California
Innovation
Corridor

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Date Prepared:__________
Date Reviewed: Spring 2006
Date Reviewed: Fall 1999
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: COM SC 121

CATALOG TITLE: Fundamentals of Programming 1

SCHEDULE TITLE: Fundamentals of Programming 1

UNITS: 4

WEEKLY LECTURE HOURS: 4

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Math 311

ADVISORY(IES): COM SC 102

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
Introduces the fundamentals of computer programming and software design. Topics include variables, data types, assignment, expressions, basic I/O, control flow, functions and parameters, scope, and data structures. Emphasizes top-down design, step-wise refinement, and an engineering approach, using a high-level language such as 'C'.

SCHEDULE DESCRIPTION
Introduces the fundamentals of computer programming and software design. Topics include variables, data types, assignment, expressions, basic I/O, control flow, functions and parameters, scope, and data structures. Emphasizes top-down design, step-wise refinement, and an engineering approach, using a high-level language such as 'C'.

COURSE GOALS To encourage and enable students to:
1. understand the process of high-level language translation and execution.
2. learn the basic principles of algorithmic problem-solving, software development and programming through the use of a computer.
3. understand the syntax and semantics of a modern, high-level programming language.

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4. learn the terminology of computer programming and the purpose of each phase in the software development process.
5. appreciate the trade-offs among alternative algorithms that solve a given problem.
6. learn how to detect, isolate, and correct programming errors.

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

1. devise and implement algorithms that solve a given set of requirements for practical problems.
2. design, code, test and debug programs that implement these algorithms on a computer.
3. analyze, modify and create simple programs involving the fundamental programming constructs studied in the course.
4. apply the techniques of structured decomposition to break a program into modular parts, incorporating library routines when appropriate.
5. describe the concepts of scope and parameter passing methods.
6. compare and evaluate the efficiency and clarity of alternative algorithms that solve a given problem.

OUTLINE OF COURSE CONTENT AND SCOPE

		WEEKS
1.	History and pioneers of computing, history of, and trends in programming languages, survey of programming paradigms, ethical aspects of computing, fundamental concepts of computer systems and programming, program construction and programming style (naming, indentation)	1
2.	Variables, Primitive Data Types, Enumerated Types, Assignment, Expressions	1
3.	Basic I/0 and Importation of Library Modules	1
4.	Control Flow: sequence, conditional execution, branching and iteration	2
5.	Subprograms: Functions and parameter passing	1
6.	Top-Down program design, stepwise refinement and structural decomposition	1
7.	Variable scope, types of parameters	1
8.	Structured data types	1
9.	One-dimensional and multi-dimensional Arrays	1
10.	Strings and String Processing	1
11.	Streams and Files	1
12.	Modules and Libraries	1
13.	Problem Solving Strategies and Algorithm Design, Pseudo-code	1
14.	Introduction to Pointers and References	1
15.	Debugging Strategies, Introduction to Principles of Object-Oriented Programming	1

APPROPRIATE READINGS (Other than Textbook)

H. H. Andrew Tan, T. D'Orazio. C Programming for Engineering and Computer Science. McGraw-Hill. 1st ed. 1998

OUTSIDE ASSIGNMENTS

Types of assignments include software programming assignments that students design, implement and test.

Example programming assignments:

Problem 1: Imagine a grid of squares, like the one drawn below, with an equal number of squares in width and height. How many unique squares of any size could be outlined from the grid if the number of squares along one side was N? Well, the grid below has N=4 squares along each side. Convince yourself that we could outline 16 squares of size 1, 9 squares of size 2 (each consisting of 4 individual squares), 4 squares of

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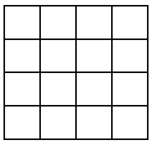
size 3 (each consisting of 9 individual squares), and 1 square of size 4 (the entire grid). The general formula for the number of unique squares that could be outlined is $F(N) = 1^2 + 2^2 + \ldots N^2$. Write a program to prompt the user for the number of squares along one side (N) and display the answer for a grid 6 squares in width and height.



Problem 2: Assume this time that the grid is A squares wide and B squares high, and A is not necessarily the same as B. If a line is drawn from the lower left corner of the grid to the upper right corner of the grid, how many individual squares will it pass through? For this problem, you must create the correct formula for the general case of A squares wide and B squares high, and then use this formula to display your answer for a grid that is 24 squares wide and 16 squares high. (Note that if the line passes precisely through the corner of a square, than it is not considered to pass through the squares to either side. For example, in the grid pictured above, the line would pass through 4 squares.) Hint: the correct formula includes the greatest common factor (gcf) of A and B.

EVALUATION

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

Sample exam question: Rewrite the code fragment below using a switch statement:

```
if (dayOfWeek == 6)
  return “hours are 9 a.m. to 6 p.m.”;
else if (dayOfWeek > 5)
  return “hours are 12 p.m. to 5 p.m.”;
else if (dayOfWeek >=1 || dayOfWeek <= 5)
  return “hours are 8 a.m. to 5 p.m.”;
else
  return “error”;
```

TEXTS AND SUPPLIES

Adopted Text: Koffman. Problem Solving and Program Design in C. 5th ed. Addison Wesley. 2007.

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

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 104 (COM EL 104) (ET 104)

CATALOG TITLE: Introduction to Robotics and Mechatronics

SCHEDULE TITLE: Intro to Robotics & Mechatronics

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 DESCRIPTION

An introduction to robotic control applications. Basic electronics including digital, analog, and microcontroller devices, sensors and transducers, and actuators will be emphasized for automation control. Topics include Basic, Assembly and C language programming for robotic control; interfacing of indicators, switches, sensors and transducers; controlling motion and motors; monitoring and measurement of rotation; measuring light, temperature and conductance; application of navigation and measurement techniques; remote control applications; mechanical systems; and the control of frequency and sound. This course is not open to students who are enrolled in or have received credit for Computer Electronics 104 or Engineering Technology 104.

SCHEDULE DESCRIPTION

Introductory hands-on course in mechatronics applying computer science, electronics, and mechanical technologies to robotics and automation. Included is the study of microcontroller systems, sensors, transducers, actuators, mechanical systems, and robotic control programming in BASIC, Assembly, and C languages. Not open to students who are enrolled in or have received credit for COM EL 104 or ET 104.

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 to microcontrollers.
3. gain hands-on experience with commonly used electronic test and measurement instrumentation.
4. create PBASIC, Assembly, and C computer language programs for robotic and automation control.
5. improve written communication skills through laboratory and project reports.
6. obtain practical experience in mechatronics by applying knowledge gained in the course through hands-on projects.

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

1. explain the concept and characteristics of a signal source.
2. select and configure proper circuits to achieve desired interfacing requirements between a signal source and a downstream device such as a microcontroller or data acquisition system.
3. explain the practical limitations of operational amplifiers and estimate the effects of these limitations on output voltage and current of the op-amp.
4. design and analyze the performance of RC low-pass and high-pass filter circuits.
5. explain the basic operation of bipolar and MOS field-effect transistors and design with them to activate solenoids, relays, motors, etc. from signal sources.
6. explain the input/output characteristics of digital logic devices and design a logic circuit that accomplishes a given task.
7. explain the underlying operational principles of servo motors.
8. determine the torque and speed requirements for a given motion control application considering system inertia, external forces or torques, and motion profiles and select an appropriate motor.
9. explain the basic structure of the BASIC Stamp2 and 68HC11 microcontrollers.
10. write PBASIC, Assembly, and C language programs to successfully perform digital input and output functions from a microcontroller port.
11. explain the common analog-to-digital-conversion (A/D) methods.
12. develop a program to successfully perform A/D conversion using the BASIC Stamp2 and 68HC11 microcontrollers.
13. explain the digital-to-analog (DAC) conversion process.
14. write programs to successfully interface analog and digital devices, such as sensors and actuators, to the BASIC Stamp2 and 68HC11 microcontrollers.
15. function effectively, as a team member, in carrying out laboratory assignments and open-ended project.
16. document, in written form, laboratory experiments and projects clearly and completely.

