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Date Prepared: Spring 2006
Date Reviewed: Fall 2006
Date Reviewed:
PCA Established:
GE Approved/Review:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: COM SC 122

CATALOG TITLE: Fundamentals of Programming 2

SCHEDULE TITLE: Fundamentals of Programming 2

UNITS: 2

WEEKLY LECTURE HOURS: 4

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16) 8

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Math 311

ADVISORY(IES): COM SC 121

ENTRANCE SKILLS The student must have the ability to:
1. use the basic real number axioms.
2. perform the four basic operations with real numbers.
3. evaluate and simplify variable expressions.
4. solve linear equations and their applications
5. translate and solve word problems at the Math 311 level.
6. factor and perform the four basic operations with polynomials.
7. graph linear equations with one or two variables by intercept and slope methods.
8. solve and graph linear inequalities; use factoring to solve quadratic equations.

CATALOG DESCRIPTION
A continuation of the fundamentals of programming. Topics include algorithm design and problem-solving strategies; concepts of object-oriented programming: classes, objects, encapsulation, inheritance and polymorphism. Students will develop applications using class hierarchies and abstract data types. Searching and sorting algorithms will be introduced.

SCHEDULE DESCRIPTION
A continuation of the fundamentals of programming. Topics include algorithm design and problem-solving strategies; concepts of object-oriented programming: classes, objects, encapsulation, inheritance and polymorphism. Students will develop applications using class hierarchies and abstract data types. Searching and sorting algorithms will be introduced.

COURSE GOALS To encourage and enable students to:
1. understand the core concepts of Object-Oriented programming.
2. understand the concepts and principles of user interface design, screen layouts and event handling.
3. understand the concepts of basic searching and sorting algorithms.
4. understand the basic data structures: multi-dimensional arrays, vectors, collections, tables, stacks, and queues.

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5. understand and appreciate the concept of various forms of recursion in programming, and appreciate the difference in designing an algorithm to be recursive or iterative.
6. understand the principles of interfaces, class inheritance and class hierarchies.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. design and implement solutions to software program requirements applying the concepts of object-oriented programming.
2. compare and contrast object-oriented analysis and design with structured analysis and design.
3. implement and analyze the efficiency of searching and sorting algorithms: linear search, binary search, selection sort, insertion sort, merge sort.
4. design and implement graphical user interfaces using a variety of graphics class libraries that provide containers, components, layout managers and event-handlers.
5. design and implement recursive algorithms.
6. design and implement solutions to software program requirements utilizing basic data structures such as multi-dimensional arrays, vectors, elections, tables, stacks, and queues.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Object-Oriented Programming: classes and objects, constructors, mutators, accessors, destructors	1
2.	Graphical User Interfaces: overview, components, containers, layout managers, class libraries, event-driven programming, design.	2
3.	Algorithm Design: recursive thinking, recursive programming, head and tail recursion, recursion versus iteration, applications of recursion	1
4.	Concepts and Use of Data Structures: multi-dimensional arrays, vectors, collections, tables, stacks, and queues; algorithms and data structures	2
5.	Software Re-use: class inheritance, class hierarchies, polymorphism, class interfaces, class libraries	1
6.	Searching and Sorting Algorithms: linear search, binary search, selection sort, insertion sort, quick-sort, merge-sort.	1

APPROPRIATE READINGS (Other than Textbook)

1. Horstmann, C. Core Java 2, Volume 1. Prentice Hall. 7th Edition. 2004
2. Flanagan, D. Java in a Nutshell. O'Reilly. 5th Edition. 2005.
3. Arnold, K. Java Programming Language. Addison-Wesley. 4th Edition. 2005.

OUTSIDE ASSIGNMENTS

Types of assignments include software programming projects, software design documents, that implement the concepts discussed in the course.

Sample Programming Assignment:

1. Display in one pass, the Mandelbrot Set corresponding to the formula $Z_{i+1} = Z_i^2 + C$. Use double-precision floating-point arithmetic for computations, and display the graphic covering the entire Applet window.

2. Using an appropriate data structure, construct a program that recursively traverses a "maze" as a two-dimensional m x n grid of integers with values of 0 or 1. '0' is equivalent to a wall of the maze. You may not cross or step onto walls of the maze. '1' is equivalent to a valid path in the maze. You traverse the maze by taking one step up, down, left or right on a valid path in the maze. These are the only legal moves to traverse the maze. Your program must determine if it is possible to traverse the maze starting from the upper left corner position (0,0), and ending at the lower right corner position (m-1,n-1). Before beginning the maze traversal, your program will output a textual representation of the maze you constructed. If it is possible to traverse the maze, your program will output the statement "The maze was successfully traversed". You will also output another textual version of the maze, this one showing every step (position) you tried, as

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well as what the successful path was. If, on the other hand, it is not possible to successfully traverse the maze, then your program will output "there is no possible path" and show every step (position) you tried. Here is an example of program output:

Maze before traversal:
1110110001111
1011101111001
0000101010100
1110111010111
1010000111001
1011111101111
1000000000000
1111111111111

The maze was successfully traversed.

Maze after traversal:
7770110001111
3077707771001
0000707070300
7770777070333
7070000773003
7077777703333
7000000000000
7777777777777

EVALUATION

Evaluation includes programming assignments, examinations, quizzes, and will vary according to topic.

Sample exam questions :

1. Given the following class definition:

```
public class Car {
        public Car(double gallons) {
                fuelLevel = gallons;
        }

      public void addGas (double gallons) {
              fuelLevel = fuelLevel + gallons;
       }
       private double fuelLevel;
}
```

after the following code fragment executes:

Car car1 = new Car(5);
Car car2 = car1;
car2.addGas(15);

what is the value stored in fuelLevel for car1?

a. 15
b. 5
c. 20
d. 0

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2. Compare and contrast three of the sorting algorithms discussed in class. Consider the implications of different data structures in your answer.

TEXTS AND SUPPLIES

Adopted Text: Muganda. Starting Out with Java: From Control Structures Through Data Structures. 1st ed. Addison Wesley. 2007

Other Materials: None

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 9/7/06 Initiator Michael Steinore

1. Method of instruction to be used (primary modality): Hybrid (traditional classroom .375/Internet .625)
2. Instructor-student Contact

Hours Per Week

	No.			No.
e-mail communication			Chatroom	
Group	2		Discussion Board	1
Individual	2		Telephone contacts	
Other 3 (in class)				

Hours Per Semester

Orientation sessions			(in person)
Group meetings	8		(in person)
Review sessions			(in person)
Labs			(in person)
Testing	1		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: One or more exams will be given online.
5. Accessible to students with disabilities: Yes
6. On-line services: Students will be advised in class.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: Fall 2007
Date Reviewed:
PCA Established:
GE Approved/Review:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: COM SC 164

CATALOG TITLE: Software Engineering

SCHEDULE TITLE: Software Engineering

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Math 311

ADVISORY(IES): COM SC 121 and COM SC 122 or COM SC 175

ENTRANCE SKILLS The student must have the ability to:
1. use the basic real number axioms.
2. perform the four basic operations with real numbers.
3. evaluate and simplify variable expressions.
4. solve linear equations and their applications
5. translate and solve word problems at the Math 311 level.
6. factor and perform the four basic operations with polynomials.
7. graph linear equations with one or two variables by intercept and slope methods.
8. solve and graph linear inequalities; use factoring to solve quadratic equations.

CATALOG DESCRIPTION
A language-independent study of current software development methodologies. Students learn and perform the stages of requirements analysis, system design, implementation, testing and debugging, maintenance, in the course of completing a practical software project. A modern programming language such as Java will be used.

SCHEDULE DESCRIPTION
A language-independent study of current software development methodologies. Students learn and perform the stages of requirements analysis, system design, implementation, testing and debugging, maintenance, in the course of completing a practical software project. A modern programming language such as Java will be used.

COURSE GOALS To encourage and enable students to:
1. understand the properties and key concepts of good software design.
2. appreciate the practical aspects of the software engineering principles and skills covered.
3. critique the quality of multiple software designs based on key design principles and concepts.
4. gain practical experience designing, implementing and testing a large-scale software project in a collaborative environment.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to;

1. apply successful software engineering principles to solving a software problem.
2. compare and contrast object-oriented analysis and design with structured analysis and design.
3. elicit software requirements for a substantial software project from a customer or user.
4. create and specify a software design model for a software product from a software requirements document.
5. design, implement, test and debug programs that utilize large-scale application programming interface packages.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Software engineering concepts and principles	1
2.	Application software, middleware, hardware architecture	1
3.	Requirements analysis, derivation, specification, validation	1
4.	User interface rapid-prototyping	1
5.	Structured top-down and component level design	1
6.	Object-oriented analysis and design, UML	2
7.	Test Cases in design methodology	1
8.	Model-to-Code Conversion Tools	1
9.	Implementation/Coding – Functional Decomposition, Self-Documentation	2
10.	API programming and debugging, Class Browsers	1
11.	Generic programming, abstract data types, interfaces, system integration	1
12.	Testing and debugging, top-down, bottom-up, workflow	1
13.	Documentation, Help and Technical Writing, Portability, Design for Reuse and Internationalization	1 1
14.	Software Project Management, project estimation	1

APPROPRIATE READINGS (Other than Textbook)

1. Pfleeger, S, J. Atlee. Software Engineering. Prentice Hall. 3rd ed. 2005.
2. Fowler, M. UML Distilled: A Brief Guide to the Standard Object Modeling Language. Addison Wesley. 3rd ed. 2003.
3. Pilone, D., Pitman, N. UML 2.0 In a Nutshell. O'Reilly. 1st ed. 2005.

OUTSIDE ASSIGNMENTS

Types of assignments include writing a software requirements document for a given software project, producing an object-oriented design using UML, software and documentation that implements the design model, and a written test plan for the software.

Sample writing assignment: Write a requirements specification for a hotel booking that keeps track of current guests, available rooms, future bookings, and payments of accounts. Include the ability to handle room service orders by tracking them, billing them to the appropriate room, and showing the total sales for a given period.

EVALUATION

1. Homework assignments
2. In-class written examinations
3. Group Software Development Project

Sample exam questions:

1. For the application described below, draw a class hierarchy that you would create. Show class inheritance and composition and attributes (fields) of each class. Be sure to show where public inheritance, private inheritance and class composition would be used. Do not show any member functions/methods.

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The goal is to model seat reservations for an airline reservation system. The reservation system stores flight information for many different airlines (e.g., USAir, American, Delta). Each flight has a departure and arrival time, and a specific type of airplane. Each airplane has a specific number of seats, some of which are full for any specific flight. There are a certain number of seats available in each of several price categories (frequent flyer seats, book in advance seats, full fare seats, etc.). Customers will need to look, change, cancel seat reservations.

2. A new piece of software (approx. 5,000 lines of C++ code) is dropped on your desk. Your goal is to evaluate its quality and reusability, which will determine whether or not to keep/modify the code or start from scratch. List 5 quantitative measures you would use to assess the code quality. These measures should not include any correctness testing. Be clear about how you would calculate the measures.

TEXTS AND SUPPLIES

Adopted Text: Sommerville. Software Engineering. Addison Wesley. 2006.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:
Date Reviewed: Fall 2005
Date Reviewed: Spring 2006
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: COM SC 175

CATALOG TITLE: Object-Oriented Programming

SCHEDULE TITLE: Object-Oriented Programming

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 0

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Math 311

ADVISORY(IES): Com Sc 121

ENTRANCE SKILLS The student must have the ability to:
1. use the basic real number axioms.
2. perform the four basic operations with real numbers.
3. evaluate and simplify variable expressions.
4. solve linear equations and their applications
5. translate and solve word problems at the Math 311 level.
6. factor and perform the four basic operations with polynomials.
7. graph linear equations with one or two variables by intercept and slope methods.
8. solve and graph linear inequalities; use factoring to solve quadratic equations.

CATALOG DESCRIPTION
A study of object-oriented programming including objects, classes, member functions, encapsulation, inheritance and polymorphism. Control flow, function overloading, search and sort algorithms, recursion, template classes and functions, as will as dynamic data structures are covered. Uses the C++ language.

SCHEDULE DESCRIPTION
A study of object-oriented programming including objects, classes, member functions, encapsulation, inheritance and polymorphism. Control flow, function overloading, search and sort algorithms, recursion, template classes and functions, as will as dynamic data structures are covered. Uses the C++ language.

COURSE GOALS To encourage and enable students to:
1. gain a sound understanding of the basic elements of object oriented design and analysis.
2. understand and explain the object-oriented principles of encapsulation, inheritance, polymorphism.
3. understand and explain dynamic data structures such as linked lists, stacks and trees.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. write programs that will perform a given algorithm.
2. properly use and describe the function of statements or commands from an object oriented language.
3. Implement and apply algorithms associated with dynamic data structures such as linked lists, stacks and trees.
4. Implement and apply the principles of object oriented programming such as inheritance, polymorphism and encapsulation.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Introduction to Object Oriented Analysis, Design, and Programming	1
2.	Streams and File Input/Output, Operators	1
3.	Variables, Data Types, Expressions, Control Structures	1
4.	Functions	1
5.	Classes, Pointers, and Dynamic Arrays	2
6.	Searching, Sorting, 1-dimensional and multi-dimensional Arrays	1
7.	Objects and Classes	2
8.	Function and Operator Overloading and Polymorphism	2
9.	Inheritance and Code Reuse	1
10.	Recursion	1
11.	Templates Functions and Classes	1
12.	Dynamic Data Structures: Linked Lists, Stacks, And Trees	2

APPROPRIATE READINGS (Other than Textbook)

Deitel & Deitel. C++ How to Program. 5th ed. Prentice Hall. 2005

OUTSIDE ASSIGNMENTS

Types of assignments: programming assignments in which students implement self-contained programs that implement algorithms and/or demonstrate concepts covered in class.

Sample Problems:

1. Create a class to represent the display of a digital clock. Write member functions to set the time, increment the time and display the time.
2. Write a function that uses a switch to take the representations of decimal digits as char's and converts them to 4-bit binary strings packed into an int. If an int has 32 bits, then 8 digits can be packed into it. Also write the inverse function that will unpack the 8 decimal digits and change them back to their ASCII code.
3. Create a class to represent a point, (x,y), on a graph. Write member functions to set the point, change the point and display the point. Create a class to represent a line on the graph which inherits the properties of the point class. The line will have two additional data members, slope and y-intercept. Write member functions to find the slope or y-intercept when given two points on the line.
4. Discuss why constructors are almost always public member functions. What goes wrong if they are private?
5. Write a function template to swap two values. Use this template to swap two values of the following classes: character, double and point.

EVALUATION

1. Programming exercises which enable students to experiment with their particular computer system. Students will demonstrate critical thinking skills by comparing their results with the other students and explaining why they may be different.
2. Non-programming exercises which include finding errors in existing programs or tracing through programs and determining the resulting output. These exercises will be graded based on accuracy.
3. Exams which contain questions covering each of the topics in the course outline. Exam questions may be multiple choice, short answer, tracing programs, and writing programs.

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4. A final exam stressing accepted object oriented programming principles as well as problem solving abilities.

Sample Exam Questions:

1. Give two examples of C++ variables or data types that are equivalent to constant pointers, and therefore cannot be reassigned to a different value.
2. Suppose the following declarations have been made:

```
int* e = new int(4);   int* f = new int(8);
swapTwoValues(e,f);
cout << "e= " << *e << " f= " << *f << endl;
```

The desired output is e= 8 f= 4. Write the function swapTwoValues.

