c) Parameter passing by value and by reference.
      3) Write simple classes and objects.
         a) Classes.
         b) Objects.
         c) Method declaration/implementation and method calls.
         d) Constructors.
         e) Encapsulation through visibility modifiers (public, private)
         f) Class and instance methods and fields (static)
      4) Inheritance and Polymorphism
         a) Extending classes, subclasses
         b) Overriding methods
         c) Polymorphism
      5) Interfaces
         a) Interfaces as types
         b) Implementing by classes
      6) Program Development
         a) Algorithm design and representation using pseudocode, flowcharts, etc.
         b) Evaluate algorithm efficiency.
         c) Stepwise refinement.
         d) Program lifecycle.

3. **Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.**
   a. Sequence.
   b. Selection.
   c. Repetition.

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4. **Identify relationships between computer systems, programming and programming languages.**
   a. Computer organization and architecture (memory, arithmetic-logic unit, control unit).
   b. Binary representation of data (range of data type, precision and round-off, image representation).
   c. Operating system concepts.
   d. Programming language assembler/compiler.
5. **Demonstrate working with primitive data types, strings and arrays.**
   a. Primitives Types
      1. Numeric, character and boolean types.
      2. Numeric accuracy.
      3. Memory requirements.
      4. Declaration.
      5. Initialization.
   b. Integer Arithmetic
      1. Addition and subtraction, increment and decrement
      2. Multiplication, division, and modulo.
      3. Truncation.
   c. Casting
      1. Type assignment.
      2. Implicit and explicit casting.
   d. Strings
      1. Constants
      2. Concatenation.
   e. Arrays
      1. Declaration
      2. Access to array vs. access to an element
      3. Multidimensional arrays

Skills
1. **Use an appropriate programming environment to design, code, compile, run and debug computer programs.**
   a. Use programming tools to model a problem and design algorithms that express its solution.
   b. Formulate models and algorithms in the syntax of an object-oriented programming language using either an Integrated Development Environment (IDE) or a text editor.
   c. Utilize either an IDE or a command prompt to compile and run programs.
   d. Test and debug programs to produce code that runs and generates the correct results.
2. **Demonstrate basic problem solving skills: analyzing problems, modeling a problem as a system of objects, creating algorithms, and implementing models and algorithms in an object-oriented computer language (classes, objects, methods with parameters, abstract classes, interfaces, inheritance and polymorphism).**

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a. Classes, objects, and methods
   1) Use API classes, objects, and methods, citing examples.
   2) Write simple classes and create objects that interact between multiple classes.
   3) Understand parameter passing and methods returning values
   4) Inheritance and Polymorphism
      a) Model a problem as a hierarchy of classes
      b) Differentiate between overloading and overriding.
   5) Define Interfaces and implement them with classes
b. Apply problem-solving techniques such as stepwise refinement and object-oriented analysis
c. Incorporate the concept of software life cycle into program development.
d. Determine and design an algorithm to solve a specific problem. Evaluate algorithm performance.

3. **Illustrate basic programming concepts such as program flow and syntax of a high-level general purpose language.**
   a. Describe sequential, branching, and repetitive concepts.
   b. Use flowcharting to capture sequential, branching, and repetitive concepts.
   c. Incorporate good programming practices.

4. **Identify relationships between computer systems, programming and programming languages.**
   a. Examine the hardware (binary numbers, character encoding, Boolean logic) and basic computer system architecture concepts.
   b. Examine system software and virtual machine concepts.
   c. Describe the concept of program compilation and translation to machine code.

5. **Demonstrate working with primitive data types, strings and arrays.**
   a. Primitive types
      1) Utilize and understand primitive types, their accuracy, memory requirements
      2) Declarations and initialization of primitive types.
      3) Demonstrate integral arithmetic including mod.
      4) Explain casting and differentiate between implicit and explicit casting.
   b. Strings
   c. Arrays

F. *Text and Materials*
   Varied

G. *Reference Materials*
   Varied

H. *Auxiliary Materials and Content*
   Varied

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I. **Learning Assessment Tasks**
Formative and summative assessments: Students may be asked to take written or oral quizzes and examinations to assess their understanding of the various learning outcomes.

Design, implement, and test computer programs to demonstrate understanding of the various learning outcomes.