OUTLINE OF COURSE CONTENT AND SCOPE

	WEEKS
1. Introduction to the BASIC Stamp2 and 68HC11 Microcontollers	1
2. Introduction to PBasic, Assembly, and C language Programming	3
3. Basic Electronics for interfacing analog and digital devices with signal conditioning	3
4. Introductory elements to Motors and Controls	2
5. Introductory elements for Applied Sensors	3
6. Introductory elements of Industrial Controls	3
7. Introductory Remote Control applications for automation and robotics	1

APPROPRIATE READINGS (Other than Textbook)

1. User's manuals for software tools.
2. Manufacturer's reference and data manuals.
3. D. Alciatore. Introduction to Mechatronics and Measurement Systems. 2nd ed. McGraw Hill. 2003
4. W. Bolton. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, 3rd ed. Prentice Hall. 2003
5. J. Rehg. Industrial Electronics. Prentice Hall. 2006
6. P. Spasov. Microcontroller Technology The 68HC11 and 68HC12, 2004, Prentice Hall
7. C. Kuhnel, Basic Stamp. 2nd ed. Newnes. 2000
8. E. Wise. Applied Robotics. Prompt. 1999
9. S. Yalamanchili. VHDL A Starter's Guide. 2nd ed. Prentice Hall. 2005
10. Course's blackboard website for tutorials and supplements.

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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 the principle of electromagnetic induction.
2. Compile a list of different types of electric motors found in household devices and automobiles. Describe the reasons why you think the particular type of motor is used for each example listed.
3. Explain how to use a FOR…NEXT loop with an ON…GOSUB command to cycle through a list of subroutines.
3. When should you test subsystems individually before trying to make them work as a system? Why?

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. Design group projects, presentations, and short papers are assigned and graded for quality of research, 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 conclusion

Sample essay questions:

1. For the field of electronics, explain the interrelationships of the following circuit parameters: charge, potential difference, current, resistance, and power.
2. Explain how you access a particular element in a variable array?
3. Explain what you can do to increase or decrease the current passing through a transistor and power MOSFET devices.

TEXTS AND SUPPLIES

Adopted Text: Gilliland. The Microcontroller Applications Cookbook. Parallax, Inc. 2000.

Other Materials:
- Microcontroller Development Boards (supplied by instructor)
- Programmable Logic Device Prototyping Boards (Xilinx and Altera)
- Software Design Tools (supplied by instructor)
- Scientific Calculator
- Graph paper and normal school supplies
- Instructor handouts
- Data Storage Device (Thumb Drive)

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

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 111

CATALOG TITLE: Fundamentals of DC Circuit Analysis

SCHEDULE TITLE: Fundamentals of DC Circuit Analysis

UNITS: 1.5

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 0

TOTAL NUMBER OF WEEKS: 8 weeks

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: Math 311

ADVISORY(IES): Concurrent enrollment in EL 112

ENTRANCE SKILLS: Math 311: manipulate algebraic expressions, graph linear and quadratic equations, find inverse of a given relation, solve linear systems of equations.

CATALOG DESCRIPTION
An introductory study of the nature of electricity, the processes employed in the analysis and documentation of DC electric circuits, and the use of basic electronic testing instruments. Topics include: current, voltage, resistance and power, Ohm's law, series and parallel resistive circuits, Kirchhoff's voltage and current laws, loading effects of meters and supplies, capacitors and inductors, RC and RL time constants, applications of Kirchhoff's laws to multiple source and complex series-parallel circuits, determinants and matrices. Mesh analysis: Thevenin, Norton, superposition, manimum power transfer network theorems techniques. This course is not open to students who are enrolled in or who have received credit for Electronics 118.

SCHEDULE DESCRIPTION
An introductory study of the nature of electricity, the processes employed in the analysis and documentation of DC electric circuits, and the use of basic electronic testing instruments. Not open to students who are enrolled in or who have received credit for Electronics 118.

COURSE GOALS: to encourage and enable students to
1. learn electronic terminologies.
2. understand the basic interrelationships of electric properties.
3. comprehend atomic theories and models.
4. learn the unique critical thinking and perceptual approaches used to make decisions about electrical and electronic systems.
5. understand scientific methodology as it applies to electronics.
6. comprehend the application of support tools, such as computers and calculators, for the understanding of electrical concepts and for their uses in DC circuit analysis.

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

1. recognize common electric components and measuring instruments.
2. recite the basic structure of atoms and to recognize, at the atomic level, the characteristics of conductors, semiconductors, and insulators.
3. evaluate the interrelationships among current, voltage, resistance, and power.
4. define energy and power.
5. determine current direction in DC circuits and calculate it's value.
6. apply Kirchhoff's voltage and current laws to DC circuits.
7. design circuits for use as a voltage divider and/or current divider.
8. evaluate unbalanced bridge circuits.
9. describe the characteristics of a current source.
10. convert a current source to a voltage source (Millman's theorem).
11. apply the superposition theorem to simplify a circuit for analysis.
12. apply Thevenin's theorem to simplify a circuit for analysis.
13. apply the maximum power transfer theorem to determine the value of load resistance.
14. write circuit equations and solve circuit parameters using determinants to solve simultaneous equations and using mesh analysis to determine circuit values.
15. explain the principles of a magnetic field.
16. explain the principle of electromagnetic induction.
17. explain how a capacitor and an inductor store charge.
18. write equations for the charging and discharging curves for RC and RL circuits.
19. comprehend troubleshooting methodology and approaches for solving problems in DC circuits.

COURSE OUTLINE	**WEEKS**
1. SI Units, Atomic Structure, Engineering Notation, Basic Components	1
2. Ohm's law; Series, Parallel, and Series Parallel resistive circuit analysis	3
3. Voltage and Current sources	0.5
4. Kirchhoff's laws and Network theorems	2
5. Magnetism, Electromagnetism, Induction and Electrostatistics	0.5
6. Inductor and Capacitors in DC circuits; RC and RL time constants	1

APPROPRIATE READINGS (other than textbook)

1. Newspapers, magazines, internet resources, and owners/operators manuals.
2. Robbins, Circuit Analysis: Theory and Practice 3rd edition. Thomson Publishing. 2004.
3. Class website tutorials.

ASSIGNMENTS

Cooperative learning groups' 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. Quizzes and exams covering assigned and related topics.
5. Design projects assigned stressing application of learned concepts and theories.

Writing Assignment:

1. A relay, who's coil resistance is 250 ohms, is designed to operate at 500mA of current flow through it's coil. If the relay is operated from a 220VDC source, determine the value of the necessary dropping resistor and the amount of power it will dissipate.
2. Explain the principal of electromagnatic induction.

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.

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

2. End of chapter problems are assigned as homework and graded for accuracy.
3. Design project assigned and graded for quality of research, techniques applied and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.

Essay question: For the field of electronics, explain the interrelationships of the following circuit parameters: charge, potential difference, current, resistance, and power.

TEXTS AND SUPPLIES

Adopted Text: 1. Electronics Workbench. EWB Multisim Student Edition Lite V.9. 3rd ed. Prentice Hall. 2007
2. Electronics Workbench. EWB Multisim Student Edition Suite V.9. 4th ed. Prentice Hall. 2007

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application software (supplied by publisher/instructor)
4. Computer diskettes
5. Three-ring binder
6. Scientific calculator (i.e. Texas Instruments model 36 or equivalent).
7. Access to the internet (in the lab, library, and/or home)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 2/3/04 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	
Group	1		Discussion Board	2
Individual	3		Telephone contacts	
Other 1				

Per Semester

Orientation sessions	1		(in person)
Group meetings			(in person)
Review sessions	2		(in person)
Labs			(in person)
Testing			(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: Class orientation and via Blackboard.

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

Date Prepared: Spring 2004
Date Reviewed: Fall 2006
Date Reviewed:
PCA Established: Spring 2004

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 112

CATALOG TITLE: Fundamentals of DC Circuit Analysis Lab

SCHEDULE TITLE: Fund of DC Circuit Analysis Lab

UNITS: 1

WEEKLY LECTURE HOURS: 0

WEEKLY LAB HOURS: 6

TOTAL NUMBER OF WEEKS: 8 weeks

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: Completion of or concurrent enrollment in EL 111

ENTRANCE SKILLS:
Perform al of the objectives of EL 111: recognize common electronic components and measuring instruments; recite the basic structure of atoms and to recognize, at the atomic level, the characteristics of conductors, semiconductors, and insulators; evaluate the interrelationships among current, voltage, resistance, and power; define energy and power; determine current direction in DC circuits and calculate its value; apply Kirchhoff's voltage and current laws to DC circuits; design circuits for use as a voltage divider and/or current divider; evaluate unbalanced bridge circuits; describe the characteristics of a current source; convert a current source to a voltage source (Millman's theorem); apply the superposition theorem to circuit analysis; apply Thevenin's theorem to simplify a circuit for analysis; apply the maximum power transfer theorem to determine the value of load resistance; write circuit equations and solve circuit parameters using determinants to solve simultaneous equations and using mesh analysis to determine circuit values; explain the principles of a magnetic field; explain the principle of electromagnetic induction; explain how a capacitor and inductor stores charge; write equations for the charging and discharging curves for RC and RL circuits; comprehend throubleshooting methodology and approaches for solving problems in DC circuits.