TEXTS AND SUPPLIES

Adopted Text: Savitch, W. Absolute C++. Addison-Wesley. 2nd ed. 2005

Other Materials: None

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2000
Date Reviewed: Spring 2003
Date Reviewed: Fall 2007
PCA Established: Spring 2000

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: COM SC 320 (EL 320)

CATALOG TITLE: A+ Certification

UNITS: 2

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 2

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

ADVISORY: EL 105/COM SC 105

CATALOG DESCRIPTION

Computer repair and maintenance with a focus on preparations required for achieving the industry standard CompTIA A+ Certification. The "hands-on" study includes the A+ Core Test Domains and the Windows/DOS Test Domains. This course is not open to students who are enrolled in or have received credit for Electronics 320.

COURSE GOALS: To encourage and enable students to

1. pass the CompTIA Core and Windows/DOS A+ Certification Examinations.
2. understand the technologies that comprise a computer system.
3. apply learned concepts to the repair and maintenance of computer hardware and software systems.

INSTRUCTIONAL OBJECTIVES: At the end of the course, the student will demonstrate the ability to

1. identify and apply basic terms, concepts, and functions of computer system modules and software, including how each module should work during normal operation.
2. identify and apply basic procedures for adding and removing field replaceable modules.
3. apply basic troubleshooting procedures and good practices for eliciting problem symptoms from customers.
4. identify potential hazards and proper safety procedures relating to computer systems, lasers and high voltage equipment.
5. identify items that require special disposal procedures that comply with environmental guidelines.
6. identify common printer problems and apply proper service techniques.
7. identify the unique components of portable computers and their unique problems.
8. identify basic networking concepts, including how a network works.
9. identify typical memory conflict problems and how to optimize memory use.

COURSE OUTLINE

	WEEKS
A+ Core Module	
1. Basic Computer Service Concepts and Safety	.5
2. PC Architecture	1
3. PC Memory Architecture	.5
4. Disk System Architecture	1
5. PC Bus Architectures	.5

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

6. Peripheral devices 1
7. Installation and Upgrades 1
8. How Printers Work 1
9. Networking Fundamentals 1
10. Customer Service 1
11. Troubleshooting Techniques 2

A+ DOS/Windows Module

1. Operation and installation of Microsoft Operating Systems 1
2. Operating System Configuration and Management 1
3. Installing and Running Applications .5
4. Networking with DOS and Windows 1
5. Troubleshooting Operating Systems and Applications 2

APPROPRIATE READINGS (Other than Textbook)

1. Groth, D. A+ Complete Study Guide. Sybex
2. Antonakos, J. Microcomputer Repair. Prentice Hall
3. Mueller, S. Upgrading and Repairing PCs. QUE

ASSIGNMENTS

1. Readings from assigned textbooks
2. Online CBT practice exams and instructional material (Intranet)
3. Troubleshooting Projects (hardware and software)
4. Customer Service assignments (service calls)

EVALUATION

1. Chapter and section exams (some exams online to simulate actual A+ Certification Core Exams)
2. Projects and assignments graded
3. Final Exam

Sample essay question: Explain the limitations that are presented by digital phone lines. Older phone lines, before 1940, were analog from beginning to end; there were no digital components. This is not true today. Regular telephone lines are always analog as they leave a customer's house or office building, but are almost always converted to a digital signal at some point in the transmission. There, digital signals can then be transmitted, using sophisticated computing equipment and methods, and then converted back to analog signals at some point before traveling that last step between a local central office and the phone of the person receiving the call. The limitation on modem on modem speeds is the result of the method used when an analog signal is converted to a digital signal.

TEXTS AND SUPPLIES

Adopted Text: Andrews, J. A+ Guide to Managing and Maintaining Your PC, Course Technology. 2007
Andrews, J. A+ Lab Manual for Managing & Maintaining Your PC, Course Technology. 2007

Other Materials:

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/24/03 Initiator Robert Alldredge

1. Method of instruction to be used (primary modality): Hybrid (Internet/Lab/Demonstration/Discussion)

2. Instructor-student Contact

	Per Week No.			No.
e-mail communication			Chatroom	.25
Group			Discussion Board	.25
Individual	.25		Telephone contacts	
Other: 3 Blackboard's Digital Drop Box – Students turn-in homework and lab assignments; they often use this option for questions and discussions. Online exams, and a required 2-hr class meeting per week.				

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Per Semester

Orientation sessions	1.5		(in person)
Group meetings			(in person)
Review sessions			(in person)
Labs	16		(in person)
Testing			(in person)
Other (Identify)			

3. Adjustments to assignments: No adjustments necessary.

4. Adjustments to evaluation: The student has three weeks to complete the examination.

5. Accessible to students with disabilities: Yes

6. On-line services: Class orientation and email communications are used to inform students about services.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 1996
Date Reviewed: Fall 2002
Date Reviewed: Spring 2003
PCA Established: Spring 1996

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. EL 105 (COM SC 105) Catalog Title PC Preventive Maintenance and Upgrading

Units 3 Weekly lecture hours 2 Weekly lab hours 3 Department Mathematical Sciences

Credit/No Credit Option

Prerequisite: None

CATALOG DESCRIPTION

Necessary skills and information needed to make an informed purchase, maintain, upgrade, and evaluate personal computer systems. The student will receive hands-on instruction for performing basic preventive maintenance and the installation of simple upgrades such as adding RAM, installing hard drives, sound cards, etc. Included is the study of soldering techniques, electronic part identification, and safety and system operation. Emphasis will be placed on the student's ability of keeping personal computers running at their best performance levels.

COURSE GOALS: To encourage and enable students to

1. correctly apply electrical and mechanical safety principles.
2. identify the basic operational components that form a personal computer system.
3. disassemble, assemble a PC.
4. install upgraded subassemblies into a personal computer.
5. understand the basics of operating systems and their use to configure PC subassemblies.
6. analyze and determine hardware requirements for computer purchases.
7. maintain a personal computer and keep it at its best performance level.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to

1. identify the major components found in a personal computer.
2. perform common preventive maintenance procedures to extend the life of a personal computer.
3. correctly remove and reinsert IC's (RAM) in a personal computer.
4. solder and desolder electronic components and wire from printed circuit boards.
5. create an CONFIG.SYS and AUTOEXEC.BAT files that will properly startup a PC.
6. install and set-up both hard and floppy disk drives.
7. determine if the hard drive has been set-up for the most efficient system operation.
8. backup and restore data on a hard disk drive.
9. configure the system parameters and store the information in CMOS memory.
10. configure a video display for different screen resolutions and displayed colors.

COURSE OUTLINE — WEEKS

1. Basic Skills — 3
   A. safety
   B. hand tool usage
   C. component identification
   D. soldering desoldering techniques
2. Operating Systems — 2
   A. using floppy disks
   B. files

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

C. editors
D. utilities

3. Preventive Maintenance 4
   A. system teardown and assembly
   B. power supplies, drives, printers
   C. monitors
4. Subsystem Replacements 5
   A. RAM
   B. Drives
   C. Upgrades, including CD-ROM and modems
5. Performance Tests and Failure Recovery 2

APPROPRIATE READINGS (Other than Textbook)
1. Richard Stanley, Data Communications and Networks, Heath Company, 1994.
2. Roger Kersey, Personal Computer Operation and Troubleshooting, Prentice Hall, 1996.

ASSIGNMENTS (Give types of assignments and one example of specific writing assignments.)
1. Readings from adopted text and instructor handouts, evaluate sample problems and work end of chapter problems.
2. Study and perform laboratory experiments.
3. Prepare laboratory written reports.
4. Participate in post-lab evaluation discussions.
5. Quizzes and tests covering assigned and related topics.

Example: From laboratory written report

> Referring to computer switching power supplies, explain and indicate how the following terms are related: current, voltage, and power.

EVALUATION
1. Written and performance-based examinations for each major study area. These examinations are graded for accuracy.
2. Assigned homework problems will be graded for accuracy.
3. Laboratory reports are graded for accuracy and content.
4. A final laboratory examination evaluating the student's abilities to correctly perform preventive maintenance on a computer systems will be administered. A comprehensive written final examination will also be graded for accuracy and applied techniques.

Example: Explain how to reduce the effects of EMI (RFI) on your computer.

TEXTS AND SUPPLIES
Adopted Text: James Antonakos, Microcomputer Repair, 5th Edition, Prentice Hall, 2004

Other Materials:
1. computer data diskettes
2. graph paper and normal school supplies
3. scientific calculator
4. 3-ring binder

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/24/03 Initiator Robert Alldredge

1. Method of instruction to be used (primary modality): Internet

2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	.25
Group			Discussion Board	.25
Individual	.25		Telephone contacts	
Other: 1 Blackboard's Digital Drop Box – Students turn-in homework and lab assignments; they often use this option for questions and discussions.				

Per Semester

Orientation sessions	1.5		(in person)
Group meetings			(in person)
Review sessions			(in person)
Labs	Depends on students equipment; may need to use our labs for assignments.		(in person)
Testing			(in person)
Other (Identify)			

3. Adjustments to assignments: No adjustments necessary.

4. Adjustments to evaluation: The student has three weeks to complete the examination.

5. Accessible to students with disabilities: Yes

6. On-line services: Class orientation and email communications are used to inform students about services.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 1999
Date Reviewed: Fall 2003
Date Reviewed: Fall 2002
PCA Established: Spring 1999

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 106 (COM SC 106)

CATALOG TITLE: Networking Essentials 1

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

ADVISORY: EL 105 or COM SC 105 and either EL 125 or COM SC 141

CATALOG DESCRIPTION

First course in a series designed to provide students with knowledge of and laboratory experiences with current and emerging computer networking technology. Focus will be on LANs, WANs, OSI models, IP addressing, cabling, CompTIA Network+, and network standards; the theory behind the various kinds of network architectures and data transmission methods; the use of decision-making and problem-solving techniques in applying science, mathematics, and communication concepts to solve networking problems. Instruction and training are provided in the proper care, maintenance, and use of networking software, tools, and equipment. (Emphasis will be placed on Cisco Systems Certification.) Not open to students currently enrolled in or have received credit for Computer Science 301.

COURSE GOALS To encourage and enable students to:

1. understand basic hardware and software of microcomputers.
2. apply learned concepts to establish and maintain network systems.
3. understand data communications and network operating systems.
4. comprehend various network topologies and connection options.
5. master basic lab skills: PC hardware, software, and test equipment.
6. apply deductive reasoning to troubleshoot and identify the source of network problems.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. explain the basic electrical and electronic devices used in a PC and networking environment.
2. identify and explain the basic operation of PC hardware.
3. explain the concept of networking.
4. explain and identify the OSI model.
5. explain and identify IP addressing.
6. describe the function of routers, switches, and hubs.
7. demonstrate the processes of laying and terminating networking media.
8. design and install a local area network.
9. describe various troubleshooting tools and techniques of LAN maintenance.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

COURSE OUTLINE

	WEEKS
1. PC Hardware and Software; Journal; Networking: Layered Communications	1
2. The OSI Model; Encapsulation; Layer 1	1
3. IP Addressing	3
4. ARP and RARP (Address Resolution Protocol)	1
5. Cabling Media and Design with Labs	2
6. Network Topology	2
7. Structured Cabling with Labs	2.5
8. Electronics	1.5
9. Network Management and Trouble Shooting	2

APPROPRIATE READINGS (Other than Textbook)

1. Jenkins, N. Understanding Local Area Networks, SAMS. 1998
2. Derfler, F. Get a Grip on Network Cabling, ZD Press. 1993
3. Lewis, C. Cisco TCP/IP Routing Professional Reference, McGraw Hill, 1999.
4. Palmer, M. Hands-On Microsoft Windows NT 4.0 Server with Projects, Course Technology. 1997

ASSIGNMENTS

1. Read 15 online study units and take end of unit exams from Cisco Systems courseware (requires Internet connection from laboratory stations for taking online exams).
2. Readings from adopted text and instructor handouts, evaluate sample problems and work end of chapter problems.
3. Study laboratory experiments.
4. Prepare laboratory written reports.
5. Participate in post-lab evaluation discussions.
6. Quizzes and exams covering assigned and related topics.

Writing Assignment Example: As a network administrator for a growing firm, you want to design your network to run efficiently now and in the future. Currently, you are planning to implement a server-based Windows NT network. Although you currently support only 20 users on one floor of one building, management is rumored to be planning an acquisition, which would effectively double your method or network size. Highlight your current and future requirements, and choose the protocol(s) and channel access method best-suited to this situation. Then, explain why you chose those protocols and access methods.

EVALUATION

1. Exam reports for each study unit form Cisco Systems.
2. Written and performance based examinations for each major study area. Examinations will include problem-solving techniques and word-type problems. Examinations are graded for accuracy.
3. Class project will be graded for accuracy, content, and applied techniques.
4. Assigned homework problems will be graded for accuracy.
5. Laboratory reports are graded for accuracy and content.
6. A comprehensive written final examination will be administered and graded for accuracy and applied techniques as well as a laboratory examination evaluating the student's abilities in applying networking concepts.

Sample Essay Question: Your network consists of two buildings with computer on all three floors in both buildings. The buildings are connected by fiber-optic cable, with each of the floors wired with Cat 5 cabling. Your SNMP manager notifies you that no networking components are responding from the outer building. In addition to an SNMP manager, you have a Network General Sniffer and a cable tester at your disposal.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

TEXTS AND SUPPLIES

Adopted Text: Lammle Todd. CCNA Cisco Certified Networking Associate Study Guide Sybex Inc. 1999, ISBN: 0-7821-2381-3

Other Materials: Computer Data diskettes
Graph paper and normal school supplies
Scientific Calculator
Three-Ring Binder

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 1999
Date Reviewed: Fall 2001
Date Reviewed: Fall 2002
PCA Established: Spring 1999

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 107 (COM SC 107)

CATALOG TITLE: Networking Essentials 2

SCHEDULE TITLE: Network Essentials 2

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: COM SC 106 or EL 106

ENTRANCE SKILLS 1) explain the concept of networking; 2) explain and identify the OSI model; 3) explain and identify IP addressing; 4) describe the function of routers, switches, and hubs; 5) demonstrate the processes of laying and terminating networking media; 6) design and install a local area network; and 7) describe various troubleshooting tools and techniques of LAN maintenance.

CATALOG DESCRIPTION
Second course in a series designed to provide students with knowledge of and laboratory experiences with current and emerging computer networking technology. Focus will be on LANs, WANs, OSI models, IP addressing and router programming and the theory behind the various kinds of network architectures and data transmission methods including network troubleshooting. This course is not open to students who are enrolled in or have received credit for ComSc 302. Emphasis will be placed on Cisco Systems Certification.

COURSE GOALS To encourage and enable students to:
1. comprehend basic router components.
2. master lab skills: associated hardware and software.
3. master documentation skills: maintain engineering journal; cable management techniques.
4. comprehend router basics, configuration, and setup.
5. understand the functions of the TCP/IP transport-layer protocols.
6. apply deductive reasoning to solve router setup and programming problems.
7. understand router and switched based networks.
8. support popular WAN technologies.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:
1. examine router elements (RAM, ROM, CDP, show).
2. define flow control and describe the three basic methods used in networking.
3. identify the functions of the TCP/IP transport-layer protocols.
4. control router passwords, identification, and banner.
5. check an initial configuration using the setup command.
6. configure and use telnet applications for accessing routers.
7. use ping and trace programs to troubleshoot network problems.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

8. log into a router in both user and privileged modes.
9. load Cisco IOS software from: flash memory, a TFTP server, or ROM.
10. list problems that each routing type encounters when dealing with topology changes, and describe techniques to reduce the number of these problems.
11. configure IP addresses.
12. prepare the initial configuration of a router and enable IP.
13. add RIP and IGRP routing protocol to the configuration.
14. configure extended access lists to filter IP traffic.