J. **Methods of Instruction**
Lecture

Per Attachment V, CCCM #6100 (Revised August 28, 1991)
and *The Outcomes Primer* by RuthStiehl, pp. 46-47 © 2002

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ICS 211 Introduction to Computer Science II (UHM, HonCC, KapCC, LeeCC, MauCC)
CS 151 Introduction to Software Development (UHH)

Course Outline

Revised 11/22/05

A. *Course Description*
UHH: CS 151 Introduction to Software Development (3 credits). Continuation of CS 150. Recursion, dynamic memory allocation, sort/search, simple structured data types: strings, stacks, queues, lists, and trees. Program design, testing, and documentation. Pre: CS 150.

UHM: ICS 211 Introduction to Computer Science II (3 credits). This second course in computer programming completes the fundamental material needed for Information and Computer Sciences, and Computer Science majors. The course emphasizes the use of arrays, lists, stacks, queues and other data structures; selecting appropriate searching and sorting algorithms; developing recursive programs; using advanced object orientated programming techniques and creating graphical user interfaces.

HonCC: ICS 211 Introduction to Computer Science II (3 credits). A second course in computer programming. Programming consists of data structures and algorithms together. The first course covers algorithms; this course emphasizes data structures: lists, stacks, queues, binary trees. The course conforms with the ACM (Association of Computing Machinery) description of CS-2.

KapCC: ICS 211 Introduction to Computer Science II (3 credits). ICS 211 completes the coverage of material that is considered fundamental to a beginning student in computer science. The major areas emphasized are advanced features of programming languages, program correctness, algorithms for searching and sorting, data structures, including lists and binary trees, and introduction to the theory of computation. The programs are implemented in a structured language. The course meets the Association for Computing Machinery CS 2 course standards. ICS 211 completes the coverage of material that is considered fundamental to a beginning student in computer science. The major areas emphasized are advanced features of programming languages, program correctness, algorithms for searching and sorting, data structures, including lists and binary trees, and introduction to the theory of computation. The programs are implemented in a structured language. The course meets the Association for Computing Machinery CS 2 course standards.

LeeCC: ICS 211 Introduction to Computer Science II (3 credits). This is a second course in programming. The course will cover topics subsequent to those

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ICS 211 Introduction to Computer Science II/CS 151 Introduction to Software Development Core Outline

covered in ICS 111. This course emphasizes data structures: lists, queues, stacks, binary trees. (45 lecture hours)

MauCC: ICS 211 Introduction to Computer Science II (3 credits). Reinforces and strengthens problem solving using advanced features of computer programming languages and algorithms. Introduces students to the concepts and applications of computer data types, storage, sorting, retrieval, removal, and maintenance of data structures. Problem solving techniques are refined using high-level object-oriented programming languages and sophisticated programming techniques, recursive applications, and algorithms. Meets the ACM CS2 course standards.

Effective Fall 2007, each university and community college campus offering this course has agreed to:

Course alpha and number: ICS 211 (3 credits) or CS 151 (3 credits)

Course title: Introduction to Computer Science II

Course description: Reinforce and strengthen problem-solving skills using more advanced features of programming languages and algorithms such as recursion, pointers, and memory management. Emphasize the use of data structures such as arrays, lists, stacks, and queues.

Note: Effective Fall 2008, Kaua'i Community College will create a new course, ICS 211, Introduction to Computer Science II (3 credits)

B. *Hours Per Week*

    UHH: Lecture: <u>3 hours</u>
    UHM: Lecture: <u>3 hours</u>
    HonCC: Lecture: <u>3 hours</u>
    KapCC: Lecture: <u>3 hours</u>
    LeeCC: Lecture: <u>3 hours</u>
    MauCC: Lecture/Lab: <u>3 hours</u>

C. *Prerequisites or Required Preparation*

    UHH: Prerequisites: CS 150

    UHM: Prerequisites: Grade of "B" or higher in ICS 111 or consent. All students wishing to enroll in ICS courses above 211 must meet the prerequisite grade requirement of B or higher in ICS 111 and 211 prior to registering for the course.

    HonCC: Prerequisites: ICS 111

    KapCC: Prerequisites: A grade of "B" or higher in ICS 111 or consent of the instructor

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LeeCC: Prerequisites: ICS 111 and ICS 141 or equivalent, all with a grade of C or better, or instructor consent.