CATALOG DESCRIPTION
Provides the student with practical experiences for the comprehension of DC electrical concept introduced in EL 111and to present the proper use of electronic test instrumentation for the measurement of circuit parameters. Safety and troubleshooting concepts are presented in each laboratory assignment.

SCHEDULE DESCRIPTION
Provides the hands-on practical experiences for the comprehension of DC electrical concepts introduced in EL 111 and present the proper use of electronic test instrumentation. Safety and troubleshooting concepts are emphasized.

COURSE GOALS: to encourage and enable students to
1. learn electronic terminologies.
2. understand the basic interrelationships of electric properties.
3. become familiar with the concepts presented in EL 111 through hands-on exposure to electronic components, circuits and testing instruments.

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

4. learn the unique critical thinking and perceptual approaches used to make decisions about electrical and electronic systems.
5. understand scientific methodology as it applies to electronics.
6. comprehend the application of support tools, such as computers and calculators, for the understanding of electrical concepts and for their uses in DC circuit analysis.
7. acquire the necessary skills for becoming an electronic technician.

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

1. demonstrate basic laboratory safety procedures.
2. identify common electronic components and measuring instruments.
3. construct DC circuits from a schematic diagram.
4. correctly measure all DC parameters, diagnose and correct malfunctions in DC electric circuits.
5. interpret measured DC parameters, diagnose and correct malfunctions in DC electric circuits.
6. design DC circuits using standard engineering practices.
7. draw graphs indicating relationships between electronic parameters.
8. determine current direction in DC circuits and calculate it's value.
9. apply Kirchhoff's voltage and current laws to DC circuits.
10. evaluate unbalanced bridge circuits.
11. apply the superposition theorem to circuit analysis.
12. apply Thevenin's theorem to simplify a circuit for analysis.
13. apply the maximum power transfer theorem to determine circuit values.
14. write circuit equations and solve circuit parameters using determinants to solve simultaneous equations and using mesh analysis to determine circuit values.
15. write equations for the charging and discharging curves for RC and RL circuits.
16. comprehend troubleshooting methodology and approaches for solving problems in DC circuits.

COURSE OUTLINE	**WEEKS**
1. SI Units, Atomic Structure, Engineering Notation, Basic Components	1
2. Ohm's law; Series, Parallel, and Series Parallel resistive circuit analysis	3
3. Voltage and Current sources	0.5
4. Kirchhoff's laws and Network theorems	2
5. Magnetism, Electromagnetism, Induction and Electrostatistics	0.5
6. Inductor and Capacitors in DC circuits; RC and RL time constants	1

APPROPRIATE READINGS (other than textbook)

1. Newspapers, magazines, internet resources, and owners/operators manuals.
2. Robbins, Circuit Analysis: Theory and Practice 3rd edition. Thomson Publishing. 2004.
3. Floyd, T. Principals of Electric Circuits. 6th edition. Prentice Hall.
4. Class website tutorials.

ASSIGNMENTS

Cooperative learning groups' projects, presentations, short papers, research and the following:

1. Readings from EL 111 lecture courses adopted text and instructor handouts.
2. Study laboratory experiments, evaluate sample problems and circuits.
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. Use computer applications to expand upon circuit analysis and comprehension.
7. Use the internet as an information resource to support topics studied in this course.
8. Design projects stressing application of learned concepts and theories.

Writing Assignment: For a three source series-parallel network, contrast Thevenin's theorem techniques with superposition theorem techniques for the solution of circuit parameters.

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

EVALUATION

1. 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 solution.
   E. procedures and data collection.
   F. end of experiment questions and conclusions.
2. A final laboratory examination evaluating students' abilities to correctly connect circuits, make circuit measurements using standard test instruments, interpret collected data to troubleshoot DC circuits and identify defective circuit component is graded for accuracy and content.
3. Written final examination emphasizing AC circuit behavior, components, and test instruments is graded for accuracy and content.

Essay question: Design a DC voltage divider circuit that will vary between 15V and 30V from a source supply of 45V. Draw a schematic diagram of your design and show all your computations. Build your circuit and record its operating parameters. Discuss/contrast any variations of design circuit parameters and measured circuit parameters.

TEXTS AND SUPPLIES

Adopted Text: 1. Electronics Workbench. EWB Multisim Student Edition Lite V.9. 3rd ed. Prentice Hall. 2007

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application software (supplied by publisher/instructor)
4. Computer diskettes
5. Three-ring binder
6. Scientific calculator (i.e. Texas Instruments model 36 or equivalent).
7. Access to the Internet (in the lab, library, and/or home)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 2/3/04 Initiator Robert Aldredge

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

Per Week

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

Per Semester

Orientation sessions	1		(in person)
Group meetings			(in person)
Review sessions	2		(in person)
Labs	2		(in person)
Testing	1		(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: Class orientation and via Blackboard.

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

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Date Prepared: Spring 2004
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PCA Established: Spring 2004

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 113

CATALOG TITLE: Fundamentals of AC Circuit Analysis

SCHEDULE TITLE: Fundamentals of AC Circuit Analysis

UNITS: 1.5

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 0

TOTAL NUMBER OF WEEKS: 8 weeks.

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: EL 111

ADVISORY(IES): Concurrent enrollment in EL 114

ENTRANCE SKILLS: Perform all of the objectives of EL 111; recognize common components and measuring instruments, recite the basic structure of atoms and to recognize, at the atomic level, the characteristics of conductors, semiconductors, and insulators, evaluate the interrelationships among current, voltage, resistance, and power. Define energy and power, determine current direction in DC circuits and calculate its value. Apply Kirchhoff's voltage and current laws to DC circuits, design circuits for use as a voltage divider and/or current divider, evaluate unbalanced bridge circuits, describe the characteristics of a current source, convert a current source to a voltage source (Millman's theorum), apply the superposition theorem to circuit analysism, apply Thevenin's theorem to simplify a circuit for analysis, apply the maximum power transfer theorem to determine the value of load resistance, write ciruit equations and solve circuit parameters using theorem to determine the value of load resistance, write circuit equations and solve circuit parameters using determinants to solve simultaneous equations and using mesh analysis to determine circuit values, explain the principles of a magnetic field, explain the principle of electromagnetic induction, explain how a capacitor and an inductor stores charge, write equations for the charging and discharging curves for RC and RL circuits, comprehend troubleshooting methodology and approaches for solving problems in DC circuits.

CATALOG DESCRIPTION
An introductory study of the nature of electricity; the processes employed in the analysis and documentation of AC electric circuits. Topics include: AC current and voltage, sinusional waveforms, phasors and use of the J operator (complex numbers); reactance and admittance; RC, RL and RLC circuits, resonance, filters, circuit theorems in AC analysis and the use of basic electronic testing instruments.

SCHEDULE DESCRIPTION
An introductory study of the nature of electricity, the processes employed in the analysis and documentation of AC electric circuits, and the use of basic electronic testing instruments.

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

COURSE GOALS: to encourage and enable students to

1. learn electronic terminologies.
2. understand the basic interrelationships of AC electric properties.
3. learn the unique critical thinking and perceptual approaches used to make decisions about AC electrical and electronic systems.
4. understand scientific methodology as it applies to AC electronics.
5. comprehend the application of support tools, such as computers and calculators, for the understanding of electrical concepts and for their uses in AC circuit analysis.

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

1. recognize common electronic components and measuring instruments.
2. identify a sinusoidal waveform and measure its characteristics.
3. describe how sine waves are generated.
4. determine the various voltage and current values of a sine wave (measurement quantities).
5. describe angular relationships of sine waves.
6. find instantaneous values using the sine waves.
7. apply the basic circuit laws (Ohm's and Kirchhoff's) to AC resistive, RC, and RL circuits.
8. identify the characteristics of basic nonsinusoidal waveforms.
9. use a phasor to represent a sine wave.
10. use complex numbers to express phasor quantities.
11. describe the basic construction and characteristics of a capacitor and of an inductor.
12. analyze series and parallel combination of capacitors and inductors in AC circuits.
13. explain mutual inductance and how a transformer is constructed and how it operates.
14. determine the effect of a resistive load across the secondary winding of a transformer.
15. describe the relationship between current and voltage in RC, RL, and RLC circuits.
16. determine the impedance, phase angle, and power in series, parallel, series-parallel, series-parallel, RC, RL, and RLC circuits.
17. describe how RC, RL circuits operate as a filter.
18. analyze a circuit for series and parallel resonance.
19. determine the bandwidth of resonant circuits, define half-power frequency, Q, and selectivity.
20. analyze low-pass, high-pass, band-pass, and notch filters, determine critical frequencies, roll-offs, and generate Bode plots.
21. apply the superposition, theorems to AC circuit analysis.
22. apply the Thevenin's theorem to simplify AC circuits for analysis.
23. apply the maximum power transfer theorem to AC circuits for analysis.
24. comprehend troubleshooting methodology and approaches for solving problems in AC circuits.