COURSE OUTLINE

		WEEKS
1.	The OSI Model; Layers 1,2,3,4,5,6, and 7; WANs	2
2.	Routing concepts and routing using routers and *CIM tools (Labs)	2
3.	Router Components	2
4.	Router Startup, setup, and router configuration (Labs)	2
5.	IOS	2
6.	TCP/IP and IP addressing (Labs)	2
7.	Routing Protocols (Labs)	3
8.	Course Review and Practice for Final Exam and Laboratory	1

*CIM – Lab simulations using the Cisco Interactive Mentor (CIM) tool.

APPROPRIATE READINGS (Other than Textbook)

1. Jenkins, N. Understanding Local Area Networks, SAMS. 1998
2. Tittel, E. A guide to Networking Essentials, Course Technology, 1998
3. Palmer, M. A Guide to Microsoft Windows NT Server 4.0, Course Technology. 1998
4. Palmer, M. Hands-On Microsoft Windows NT 4.0 Server with Projects, Course Technology. 1997

ASSIGNMENTS

1. Read online study units and take end of unit exams from Cisco Systems courseware (requires Internet connection from laboratory stations for taking online exams).
2. Readings from adopted text and instructor handouts, evaluate sample problems and work end of chapter problems.
3. Study laboratory experiments.
4. Prepare laboratory written reports.
5. Participate in post-lab evaluation discussions.
6. Quizzes and Exams covering assigned and related topics.

Sample Writing Assignment: Allan Hancock College is planning to add a new client/server system (with new hardware), so that all of the department chairs and administrators and administrative assistants (total of 134 clients) can view the status of their budgets. How would you plan for the resulting impact on the network?

EVALUATION

1. Exam reports for each study unit from Cisco Systems.
2. Written and performance based examinations for each major study area. Examinations will include problem solving techniques and word type problems. Examinations are graded for accuracy.
3. Class project will be graded for accuracy, content, and applied techniques.
4. Assigned homework problems will be graded for accuracy.
5. Laboratory reports are graded for accuracy and content.
6. A comprehensive written final examination will be administered and graded for accuracy and applied techniques as well as a laboratory examination evaluating the student's abilities in applying networking concepts.

Sample Essay Question: What is capacity planning? Why is it important for a network manager to perform capacity planning?

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Describe the procedures and equipment you will use to determine where the problem exists. In addition, outline the steps you will take to alleviate the problem.

TEXTS AND SUPPLIES

Adopted Text: Lammle Todd, CCNA Cisco Certified Networking Assoc. Study Guide, Sybex Inc. 1999, ISBN: 0-7821-2381-3 Cisco Systems Networking Academy Curriculum - Semester Two

Other Materials: Computer Data diskettes
Graph paper and normal school supplies
Scientific Calculator
Three-Ring Binder

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: Fall 2006
Date Reviewed: Fall 2007
PCA Established:
GE Approved/Review:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 128 (COM EL 128) (ET 128)

CATALOG TITLE: Renewable Energy

SCHEDULE TITLE: Renewable Energy

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit / No Credit Option

PREREQUISITE(S): COM EL104 or EL 104 or ET 104. Electronics 118 and 119 or Electronics 111, 112, 113, and 114.

ENTRANCE SKILLS The student must have the ability to:

1. explain the application of atomic theory to electronics; correctly analyze and solve electronic circuits; express in writing the relationship between electricity and magnetism.
2. describe in writing the construction, operation, and purpose of resistors, potentiometers, switches, fuses, capacitors, inductors and batteries.
3. identify the average, effective, peak, peak-to-peak values of AC waveforms; predict the frequency and period of AC waveforms.
4. identify defects in DC and AC circuits; interpret circuit parameters, diagnose and correct malfunctions in electronic circuits.
5. design DC and AC circuits using standard engineering practices; develop graphs indicating relationships of electronic parameters.
6. evaluate the operation and circuit parameters for all experimental circuits.
7. interface electromechanical systems to microcontrollers.
8. use commonly used electronic test and measurement instrumentation and develop Assembly and PBASIC computer language programs for automation control.

CATALOG DESCRIPTION

A study of the principles behind energy generation and conversion that can be applied to modern electrical, mechanical, and chemical devises that use or produce power. Special emphasis will be given to the study of electricity as a renewable energy source. This course is not open to students who are enrolled in or have received credit for Computer Electronics 128 or Engineering Technology 128.

SCHEDULE DESCRIPTION

A study of the principles behind energy generation and conversion that can be applied to modern electrical, mechanical, and chemical devises that use or produce power. Special emphasis will be given to the study of electricity as a renewable energy source. This course is not open to students who are enrolled in or have received credit for COM EL 128 or ET 128.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

COURSE GOALS To encourage and enable students to:

1. know the career possibilities in the energy and power electronics field.
2. understand DC and AC electrical concepts.
3. produce DC and AC power from renewable energy sources.
4. apply an intellectual curiosity to learn more about the various forms of electrical energy and how best to apply them in a technical sense.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. design programmable charger systems for rechargeable batteries.
2. describe the operation of photovoltaic cells.
3. design power generation systems using solar cells.
4. fabricate servo-driven sun tracking capabilities to maximize power output of energy system.
5. describe the operation of AC alternators.
6. design power generation systems using wind-driven AC alternators.
7. determine the generation of three-phase power using both Delta or Wye configurations.
8. convert AC into DC using two basic forms of rectification, half-wave and full-wave.
9. design, build and program half- and full-wave rectification systems.
10. compare single-phase and three-phase power generation and applications to real-world devices.
11. design and program microcontroller systems to collect, log, plot, and analyze data from energy generation sources.
12. program microcontroller systems for control of energy generation sources.

OUTLINE OF COURSE CONTENT AND SCOPE

	WEEKS
1. Solar Thermal Energy	2
2. Solar Photovoltaics	3
3. Wind Energy	3
4. Hydroelectricity	1
5. Tidal Power	1
6. Geothermal Energy	1
7. Bioenergy	1
8. Intergration and Control	4

APPROPRIATE READINGS (Other than Textbook)

1. B. Sorensen. Renewable Energy. 3rd ed. Academic Press. 2004
2. G. Masters. Renewable and Efficient Electric Power Systems. Wiley-IEEE Press. 2004

OUTSIDE ASSIGNMENTS

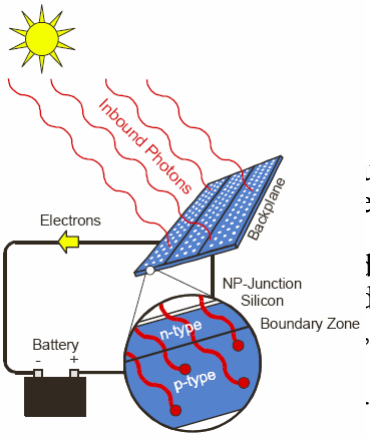
Cooperative learning group projects; presentations; short papers; research; and the following:

1. Readings from adopted text and instructor handouts; evaluate sample problems and work end of chapter problems.
2. Use computer applications to expand upon circuit analysis and comprehension.
3. Use the Internet, as an information resource, to support topics studied in this course.
4. Online practice quizzes and take-home exams covering assigned and related topics.
5. Design projects assigned stressing application of learned concepts and theories.

Sample writing assignment:

Using the following diagram, explain the operation of the photovoltaic reaction for the charging of a battery storage devices.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative



EVALUATION

1. Comprehensive written ex …udy area. Exams will include problem solving techniques and word type … graded for accuracy and techniques used for problem solutions.
2. End of chapter problems a… graded for accuracy.
3. Individual and group desig… short papers are assigned and graded for quality of research, style and tech… and for proper engineering practices.
4. Comprehensive final exan… and applied techniques.
5. Laboratory reports are gra… Reports consist of:
   a. text study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay question:
Read the explanation of how the following programmable battery charger program works, and then discuss how and why the timer takes 64 seconds to complete its operation and reset.

```
Exp_1_Charge:
        IF (doneCharging = True) THEN GOTO Exp_1_End
        HIGH ChargeBatt
        LOW DrainBatt
        TOGGLE ChargeLed
        LOW DrainLED
        LOW ReplayLED
```

The first line of code checks the doneCharging flag. If it's True, the program simply exits. Otherwise, a HIGH ChargeBatt activates Charge transistor circuit, which allows current to begin flowing into the batteries (refer to Figure 2-3). Correspondingly, the LOW DrainBatt deactivates the Discharge transistor circuit, disabling the batteries to drain or discharge. The TOGGLE instruction causes the green charge LED to flash each time through this part of the subroutine. And finally, the last two instructions deactivate the other two LEDs. Now to the next group of instructions…

```
a2dMuxId = a2dMuxId3
GOSUB A2D
ch3 = (255-a2dResult)
avgCurrent = avgCurrent+ch3

a2dMuxId = a2dMuxId2
```

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

```
GOSUB A2D
ch2 = a2dResult
avgVolts = avgVolts+ch2

IF (ch2 > BattFullChg) AND (dataPtr <10 ) THEN
doneCharging = True
HIGH ChargeLed
LOW ChargeBatt
ENDIF
counter = counter - 1
        IF counter <> 0 THEN Exp_1_End
```

The first two instructions set the A/D Converter channel to ch3 and then take a voltage sample. While still a voltage sample, this is actually a measure of BCI, the battery charge current, based on the voltage drop across the 10 Ω resistor connected to Vdd. The voltage drop across this resistor is the difference between Vdd, which is 5.00 volts (or 255 as it would be measured by the A/D converter) minus the sampled voltage (a2dResult). The third instruction computes this result and sets ch3 equal to it. The StampPlot macro further adjusts this voltage reading to the equivalent current value. Finally, the fourth instruction adds the value of ch3 to the avgCurrent. Recall that avgCurrent and avgVolts, coming up next, were both initialized to zero in the Exp_1_Init subroutine, so we're starting off our averaging cycle with a clean slate. The next four instructions sample the battery voltage directly and store the result to avgVolts, with A/D channel ch2 displayed as BV, or battery voltage, on StampPlot.

Following this, the IF statement is placed here to protect from overcharging the batteries by comparing the current battery voltage to the value of BattFullChg (CON 150 or 3.00 volts). However, this event must occur early in the charging cycle when dataPtr is less than 10. Or said another way, this event must occur within the first 256 seconds of the charge cycle. You'll see what we mean shortly. And setting codePtr=2 will cause the BRANCH instruction to jump to the Exp_1_Drain subroutine the next time through. The following instruction decrements the averaging counter (counter), which was initialized to zero in Exp_1_Init. If this is the first time through this subroutine from power on or reset, the counter value will be 255, since decrementing a byte set to zero causes the value to "roll over" to 255. Therefore, it will take another 255 decrements until the counter value is again zero. And this will take just over 64 seconds.

TEXTS AND SUPPLIES

Adopted Text: Chiras. The Homeowner's Guide to Renewable Energy. New Society Publishers. 2006

Other Materials:
- Software Tools (supplied by instructor and textbook bundle)
- Microcontroller Development System (supplied by instructor)
- Scientific Calculator
- Graph paper and normal school supplies
- Instructor handouts
- Data Storage Device (Thumb Drive)

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
Individual	As needed		Telephone contacts	As needed
Other				

Per Semester

Orientation sessions	2 hours		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs	48 hours		(in person)
Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: Fall 2007
Date Reviewed:
PCA Established:
GE Approved/Review:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 131 (COM EL 131) (ET 131)

CATALOG TITLE: Programmable Logic Controllers and Industrial Control Design

SCHEDULE TITLE: PLCs and Industrial Control Design

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit / No Credit Option

PREREQUISITE(S): EL 125 or COM SC 141

ENTRANCE SKILLS The student must have the ability to:
1. evaluate and draw a block diagram of a computer system, label each major component and register, and sequentially follow the flow of data through the various registers as a sample program is executed.
2. convert a number given in any base to an equivalent number in another base with an emphasis on binary, octal, decimal, and hexadecimal number systems.
3. synthesize the operation and uses of state of the art digital devices such as multiplexers, ALU's, Programmable Logic Arrays.
4. design and analyze counters, registers, and dividers using bi-stable devices.
5. properly interface logic families that have different operational parameters.
6. design logic circuits and networks to solve assigned projects using standard engineering practices.

CATALOG DESCRIPTION
A study of the purpose and operating features of a programmable logic controller (PLC). Topics include PLC terminology, architecture, input/output modules, memory, commands for internal relays, on/off timers, up/down counters, use of subroutines, program control, and math instructions. Relay schematics, ladder logic diagrams, and programming of logic controllers are emphasized. Sensing devices and time-driven process sequences will be studied and integrated into control systems. This course is not open to students who are enrolled in or have received credit for Computer Electronics 131 or Engineering Technology 131.

SCHEDULE DESCRIPTION
A study of PLCs and the use of RSLogix to implement automated systems to transform typical hardwired circuitry into a PLC controlled system. Focus is upon I/O addressing and related commands, relay schematics, ladder logic diagrams, limit switches, on/off and temperature devices, event-driven and time-driven process sequences. Not open to students who are enrolled in or have received credit for COM EL 131 or ET 131.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

COURSE GOALS To encourage and enable students to:

1. understand the normal operation of a PLC controlled system.
2. understand how the PLC's operation is affected by user generated programs.
3. understand the process of creating ladder logic programs.
4. learn how to apply a PLC to control a process.
5. understand the components that make up a PLC
6. understand number systems and codes.
7. appreciate how Boolean algebra and digital logic gates can be implemented into PLC control.
8. learn to apply PLC instructions, timer and intervals operations.
9. understand typical industrial program control applications.
10. appreciate the processes of transferring data (word and file) and operating on data with math functions, data conversions, data comparisons, and logical operations.
11. understand the kinds of industrial processes that can be PLC controlled.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. define what a PLC is and list its advantages over relay systems.
2. identify the main parts of a PLC and describe their function.
3. outline the basic sequence of operation for a PLC
4. describe the basic circuitry and applications for discrete and analog I/O and CPU specifications.
5. explain I/O addressing
6. explain the BCD, Gray, and ASCII code systems, and perform math operations with binary numbers.
7. construct circuits from Boolean expressions and derive Boolean equations from given logic circuits.
8. convert relay ladder schematics to ladder logic programs.
9. develop elementary programs based on logic gate functions.
10. program instructions that perform logical operations.
11. explain the operation of sensors commonly found in PLC installations.
12. explain the operation of output control devices commonly found in PLC installations.
13. compare sequential and combination control processes.
14. write PLC programs directly from a narrative description
15. describe the operation of pneumatic on-delay and off-delay timers.
16. convert fundamental timer relay schematic diagrams to PLC ladder logic programs.
17. analyze and interpret typical PLC timer ladder logic programs.
18. list and describe the functions of PLC counter instructions.
19. describe the operation principle of a transitional, or one-shot, contact.
20. apply the PLC counter function and associated circuitry to control systems.
21. state the purpose of program control instructions.
22. explain the functions of subroutines.
23. describe safety considerations built into PLCs and programmed into a PLC installation.
24. explain how the temporary end instruction can be used to troubleshoot a program.
25. describe the basic operation of a closed-loop control system.
26. interpret data transfer and data compare instructions as they apply to a PLC program.
27. apply combinations of PLC arithmetic functions to processes.
28. compare the operation of an event-driven and a time-driven sequencer.
29. interpret and develop programs that use shift registers.
30. list and describe specific PLC troubleshooting procedures.
31. identify and describe the functions of bleeder resistors in PLCs.
32. compare individual, centralized, and distributive control systems.
33. outline the function of the different parts of a data acquisition system.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	PLC Principles of Operation	.5
2.	PLC Hardware Components	1
3.	Review of Number Systems, Codes, and Fundamentals of Logic	.5
4.	PLC Programming, RSLogic Familiarization	2.5
5.	PLC Wiring Diagrams and Ladder Logic Programs	2.5
6.	Programming Timers and Counters	1
7.	Program Control Instructions	1
8.	Math, Sequencer, and Shift Register Instructions	1
9.	PLC Installation Practices, Editing and Troubleshooting	.5
10.	Process Control and Data Acquisition Systems	1.5
11.	Computer-Controlled Machines and Process	1
12.	Projects: Traffic Light Control Scenario, Elevator Control Scenario, Amusement Ride Scenario, and Power Management System Scenario	3

APPROPRIATE READINGS (Other than Textbook)

1. NIDA. Homework CD 2. NIDA Corp. 2006.
2. J. Stenerson. Programming PLCs Using Rockwell Automation Controllers. Prentice Hall. 2004.
3. M. Rabiee. Programmable Logic Controllers Hardware and Programming. Goodheart-Willcox. 2002.
4. J. Rehg. Industrial Electronics. Prentice-Hall. 2006.