MauCC: Prerequisites: ICS 111 (C or better) or consent. Corequisites: None. Recommended preparation: MATH 135 or 155

D.   *Intended Student Learning Outcomes*
1. Recognize the use of arrays, lists, stacks, queues, and other data structures.
2. Select the appropriate searching or sorting algorithm based on the algorithm's behavior.
3. Develop recursive algorithms and programs.
4. Select appropriate data structure for a given application.
5. Use advanced object-oriented programming techniques (polymorphism, inheritance, and encapsulation) and standard libraries.
6. Produce robust programs using exception handling and extensive program testing.
7. Create simple graphical user interface (GUI) program.

E.   *Course Content*
Concepts
1. **Recognize the use of arrays, lists, stacks, queues, and other data structures.**
   a. Select the appropriate searching or sorting algorithm based on the algorithm's behavior.
      1) Illustrate data types and characterize them.
         a) Data types.
         b) Characteristics.
      2) Explain how data types are used in program control and corresponding potential pitfalls.
         a) Stacks.
         b) Queues.
         c) Use of pointers.
      3) Demonstrate use of data structures by writing classes and incorporating built-in classes/libraries.
         a) Data structures.
         b) Packages/libraries.
         c) Write classes.
2. **Select the appropriate searching or sorting algorithm based on the algorithm's behavior.**
   a. Sorting algorithms (e.g.: selection sort, insertion sort, bubble sort, quick sort).
   b. Searching algorithms (sequential vs. binary).
3. **Develop recursive algorithms and programs.**
   a. Recursion concept.
   b. Recursion implementation.
   c. Iterative vs. recursive efficiency.
4. **Select appropriate data structure for a given application.**

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    a. Performance characteristics of array and linked implementations.
       1) Performance evaluation.
    b. Problem characteristics to determine whether array, list, stack, or queue provides best representation.
       1) Problem analysis for data structure selection.

5. Use advanced object-oriented programming techniques such as inheritance and standard libraries.
    a. Inheritance.
    b. Standard libraries.
    c. Library organization.

6. Produce robust programs using exception handling and extensive program testing.
    a. Exception handling.
    b. Program testing techniques.
    c. Testing design strategies.
    d. Defensive programming.

7. Create simple graphical user interface (GUI) program.
    a. Good user interface design.
    b. Library GUI objects.
    c. Event-driven programming paradigm.

Skills

1. Recognize the use of arrays, lists, stacks, queues, and other data structures.
    a. Illustrate data types and characterize them.
    b. Explain how data types are used in program control and potential pitfalls.
    c. Demonstrate use of data structures by writing classes and incorporating built-in classes/libraries.
    d. Use of pointers.

2. Select the appropriate searching or sorting algorithm based on the algorithm's behavior.
    a. Analyze the efficiency of various sorting algorithms, including insertion sort, selection sort, bubble sort, merge sort, and quicksort.
    b. Analyze the efficiency of various searching algorithms including linear search and binary search.
    c. Utilize an appropriate sorting technique for a given data set.
    d. Utilize an appropriate searching techniques for a given data set.

3. Develop recursive algorithms and programs.
    a. Write recursive functions and algorithms.
    b. Compare efficiency of iterative vs. recursive solution.

4. Select appropriate data structure for a given application.
    a. Choose between array and linked implementation.
    b. Evaluate problem characteristics to determine whether array, list, stack, or queue provides best representation.

5. Use advanced object-oriented programming techniques such as inheritance and standard libraries.

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a. Write a derived class.
b. Navigate the library hierarchy.
c. Use appropriate library functions.
6. **Produce robust programs using exception handling and extensive program testing.**
7. **Create simple graphical user interface (GUI) program.**
a. Demonstrate knowledge of available GUI objects.
b. Design a simple GUI.
c. Implement a GUI program with event-driven programming techniques.

F. *Text and Materials*
Varied

G. *Reference Materials*
Varied

H. *Auxiliary Materials and Content*
Varied

I. *Learning Assessment Tasks*
Formative and summative assessments: Students may be asked to take written or oral quizzes and examinations to assess their understanding of the various learning outcomes.

Design, implement, and test computer programs to demonstrate understanding of the various learning outcomes.