COURSE OUTLINE	**WEEKS**
1. Introduction to alternating current and voltage, Ohm's and Kirchhoff's Laws	1
2. Phasors and complex numbers	1
3. Capacitator and inductors in AC circuits	1
4. RC and RL circuits; series, parallel, and series-parallel	2
5. RLC circuits and resonance	1
6. Low-pass, high-pass, band-pass, and band-stop filters	1
7. Circuit theorems in AC circuits 1	

APPROPRIATE READINGS (other than textbook)

1. Newspapers, magazines, internet resources, and owners/operators manuals
2. Robbins. Circuit Analysis: Theory and Practice, 3rd edition. Thomson Publishing. 2004.
3. Class websites for tutorials

ASSIGNMENTS

Cooperative learning groups' 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.

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

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. Quizzes and exams covering assigned and related topics.
5. Design projects stressing application of learned concepts and theories.

Writing assignment: Describe the relationship between current voltage in RC, RL and RLC circuits.

EVALUATION

1. Comprehensive written examinations for each major study area. Exams will include problem solving techniques and word 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. Design project is graded for quality of research, techniques applied, and for proper engineering practices.
4. Comprehensive final exam. Exam graded for accuracy and applied techniques.

Essay Question: For the field of electronics, explain the interrelationships of the following AC circuit parameters: potential difference, current, resistance, inductive reactance, capacitive reactance, impedance, and power (real and reactive).

TEXTS AND SUPPLIES

Adopted Text:
1. Electronics Workbench. EWB Multisim Student Edition Lite V.9. 3rd ed. Prentice Hall. 2007
2. Electronics Workbench. EWB Multisim Student Edition Suite V.9. 4th ed. Prentice Hall. 2007

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application software (supplied by publisher/instructor)
4. Computer diskettes
5. Three-ring binder
6. Scientific calculator (i.e. Texas Instruments model 36 or equivalent).
7. Access to the internet (in the lab, library, and/or home)

ACADEMIC POLICY AND PLANNNG COMMITTEE
DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 2-3-04 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	
Group	1		Discussion Board	2
Individual	3		Telephone contacts	
Other 1				

Per Semester

Orientation sessions	1		(in person)
Group meetings			(in person)
Review sessions	2		(in person)
Labs			(in person)
Testing			(in person)
Other (Identify)			

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes

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

6. On-line services: Class orientation and via Blackboard.

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

Date Prepared: Spring 2004
Date Reviewed: Fall 2006
Date Reviewed: ____________
PCA Established: Spring 2004

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 114

CATALOG TITLE: Fundamentals of AC Circuit Analysis Lab

SCHEDULE TITLE: Fund of AC Circuit Analysis Lab

UNITS: 1

WEEKLY LECTURE HOURS: 0

WEEKLY LAB HOURS: 6

TOTAL NUMBER OF WEEKS: 8 weeks.

GRADING OPTION: Credit/No Credit Option

PREREQUISITE: EL 112 and completion of or concurrent enrollment in 113.

ENTRANCE SKILLS: Perform all of the objectives of EL 112: demonstrate basic laboratory safety procedures; identify common electronic components and measuring instruments; construct DC circuits from a schematic diagram; correctly measure all DC parameters in resistive circuits using standard test instruments; interpret measured DC parameters, diagnose and correct malfunctions in DC electronic circuits; design DC circuits using standard engineering practices; draw graphs indicating relationships between electronic parameters; determine current direction in DC circuits and calculate its value; apply Kirchhoff's voltage and current laws to DC circuits; evaluate unbalanced bridge circuits; apply the superposition theorem to circuit analysis; apply Thevenin's theorem to simplify a circuit for analysis, apply the maximum power transfer theorem to determine the value of load resistance, write circuit equaltions and solve circuit parameters using determinants to solve simultaneous equations and using mesh analysis to determine circuit values, write equations for the charging and discharging curves for RC and RL circuits, comprehend troubleshooting methodology and approaches for solving problems in DC circuits.

CATALOG DESCRIPTION
Provide the student with practical experiences for the comprehension of AC electrical concepts introduced in EL 113 (Fundamentals of AC Circuit Analysis) and to present the proper use of electronic test instrumentation for the measurement of circuit parameters. Safety and troubleshooting concepts are presented in each laboratory assignment.

SCHEDULE DESCRIPTION
Provides the hands-on practical experiences for the comprehension of AC electrical concepts introduced in EL 113 and presents the proper use of electronic test instrumentation. Safety and troubleshooting concepts are presented in each laboratory assignment.

COURSE GOALS: to encourage and enable students to
1. learn electronic terminologies.
2. understand the basic interrelationships of electric properties.
3. become familiar with the concepts presented in EL 113 through hands-on exposure to electronic components, circuits and testing instruments.

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

4. learn the unique critical thinking and perceptual approaches used to make decisions about electrical and electronic systems.
5. understand scientific methodology as it applies to electronics.
6. comprehend the application of support tools, such as computers and calculators, for the understanding of electrical concepts and for their uses in AC circuit analysis.
7. acquire the necessary skills for becoming an electronic technician.

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

1. demonstrate basic laboratory safety procedures.
2. identify common electronic components and measuring instruments.
3. identify a sinusoidal waveform and measure its characteristics.
4. describe how sine waves are generated.
5. determine the various voltage and current values of a sine wave (measurement quantities).
6. describe angular relationships of sine waves.
7. find instantaneous values using the sine waves.
8. apply the basic circuit laws (Ohm's and Kirchhoff's) to AC resistive, RC, and RL circuits.
9. identify the characteristics of basic nonsinusoidal waveforms.
10. use a phasor to represent a sine wave.
11. use complex numbers to express phasor quantities.
12. describe the basic construction and characteristics of a capacitor and of an inductor.
13. analyze series and parallel combination of capacitors and inductors in AC circuits.
14. explain mutual inductance and how a transformer is constructed and how it operates.
15. determine the effect of a resistive load across the secondary winding of a transformer.
16. describe the relationship between current and voltage in RC, RL, and RLC circuits.
17. determine the impedance, phase angle, and power in series, parallel, series-parallel, series-parallel, RC, RL, and RLC circuits.
18. describe how RC, RL circuits operate as a filter.
19. analyze a circuit for series and parallel resonance.
20. determine the bandwidth of resonant circuits, define half-power frequency, Q, and selectivity.
21. analyze low-pass, high-pass, band-pass, and notch filters, determine critical frequencies, roll-offs, and generate Bode plots.
22. apply the superposition, theorems to AC circuit analysis.
23. apply the Thevenin's theorem to simplify AC circuits for analysis.
24. apply the maximum power transfer theorem to AC circuits for analysis.
25. comprehend troubleshooting methodology and approaches for solving problems in AC circuits.

COURSE OUTLINE	**WEEKS**
1. Introduction to alternating current and voltage, Ohm's and Kirchhoff's Laws	1
2. Phasors and complex numbers	1
3. Capacitator and inductors in AC circuits	1
4. RC and RL circuits; series, parallel, and series-parallel	2
5. RLC circuits and resonance	1
6. Low-pass, high-pass, band-pass, and band-stop filters	1
7. Circuit theorems in AC circuits	1

APPROPRIATE READINGS (other than textbook)

1. Newspapers, magazines, internet resources, and owners/operators manuals
2. Robbins. Circuit Analysis: Theory and Practice, 3rd edition. Thomson Publishing. 2004.
3. Floyd, T. Principles of Electric Circuits. 6th edition. Prentice Hall. 2003.
4. Class websites for tutorials

ASSIGNMENTS

Cooperative learning groups' projects, presentations, short papers, research and the following:

1. Readings from EL 113 lecture courses adopted text and instructor handouts.
2. Study laboratory experiments, evaluate sample problems and circuits.
3. Mathematically evaluate the operation of each experimental circuit.

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

4. Draw a component diagram for each experimental circuit.
5. Answer a series of questions designed to that students can express in writing the conclusions they have developed from performing each experiment.
6. Use computer applications to expand upon circuit analysis and comprehension.
7. Use the internet, as an information resource, to support topics studied in this course.
8. Design projects assigned stressing application of learned concepts and theories.

Writing sample: In a series RC circuit, the true power is 2 W, and the reactive power is 3.5 VAR. Determine the apparent power. Explain the reason for determining apparent power and contrast true power and reactive power.

EVALUATION

1. 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.
2. A final laboratory examination evaluating students' abilities to correctly connect circuits, make circuit measurements using standard test instruments, interpret collected data to troubleshoot AC circuits and identify defective circuit component is graded for accuracy and content.
3. Written final examination emphasizing AC circuit behavior, components, and test instruments is graded for accuracy and content.