OUTSIDE ASSIGNMENTS

Cooperative learning group projects; presentations; short papers; research; and the following:

1. readings from adopted text, CAI software, and instructor handouts; evaluate sample problems, work end of chapter problems and lab exercises.
2. use computer applications to expand upon circuit analysis and comprehension.
3. use the Internet, as an information resource, to support topics studied in this course.
4. online practice quizzes and take-home exams covering assigned and related topics.
5. design projects assigned stressing application of learned concepts and theories.

Sample writing assignment:
Prepare a users and maintenance pamphlet that explains the operation and the logic you designed for one of the four-class projects: Traffic Light Scenario, Elevator Control Scenario, Amusement Ride Scenario, or the Power Management System Scenario.

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word type problems. The exams will be graded for accuracy and techniques used for problem solutions.
2. End of chapter problems are assigned as homework and graded for accuracy.
3. Individual and group design projects, presentations, and short papers are assigned and graded for quality of research, style and techniques applied and presented, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.
5. Laboratory reports are graded for accuracy and content. Reports consist of:
   a. text study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay questions:

1. Compare and contrast the operation of the final control element in on/off and proportional control systems.
2. Compare the ways a timer is addressed in the Allen-Bradley PLC-5 and SLC-500 controllers with the methods used in a ControlLogix controller.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

TEXTS AND SUPPLIES

Adopted Text: Petruzella. Programmable Logic Controllers. 3rd ed. McGraw-Hill. 2005
Petruzella. Lab Manual forProgrammable Logic Controllers. 3rd ed. with LogixPro PLC Simulator. McGraw-Hill. 2005
Petruzella. Activities Manual for Programmable Logic Controllers. 3rd ed. McGraw-Hill. 2005

Other Materials: Software Tools (supplied by instructor and textbook bundle)
Scientific Calculator
Graph paper and normal school supplies
Instructor handouts
Data Storage Device (Thumb Drive)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
Individual	As needed		Telephone contacts	As needed
Other				

Per Semester

Orientation sessions	2 hours		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs	48 hours		(in person)
Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: Fall 2006
Date Reviewed: Fall 2007
PCA Established:
GE Approved/Review:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 133 (COM EL 133) (ET 133)

CATALOG TITLE: Transducers, Sensors, and Programming for Industrial Control

SCHEDULE TITLE: Sensors & Industrial Cntrl Program

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE(S): COM EL 104 or EL 104 and EL 122 or EL 125 or COM SC 141.

ENTRANCE SKILLS The student must have the ability to:
1. understand the basic elements underlying mechatronic systems: analog electronics, digital electronics, and microcontrollers.
2. interface electromechanical systems to microcontrollers.
3. use commonly-used electronic test and measurement instrumentation and develop Assembly and PBASIC computer language programs for robotic and automation control.

CATALOG DESCRIPTION
A study with hands-on application of the mechanical engineering, electronics, computer programming and electromechanical concepts (mechatronics) in the production of goods and services. Emphasis is on how a wide variety of technical elements fit into industrial applications. Topics include transducers and sensors for light, heat, motion, pressure and position; switching devices; input and output signal conditioning; continuous, closed-loop, and proportional integral derivative process control; and safety. This course is not open to students who are enrolled in or have received credit for Computer Electronics 133 or Engineering Technology 133.

SCHEDULE DESCRIPTION
Focus upon mechanical engineering, electronics, computer programming, to provide the background in electromechanical concepts (mechatronics) used in industry. Topics include: transducers and sensors, switching devices, signal conditioning, process control, DC and AC motors and control circuits, and safety. Not open to students who are enrolled in or have received credit for COM EL 133 or ET 133.

COURSE GOALS To encourage and enable students to:
1. understand the basic elements underlying mechatronic systems: analog electronics, digital electronics, semiconductor electronics, sensors, actuators, and microcontrollers.
2. know how to interface electromechanical systems.
3. gain hands-on experience with commonly used electronic test and measurement instrumentation.
4. create Assembly and PBASIC computer language programs for robotic and automation control.
5. improve written communication skills through laboratory and project reports.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

6. obtain practical experience in mechatronics by applying knowledge gained in the course through hands-on projects.
7. know how to condition input and output signals for industrial applications.
8. understand continuous, closed-loop, and proportional integral derivative process control as it applies to industrial applications

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to

1. identify, describe, and make an application selection for mechanically activated limit switches an process switches.
2. identify, describe, and make an application selection for the following control output devices: solenoids, commercial relays, industrial control and time delay relays, contactors, process solenoid valve, pneumatic direction control valves, heaters, and pilot lamps.
3. describe the operation of the low-pass, high-pass, bandpass, and band-elimination active filters.
4. describe the structure and operation of SCRs, tracs, and other members of the thyristor family.
5. select the appropriate noncontact sensor given the parameters for a sensing application and integrate the sensor using good design practices.
6. match the output of a sensor to the input of the controller using current-sourcing and current-sinking techniques.
7. select the appropriate type of vision and illumination system given the parameters for a sensing application.
8. analyze the characteristics of devices that convert electricity into light and light into electricity.
9. apply optical fiber as a medium for light transmission.
10. determine the range, linearity, and sensitivity of various thermal transducers.
11. analyze dynamic temperature transducer amplifiers.
12. identify the principles of motion transducers.
13. compute linear and circular motion rates based on a system's mechanical and electrical parameters.
14. analyze the operation of optical-motion-to-frequency and motion-to-analog-DC-voltage transducer circuits for RPM, velocity, acceleration, and deceleration.
15. identify the principles of position-sensing circuits.
16. compute linear and rotary position based on electrical and mechanical circuit parameters.
17. develop a safety strategy, including risk assessment, risk elimination, and hazard minimization.
18. identify the principles of A/D and D/A conversion.
19. analyze the operation of PAM, PWM, PPM, modulation and demodulation circuits.
20. explain the construction and operation of various DC and AC motors and how to interface them into control systems.
21. list the general closed-loop control modes and explain how each acts to correct the system error.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Discrete control input and output devices	.5
2.	Review: Solid-State Devices in Industrial Applications, Operational Amplifiers and Linear ICs	1
3.	SCR, TRIACs, and other Thyristors	2
4.	Discrete Automation Sensors and Devices including Vision Systems	2
5.	Analog Process Control Devices and Sensors: Heat, Pressure, Flow, Level, and Position	3
6.	Intro to Motors and Control Circuits and Devices	2
7.	Control of Continuous Processes	3
8.	Data Communication between Intelligent Machines	2
9.	Safety	5

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

APPROPRIATE READINGS (Other than Textbook)

1. D. Alciatore. Introduction to Mechatronics and Measurement Systems. 2nd ed. McGraw Hill. 2003.
2. W. Bolton. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering. 3rd ed, Prentice Hall. 2003
3. Lindsay. What's a Microcontroller? Parallax (available online) 2003
4. Lindsay. Robotics with the Boe-Bot. Parallax (available online) 2004
5. W. Kleitz. Digital Electronics with VHDL. Prentice Hall. 2006
6. J. Stenerson. Programming PLCs Using Rockwell Automation Controllers. Prentice Hall. 2004
7. M. Rabiee. Programmable Logic Controllers Hardware and Programming. Goodheart-Willcox. 2002
8. M. Gilliland. The Microcontroller Application Cookbook. Woodglen Press. 2000
9. Course's blackboard website for tutorials and supplements.

OUTSIDE ASSIGNMENTS

Cooperative learning group projects; presentations; short papers; research; and the following:

1. readings from adopted text, CAI software, and instructor handouts; evaluate sample problems, work end of chapter problems and lab exercises.
2. use computer applications to expand upon circuit analysis and comprehension.
3. use the Internet, as an information resource, to support topics studied in this course.
4. online practice quizzes and take-home exams covering assigned and related topics.
5. design projects assigned stressing application of learned concepts and theories.

Sample writing assignment:
Describe how current-sourcing and current-sinking outputs operate. Why is current sinking associated with NPN transistors and current sourcing with PNP?

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word type problems. The exams will be graded for accuracy and techniques used for problem solutions.
2. End of chapter problems are assigned as homework and graded for accuracy.
3. Individual and group design projects, presentations, and short papers are assigned and graded for quality of research, style and techniques applied and presented, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.
5. Laboratory reports are graded for accuracy and content. Reports consist of:
   a. text and CAI study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay question:
How can you compare the frequency response specification given for inductive sensors with the rise- and fall-time specification given for photoelectric sensors?

TEXTS AND SUPPLIES

Adopted Text: Rehg. Industrial Electronics. Prentice Hall. 2006

Other Materials:
NIDA Corporation Homework Disk 2
Software Tools (supplied by instructor and textbook bundle)
Microcontroller Development Boards and Lab Components (supplied by instructor)
Scientific Calculator
Graph paper and normal school supplies
Instructor handouts

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Data Storage Device (Thumb Drive)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
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Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 1988
Date Reviewed: Spring 2006
Date Reviewed: Fall 2002
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 135

CATALOG TITLE: Electronic Measurement and Instrumentation

SCHEDULE TITLE: El Measurement & Instrumentation

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): EL 122, EL 123, EL 125, and EL 126.

ADVISORY(IES): EL 136.

ENTRANCE SKILLS The student must have the ability to:

1. derive an equivalent logic circuit from a Boolean expression.
2. design and analyze counters, registers, and dividers using bi-stable devices; properly interface logic families that have different operational parameters
3. design logic systems for a stated problem using standard engineering practices.
4. analyze logic systems to determine their operating parameters.
5. explain in writing how semiconductor devices operate.
6. differentiate the schematic symbols that are used to represent a wide variety of semiconductor devices.
7. interpret device specifications using manufactures data sheets; analyze transistor amplifier circuits, describe their operation and list the characteristics for each.
8. identify and explain the operation of power supply rectifiers, filters, and regulation circuits; interpret semiconductor manufactures data sheets and characteristics curves.
9. design properly biased transistor circuits.
10. evaluate semiconductor circuits for operating parameters.
11. design logic circuits and networks to solve assigned projects using standard engineering practices.

CATALOG DESCRIPTION

Designed to familiarize students with operating principles and characteristics of basic electronic testing equipment as well as advanced specialized measuring instruments. Methods of operation and calibration of these devices are covered including an overview of Automated Test Equipment (ATE) systems.

COURSE GOALS: To encourage and enable students to

1. maintain proficiency within a rapidly changing technology.
2. understand the theory and concepts of electronic measurements and measuring instruments.
3. learn the processes required to calibrate test instruments.
4. learn which type of test instrument to use for a specific measurement task.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

1. analyze the operating principles and applications of the commonly used electronic instruments such as multimeters, signal generators, oscilloscopes, electronic bridges, and frequency measuring instruments.
2. calibrate instruments against standards.
3. read schematic diagrams of electronic test instruments and equipment.
4. mathematically calculate the values to make alterations in test instruments to meet special requirements.
5. evaluate Automated Test Equipment (ATE) requirements for the performance of specific measurements.

COURSE OUTLINE

		WEEKS
1.	Passive Multimeters	3
2.	Active Multimeters	2
3.	Analog and Digital Oscilloscopes	3
4.	Signal Generators	4
5.	Special Measuring Instruments	3
6.	Measurement Systems (ATE)	2

APPROPRIATE READINGS (Other than Textbook)

1. Operation and service manuals for each instrument studied.
2. Heathkit. Electronic Test Equipment. (Student Workbook). Heath Company. 1988.

OUTSIDE ASSIGNMENTS

1. Readings from adopted text and instructor handouts on selected topics, evaluate sample problems and work end of chapter problems.
2. Solutions of word problems stressing mathematical modeling and formulations.
3. Use computer applications software to expand circuit analysis formulations and concepts.
4. Quizzes and tests for assigned and related topics.
5. Design projects assigned stressing application of learned concepts and theories.

Sample problems:

1. A 10uA meter movement has a resistance of 1500 ohms. What value of multiplier resistor is required to extend the range to 200 volts?
2. Draw a simple diagram of a dual slope ADC and explain the operation of each major section.

EVALUATION

1. Comprehensive written examinations for each major study area. Examinations are to include problem solving techniques and word type problems. These examinations are graded for accuracy and the techniques used in solving the problems.
2. Assigned homework problems will be graded for accuracy.
3. Design projects will be graded for techniques that were applied and for proper engineering practices.
4. Comprehensive final examination will be graded for accuracy and applied techniques.

Sample essay question: Explain how you would measure the parameters of a non-electrolytic capacitor using an impedance bridge. Be sure to list all the precautions which must be taken to prevent false readings.

TEXTS AND SUPPLIES

Adopted text: Perozzos. The Complete Guide to Electronic Troubleshooting. 3rd ed. Thomson Learning. 1994.

Other Materials:
1. Scientific calculator.
2. Graph paper and normal school supplies.
3. Computer application programs.
4. Computer data diskettes.
5. Three ring binder.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 1988
Date Reviewed: Fall 2002
Date Reviewed: Fall 1992
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. EL 136 Catalog Title Electronics Measurement and Instrumentation Laboratory

Schedule Title El Measurement & Instrumentation Lab

Units 2 Weekly lecture hours ___ Weekly lab hours 6 Department Mathematical Sciences

Letter Grade Only

Prerequisites: EL 122, 123, 125, and 126. Corequisite: EL 135.

Entrance Skills: The lab experience is the hands-on application of the theory taught in the concurrent class.

CATALOG DESCRIPTION
Provides hands-on laboratory experience for the study and construction of electronic testing instruments. The student is introduced to many different types of testing equipment currently used by the electronics' industry.