J. *Methods of Instruction*
Lecture

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ICS 211 Introduction to Computer Science II/CS 151 Introduction to Software Development Core Outline

ICS 141 Discrete Mathematics for Computer Science I
(UHM, HonCC, KapCC LeeCC)
CS 215 Discrete Mathematics (UHH)

Course Outline

Revised 11/22/05

A. ***Course Description***

UHH: CS 215 Discrete Mathematics (3 credits). Topics from discrete mathematics, including logic, proof techniques, recurrence relations, set theory, combinatorics, relations, functions, graphs, Boolean algebra, finite-state machines. Not open to students with credit in MATH 310.

UHM: ICS 141 Discrete Mathematics for Computer Science I (3 credits). Logic, sets, functions, matrices, algorithmic concepts, mathematical reasoning, recursion, counting techniques, probability theory.

HonCC: ICS 141 Discrete Mathematics for Computer Science I (3 credits). Introduction to discrete mathematics: logic, sets, functions, number theory, matrices, mathematical reasoning, counting techniques, recurrence relations, relations, equivalences, partial orders, graph and tree concepts.

KapCC: ICS 141 Discrete Mathematics for Computer Science I (3 credits). Covers logic, sets, functions, matrices, algorithmic concepts, mathematical reasoning, counting techniques, probability theory, relations, equivalences, partial orders, basic graphs, and tree concepts.

LeeCC: ICS 141 Discrete Mathematics for Computer Science I (3 credits). Covers logic, sets, functions, algorithms, number theory, matrices, mathematical reasoning, probability theory, counting techniques, and relations (including closures, equivalence relations and partial orders). Selected algorithms/ programs will be observed and compared on the computer. (45 lecture hours)

Note: Students taking ICS 141 Discrete Mathematics for Computer Science I and ICS 241 Discrete Mathematics for Computer Science II from UH Mānoa, Honolulu CC, Kapiʻolani and Leeward CC may have credits transferred among these campuses. Students transferring from UHM, HonCC, KapCC, and LeeCC to UH Hilo must complete **both** ICS 141 **and** ICS 241 to receive credit for CS 215 Discrete Mathematics (3 credits).

Students transferring from UH Hilo to UHM, HonCC, KapCC, or LeeCC must complete **both** CS 215 Discrete Mathematics (3 credits) **and** MATH 421 Probability (3 credits) to receive credit for **both** ICS 141 Discrete Mathematics for Computer Science I **and** ICS 241 Discrete Mathematics for Computer Science II.

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ICS 141 Discrete Mathematics for CS I/CS 215 Discrete Mathematics Core Outline

> **Effective Fall 2007, each university and community college offering this course has agreed to:**
>
> <u>Course alpha and number</u>: ICS 141 (3 credits) or CS 141 (3 credits)
>
> <u>Course title</u>: Discrete Mathematics for Computer Science I
>
> <u>Course description</u>: Includes logic, sets, functions, matrices, algorithmic concepts, mathematical reasoning, recursion, counting techniques, probability theory.
>
> <u>Prerequisite</u>: UH Mānoa: university entry requirements. Recommended Preparation: Pre-calculus.
>
> <u>Prerequisite</u>: UH Hilo: Math 205 or consent of instructor
>
> <u>Prerequisite</u>: Honolulu CC, Kapiʻolani CC and Leeward CC: MATH 103 College Algebra, or equivalent, or consent of instructor.
>
> **Note:** Effective Fall 2007, UH Hilo will replace CS 215 with CS 141 equivalent to ICS 141 courses system-wide and CS 241 equivalent to ICS 241 courses system-wide.

B.   ***Hours Per Week***
   UHH   Lecture: <u>3 hours</u>
   UHM: Lecture: <u>3 hours</u>
   KapCC: Lecture: <u>3 hours</u>
   HonCC: Lecture: <u>3 hours</u>
   LeeCC: Lecture: <u>3 hours</u>

C.   ***Prerequisites or Required Preparation***
   UHH: Math 205 (Calculus I) or equivalent. Not open to students with credit in MATH 310.

   UHM: ICS 111 (or corequisite) and pre calculus assessment

   KapCC: Qualification for MATH 135; or consent of instructor

   HonCC: MATH 135. <u>Prerequisite or Corequisite</u>: ICS 111. <u>Recommended preparation</u>: MATH 205

   LeeCC: MATH 100 or higher and ICS 111 (or concurrent), all with a grade of "C" or better.