Essay Question: Explain the electronic operation of a capacitor when it is excited by a 300 Hz wave form.

TEXTS AND SUPPLIES

Adopted Text: 1. Electronics Workbench. EWB Multisim Student Edition Lite V.9. 3rd ed. Prentice Hall. 2007

Other Materials:
1. Graph paper and normal school supplies
2. Instructor handouts
3. Computer application software (supplied by publisher/instructor)
4. Computer diskettes
5. Three-ring binder
6. Scientific calculator (i.e. Texas Instruments model 36 or equivalent).
7. Access to the internet (in the lab, library, and/or home)

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 2/3/04 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	
Group	1		Discussion Board	2
Individual	3		Telephone contacts	
Other 1				

Per Semester

Orientation sessions	1		(in person)
Group meetings			(in person)
Review sessions	2		(in person)
Labs	2		(in person)

Testing	1		(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: class orientation and via Blackboard.

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

Date Prepared:__________
Date Reviewed: Fall 2002
Date Reviewed: Spring 1996
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. EL 122 Catalog Title Electronic Devices and Circuits

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

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Letter Grade Only

Prerequisites: EL 118 and EL 119. Advisory: Concurrent enrollment in EL 123.

Entrance Skills: explain the application of atomic theory to electronics; correctly analyze and solve electronic circuits; express in writing the relationship between electricity and magnetism; describe in writing the construction, operation, and purpose of resistors, potentiometers, switches, fuses, capacitors, inductors and batteries; identify the average, effective, peak, peak-to-peak values of AC waveforms; predict the frequency and period of AC waveforms; identify defects in DC and AC circuits; interpret circuit parameters, diagnose and correct malfunctions in electronic circuits; design DC and AC circuits using standard engineering practices; develop graphs indicating relationships of electronic parameters; evaluate the operation and circuit parameters for all experimental circuits.

CATALOG DESCRIPTION
Introductory study of semiconductor devices and systems. A detailed analysis of: Diodes, BJT's and FET's, biasing techniques, active circuits, thyristors and optoelectronic components, and linear integrated circuits.

COURSE GOALS: To encourage and enable students to
1. maintain proficiency within a rapidly changing technology.
2. learn the basic characteristics of semiconductor devices used in electronics.
3. develop an understanding of integrated circuit operation.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to
1. describe the electrical characteristics of semiconductor materials.
2. explain in writing how semiconductor devices operate.
3. differentiate the schematic symbols that are used to represent a wide variety of semiconductor devices.
4. interpret device specifications using manufactures data sheets.
5. analyze transistor amplifier circuits, describe their operation and list the characteristics for each.
6. identify and explain the operation of power supply rectifiers, filters, and regulation circuits.
7. evaluate the effects of negative and positive feedback on integrated circuits.
8. analyze the basic operation of common linear integrated circuit systems.

COURSE OUTLINE

	WEEKS
1. Semiconductor Materials, Diodes and Applications	2
2. Transistors and Thyristors	2
3. Amplifiers and Oscillators	2
4. Operational Amplifiers	2
5. Op-amp Responses	1
6. Basic Op-amp Circuits	2
7. Active Filters	2
8. Signal Generators and Timers	1
9. Power Supplies	2

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

APPROPRIATE READINGS (Other than Textbook)

1. Frederiksen, Thomas. Intuitive IC Op Amps. National Semiconductor Tech Series 1, 1984.
2. Intusoft Newsletter. Intusoft Newsletter Series. Current issues.
3. IS-Spice Home Page. Internet address:

ASSIGNMENTS

1. Readings from adopted text and instructor handouts on selected topics, evaluate sample problems, 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 certain transistor has an I_C = 25mA and an I_B = 200 μA. Determine β_{dc}.
2. Explain the importance of evaluating phase margin in a high frequency linear amplifier.

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

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 questions:

1. Describe the overall operation of the circuit and the function of each component. In discussing the general operation and basic purpose of each component, make sure you identify the negative feedback loop, the type of op-amp configuration, which component determine the voltage gain, which components set the loer critical frequency, and the purpose of each of the capacitors. Use the results of Activity 2 when appropriate.

TEXTS AND SUPPLIES

Adopted text: Floyd. Electronic Devices (Electron Flow Version). 5th Edition. Prentice Hall

Other materials: 1. Scientific calculator.
2. Graph paper and normal school supplies.
3. Instructor handouts.
4. Computer application programs.
5. Computer data diskettes.

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

Date Prepared: Spring 1988
Date Reviewed: Fall 2005
Date Reviewed: Fall 2006
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. EL 123 Catalog Title Electronic Devices and Circuits Laboratory

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

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Letter Grade Only

Prerequisites: EL 118, EL 119, and completion of or concurrent enrollment in EL 122.

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

CATALOG DESCRIPTION
Provides the opportunity for the student to apply theoretical semiconductor concepts in a laboratory environment. Major areas of emphasis: Diodes, BJT, FETs, Thyristers, optoelectronic components, and linear integrated circuits.

COURSE GOALS: To encourage and enable students to
1. apply theory learned in companion lecture courses.
2. synthesize data into useful information in order to derive meaningful conclusions.
3. grasp the significance that all electronic instruments are limited in their applications to testing components and circuits.

INSTRUCTIONAL OBJECTIVES: At the end of the course, students will demonstrate the ability to
1. determine component types and lead or pin indentifications.
2. interpret semiconductor manufactures data sheets and characteristics curves.
3. operate semiconductor testers and curve tracers.
4. design properly biased transistor or linear amplifier circuits.
5. construct a circuit and collect the necessary measurements required to determine voltage, current and power gains, input and output impedances, and frequency response.
6. design and construct linear integrated circuits.

COURSE OUTLINE

	WEEKS
1. Introduction to Laboratory Equipment	1
2. Diode Circuits	2
3. Transistor Testing and Biasing	2
4. Transistor Circuits	2
5. Amplifier Frequency Response and Bode Plots	1
6. Thyrister and Optoelectronic Devices	1
7. Operational Amplifiers	1
8. Operational Amplifier Circuits	4
9. Signal Generators and Timers	1
10. Power Supplies	1

APPROPRIATE READINGS (Other than Textbook)
1. Frederiksen, Thomas. Intuitive IC Op Amps. National Semiconductor Tech Series 1, 1984.
2. Intusoft Newsletter. Intusoft Newsletter Series. Current issues.
3. IS-Spice Home Page. Internet address:

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

ASSIGNMENTS

1. Study laboratory experiments, evaluate sample problems and circuits.
2. Participate in post-lab evaluation discussion.
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. Is the input and output signal voltage of the common collector circuit in phase? Explain your answer.
2. What is the voltage gain of a non-inverting opamp with a feedback resistor RF of 10 kohms and an R1 of 2.2 kohms.

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:

1. Describe the overall operation of the circuit and the function of each component. In discussing the general operation and basic purpose of each component, make sure you identify the negative feedback loop, the type of op-amp configuration, which component determine the voltage gain, which components set the lower critical frequency, and the purpose of each of the capacitors. Use the results of Activity 2 when appropriate.

TEXTS AND SUPPLIES

Adopted text: Berube. Computer Simulated Experiments for Electronic Devices Using Electronic Workbench. 3rd ed. Prentice Hall. 2003

Other Materials:
1. Scientific calculator
2. Graph paper and normal school supplies
3. Instructor handouts
4. Computer data diskettes
5. Electronic parts and protoboards

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 10/11/2005 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	
Group	1		Discussion Board	2
Individual	2		Telephone contacts	
Other 1 office hour				

Per Semester

Orientation sessions	2		(in person)
Group meetings	As needed		(in person)
Review sessions	As needed		(in person)
Labs			(in person)
Testing			(in person)
Other (Identify)	1		

3. Adjustments to assignments: None
4. Adjustments to evaluation: None
5. Accessible to students with disabilities: Yes
6. On-line services: in person class orientation session and through announcements via blackboard.

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

Date Prepared: Spring 1988
Date Reviewed: Fall 2007
Date Reviewed: Spring 2006
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 125

CATALOG TITLE: Digital Devices and Circuits

SCHEDULE TITLE: Digital Devices and Circuits

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS:

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Electronics 118 and Electronics 119

ENTRANCE SKILLS The student must have the ability to:
1. correctly analyze and solve electronic circuits.
2. identify the average, effective, peak, peak-to-peak values of AC waveforms.
3. predict the frequency and period of AC waveforms
4. interpret circuit parameters
5. design DC and AC circuits using standard engineering practices.
6. develop graphs indicating relationships of electronic parameters.