COURSE GOALS: To encourage and enable students to
1. understand the maintenance and calibration of electric and electronic instruments.
2. use ATE systems for production testing.
3. experience the operation of a variety of electronic testing instruments.
4. grasp the significance that all electronic instruments are limited in their applications to testing components and circuits.
5. gain the necessary knowledge in measurements and instrumentation to be competitive in the job market.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to
1. operate the most commonly used electronic instruments.
2. calibrate instruments and evaluate both passive and active devices and circuits with laboratory grade instruments.
3. trace the circuits of test equipment and signal trace the instrument with an oscilloscope.
4. make complex instrumentation measurements using electronic instruments, mathematical and mechanical skills.
5. make alterations in testing instruments to meet special calibration requirements.
6. operate an ATE station.
7. make response curves of electronic instruments to industrial standards.

COURSE OUTLINE

		WEEKS
1.	Errors in Experimental Data	1
2.	Voltmeters and Multimeters	2
3.	AC Voltmeters	1
4.	Basic Reference Sources	1
5.	A/D Converters	1
6.	Bridges	1
7.	Oscilloscopes	3
8.	Counter Circuits	2
9.	Function Generators	2
10.	Sweep Frequency Generators	1
11.	Spectrum Analyzer	1
12.	Automated Test Equipment (ATE)	1

APPROPRIATE READINGS (Other than Textbook)
1. Operation and service manuals for each instrument used in the laboratory.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

2. Heathkit. Electronic Test Equipment. (Book 1 and 2). Heath Company. 1986

ASSIGNMENTS

1. Study laboratory experiments, evaluate sample problems and circuits.
2. Participate in post-lab evaluation discussions.
3. Mathematically evaluate the operation of each experimental circuit.
4. Draw a component diagram for each experimental circuit.
5. Answer a series of questions designed so that students can express in writing the conclusions they have developed from performing each experiment.
6. Study instructor handouts on selected topics.
7. Use computer application software for tutorial purposes and evaluation of circuit parameters.

Sample problems:

1. Design a function generator using an XR2206 that will satisfy the following specifications:
   A. Vout = 2 VRMS; Freq. range 20Hz-200KHz;
   B. Sine and triangle outputs
2. List the procedure for measuring the level of modulation of an AM signal using a Spectrum Analyzer.

EVALUATION (The methods by which students and instructors will know how the objectives listed above have been met.)

1. Laboratory reports are graded for accuracy and content. Reports consist of:
   A. text study information
   B. mathematical evaluations of each circuit studied in the experiment
   C. component diagrams for each circuit
   D. design problem solutions
   E. procedures and data collection
   F. end of experiment questions and conclusions
2. Mid term laboratory examination evaluating the students' abilities to correctly connect circuits, make circuit measurements using standard test instruments, and interpret their data to determine electrical concepts. A written examination is also given emphasizing circuit behavior, components, and test instruments. These examinations are graded for accuracy and content.
3. A final laboratory examination evaluating the students' abilities to correctly connect circuits, make circuit measurements using standard test instruments, and interpret their data to determine electrical concepts. A written examination is also given emphasizing circuit behavior, components, and test instruments. These examinations are graded for accuracy and content.

Sample essay question: Explain the major advantages and disadvantages of using an ATE system for testing electronic circuits.

TEXTS AND SUPPLIES

Adopted text: 1. Crozier. Electronic Instruments & Measurements. Delmar. First edition.

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application programs
4. Computer data diskettes
5. Electronic parts and proto boards
6. Three ring binder

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Fall 1988
Date Reviewed: Spring 2006
Date Reviewed: Fall 2002
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 137 (COM SC 137)

CATALOG TITLE: Microcomputer Architecture and Software Design

SCHEDULE TITLE: Microcomputer Software Design

UNITS: 4

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): COM SC 141 or EL 125 and 126.

ADVISORY(IES): Any computer programming course.

ENTRANCE SKILLS The student must have the ability to:
1. evaluate and draw a block diagram of a computer system, label each major component and register, and sequentially follow the flow of data through the various registers as a sample program is executed.
2. convert a number given in any base to an equivalent number in another base. Emphasis will be placed on binary, octal, decimal, and hexadecimal number systems.
3. synthesize the operation and uses of state of the art digital devices such as multiplexers, ALU's, Programmable Logic Arrays
4. design and analyze counters, registers, and dividers using bi-stable devices.
5. properly interface logic families that have different operational parameters.
6. design logic circuits and networks to solve assigned projects using standard engineering practices.

CATALOG DESCRIPTION
An introduction to microcomputer system development. Emphasis is upon assembly language programming, computer/microprocessor architectures, addressing modes, and machine language formats. Assemblers, disassemblers, cross-assembly techniques, simulators, and hardware development systems will be studied and used for the development, debugging and testing of software. Problem solution, programming style and techniques will be stressed throughout this course. This course is not open to students who are enrolled in or have received credit for Electronics 137.

COURSE GOALS: To encourage and enable students to
1. maintain proficiency within a rapidly changing technology.
2. develop a structured approach to system software design.
3. experience the applications of microcomputer development tools for the design of system hardware and software.
4. understand and use the terminologies of this science.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to

1. analyze the organization of the physical components of a microprocessor-based system and describe how these affect the writing of software in assembly language.
2. demonstrate how fixed point arithmetic, negative integers, floating point numbers, packed binary coded decimal (BCD) numbers, and ASCII information can be represented in memory elements.
3. design and write effective assembly language programs in a structured format with proper use of pseudo-ops, macros and parameter passing.
4. assemble and link programs to produce the object code for down loading to target systems for final testing and debugging.
5. verify software logic through the use of simulators and hardware development system debugging techniques.
6. evaluate the similarities, differences and applications of the various processors, controllers and systems used in this course, Motorola's 6800, 6809, 68HC11, and 68000 devices.

COURSE OUTLINE

	WEEKS
1. Introduction to Computers, Software Tools, and Operating Systems	1.5
2. Data Representation, Number Systems and Formats, Codes, Computer Arithmetic, Floating Point, Conversions, and Logic Operations	2
3. Fundamentals of Microprocessor-Based Computers	2
A. memory concepts	
B. ALU	
C. control unit	
D. fetch/execute cycle	
E. architecture and instructions	
4. The Microprocessors (6800, 6809, 68HC11, 68000)	6
A. architecture	
B. addressing modes	
C. machine ops	
D. condition codes	
E. stack	
F. interrupts and exception handling	
G. instruction format	
H. index registers	
I. string operations	
J. branches	
K. calls and arithmetic	
5. Assembly Language Programming	4
A. algorithms	
B. macros	
C. subroutine linking and parameter passing	
D. interrupts	
E. assemblers and disassemblers	
6. Microcomputer Development Systems Operation, Debugging,	1.5
A. operation	
B. debugging	
C. simulation and hardware target systems.	

APPROPRIATE READINGS (Other than Textbook)

1. User's manuals for software tools
2. Manufacturer's reference and data manuals
3. Lipovski, G. Single and Multiple-Chip Microcomputer Interfacing. Prentice-Hall. 1988
4. Peatman J. Design with Microcontrollers. McGraw Hill. 1988
5. Wilcox, A. 68000 Microcomputer Systems. Prentice Hall. 1987

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

OUTSIDE ASSIGNMENTS

1. Readings from adopted texts, reference and data manuals, and instructor handouts on selected topics, evaluate sample problems and programs, and work end of chapter problems.
2. Design, write and debug assembly language programs covering a variety of topics.
3. Preparation for laboratory experimentations.
4. Quizzes and tests for assigned and related topics.
5. Design projects assigned stressing application of learned concepts and theories.

Sample problems:

1. Given five one-byte numbers stored in locations $10 to $14, write a routine that will put the greatest number in an accumulator, assuming that the numbers can be in 2's complement representation.
2. Write a formula tree and subroutine call program that will evaluate the following: $AX^3 + BX^2 + CX + D$.
3. Write a table interpreter to test 14 and 16 pin integrated circuits, using the IC tester developed in the lab. The first row will define the inputs and outputs of the device and the remaining rows will define a sequence of tests on the device.
   A. Write a table in assembly language for a test on the 74HC00
   B. Write a table in assembly language for a test on the 74HC74

EVALUATION

1. Comprehensive written examinations for each major study area. Examinations are to include problem solving techniques and word type problems. These examinations are graded for accuracy and the techniques used in solving the problems.
2. Assigned homework problems, software projects, and laboratory experiments will be graded for accuracy and problem solving techniques.
3. Design projects will be graded for techniques that were applied and for proper engineering practices.
4. Comprehensive final examination will be graded for accuracy and applied techniques. A final project evaluating the student's abilities to solve problems using assembly language to control a microprocessor based system will be graded.

Sample essay questions:

1. Explain the difference between the addressing modes used by the 68000 microprocessor.
2. Detail why and when macros are used in assembly language programs.

TEXTS AND SUPPLIES

Adopted text: Huang. An Introduction Softare and Hardware Interfacting. 2nd ed. Thomson Lerning. 2001.
Dirkman. Microcontroller Lab Workbook. 1st ed. Prentice Hall. 1996

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application programs
4. Computer data diskettes
5. Three ring binder

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: _____
Date Reviewed: _____
PCA Established: _____
GE Approved/Review: _____

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 138 (COM EL 138) (ET 138)

CATALOG TITLE: Introduction to Motorola's 68000 Microprocessor Family

SCHEDULE TITLE: Intro to the MC68000 Microprocessor

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE(S): COM SC 141 or EL125

ENTRANCE SKILLS The student must have the ability to:
1. evaluate and draw a block diagram of a computer system, label each major component and register, and sequentially follow the flow of data through the various registers as a sample program is executed.
2. convert a number given in any base to an equivalent number in another base using binary, octal, decimal, and hexadecimal number systems.
3. synthesize the operation and uses of state of the art digital devices such as multiplexers, ALU's, Programmable Logic Arrays.
4. design and analyze counters, registers, and dividers using bi-stable devices.
5. properly interface logic families that have different operational parameters.
6. design logic circuits and networks to solve assigned projects using standard engineering practices.

CATALOG DESCRIPTION
An exploration of the Motorola MC 68000 family of microprocessors including internal architecture, memory, addressing, support devices and its control through the use of Assembly and C languages. Students will write programs to perform logic functions and high speed hardware control operations. The use of assemblers, compilers, linkers, and debugging tools will be explored. This course is not open to students who are enrolled in or have received credit for Computer Electronics 138 or Engineering Technology 138.

SCHEDULE DESCRIPTION
Basic concepts of the MC68000 family of processors; internal architecture, memory, addressing, support devices, and control using Assembly and C languages. Students will write programs to perform logic functions and high speed hardware control. The use of assemblers, compilers, linkers, and debugging tools will be explored. Not open to students who are enrolled in or have received credit for COM EL 138 or ET 138.

COURSE GOALS To encourage and enable students to:
1. apply fundamental Assembly and C language programming skills
2. understand the functional hardware components operation of a microprocessor/microcontroller.
3. demonstrate the necessary skill to interface a variety of external devices to a microprocessor.
4. understand the operation of the user and supervisor stacks.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

5. analyze the purpose and usage of I/O circuits.
6. recognize the operation and use of the serial and parallel ports.
7. be familiar with the different states of microprocessor operation.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. identify the major sections of a microprocessor system.
2. define and identify the buses used by the 68000 for addressing, data, and control.
3. distinguish between the modes of operation for the 68000.
4. outline the operation of the clock and reset circuits of the 68000 microprocessor.
5. provide examples of the operation of the microprocessor interrupts.
6. evaluate the purpose and usage of the internal registers.
7. define the types of external memory.
8. explain the connections and control of memory in the 68000 microprocessor.
9. display the contents of registers in the 68000.
10. display the contents of external memory to the 68000.
11. observe data communications through the parallel port.
12. explain the vector addressing of the 68000 microprocessor.
13. describe the different types of exceptions recognized by the 68000 microprocessor.
14. observe and identify the results of the exceptions caused by the manually entered code.
15. explain the purpose and usage of programming a microprocessor system.
16. provides example of the different groups of instruction and which instructions are in those groups.
17. evaluate the instruction codes of a simple program.
18. evaluate the different types of move and branch instructions.
19. provide examples of the usage of both arithmetic and logic instructions.
20. demonstrate the ability to debug a small program.
21. describe the techniques required to troubleshoot a defective microprocessor system.
22. identify preventive maintenance techniques.
23. evaluate the basic tools used to troubleshoot microprocessor systems.
24. perform successful troubleshooting with the 68000 microprocessor trainer.
25. analyze, specify, design, create and test Assembly and C language programs of moderate complexity.
26. assemble the appropriate 'architecture' and/or program design to apply to a particular situation; e.g. an interrupt-driven I/O handler for a responsive real-time machine.
27. calculate the worst-case execution times of programs or parts of programs, and to design and build software to maximize its run time memory and/or execution-time behavior.
28. predict the effects of the properties of the bus on the overall performance of a system.
29. describe the characteristics of RISC and CISC architectures.

OUTLINE OF COURSE CONTENT AND SCOPE

	WEEKS
1. Introduction to the 68000 Microprocessor	1
2. Introduction to Programming the 68000 Microprocessor	3
3. Exception Processing	2
4. Data Structures	1
5. Hardware Details of the 68000	3
6. Registers and Memory System Design	2
7. Input/Output System Design	2
8. Compatibility, Debugging, and Troubleshooting	2

APPROPRIATE READINGS (Other than Textbook)

1. J. Antonakos. The 68000 Microprocessor. 5th ed. Prentice Hall. 2003
2. A. Clements. 68000 Family Assembly Language. Thomson-Engineering. 1993
3. J. Wakerly. Microcomputer Architecture and Programming: The 68000 Family. Wiley. 1989

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

OUTSIDE ASSIGNMENTS

Cooperative learning group projects; presentations; short papers; research; and the following:

1. readings from adopted text, CAI software, and instructor handouts; evaluate sample problems, work end of chapter problems and lab exercises.
2. use computer applications to expand upon circuit analysis and comprehension.
3. use the Internet, as an information resource, to support topics studied in this course.
4. online practice quizzes and take-home exams covering assigned and related topics.
5. design projects assigned stressing application of learned concepts and theories.

Sample writing assignment:
Discuss the use of a jump table if the program is in read-only memory but the routines to be executed may have a different starting address in different systems.

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word type problems. The exams will be graded for accuracy and techniques used for problem solutions.
2. End of chapter problems are assigned as homework and graded for accuracy.
3. Individual and group design projects, presentations, and short papers are assigned and graded for quality of research, style and techniques applied and presented, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.
5. Laboratory reports are graded for accuracy and content. Reports consist of:
   a. text and CAI study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay question:
Assume the lower memory is volatile RAM. Explain the decisions required by external circuitry to allow the CPU to address nonvolatile ROM locations during the reset sequence. Assume that the reset vectors are held in ROM beginning at hexadecimal location $20000. The initial (SSP) is $06B8 and the initial (PC) is #20008.