D.   ***Intended Student Learning Outcomes***
   Analyze issues and apply mathematical problem solving skills to plan courses of actions in decision-making situations.

E.   ***Course Content***
   <u>Concepts</u>
       1. Basic mathematical formal logic.
       2. Proofs.

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ICS 141 Discrete Mathematics for CS I/CS 215 Discrete Mathematics Core Outline

3. Recursion.
4. Analysis of algorithms.
5. Sets.
6. Combinatorics.
7. Relations.
8. Functions.
9. Matrices.
10. Probability

Skills
Demonstrate mastery of techniques using:
1. Basic mathematical formal logic.
2. Proofs.
3. Recursion.
4. Analysis of algorithms.
5. Sets.
6. Combinatorics.
7. Relations.
8. Functions.
9. Matrices.
10. Probability.

F. *Text and Materials*
Varied

G. *Reference Materials*
Varied

H. *Auxiliary Materials and Content*
Varied

I. *Learning Assessment Tasks*
Assessments may include homework assignments and exams to solve situational problems supported by an analysis using mathematical formulas, algorithms, and techniques.

J. *Methods of Instruction*
Lecture

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ICS 141 Discrete Mathematics for CS I/CS 215 Discrete Mathematics Core Outline

ICS 241 Discrete Mathematics for Computer Science II (UHM, HonCC, LeeCC)

Course Outline

Revised 11/22/05

A. ***Course Description***

UHM: ICS 241 Discrete Mathematics for Computer Science II (3 credits).
Program correctness, recurrence relations and their solutions, divide and conquer relations, relations and their properties, graph theory, trees and their applications, Boolean algebra, introduction to formal languages and automata theory.

HonCC: ICS 241 Discrete Mathematics for Computer Science II (3 credits).
Recursive algorithms, program correctness, structured programs, graph theory, trees and their applications, probability theory, Boolean algebra, introduction to formal languages and automata theory.

KapCC: 241 Discrete Mathematics for Computer Science II (3 credits).
This course covers recursive algorithms, program correctness, structured programs, graph theory, trees and their applications, probability theory, Boolean algebra, introduction to formal languages and automata theory.

LeeCC: ICS 241 Discrete Mathematics for Computer Science II (3 credits).
Recursive algorithms, program correctness, structured programs, graph theory, trees and their applications, probability theory, Boolean algebra, introduction to formal languages and automata theory. (45 lecture hours)

Effective Fall 2007, each university and community college campus offering this course has agreed to:

Course alpha and number: ICS 241 (3 credits) or CS 241 (3 credits)

Course title: Discrete Mathematics for Computer Science II

Course description: Includes program correctness, recurrence relations and their solutions, divide and conquer relations, graph theory, trees and their applications, Boolean algebra, introduction to formal languages and automata theory.

Prerequisite: ICS 111 Introduction to Computer Science I and ICS 141 Discrete Mathematics for Computer Science I, or consent of instructor.

Prerequisite: UH Hilo CS 141

Note: Effective Fall 2007 UH Hilo will develop a course, CS 241 (3 credits) equivalent to ICS 241.

B. ***Hours Per Week***

UHM: Lecture: 3 hours
HonCC: Lecture: 3 hours

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ICS 241 Discrete Mathematics for CS II Core Outline

KapCC: Lecture: <u>3 hours</u>
LeeCC: Lecture: <u>3 hours</u>

C. **Prerequisites or Required Preparation**
UHM: <u>Prerequisites</u>: ICS 111 and 141, or consent
HonCC: <u>Prerequisites</u>: ICS 111 and ICS 141. <u>Prerequisite or Corequisite</u>:
MATH 205 or placement in MATH 206
KapCC: <u>Prerequisites</u>: ICS 111 and ICS 141
LeeCC: <u>Prerequisites</u>: ICS-111 and ICS-141

D. **Intended Student Learning Outcomes**
Analyze issues and apply more complex mathematical problem solving skills to
plan courses of actions in high-level decision-making situations.