CATALOG DESCRIPTION
Study of modern logic devices, circuits, and design techniques. Emphasizing logic families, implementation of devices, combinational and sequential logic circuits, number systems and codes, A/D and D/A conversion, ALU's, digital computer math techniques, memories, system design, and troubleshooting practices.

COURSE GOALS To encourage and enable students to:
1. comprehend the terminologies, devices and standard circuits of modern digital electronics.
2. learn defect analysis techniques to logic circuits and networks.
3. gain the necessary knowledge of digital system to be competitive in the job market.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. model digital circuits using Boolean algebra.
2. derive an equivalent logic circuit from a Boolean expression.
3. design and analyze counters, registers, and dividers using bi-stable devices.
4. properly interface logic families that have different operational parameters.
5. design logic systems for a stated problem using standard engineering practices.
6. analyze logic systems to determine their operating parameters.

COURSE OUTLINE

	WEEKS
1. Basics of Logic Devices and IC Technologies	2

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

2.	Number Systems and Codes	1
3.	Boolean Algebra and Mapping Techniques	2
4.	Combinational Logic and Functions	3
5.	Bi-stable Devices, Circuits and Applications	3
6.	Registers and Memories	2
7.	Interfacing and Data Transmission	2
8.	Arithmetic Processes	2

APPROPRIATE READINGS (Other than Textbook)

1. Fletcher, W. An Engineering Approach to Digital Design. Prentice-Hall. l980.
2. Greenfield, J. Practical Digital Design Using IC's. Wiley. l983.
3. Roth, C. Fundamentals of Logic Design. West. l985.

OUSIDE 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. Design projects assigned stressing application of learned concepts and theories.

Sample Assignments:

1. Design the logic circuits required to produce and interrupt control signal to a computer system that monitors a series of traffic lights used at an intersection for malfunctioning conditions.
2. Determine the binary code output of the three-bit simultaneous A/D converter for the analog input signal in figure 11-22 and the sampling pulses shown. Vref = +l8V.
3. Explain the differences between totem-pole outputs and open-collector outputs. Use schematic diagrams to support your answer.

EVALUATION

1. Comprehensive written examinations for each major study area. Exams are to include problem solving techniques and word type problems. These examinations will be 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 questions:

1. Explain the advantages of data lock-out flip-flops compared to edge-triggered devices.
2. Which interface requires additional circuitry, CMOS to TTL or TTL to CMOS. What is required and why?

TEXTS AND SUPPLIES

Adopted text: Floyd, T. Digital Fundamentals. Prentice Hall. 2006.

Other Materials:
1. Scientific calculator.
2. Graph paper and normal school supplies.
3. Instructor handouts.
4. Computer application programs.
5. Computer data diskettes.
6. Three 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 9/3/04 Initiator Bob Alldredge

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

2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	
Group	1		Discussion Board	2
Individual	2		Telelphone contacts	As needed
Other Fax homework & exams; attend office hour or group tutorial sessions if necessary				

Per Semester

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

3. Adjustments to assignments: No adjustments will be made

4. Adjustments to evaluation: None

5. Accessible to students with disabilities: Yes

6. On-line services: In-person orientation session and through announcements via Blackboard.

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

Date Prepared: Spring 1988
Date Reviewed: Spring 2006
Date Reviewed: Fall 2007
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 126

CATALOG TITLE: Digital Devices and Circuits Lab

SCHEDULE TITLE: Digital Devices and Circuits Lab

UNITS: 2

WEEKLY LECTURE HOURS:

WEEKLY LAB HOURS: 6

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter Grade Only

PREREQUISITE(S): Electronics 118 and Electronics 119

ADVISORY: Completion of or concurrent enrollment in Electronics 125.

ENTRANCE SKILLS The student must have the ability to:
1. correctly analyze and solve electronic circuits.
2. identify the average, effective, peak, peak-to-peak values of AC waveforms.
3. predict the frequency and period of AC waveforms
4. interpret circuit parameters
5. design DC and AC circuits using standard engineering practices.
6. develop graphs indicating relationships of electronic parameters.

CATALOG DESCRIPTION
Digital electronics laboratory designed to parallel Digital Devices and Circuits (EL 125). Emphasis in this lab course is placed upon device operation in circuits and networks, and upon the proper use of standard digital logic test instruments used in the process of troubleshooting and verifying proper circuit operations.

COURSE GOALS To encourage and enable students to:
1. properly use modern testing instruments to analyze logic circuits and networks.
2. apply theory learned in companion lecture courses.
3. synthesize data into useful information in order to derive meaningful conclusions.
4. implement their logic designs, verify proper operation of designed circuits.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. construct a logic circuit from a schematic diagram using digital logic integrated circuits.
2. test and analyze constructed logic circuits for proper operating parameters.
3. use modern testing instruments to gather information necessary in defect analysis of logic circuits.
4. design logic circuits and networks to solve assigned projects using standard engineering practices.

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

COURSE OUTLINE

		WEEKS
1.	Basic of Logic Devices and IC Technologies	2
2.	Number Systems and Codes	1.5
3.	Boolean Algebra and Mapping	2.5
4.	Combinational Logic and Functions	3
5.	Bi-stable Devices, Circuits and Applications	3
6.	Registers and Memories	2
7.	Interfacing and Data Transmission Techniques	2
8.	ALU's	1

APPROPRIATE READINGS (Other than Textbook)
1. Fletcher, W. An Engineering Approach to Digital Design. Prentice-Hall. l980
2. Greenfield, J. Practical Digital Design Using IC's.
3. Roth, C. Fundamentals of Logic Design. West. l985

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

Sample assignments:
1. Does your predicted timing diagram for figure 14-2 agree with the timing diagram captured by your logic analyzer?
2. If the input clock frequency into two cascaded 7490A's is 8kHz, what will the output frequency be at output Qd of the first 7490A? At the Qd output of the second 7490A?

EVALUATION
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. Midterm 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 test questions:
1. Explain the advantages and difficulties of using a data selector for the implementation of combinational logic designs.
2. Explain the processes required to implement 9's and 10's complementation when using BCD arithmetic.

TEXTS AND SUPPLIES

Adopted text: Buchla. Experiments in Digital Fundamentals with VHDL. 1st ed. Prentice Hall 2003.

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

For Distance Learning Sections only:
Adopted Text: Berube. Computer Simulated Experiments for Digital Electronics Using Electronics. Workbench. 2nd ed. Prentice Hall. 2005.

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

ACADEMIC POLICY AND PLANNNG COMMITTEE

DISTANCE LEARNING COURSE STATUS

Date Approved for Distance Learning 9/3/04 Initiator Bob Alldredge

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

2. Instructor-student Contact

Per Week

	No.			No.
e-mail communication			Chatroom	
Group	1		Discussion Board	2
Individual	2		Telephone contacts	As needed
Other Fax homework & exams; attend office hour or group tutorial sessions if necessary				

Per Semester

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

3. Adjustments to assignments: No adjustments will be made

4. Adjustments to evaluation: None

5. Accessible to students with disabilities: Yes

6. On-line services: In-person orientation session and through announcements via Blackboard.

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

Date Prepared:____________
Date Reviewed: Fall 2004
Date Reviewed: Fall 2006
PCA Established: Fall 2004

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **MATHEMATICAL SCIENCES**

PREFIX & NO.: EL 146

CATALOG TITLE: Electronic Product Design, Fabrication and Documentation

SCHEDULE TITLE: Elect Product Design & Fabrication

UNITS: 2

WEEKLY LECTURE HOURS: 1

WEEKLY LAB HOURS: 3

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Credit/No Credit Option

PREREQUISITE(S): EL 122 or EL 125

ENTRANCE SKILLS The student must have the ability to
1. analyze project designs using standard breadboarding techniques.
2. identify electronic components and symbols.
3. differentiate the schematic symbols that are used to represent a wide variety of semiconductor, reactive, and passive electronic devices.
4. interpret device specifications using manufactures data sheets; analyze circuits, describe their operation, and list characteristics for each.

CATALOG DESCRIPTION
A study of product fabrication emphasizing mechatronic applications and designs. Topics include: the design process; CADD drawings, schematics diagrams, and support graphic requirements; printed circuit board layout and population techniques; technical writing; project documentation requirements; surface mount technologies; prototyping; printed circuit board testing, troubleshooting, and final documentation emphasizing hands-on experiences. The use of industry standard computer aided drafting and support software will be studied and utilized in all phases of documentation through camera ready artwork.

SCHEDULE DESCRIPTION
A study of mechatronic applications and design product fabrication techniques. Topics include: design process, CADD applications, prototyping, fabrication, surface mount technologies, PC board layout and population, documentation, testing, troubleshooting, using hands-on experiences.