TEXTS AND SUPPLIES

Adopted Text: NIDA. MC68000 CAI Software. NIDA Corp. 2006
A. Clements. Microprocessor Systems Design:68000 Hardware. 2nd ed. PWS. 1992

Other Materials: NIDA, Homework Disk 2
Hardware Development System (supplied by instructor)
Software Tools (supplied by instructor and textbook bundle)
Scientific Calculator
Graph paper and normal school supplies
Instructor handouts
Data Storage Device (Thumb Drive)

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
Individual	As needed		Telephone contacts	As needed
Other				

Per Semester

Orientation sessions	2 hours		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs	48 hours		(in person)
Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: _____
Date Reviewed: _____
PCA Established: _____
GE Approved/Review: _____

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 139 (COM EL 139) (ET 139)

CATALOG TITLE: Electrical Power, Motors, and Controls

SCHEDULE TITLE: Electrical Power, Motors, & Controls

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE(S): EL 122 and EL 125 or COM SC 141

ENTRANCE SKILLS The student must have the ability to:
1. understand analog and digital electronics which are the basic elements underlying mechatronic systems.
2. use commonly-used electronic test and measurement instrumentation.
3. analyze project designs using standard breadboarding techniques.
4. identify electronic components and symbols.
5. differentiate the schematic symbols that are used to represent a wide variety of semiconductor, reactive, and passive electronic devices.
6. interpret device specifications using manufactures data sheets.
7. analyze circuits, describe their operation, and list characteristics for each.

CATALOG DESCRIPTION
A study of electronics, signal communication and power technology that support efficient manufacturing processes for various industries. Topics include motors, their drives and controls, power electronics, PLCs, and communications networks used to monitor industrial processes. This course is not open to students who are enrolled in or have received credit for Computer Electronics 139 or Engineering Technology 139.

SCHEDULE DESCRIPTION
A study of electronics, signal communication and power technology that support efficient manufacturing processes for various industries. Topics include motors, their drives and controls, power electronics, PLCs, and communications networks used to monitor industrial processes. Not open to students who are enrolled in or have received credit for COM EL 139 or ET 139.

COURSE GOALS: To encourage and enable students to
1. appreciate power electronics and the need for power quality.
2. understand the fundamentals of Energy and Power Systems.
3. understand the various devices that are called rotation machinery.
4. understand the operation of a variety of DC and AC motors and generators.
5. understand safety issues that pertain to rotation machinery.
6. understand the principles of pulse width modulation for motor control.
7. understand open loop and closed loop motor control systems.
8. understand Electrical Power and Transmission Distribution Systems.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:

1. describe speed, torque, counter electromotive force, loads, power and efficiency in rotation machinery.
2. describe the operation of DC motors and generators.
3. measure signals in the control circuits for a DC motor/generator set.
4. troubleshoot a DC motor/generator set.
5. describe the operation and characteristics of stepper motors.
6. measure signal in the control circuits for stepper motors.
7. troubleshoot stepper motors.
8. describe AC motor theory of operation, and construction for single and three phase motors.
9. describe the equivalent model of an induction motor transformer.
10. describe general AC generator theory, construction and characteristics.
11. describe the DC Series Field motor and its characteristics.
12. identify the principles of circular force and torque.
13. identify the loaded characteristics of a DC Series Field motor.
14. identify the physical characteristics of a BLDC, brushless DC motor.
15. describe motor drive, position sensing, and other controller functions.
16. perform routine maintenance, operational, and performance tests on motors.
17. identify the principles of PWM, pulse width modulation.
18. describe the operation of PWM motor control.
19. describe the operation of a PWM Amplifier/Driver.
20. describe an open loop motor system.
21. examine block diagrams of open loop systems.
22. list the terminal characteristics of an armature-controlled motor.
23. measure circuit frequency and calculate RPM.
24. identify the characteristics of motion transducers.
25. compute linear and rotary motion rates based on system mechanical and electrical parameters.
26. analyze motion to frequency for RPM and velocity determinations.
27. analyze motion to analog DC for RPM and velocity determinations.
28. describe a closed loop feedback controlled motor system.
29. measure the error and feedback signals in a closed loop DC motor system.
30. describe the basic process of troubleshooting motor control systems.
31. trace signal flow through a closed loop feedback system
32. troubleshoot and fault isolate to the circuit level of a closed loop feedback system.
33. identify the principles of PID, Proportional, Integral, and Derivative control.
34. adjust the PID proportional gain.
35. adjust the PID integral reset control.
36. adjust the PID derivative rate control

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Fundamentals of Energy, the Power System, and Quality Considerations	1
2.	Single and Three-Phase Power	1
3.	Transformers, Magnet materials, and Circuits	1
4.	Introduction to DC Motors and Generators Stepper Motors DC Series Motors Brushless DC Motors	1
5.	Introduction to AC Motors and Generators Single Phase Three Phase	2
6.	Pulse Width Modulation and Amplification	1
7.	Open Loop Motor Systems	1
8.	Motion Detection	1
9.	Closed Loop Motor Systems	2
10.	Proportional, Integral, and Derivative Control Systems	3
11.	System maintenance and Troubleshooting	1

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

APPROPRIATE READINGS (Other than Textbook)

1. G. Rockis. Electrical Motor Controls for Integrated Systems. 3rd ed. Industrial Text Co. 2005
2. D. Patrick. Electrical Motor Control Systems. Goodheart-Willcox. 2000
3. Course's blackboard website for tutorials and supplements.

OUTSIDE ASSIGNMENTS

Cooperative learning group projects; presentations; short papers; research; and the following:

1. readings from adopted text and instructor handouts; evaluate sample problems and work end of chapter problems.
2. use computer applications to expand upon circuit analysis and comprehension.
3. use the Internet, as an information resource, to support topics studied in this course.
4. online practice quizzes and take-home exams covering assigned and related topics.
5. design projects assigned stressing application of learned concepts and theories.

Sample writing assignments:

1. Explain how the direction of rotation of a three-phase induction motor can be reversed.
2. What are the advantages of wound-rotor induction motors?

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word type problems. The exams will be graded for accuracy and techniques used for problem solutions.
2. End of chapter problems are assigned as homework and graded for accuracy.
3. Individual and group design projects, presentations, and short papers are assigned and graded for quality of research, style and techniques applied and presented, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.
5. Laboratory reports are graded for accuracy and content. Reports consist of:
   a. text study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay Questions:

1. Why is power-factor correction important for industries?
2. Evaluate and explain the relationships of rotor current and stator current in a three-phase synchronous motor at unity power factor.

TEXTS AND SUPPLIES

Adopted Text: NIDA Corp. Motors and Motor Control Systems. CAI software, NIDA Corp. 2005
T. Skvarenina. Electrical Power and Controls. 2nd ed. Prentice Hall. 2005

Other Materials:
NIDA Corporation Homework Disks 2 and 3
Software Tools (supplied by instructor and textbook bundle)
Scientific Calculator
Graph paper and normal school supplies
Instructor handouts
Data Storage Device (Thumb Drive)

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
Individual	As needed		Telephone contacts	As needed
Other				

Per Semester

Orientation sessions	2 hours		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs	48 hours		(in person)
Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2006
Date Reviewed: _____
Date Reviewed: _____
PCA Established: _____
GE Approved/Review: _____

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 162 (COM EL 162) (ET 162)

CATALOG TITLE: Fluid Power and Control

SCHEDULE TITLE: Fluid Power and Control

UNITS: 2

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISTE: None

CATALOG DESCRIPTION
An introduction to the generation, control and basic applications of hydraulics and pneumatics force and motion systems. Topics include safety, properties of and forces in liquids, pumps, motors, valves, reservoirs, strainers, filers, accumulators, basic diagramming, system design and troubleshooting. This course is not open to students who are enrolled in or have received credit for Computer Electronics 162 or Engineering Technology 162.

SCHEDULE DESCRIPTION
An introduction to the generation, control and basic applications of hydraulics and pneumatics force and motion systems. Topics include safety, properties of and forces in liquids, pumps, motors, valves, reservoirs, strainers, filers, accumulators, basic diagramming, system design and troubleshooting. Not open to students who are enrolled in or have received credit for COM EL 162 or ET 162.

COURSE GOALS To encourage and enable students to:
1. understand the relationship between pressure, force, and area in fluid systems.
2. understand the basic concepts of hydraulics and pneumatics.
3. demonstrate an understanding of hydraulic and pneumatic pressure, Pascal's law, fluid properties, piston/cylinder combinations.
4. recognize examples of devices that use fluid power in every day life.
5. understand the process of determining the mechanical advantage of a given system.
6. recognize and identify hydraulic and pneumatic component schematic symbols.
7. understand the symptoms of common hydraulic and pneumatic component failures.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:
1. apply safety procedures and issues in the areas of hydraulics and pneumatics.
2. identify and describe a basic hydraulic and pneumatic system and their components.
3. explain the construction and operation of fluid power cylinders.
4. explain the construction and operation of directional control valves.
5. explain the operations of fluid power components such as filters, regulators, lubricators, needle valves, check valves, flow control valves, and quick exhaust valves.

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6. explain the construction and the operation of common fluid power circuits.
7. design basic fluid power systems using schematic diagrams to document designs.
8. identify common hydraulic and pneumatic component failures and symptoms.
9. identify symptoms of common pump failures.
10. describe the basic repairs needed to restore pump operation.
11. describe the electrical control of fluid power components.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	Introduction to Fluid Power	1
2.	Physical Properties of Fluids	1
3.	Energy and Power in Fluid Power Systems	1
4.	Losses in Hydraulic Pipelines	1
5.	Fluid Power Motors and Pumps	2
6.	Cylinders and Cushioning Devices	2
7.	Valve Construction and Operation	2
8.	Basic Electrical Controls for Fluid Power Circuits	2
9.	Fluid Logic Control Systems	2
10.	Designing and Troubleshooting Fluid Power Systems	2

APPROPRIATE READINGS (Other than Textbook)

J. Johnson. Introduction to Fluid Power. Thomson. 2002
D. Norvelle. Fluid Power Technology. Thomson. 1994
Course's blackboard website for tutorials and supplements.

OUTSIDE ASSIGNMENTS

Cooperative learning group projects; presentations; short papers; research; and the following:
1. readings from adopted text and instructor handouts; evaluate sample problems and work end of chapter problems.
2. use computer applications to expand upon circuit analysis and comprehension.
3. use the Internet, as an information resource, to support topics studied in this course.
4. online practice quizzes and take-home exams covering assigned and related topics.
5. design projects assigned stressing application of learned concepts and theories.

Sample writing assignments:
1. Describe Pascal's Law as it relates to fluid power.
2. Explain why gases are used for some fluid systems and liquids are used in others.

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word type problems. The exams will be graded for accuracy and techniques used for problem solutions.
2. End of chapter problems are assigned as homework and graded for accuracy.
3. Individual and group design projects, presentations, and short papers are assigned and graded for quality of research, style and techniques applied and presented, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.
5. Laboratory reports are graded for accuracy and content. Reports consist of:
   a. text study information.
   b. mathematical evaluations of each experimental circuit studied.
   c. component diagrams for each circuit.
   d. design problem solutions.
   e. procedures and data collection.
   f. end of experiment questions and conclusions.

Sample essay questions:
1. Discuss the pros and cons of hydraulics and pneumatics.
2. Explain why gases are used for some fluid systems and liquids are used in others.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

TEXTS AND SUPPLIES

Adopted Text: A. Esposito. Fluid Power with Applications. 6th ed. Prentice Hall. 2003
NIDA Corp. Hydraulic and Pneumatic Systems. CAI software. NIDA Corp. 2005

Other Materials: NIDA Corporation Homework Disk 2
Software Tools (supplied by instructor and textbook bundle)
Scientific Calculator
Graph paper and normal school supplies
Instructor handouts
Data Storage Device (Thumb Drive)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 3/27/06 Initiator Bob Alldredge

1. Method of instruction to be used (primary modality): Hybrid
2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	As needed
Group	As needed		Discussion Board	As needed
Individual	As needed		Telephone contacts	As needed
Other				

Per Semester

Orientation sessions	2 hours		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs	48 hours		(in person)
Testing	4 hours		(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: Classroom meetings, orientation, and online announcements.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:
Date Reviewed: Spring 1988
Date Reviewed: Spring 2006
PCA Established:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY**

PREFIX & NO.: ET 100

CATALOG TITLE: Computer Aided Drafting and Design

SCHEDULE TITLE: Computer Aided Drafting

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE(S): None

CATALOG DESCRIPTON
An introduction to computer-aided drafting and design (CADD) which covers operation of a computer graphics terminal (specifically AutoCAD) to create, modify, delete, transfer, and plot graphic files used to produce complete engineering drawings.

SCHEDULE DESCRIPTON
An introduction to computer-aided drafting and design (CADD) which covers operation of a computer graphics terminal (specifically AutoCAD) to create, modify, delete, transfer, and plot graphic files used to produce complete engineering drawings.

COURSE GOALS: To encourage and enable students to:
1. learn the various components of the hardware configuration, the software capabilities, input operations, and input commands of a CADD system.
2. become familiar with input operations that involve various components of the hardware configuration, the software capabilities, input operations, and input commands for a CADD system.
3. appreciate the abilities necessary to use the CADD system to perform input operations by entering data into the system for the purpose of creating the various types of documentation intrinsic to drafting (drawings, part lists, bills of materials, schedule, etc.).
4. become familiar with data manipulation processes.
5. appreciate the hardcopy output of data contained in a CADD system.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. explain the function of the three major components of a CADD system processor (processing section, memory section, and data transfer).
2. perform keying, cursor control, and digitizing tasks on a CADD system.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

3. use input commands for accomplishing drafting tasks on a CADD system.
4. perform various manipulation commands on a CADD system.
5. secure a hardcopy of data that appears on a graphics display.
6. set up a plotter, load the media, and give the plot commands to produce a hardcopy.

COURSE OUTLINE

	WEEKS
1. Introduction to CADD	1
2. System-Hardware Description and Operation	1
3. System Operating Modes	1
4. Drawing File Structure including Storing and Loading Files	1
5. CADD Software	1
6. Creating Drawings	2
7. Command Entry Methods	2
8. Creation and Manipulation of Drawing Data	2
9. Modifying the Geometry and the Drawing	1
10. Text	1
11. Dimensioning	1
12. Plotting	1
13. Creating a Parts Library; Symbols, and Macros	1
14. CADD/CAM Links	1

APPROPRIATE READINGS (Other than Textbook)

1. Shumaker, T. and Madsen, D. AutoCAD and Its Applications Basics. 2006
2. Shumaker, T. and Madsen, D. AutoCAD and Its Applications Advanced. 2006

OUTSIDE ASSIGNMENTS

A variety of computer-aided drafting assignments are required of each student to complete the requirements of ET 100. Each lab project requires the use of a new CADD principle (and a CADD workstation) and mastery of the material can be demonstrated by the quantity and quality of the work completed.

EVALUATION

The student's grade will be determined by the quality of work performed on assigned drawings, completing a minimum number of clock hours using the CADD system, unit tests, and the final exam. The vast majority of test questions require students to demonstrate their understanding of the subject by writing short statements or a paragraph or two.

Sample Test Questions:

1. Given the dimensioned drawing, reproduce the drawing using AutoCAD.
2. If grid accuracy is insufficient, describe another method which provides maximum system accuracy.
3. Explain the difference between mirroring and rotate.
4. What is solid modeling, and why is it important?

TEXTS AND SUPPLIES

Adopted text: Richard, Paul F. and Fitzgerald, Jim. Introduction to AutoCAD 2006: A Modern Perspective, 200x.

Other Materials: 1.128 k (min) flash drive

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:_____
Date Reviewed: Fall l987
Date Reviewed:_____
PCA Established:_____

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. MT 110 Catalog Title Machine Tool Practices

Units 4 Weekly lecture hours 2 Weekly lab hours 6 Department Industrial Technology

Credit/No Credit Option

Catalog Prerequisites: MT 109 .