E. **Course Content**
<u>Concepts</u>
1. Graphs and Trees.
2. Boolean algebra.
3. Finite-state machines.
4. Formal languages.
5. Program correctness.
6. Solving recurrence relations.
<u>Skills</u>
Demonstrate mastery of:
1. Graphs and trees.
2. Boolean algebra.
3. Finite-state machines.
4. Formal languages
5. Program correctness.
6. Solving recurrence relations

F. **Text and Materials**
Varied

G. **Reference Materials**
Varied

H. **Auxiliary Materials and Content**
Varied

I. **Learning Assessment Tasks**
Assessments may include homework assignments and exams to solve high-level
situational problems supported by an analysis using more complex mathematical
formulas, algorithms, and techniques.
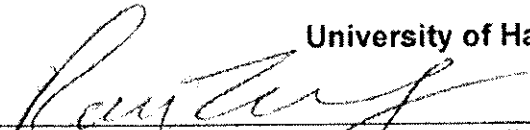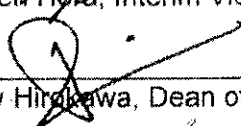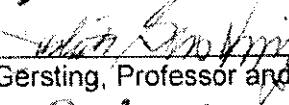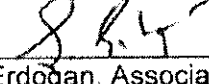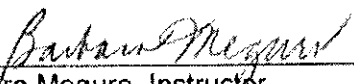
J. **Methods of Instruction**
Lecture

Per Attachment V, CCCM #6100 (Revised August 28, 1991)
and *The Outcomes Primer* by RuthStiehl, pp. 46-47 © 2002

University of Hawai'i System Articulation Agreement   Page 36 of 45   Rev. November 22, 2005
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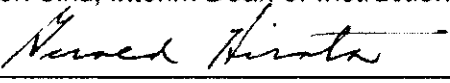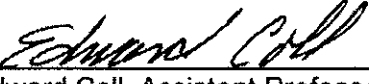ICS 241 Discrete Mathematics for CS II Core Outline

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

University of Hawai'i at Hilo

_____
Rose Tseng, Senior Vice President and Chancellor

Dec 8 2005
Date

_____
Stephen Hora, Interim Vice Chancellor for Academic Affairs

DEC 5 2005
Date

_____
Randy Hirokawa, Dean of College of Arts and Sciences

11-30-05
Date

_____
Judith Gersting, Professor and Chair, Computer Science Department

11/30/05
Date

_____
Seyki Erdogan, Associate Professor

11/30/05
Date

_____
Barbara Meguro, Instructor

11/30/05
Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

University of Hawai'i at Mānoa
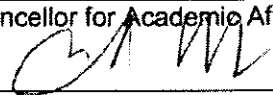
DEC - 2 2005

_____   _____
Denise Konah, Interim Chancellor   Date

_____   12\2\05
Neal Smatresk, Vice Chancellor for Academic Affairs   Date
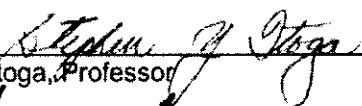
_____   12/2/15
Charles F. Hayes, Interim Dean, College of Natural Sciences   Date

_____   11/30/05
Martha E. Crosby, Chair, Department of Information and   Date
   Computer Sciences

_____   12/1/2005
Stephen Itoga, Professor   Date
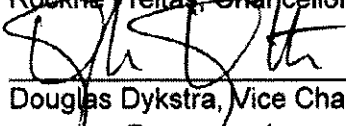
_____   11/30/05
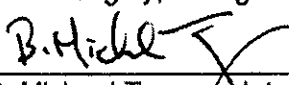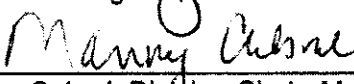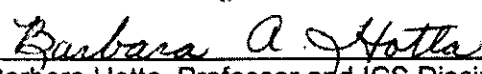Gerald Lau, Assistant Faculty Specialist   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Hawai'i Community College

_____   1/4/06
Rockne Freitas, Chancellor   Date

_____   12/16/05
Douglas Dykstra, Vice Chancellor for Academic Affairs   Date

_____   12/13/2005
Beth Sanders, Chair, Business Education and Technology Division   Date

_____   12/13/2005
Kent Killam, Professor   Date

_____   12/13/2005
Annie Brown, Associate Professor   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)
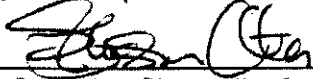
Honolulu Community College