COURSE GOALS To encourage and enable students to:
1. apply industry standard safety procedures.
2. maintain proficiency within a rapidly changing technology.
3. design mechatronic electronic products that meet standard manufacturing requirements.
4. understand the use of software products to create the required documentation to support manufacturing processes.
5. understand the scientific methodology used in the development of microcontroller based systems for use in mechatronics.

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. evaluate and interpret the five-stage design and fabrication process.
2. explain what electrical shock is, and how it can affect your heart.
3. describe how to avoid safety problems when working with power tools.
4. discuss environmental concerns with regard to product design and development.
5. select and acquire electronic components.
6. create design drawings that are required to illustrate system operation, circuit function, and packaging concepts.
7. apply computer-based design tools to design, simulate, and analyze electronic circuits.
8. identify likenesses and differences between mechanical, architectural, and electronic drawings.
9. develop the 10-drawing set needed to design and fabricate working prototype projects.
10. write proper technical documents and outlines to support working prototype projects.
11. explain the differences between breadboarding, prototyping, and production.
12. identify factors to consider in creating computer-generated PC board artwork.
13. create a photoresist pattern on the PC board.
14. explain how PC boards are manufactured in industry.
15. produce PC assembly drawings.
16. cut, drill, and punch sheet metal and plastic patterns.
17. produce wiring diagrams.
18. produce the final packaging drawing.
19. assemble the final prototype project.
20. explain the four basic testing and troubleshooting steps.
21. perform preliminary, operational, and performance tests on prototype projects.
22. develop troubleshooting flowcharts.
23. write a Test Results document.
24. write a Summary and Recommendations document.
25. compile the final prototype project report.
26. describe the many advantages of designing with surface mount technologies (SMT).
27. describe automatic SMT assembly using flow soldering.

OUTLINE OF COURSE CONTENT AND SCOPE

	WEEKS
1. Safety and Environmental Concerns	.5
2. The Design Process	.5
3. Schematic and Fabrication Drawings	1
4. Technical Writing	1
5. Experimentation and Breadboarding Designs	1
6. Surface Mount Technologies and Techniques	1
7. Prototyping PC Board Design	2
8. Prototyping PC Board Fabrication	3
9. Prototyping Final Assembly and Project Packaging	3
10. Testing, Troubleshooting, and Final Documentation	3

APPROPRIATE READINGS

1. Shimizu, Electronic Fabrication, 2nd edition, Delmar, 2002.
2. Department of Defense, Military Standards for Printed Wiring to Electronic Equipment, Department of Defense, online publication.
3. Manufacture Product Reference and Applications Manuals. (available in EL Labs).
4. Internet resources.

OUTSIDE ASSIGNMENTS

1. Read and study adopted textbook including all appendices. Evaluate sample problems in each chapter.
2. End-of-chapter problems assigned as homework.
3. Read and study instructor handouts.
4. Research data books and manuals for information required for drawings and projects.
5. Design and produce drawings and products from written and verbal instructions.

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

6. Drawing and art-work assignments will be produced using CAD equipment.
7. Use computer based software as a tool for the analysis of circuit designs.
8. Hands-on student projects are assigned for laboratory experiences.
9. Student selected final project.

Sample Assignment:
Using CADD software draw a well-proportioned schematic of a Wein Bridge Sine Wave Oscillator; include all component values, reference designators and footnotes.

Sample Writing Assignment:
You're an electronics technician working at a small electronics contract manufacturing firm. The company employs 25-30 assemblers to stuff printed circuit boards with electronic components.

The personnel turnover rate in the assembly area is high, and new hires tend to be inexperienced and lacking in electronic component familiarity. An assembler needs to have a series of Electronic Component Physical Description Sheets depicting and describing the physical characteristics of each component to be installed. The purpose of each sheet is to allow the assembler to quickly and accurately identify the correct electronic component, determine its electrical value, know if it has polarity, and recognize the special physical characteristics affecting its selection and proper installation. With a three-ring binder of individual Electronic Component Physical Description Sheets close at hand, the assembler will be greatly aid in performing his or her assembly job.

Your assignment is to prepare an Electronic Component Physical Description Sheet. Pick any component. Consider the sample sheet as a guide only (pg 95 of textbook). Feel free to structure your sheet in any way you determine is most effective in helping the assembler identify an electronic component and install it in the correct manner.

EVALUATION
1. Comprehensive exam for each major study area, written and/or practical project, will be graded for accuracy and techniques used in the solution of the problems.
2. End of chapter questions and problems will be graded.
3. Design problems will be graded for techniques used in their solution and also for proper engineering practices.
4. Student projects will be graded for techniques used in their solutions and for proper engineering practices. All projects must meet industry standards.
5. Mid-term project assigned by the instructor will be graded.
6. Effective use of CAD equipment will be looked for in each project and drawing.
7. Final examination will consist of a project selected by the student and a comprehensive exam covering material from all major study areas. Project and written exam will be graded for accuracy and to standards set by industry. The student keeps his/her final project.

Sample Evaluation Problems that requires student to think independently and write:
What important characteristic does documentation have that is of great importance to the designer and manufacturer? Why?

TEXTS AND SUPPLIES
Adopted Text: Electronics Workbench. EWB Multisim Student Edition Life V.9. 3rd ed. Prentice Hall. 2007

Other Materials:
1. Manufacture data and reference manuals
2. Graph paper
3. Instructor handouts
4. Hardware development boards
5. Blank floppy diskettes
6. Scientific Calculator

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

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

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

DEPARTMENT: **INDUSTRIAL TECHNOLOGY**

PREFIX & NO.: ET 140

CATALOG TITLE: Engineering Drawing

SCHEDULE TITLE: Engineering Drawing

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(S): Engineering Technology 100

ENTRANCE SKILLS The student must have 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.
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.

CATALOG DESCRIPTION
The principles and application of engineering drawing, including orthographic projections, freehand sketching, pictorial drawings, engineering lettering, dimensioning, sections, auxiliary, surface finish, standard and geometric tolerancing, threads, and fasteners are the core of this course. A computer aided drafting system (CADD) will be used extensively by the student to complete the requirements of this class.

COURSE GOALS To encourage and enable students to:
1. develop skills in technical drawing and develop an understanding of drafting as a means of communicating engineering information.
2. develop special skills in drafting that should lead to employment.
3. prepare for a career in engineering and related fields.
4. become familiar with the skills to develop multiview drawings of parts and assemblies using orthographic projections.
5. recognize the conventions of graphical language and use them correctly in preparing engineering drawings.
6. carry a simple design project to completion.

INSTRUCTIONAL OBJECTIVES At the end of the course, students will demonstrate the ability to:
1. use freehand sketching to convey a technical idea or concept.
2. use a CADD system to develop and produce working drawings to current industrial standards.

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

3. use a CADD system to:
   A. create, store, and retrieve "parts" from a CADD library.
   B. construct a working drawing using multiviews, pictorials, sections, and auxiliary views.
   C. dimension and tolerance working drawings to current industrial standards.
   D. place geometric tolerances and symbols to engineering drawings.

COURSE OUTLINE

		WEEKS
1.	Orthographic Projection	3
2.	Freehand Sketching	2.5
3.	Pictorial Drawings	1
4.	Lettering	.5
5.	Dimensioning	1
6.	Sectioning	1
7.	Auxiliary Views	.5
8.	Surface finish	.5
9.	Standard Tolerancing	2
	A. fit between mating parts	
	B. specification of tolerances	
	C. American National Standards	
	D. accumulation of Tolerances	
10.	Geometric Tolerancing	2
11.	Threads and Fasteners	2

APPROPRIATE READINGS (Other than Textbook)

1. ANSI Standards:
   Dimensioning and Tolerancing. (Yl4.5). 1994.
   Screw Threads. (Y14.6). l989.
   Surface Texture Symbols. (Y14.36). l996.
2. Oberg, Johns, and Horton. Machinery's Handbook. 20th ed or newer edition. Industrial Press.

OUTSIDE ASSIGNMENTS

A variety of drafting projects are assigned each student. These projects are selected in a manner to fulfill the goals and objectives of the course. The drawings require design considerations, current methodology used in an engineering drawing, ANSI Y l4.5M Standards, tolerancing, and the assembly of closely fitted parts.

EVALUATION

Each student will prepare a portfolio of their work and maintain a drafting log. The majority of the semester grade is based on the quality/quantity of the work (presented in the portfolio) and progress made during the semester. The remaining portion of the grade will be comprised of quizzes, tests and the final exam.

Sample Test Question:
Give the proper ANSI Y14.5M symbol for the following: at maximum material condition, regardless of feature size, reference dimension, counterbore/spotface, and spherical radius.