CATALOG DESCRIPTION

This course is a study of the use and care of lathes, drill presses, milling machines and grinders. Augmenting the study of the various machine tools will be the study of layout tools, hand tools, various checking and inspection instruments as well as the grinding of the tools themselves. The engine lathe section includes plane and taper turning, threading, necking, facing and form turning. Milling machine operation includes both horizontal and vertical milling with high speed and carbide cutting tools and the cutting of gears.

COURSE GOALS: To encourage and enable students to

1. be able to function in a machining facility in a safe manner.
2. demonstrate their ability to operate various lathes, milling, drilling and grinding machines.
3. be able to use the various hand and measuring tools found in a machine shop.
4. develop the ability to layout and plan simple projects to be machined on the lathe and milling machine.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to

1. measure with a venier caliper and height gages to an accuracy of ± .001" and make comparison measurements between gage block and work surfaces.
2. describe and demonstrate various thread measuring techniques, thread calculations, classes of fit and cut internal and external threads.
3. select shapes and classification of carbide inserts and tool holders from the classification system adopted by the A.S.A., based on work peramiters.
4. turn an external and internal taper, using the compound rest and the taper attachment on a lathe to the specifications given in the blueprint and calculate for offsets in tailstock tapering.
5. properly set-up and use various drill jigs and milling fixtures.
6. identify milling machine set-ups, milling cutters, end mills, face mills, slab mills, form mills including gears and rack cutters.
7. determine the correct angles for sharpening drills for cutting various materials and demonstrate their ability to properly sharpen drills.
8. install the adjustable boring head, boring bar, and bore holes to specified tolerances.
9. function in a machine facility in a safe manner.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

10. do various lathe functions including drilling, boring, counterboring, knurling, and use of special form tools.

COURSE OUTLINE

		WEEKS
1.	Introduction and Safety	1
2.	Tools and Materials	1
3.	Bench and Layout Tools	1
4.	Engine Lathe Operations	5
5.	Cutting Tools	1
6.	Milling Machine Operations	5
7.	Drill Press, Use and Types	1
8.	Tool Grinding	1
9.	Threads	1

APPROPRIATE READINGS (Other than Textbook)

1. Weingartner, C. Machinists' Ready Reference. 1972. Prakken Publications.
2. Horton, Holbrook, L. Machinery's Handbook Twentieth Edition. 1980. Industrial Press.
3. Machining Data Handbook. Metcut Research Associate. 1972. Second edition.

ASSIGNMENTS

In addition to four hours of assigned laboratory work weekly, the student will be assigned approximatly 30 pages of text and non-text reading weekly. The student will also be assigned one research project to be completed outside class.

EVALUATION (The methods by which students and instructors will know how the objectives listed above have been met.)

The students will be evaluated on the speed and accuracy with which they complete their laboratory assignments. They will also be evaluated on their work habits.

Sample assignment:
Two essay examinations will be given. These exams will include questions such as: It is well known that carbide machine tools are superior to high speed steel tools. How are the two different and why is carbide tooling superior? Explain in detail.

TEXTS AND SUPPLIES

Adopted Text: Kibbe, Neely, Meyer, and White Machine Tool Practices, 1987, John Wiley & Sons.

Other Materials: 6 inch steel ruler, safety glasses, small Allen Wrench set.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2003
Date Reviewed: _____
Date Reviewed: _____
PCA Established: Spring 2003

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **LIFE AND PHYSICAL SCIENCES**

PREFIX & NO.: PHYS 100

CATALOG TITLE: Concepts in Physics

SCHEDULE TITLE: Concepts in Physics

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: None

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

ADVISORY(IES): Math 311. Eligibility for English 101 or English 301.

CATALOG DESCRIPTION
An over review of the major areas of physics. Emphasis is on concepts, application, and the consequences for modern life. An historical perspective on the development of physical theory and its impact on civilization are explored.

SCHEDULE DESCRIPTION
An over review of the major areas of physics. Emphasis is on concepts, application, and the consequences for modern life. An historical perspective on the development of physical theory and its impact on civilization are explored.

COURSE GOALS: to encourage and enable students to
1. gain an understanding of some of the fundamental laws and principles governing the behavior of the physical world.
2. become familiar with the scientific method and how it can be applied to the solution of problems.
3. understand the development of scientific though and its contributions to the growth of civilization.
4. develop an appreciation for the history of scientific thought and the contributions of many outstanding scientists from Aristotle to Einstein.

INSTRUCTIONAL OBJECTIVES: at the end of the course, the student will demonstrate the ability to
1. associate terms with corresponding definitions, and identify significant physical variables in given situations.
2. generalize the given applications of physical principles to similar but novel situations.
3. describe physical relationships in the environment, and identify appropriate applications.
4. discuss physical theories and their implications for man and the universe.

COURSE OUTLINE — WEEKS
1. Motion form Aristotle to Newton — 1
   A. Position, displacement, velocity, and acceleration
   B. Newton's 3 Laws of Motion

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

2. Energy 2
   A. Conservation of Energy – The most fundamental physical theory
3. Waves 2
   A. Rotation and Periodic Motion
   B. Waves and Ocean Tides
   C. El Nino
4. Entropy and the 1st and 2nd Laws of Thermodynamics 2
   A. Heat, Temperature, and the 1st Law of Thermodynamics
   B. Heat Transfer and States of Matter
   C. Entropy and the 2nd Law of Thermodynamics – Consequences for the Universe
5. Electricity and Magnetism 4
   A. Electric Forces, Fields, and Potentials
   B. Current and Resistance
   C. Magnetic Forces and Fields
   D. AC Current
6. Seeing the Light – Is it a Particle or a Wave: 4
   A. Wave properties of light – Refraction, Interference and Diffraction
   B. Lenses and Mirrors
   C. Color theory of Light and Pigment
   D. Quantum and Mechanics – Light as a Particle
7. Einstein and Newton, Two Theories of Gravity 1
   A. Einstein's Theory of Special Relativity
   B. General Relativity and Newton's Law of Gravitation

APPROPRIATE READINGS (other than textbook)

1. Science News
2. Scientific American

Books to be put on reserve by the instructor:

1. Jewett, John Jr., The World of Physics – Mysteries, Magic, and Myth. Harcourt College Publishers c2001
2. Falk, David, Bruce, Dieter, and Stork, David., Seeing the Light. John & Wiley Sons, c1986

OUTSIDE ASSIGNMENTS

10 – 15 exercises per week correlated with reading and lectures

Exercise Examples:

1. Can something be moving with a constant speed, but a varying velocity? Can something be moving at a constant velocity, but have a varying speed? Defend your answers and cite examples for each case.
2. Why does the sky appear black when viewed from the moon?

EVALUATION

The course objectives will be met by completion of the weekly assignments and by performance on written quizzes and exams, which will require observation, recall of facts, written self expression, and an indication of the processes used to arrive at conclusion.

Sample exam question:

Cite the 1st Law of Thermodynamics and discuss how this law supports the principle of energy conservation for thermal systems. Discuss what limitations the 2nd Law of Thermodynamics places on the 1st, and what implications this has for energy and the universe.

TEXTS AND SUPPLIES

Adopted Text: Hewitt, Paul G. Conceptual Physics. Addison Wesley, c2002. 9th Ed.

Other Materials: Demonstration apparatus.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Fall 2000
Date Reviewed: Spring 2007
Date Reviewed:
PCA Established: Fall 2000

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **LIFE AND PHYSICAL SCIENCES**

PREFIX & NO.: PHYS 110

CATALOG TITLE: Introductory Physics

SCHEDULE TITLE: Introductory Physics

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: MATH 121 or MATH 141

ENTRANCE SKILLS: Solve algebraic equations including systems of algebraic equations; solve trigonometric equations; find trigonometric functions given an angle in degrees and radians; knowledge and use of Pythagorean theorem.

CATALOG DESCRIPTION
An introduction to physics with emphasis on units, vectors, and the definitions of physical variables. Tools and strategies necessary to be successful in Physics 161 are covered.

SCHEDULE DESCRIPTION
An introduction to physics with emphasis on units, vectors, and the definitions of physical variables. Tools and strategies necessary to be successful in Physics 161 are covered.

COURSE GOALS: to encourage and enable students to
1. describe, unambiguously, the observed behavior of their physical environment.
2. recognize and describe the nature of physical relationships in this environment.
3. reason to valid conclusions concerning the behavior of this environment.

INSTRUCTIONAL OBJECTIVES: at the end of the course, the student will demonstrate the ability to
1. associate terms with corresponding definitions.
2. identify the significant physical variables in given situations.
3. find values of quantities from their definitions, given a situation.
4. find values of quantities by reference to the appropriate conditions and principle(s), given a situation.
5. evaluate the nature of physical quantities or relationships.
6. generalize the given applications of physical principles to similar but novel situations.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

COURSE OUTLINE

		WEEKS
1.	Measurement, units, and significant figures.	2
	A. measurement systems and scientific notation.	
	B. base units and unit analysis.	
	C. notation and scientific symbols.	
	D. significant figures.	
2.	Addition and subtraction of vectors in 2 and 3 dimensions	2
	A. graphical addition and subtraction of vectors.	
	B. algebraic addition and subtraction of vectors.	
	C. Cartesian coordinate systems.	
	D. polar vs. component vector forms.	
	E. unit vector notation.	
3.	1-Dimensional Motion	2
	A. definitions of variables of motion in 1-dimension	
	B. constant acceleration	
	C. freefall	
4.	2-Dimensional Motion.	4
	A. definition of variables of motion in 2-dimensions.	
	B. constant acceleration in 2-dimensions	
	C. projectile motion	
	D. uniform circular motion	
	E. relative motion.	
5.	Newton's Law's of Motion	2
	A. The nature of force, mass, volume, and density.	
	B. Newton's three laws of motion.	
	C. Free body diagrams.	
	D. Applications of Newton's Laws with and without friction.	
6.	Further applications of Newton's laws of motion.	2
	A. Newton's 2^{nd} Law and centripetal forces.	
	B. Non-inertial reference frames.	
7.	Additional Topics which may include either	2
	A. Work and Energy, or	
	B. Impulse, Momentum, and momentum conservation.	

APPROPRIATE READINGS (other than textbook)

1. Science News.
2. Scientific American.

OUTSIDE ASSIGNMENTS

10 - 12 theoretical exercises per week correlated with reading assignments and lectures.

Samples:

1. Given the equation $F = Gm_1m_2/r^2$, use unit analysis to find the units of the constant G.
2. Vector A has a magnitude of 5 and lies along the +x-axis. Vector B has a magnitude of 4 and makes an angle, $\beta = 40^o$ with the +x-axis. What is the resultant vector, $\mathbf{A} + \mathbf{B}$?
3. A canon ball is shot into the air with an initial speed of 40 m/s at an angle of 30^o with respect to the horizontal. A) What maximum height will it attain?, B) How far from the canon will it land?

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

EVALUATION

1. Homework (outside assignments detailed above).
2. In-class projects
3. Written quizzes and exams.

Sample in-class project: Measure 2 sides of a desk, the length and width, and calculate the perimeter of the desk and uncertainty in the perimeter, such that $P = P_{best} \pm \delta P$. Then calculate the area and the uncertainty in the area such that, $A = A_{best} \pm \delta A$.

Quiz and exam questions will be similar to the homework questions, see samples above.

TEXTS AND SUPPLIES

Adopted Text: Serway, Raymond A.; Jewett, John W. Physics for Scientists and Engineers. 6th ed. 2004,

Other Materials: Demonstration apparatus.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Fall 1991
Date Reviewed: Fall 2001
Date Reviewed: Spring 2007
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **LIFE AND PHYSICAL SCIENCES**

PREFIX & NO.: PHY SC 111

CATALOG TITLE: Matter, Energy and Molecules

SCHEDULE TITLE: Matter and Energy

UNITS: 4

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

CATALOG DESCRIPTION
Introduction to the basic principles of physical science and applications of these principles in everyday life. Measurement, force and motion, work and energy, heat, waves, electricity, atomic physics, compounds, molecules, and ions will be explored.

COURSE GOALS To encourage and enable students to:
1. understand the underlying themes and philosophies of physical science.
2. develop systematic methods of interpreting and solving problems.
3. develop methods of interpreting and using data collected in the laboratory.
4. understand that the physical universe is orderly in its behavior and that logical conclusions can be drawn from the application of scientific laws and principles.
5. enrich their perspective on the development of science throughout human history and to discover how science influences the world in which we live.

INSTRUCTIONAL OBJECTIVES At the end of the course, the student will demonstrate the ability to:
1. describe the methods and standards of science and the fundamental principles that govern the universe.
2. state the major scientific principles in both verbal and in simplified mathematical form.
3. give examples of processes which illustrate the application of a major scientific principle.
4. carry out laboratory experiments; take data, make graphs, do calculations, and draw conclusions based on the results of the experiments.

COURSE OUTLINE

		WEEKS
1.	Measurement	1
2.	Motion	1
3.	Force and Motion	2
4.	Work and Energy	1
5.	Temperature and Heat	1
6.	Waves and Wave Effects	1
7.	Electricity and Magnetism	1
8.	Atomic and Nuclear Physics	2
9.	The Periodic Table	1

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

10.	Compounds, Molecules, and Ions	2
11.	Chemical Principles	2
12.	Chemical Reactions	1
13.	Complex Molecules	1

APPROPRIATE READINGS (Other than Textbook)

1. Science News.
2. Time and Newsweek (Science and Technology sections).

OUTSIDE ASSIGNMENTS

1. An old party trick is to pull a tablecloth from beneath dishes and glasses on a table. Explain, in paragraph from, how this trick relates to Newton's First Law of Motion, and how this trick can be done without upsetting or pulling the dishes and glasses with the cloth.
2. The speed of sound in water is 1530 meters/sec. What is the wavelength of a 2000 Hz sound wave?
3. Distinguish between a compound and a mixture. Give an example of each.

EVALUATION

1. Student performance will be evaluated by the use of lecture exams, homework, and quizzes.
2. The exams, homework, and quizzes will consist of problem solving exercises and short essays.

Sample essay question: Describe what is meant by the term radioactive decay. Discuss how this applies to Carbon-14 and its use in archaeological sites.

TEXTS AND SUPPLIES

Adopted Text: Hewitt, Suchocki and Hewitt. Conceptual Physical Science. 3rd ed. Addison-Wesley. 2004.

Other Materials:
1. Hewitt, Suchocki, Hewitt & Baird. Lab Manual to Conceptual Physical Science. 3rd ed. Addison-Wesley. 2004
2. Scientific calculator

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Spring 2004
Date Reviewed: _____
Date Reviewed: _____
PCA Established: Spring 2004

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: SPACE 104

CATALOG TITLE: Quality Management Control and Safety

SCHEDULE TITLE: Quality Mgt Control & Safety

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter grade only

ADVISORY(IES): Math 311 and eligibility for English 301.

CATALOG DESCRIPTION
An introduction to the basic principals of quality management control and safety. Students learn how to use various quality tools in order to improve product quality and to control resources. Identification and correction of hazards in the aerospace environment are also covered.

SCHEDULE DESCRIPTION
Introduction to the basic principles of quality management control and safety in the aerospace environment.

COURSE GOALS: to encourage and enable students to
1. understand the fundamentals of quality management principles and the tools of quality management control.
2. appreciate the role of quality management control in the aerospace environment.
3. understand the basics of safe practices in the aerospace environment.