_____   12/12/05
Ramsey Pedersen, Chancellor   Date
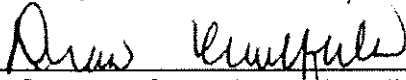
_____   12-12/05
Sharon Ota, Vice Chancellor for Academic Affairs   Date
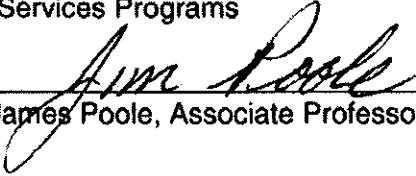
_____   12/8/05
Diane Caulfield, Chair, Technology II Communications and   Date
Services Programs
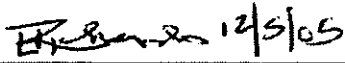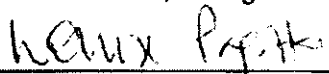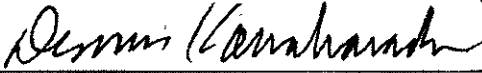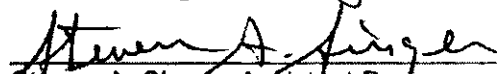
_____   Dec 7, 2005
R. James Poole, Associate Professor   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Kapi'olani Community College

_____   _____
Leon Richards, Acting Chancellor   Date

_____   _____
Louise Pagotto, Interim Assistant Dean of *Acting Vice Chancellor*   Date
Arts & Sciences and Curriculum Management *for Academic*
Affairs

_____   _____
Dennis Kawaharada, Acting Dean of Business, Health Sciences   Date
and Legal Education

_____   _____
Rosemae Harrington, Chair, Business Education Department   Date

_____   _____
Steven A. Singer, Assistant Professor and   Date
Coordinator, ICS/IT Program

_____   _____
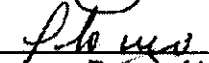Alfred Seita, Professor   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Kaua'i Community College

_____   12/08/05
Peggy Cha, Chancellor   Date

_____   12-8-05
Helen Sina, Interim Dean of Instruction   Date

_____   12/02/05
Gerald Hirata, Assistant Professor and Chair, Science and   Date
    Mathematics Division

_____   120205
Edward Coll, Assistant Professor, Coordinator, Instructional Technology   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Leeward Community College

_____   _12-16-05_
Peter Quigley, Acting Chancellor   Date

_____   __DEC 14 2005__
B. Michael Tagawa, Interim Dean of Career and Technical Education   Date

_____   _12/14/05_
Manny Cabral, Division Chair, Math and Sciences   Date

_____   _12/14/05_
Barbara Hotta, Professor and ICS Discipline Coordinator   Date

_____   _12/14/05_
Michael Bauer, Assistant Professor   Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Maui Community College

_____   11/30/05
Clyde Sakamoto, Chancellor   Date

_____   11/30/05
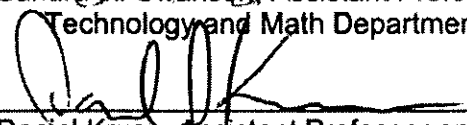flo wiger, Dean of Instruction   Date

                 NOV 2 9

_____   Date
Sandra R. Swanson, Assistant Professor and Chair, Science,
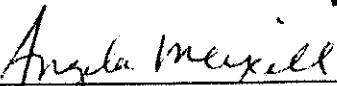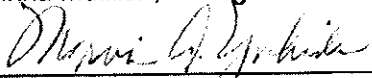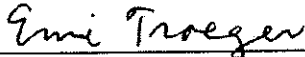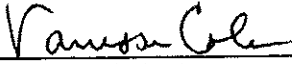 Technology and Math Department

_____   11/29/05
Daniel Kruse, Assistant Professor and Chair Academic Senate Date

UNIVERSITY OF HAWAI'I SYSTEM ARTICULATION AGREEMENT
Information and Computer Science(s) (ICS)
Computer Science (CS)

Windward Community College

Angela Meixell, Chancellor   12/02/05
                                                             Date

Linka Mullikin, Acting Dean of Instruction   11/28/05
                                                             Date

Marvin Yoshida, Chair, Math and Business Department   11/30/05
                                                             Date

Peggy Regentine, Professor   11/23/2005
                                                             Date

Emi Troeger, Professor   11/29/05
                                                             Date

Vanessa Cole, Lecturer   11/30/2005
                                                             Date