INSTRUCTIONAL OBJECTIVES: at the end of the course, the student will demonstrate the ability to
1. identify the basic quality management principals -- hardware, software, firmware – applied to both processes.
2. assess quality characteristics of the work environment.
3. recognize quality standards as established by the American Society for Quality (ASQ).
4. apply the fundamentals of quality control management to the aerospace industry.
5. identify the toxic and hazardous substances and materials associated with the aerospace industry and the correct measures to ensure safety on the job and in the environment.
6. recognize occupational health and environment requirements and maintain these requirements.

COURSE OUTLINE

	WEEKS
1. Introduction to quality management control and safety	1
2. Basic quality principals applied to both products and processes	2
3. Quality characteristics	1
4. Process capabilities	1

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

5.	Quality standards and the American Society for Quality (ASQ)	1
6.	Application of quality control management fundamentals to job, product and business as they relate to the aerospace industry	3
7.	Toxic and hazardous substance and materials	2
8.	Protection equipment	1
9.	Means of egress	1
10.	Aerospace occupational health and environment	2
11.	General aerospace environmental controls	1

APPROPRIATE READINGS (other than textbook)

1. Practical Tools for Continuous Improvement, Volumes 1 & 2. PQ Systems Publishing.
2. Accident prevention manuals related to business and industry
3. newspapers

ASSIGNMENTS

Cooperative learning groups' projects, presentations, short papers, case studies and research.

Writing assignment: After interviewing a quality control manager in aerospace or closely related industry, prepare a five-minute presentation for your classmates that demonstrates your understanding of one of the fundamentals of quality control.

EVALUATION

Group project, presentation, tests, written assignments, and final examination.

Sample essay question: Briefly describe the solution stage of problem solving and apply the quality tools for each stage of the process.

TEXTS AND SUPPLIES

Adopted Text: The Quality Technician's Handbook, 5th edition. Pearson Prentice Hall. 2004.
OSHA 29CFR 1910 (General Industry) and subparts A, B, D through L, N through P, Q, S, and Z. Downloaded from OSHA website as needed.

Other Materials: None

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:_____
Date Reviewed: Spring 2005
Date Reviewed:_____
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY AND PUBLIC SAFETY**

PREFIX & NO.: WLD T 106

CATALOG TITLE: Beginning Welding

SCHEDULE TITLE: Beginning Welding

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 4

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit

CATALOG DESCRIPTION
A study of the theory, practice, and application of various metal joining processes, including oxyacetylene welding, brass brazing, flame cutting, and electric arc processes, and an introduction to both TIG and MIG welding.

COURSE GOALS To encourage and enable students to:
1. use gas and electric welding equipment safely.
2. develop basic welding skills using both the shielded metal arc and oxyacetylene process in the flat position.
3. weld and brass braze light sheet metal.
4. perform basic flame cutting operations.
5. have some insight into the gas tungsten and gas metal arc welding processes.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to
1. flame weld thin sheet steel in the flat position, employing edge, butt, lap, and tee splints.
2. weld mild steel in the flat position using various electrodes on butt, lap, tee, and other common welding joints.
3. brass braze light sheet metal.
4. flame cut various thickness of plate steel using the oxyacetylene process.
5. function in a welding facility in a safe manner.
6. use the gas metal arc welding process to weld light gauge mild steel sheet.
7. use the gas tungsten welding process to weld light gauge aluminum.
8. evaluate each job to determine which welding process should be used based on the following criteria:
   A. which process would do the least damage to the project;
   B. how much strength is required;
   C. which process will be the least expensive;
   D. which process will give less clean up time;
   E. what processes are available at the time;
   F. are there any specs that would determine what is to be used.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

COURSE OUTLINE

		WEEKS
1.	Introduction to the Class and Safety	2
	A. general shop safety	
	B. grinders and other welding shop equipment	
	C. gas welding equipment safety	
	D. electric welding safety	
2.	Oxyacetylene Welding	5
	A. set-up and operation of gas welding equipment	
	B. gas welding procedures	
	C. how to weld a corner joint without rod	
	D. how to weld lap joints using filler rod	
	E. how to weld tee joints using filler rod	
	F. how to weld butt joints using filler rod	
	G. brazing: brass brazing light gauge sheet steel	
	H. the oxyacetylene cutting torch	
3.	Electric Welding	10
	A. welding power supplies	
	B. types of arc welding joints	
	C. electrodes	

APPROPRIATE READINGS (Other than Textbook)

Jeffas, Larry and Johnson, Harold W. Welding Principles and Applications.

OUTSIDE ASSIGNMENTS

1. Students will be responsible for homework assignments which may include:
   A. outside reading
   B. films or reading assignments in the L.R.C.
2. Weldments as listed on individual progress charts.
3. Welding assignment outside of class.

EVALUATION

1. The student will perform a series of weldments for the instructor.
2. The student will be subject to a manipulative test.
3. The student will be given a series of written examinations based on material given in the textbook and/or lectures.

Sample test question: What is duty cycle and why is it important?

TEXTS AND SUPPLIES

Adopted text: Althouse, Turnquist, Bowditch and Bowditch. Modern Welding.

Other Materials:
1. Welding hood.
2. Gloves.
3. Pliers.
4. Safety glasses.
5. Goggles.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:
Date Reviewed: Fall 2001
Date Reviewed: Spring 2005
PCA Established:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY AND PUBLIC SAFETY**

PREFIX & NO.: WLD T 107

CATALOG TITLE: Advanced Welding

SCHEDULE TITLE: Advanced Welding

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 4

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: WLD T 106

CATALOG DESCRIPTION
A continuation of WT 106, emphasizing position welding of a variety of ferrous metals, using a variety of electrodes used in industries.

COURSE GOALS To encourage and enable students to:
1. be familiar with all welding positions and basic welding electrodes used in industry.
2. identify and develop an appreciation and application of basic joint designs.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. weld in all positions using common welding electrodes popular in industry.
2. identify, fit and weld the five basic weld joints used in the welding industry.
3. pass welding tests and exams with at least an eighty percent proficiency.
4. function in a welding facility in an efficient and safe manner.

COURSE OUTLINE

	WEEKS
1. Introduction to the class	1
2. Safety	3
A. general shop safety	
B. grinders and other welding shop equipment	
C. cutting safety and operations	
D. electric arc welding safety	
3. Electric welding	13
A. welding power supplies	
A.C. machines	

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

transformers
generators

B. D. C. machines
transformers
generators

C. duty cycle
polarity

D. electrode selection and uses

APPROPRIATE READINGS

Althouse, Andrew D. Modern Welding. Goodheart-Wilcox Co. 1984.

OUTSIDE ASSIGNMENTS

1. Students will do assignments listed on progress chart.
2. Homework assignments as determined by the instructor.
3. Written and manipulative exams.

EVALUATION

1. The student will perform a series of weldmants as determines by the instructor.
2. The student will do manipulative test welding out of positions.
3. The student will take written test concerning chapters and lectures given in class.

Sample Test Question: What are the advantages of using E-6011 electrodes, and when should it be used?

TEXTS AND SUPPLIES

Adopted text: Althouse, Turnquist, Bowditch. Modern Welding.

Other Materials:
1. Welding hood.
2. Welding gloves.
3. Cutting goggles.
4. Pliers.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared: Fall 1988
Date Reviewed: Spring 2005
Date Reviewed:
PCA Established:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY AND PUBLIC SAFETY**

PREFIX & NO.: WLD T 307

CATALOG TITLE: G.M.A.W. Welding

SCHEDULE TITLE: G.M.A.W. Welding

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 4

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: WLD T 106

CATALOG DESCRIPTION
Provides students with the theory and practical applications of gas metallic arc welding (G.M.A.W.) and the operation of gas metal arc welding equipment.

COURSE GOALS To encourage and enable students to:
1. operate gas metal arc welding equipment.
2. diagnose gas metal arc welding equipment.
3. use the basic technique of gas metal arc welding.
4. weld both ferrous and non-ferrous metals with gas metal arc welding equipment.
5. do minor repair on gas metal arc welding equipment.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. weld aluminum, steel and stainless steel in all positions using gas metal arc welding equipment.
2. weld with gas metal arc welding equipment using
   A. short arc transfer technique
   B. spray arc transfer technique
   C. globular transfer technique
   D. cored wire welding
3. set-up, adjust and correct as necessary to produce the desired welds.
4. assemble and disassemble gas welding equipment.
5. evaluate G.M.A.W. welds for their quality and appearance and be able to make the necessary corrections.

COURSE OUTLINE

	WEEKS
1. Refresher In: A. safety in G.M.A.W. welding	4

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B. handling of compressed gasses
C. use of gasses for G.M.A.W.; CO^2, Argon, Helium, Mixtures

2. Equipment Set-Up of: 4
   A. G.M.A.W. welding machine (Micro)
   B. G.M.A.W. welding machine (core)
   C. G.M.A.W. (cobromatic)
   D. G.M.A.W. Dual Shield
3. G.M.A.W. Welding of: 9
   A. mild steel plate
   B. mild steel pipe
   C. aluminum plate
   D. stainless steel plate
   E. stainless steel pipe

APPROPRIATE READINGS

1. Alcoa. Aluminum. 1972.
2. Kaiser Aluminum. Welding. 1967.
3. Lincoln Electric. Gas Metal Arc Welding Guide. 1987.

OUTSIDE ASSIGNMENTS

This class will be concerned with the basic techniques in G.M.A.W. welding including setting up of and understanding of the working of such equipment.

Sample Assignments:

1. Read Chapter 3.
2. Answer questions in handout.
3. Study G.M.A.W. troubleshooting guide.
4. View film 901 on G.M.A.W. welding and be prepared to answer questions on it.
5. Complete project #14 on Progress Chart.

EVALUATION

1. Welding projects will be judged in accordance with accepted industrial standards.
2. Where practical, welds will be subjected to destructive testing.
3. Written exams, midterm and final exam.
4. Practical midterm and final exam.

Sample test question:
Small pin holes appear in a weld; what is the problem, what caused the problem, and how would you correct it?

TEXTS AND SUPPLIES

Adopted text: 1. L-Tec Welding and Cutting Systems. Mig Welding Handbook. 1987
2. Althouse, Turnquist, Bowditch, and Bowditch. Modern Welding. 1987.

Other Materials: 1. Welding gloves.
2. Welding goggles.
3. Safety glasses.
4. Appropriate clothing.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

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Date Reviewed: Fall 2001
Date Reviewed: Spring 2005
PCA Established:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY AND PUBLIC SAFETY**

PREFIX & NO.: WLD T 308

CATALOG TITLE: T.I.G. Welding

SCHEDULE TITLE: T.I.G. Welding

UNITS: 3

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 4

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: WLD T 106

CATALOG DESCRIPTION
Provides students with the theory and practical applications of gas tungsten arc welding and the operation of gas tungsten arc welding equipment.

COURSE GOALS To encourage and enable students to:
1. operate gas tungsten arc welding equipment.
2. diagnose gas tungsten arc welding equipment.
3. use the basic technique of gas tungsten arc welding.
4. weld both ferrous and non-ferrous metals with gas tungsten arc welding equipment.
5. do minor repair on gas tungsten arc welding equipment.
6. learn power supply variables.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. weld aluminum, steel and stainless steel in all positions using gas tungsten arc welding equipment.
2. set up, adjust and correct as needed to produce a desired weld.
3. function in a welding facility in a safe manner.
4. assemble and disassemble gas tungsten equipment.
5. evaluate and correct T. I. G. welds.

COURSE OUTLINE

	WEEKS
1. Refresher in:	4
A. safety in T.I.G. welding	
B. handling of compressed gasses	
C. use of gasses for T.I.G.; Argon, Helium, Mixtures	

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2. Equipment Set-Up of: 4
   A. basic T.I.G. machine
   B. basic arc welding with T.I.G. modification equipment
   C. T.I. G. with high frequency
   D. T.I.G. without high frequency
3. T.I.G. Welding of: 9
   A. mild steel plate
   B. mild steel pipe
   C. aluminum plate
   D. aluminum pipe
   E. stainless steel plate
   F. stainless steel pipe

APPROPRIATE READINGS (Other than Textbook)

1. Alcoa. Aluminum. 1972.
2. Kaiser Aluminum. Welding. 1967.
3. G.T.A.W. Handbook. 1985.

OUTSIDE ASSIGNMENTS

This class will be concerned with the basic techniques in T.I.G. welding including setting up of and understanding of the working of such equipment.

Sample Assignments:
1. Read Chapter 9.
2. Answer questions in handout on Chapter 9.
3. Study G.T.A.W. troubleshooting guide.
4. View film 906 on T.I.G. welding and be prepared to answer questions on it.
5. Complete project #2 on T.I.G. Progress Chart.

EVALUATION

1. Welding projects will be judged in accordance with accepted industrial standards.
2. Where practical, welds will be subjected to destructive or non-destructive testing.
3. Written exams, midterm and final exam.
4. Practical midterm and final exam.

Sample test question:
While using the T.I.G. process to weld stainless steel, you notice porosity in the weld.
1. What is the probable cause?
2. What is the solution?

TEXTS AND SUPPLIES

Adopted text: 1. L-Tec Welding and Cutting Systems. Mig Welding Handbook. 1987.
2. Althouse, Turnquist, Bowditch, and Bowditch. Modern Welding. 1987.

Other Materials: 1. Welding gloves.
2. Welding goggles.
3. Safety glasses.
4. Appropriate clothing.

Funding provided by Department of Labor, Employment & Training Administration: WIRED Initiative

Date Prepared:
Date Reviewed: Fall 2001
Date Reviewed: Spring 2005
PCA Established:

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY AND PUBLIC SAFETY**

PREFIX & NO.: WLDT 315 AB

CATALOG TITLE: Metal Fabrication

SCHEDULE TITLE: Metal Fabrication

UNITS: 4

WEEKLY LECTURE HOURS: 2

WEEKLY LAB HOURS: 6

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREPREQUISITE: WLD T 107

CATALOG DESCRIPTION
Provides the student with the opportunity to combine previously learned skills into a system requiring the use of prints, tolerances, and specifications.

COURSE GOALS To encourage and enable students to:
1. apply fabrication principles, techniques and processes.
2. apply most of the welding techniques learned in the other classes.
3. assemble components into final products by reading and interpreting blue prints and schematics.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. extract a materials list from shop drawings and blue prints as required.
2. cut, fit, weld, machine, and fabricate parts and sub-assemblies.
3. design and prepare working drawings for a fabricated project.
4. work safely using equipment that would be found in most welding and fabrication shops.

COURSE OUTLINE

	WEEKS
1. Project design	5
A. layout techniques	
B. fabrication principles	
2. Starting and finishing a project	2
A. estimating materials	
B. estimating the cost of materials	
C. writing a bill of materials	
D. cost analysis	
3. Building projects	10
A. how and where to start	

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B. choosing fastening techniques
C. reading blue prints

APPROPRIATE READINGS

Steward, John P. Flame Strengthening Technology. 1981.

OUTSIDE ASSIGNMENTS

1. The student will design and build a project.
2. At least one quality project will be built by the student.
3. A cost analysis on each project will be required.

EVALUATION

Each student will be graded on:

1. the quality of the finished project.
2. the design of the project.
3. the accuracy of the analysis of cost and materials.

Sample Test Question: What possible defects might be found in a three-pass built weld? List their remedies.

TEXTS AND SUPPLIES

Adopted text: Not yet determined.

Other Materials:
1. Films provided by instructor.
2. Welding tools.
3. Welding gloves.
4. Cutting goggle.
5. Pliers.

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