TEXTS AND SUPPLIES

Adopted text:
1. Goetsch, Chalk, Nelson. Technical Drawing. 4ed. Delmar. 2000
2. Madsen. Geometric Dimensioning and Tolerancing. Goodheart-Wilcox. 2003

Other Materials: USB Flash drive
Log Book
8-1/2 x 11 graph paper

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

Date Prepared: Fall 1987
Date Reviewed: ___________
Date Reviewed: ___________
PCA Established: Spring 1995

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. MT 109 Catalog Title Survey of Machining

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

Credit/No Credit Option

CATALOG DESCRIPTION

A hands on machine tool technology course that stresses the uses, capabilities and operation of basic machining tools. The classification of tools and tool cutters along with the underlying concepts of chip formation utilizing both stationary tooling and rotating cutters are the core of this course. Precision linear and angular measurement are also taught.

COURSE GOALS To encourage and enable students to:

1. identify the parts, functions and capabilities of drill presses, lathes, milling machines, shapers, surface grinders, bandsaws and hand grinders.
2. perform basic manipulative skills (including calculating feeds and speeds) on these same machines.
3. be able to identify, select, and properly use various kinds of hand tools utilized in the machining industry, including layout tools.
4. be able to function in the machining facility in a productive and safe manner.

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

1. use standard micrometers and vernier calipers to an accuracy of ± .001" and a steel rule to an accuracy of ± .003".
2. identify various stationary and rotating cutting tools, select proper tools, and grind various high speed cutters.
3. make simple machine setups, calculate feeds and speeds and calculate necessary dimensions for producing American Standard Thread forms.
4. perform basic manipulative skills utilizing the drill press, lathe, milling machine, shaper, surface grinder, band saw, and pedestal grinder.
5. be able to function in a machine facility in a safe manner.

COURSE OUTLINE

	WEEKS
1. Introduction to Course and Shop Safety	1
2. Hand Tools, Including Precision Layout Tools	1
3. Tool Selection, Tool Grinding, and Cutting Fluids	1
4. Lathes, Including Thread Cutting	5
5. Milling Machines, Horizontal and Vertical	5
6. Shapers	1
7. Drill Presses	1
8. Grinding Machines	1
9. Tool Selection, Tool Geometry and Tool Grinding	1

APPROPRIATE READINGS (Other than Textbook)

1. Baril, Richard. Modern Machine Technology. l987. Delmar Publishers Inc., Albany, N.Y.
2. Miller, Rex and Morrisey, Thomas J. Metals Technology. l975. Howard W. Sams & Co, Indianapolis, In.

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

3. How to Run a Lathe. l985. South Bend Lathe Works, South Bend, In. l985

ASSIGNMENTS

In addition to weekly laboratory assignments students will be given weekly reading assignments of an average of 30 pages and four reading assignments of an average of 25 pages from other than the text. Additional outside the class assignments will be given in developing project layout, in figuring feeds and speeds and in selection of materials.

EVALUATION

Students will be given an objective test at the end of each major section of the class. Twice during the semester students will be given a mixed objective and essay question test containing questions such as: In the development of lathe tool geometry what are the important considerations? Discuss why each of these considerations is important. Additionally students will be evaluated on the work they accomplish in the laboratory.

TEXTS AND SUPPLIES

Adopted Text: Kibbe, Neely, Meyer, and White. Machine Tool Practices. 3rd Edition. John Wiley & Sons, New York, New York. l987

Other Materials: 6 inch steel rule, safety glasses, small Allen Wrench Set.

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

Date Prepared: Spring 1999
Date Reviewed: ___________
Date Reviewed: ___________
PCA Established: Spring 1999

ALLAN HANCOCK COLLEGE
COURSE OUTLINE

Prefix & No. MT 330 Catalog Title Print Reading and Interpretation

Schedule Title Print Reading & Interpretation

Units 3 Weekly lecture hours 3 Weekly lab hours ____ Department Industrial Technology

Credit/No Credit Option

CATALOG DESCRIPTION

Prepares students to read engineering drawings and specifications and to enable them to understand the intent of the engineer by interpreting the relationship of two-dimensional drawings with respect to actual object or objects. MT 330 is not open to students who are enrolled in or have received credit for AB 330, AT 330, or ET 330.

COURSE GOALS
To encourage and enable students to:

1. read and interpret standard engineering drawing.
2. identify various drawing symbols and conventions that are used in machining, manufacturing, engineering, architecture, and welding and to understand the intent that they convey as used by engineers, architects, and technicians.
3. understand the relationship between a drawing, description of materials, specifications, and related codes and there interrelationship in the completion of the project.

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

1. read and interpret various engineering drawings by completing numerous assignments.
2. identify surface finish marks, tolerance, basic architecture, and welding symbols and be able to explain their meanings.
3. use an engineering drawing accompanying specifications and materials lists to solve industrial questions, to complete a project, or solve a related problem.
4. use related handbooks, codes, and other references as they may be needed to solve a print reading question.

COURSE OUTLINE

	WEEKS
1. Bases for Interpreting Engineering Drawings	5
A. third-angle orthographic projections	
B. title blocks	
C. drawing standards	
D. lines and lettering	
E. working drawings and dimensioning	
F. circular features	
G. drawing scale	
H. symbols	
I. section views	
J. auxiliary views	
K. surface finish	
L. tolerancing	
2. Fasteners	.5
3. Welding Drawings	2

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

4. Aircraft/Aero Space Drawings .5
5. Newer Forms of Drawing 5
   A. simplified drafting
   B. arrowhead less dimensioning
   C. Datum dimensioning
   D. modern engineering tolerancing (true position and geometric tolerancing)
6. Civil/Architectural Drawings 4
   A. description of materials
   B. specifications
   C. codes

APPROPRIATE READINGS (Other than Textbook)

A number of handouts and additional drawings are used to supplement the text as well as to cover those areas not included in the text, such as The Uniform Building Code.

ASSIGNMENTS

At each class meeting students are assigned one or more print reading assignments. Completed assignments are graded and returned to students at subsequent meeting.

EVALUATION

Each student will be required to complete a number of print reading exercises covering each unit of instruction. From these and other items such as quizzes and tests the instructor will determine the students' proficiency in reading and interpreting engineering drawings and assign a class grade.

See attached sample.

TEXTS AND SUPPLIES

Adopted text: Jensen and Hines. Interpreting Engineering Drawings. Delmar. Third edition.

Other Materials:

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 128

CATALOG TITLE: Materials and Process

SCHEDULE TITLE: Materials and Process

UNITS: 3

WEEKLY LECTURE HOURS: 3

WEEKLY LAB HOURS: 1

TOTAL NUMBER OF WEEKS: (if other than 16)

GRADING OPTION: Letter grade only

ADVISORY(IES): Math 311

CATALOG DESCRIPTION
Introduces students to the physical properties and characteristics of common materials and commodities used in the aerospace industry. Topics include compatibility of materials, basic metallurgy, and processes.

SCHEDULE DESCRIPTION
Introduces students to the physical properties and characteristics of common materials and commodities used in the aerospace industry.

COURSE GOALS: to encourage and enable students to
1. understand the nature of production processes, materials, and non-destructive testing.
2. perform processing skills on materials and composites as they relate to aerospace technology.
3. know basic metallurgy.

INSTRUCTIONAL OBJECTIVES: at the end of the course, the student will demonstrate the ability to
1. explain materials and processes with an emphasis on aerospace applications.
2. define metallurgy including atomic behavior, crystal structures; ferrous and nonferrous metals, and pure metals and alloys.
3. apply metallurgical processes.
4. carry out conventional mechanical testing.
5. identify the basic concepts in corrosion and methods of control.

COURSE OUTLINE	WEEKS
1. Introduction to materials and processes	1.5
2. Introduction to metallurgy and metallurgical processes	2
3. Experiment 1: Alternating current GTA/TIG welding of 6061 Aluminum alloy	.5
4. Mechanical behavior including 1-D stress analysis and concentrations	1.5
5. Conventional mechanical testing	2
6. Other mechanical aspects such as flexure, fatigue, hardness, and toughness	2

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

7.	Experiment 2: Tensile testing	.5
8.	Corrosion	
	A. basics	2
	B. forms, causes and prevention	2
	C. corrosion control	1.5
	D. experiment 3: Aluminum vs. titanium in electrolyte	.5

APPROPRIATE READINGS (other than textbook)

1. Federal Aviation Administration, Corrosion Control for Aircraft
2. Federal Aviation Administration, Aerospace and Corrosion Basics
3. Federal Aviation Administration, Metallurgy 2: Materials for the Characterization and the Selection Process

ASSIGNMENTS

Team experiments such as alternating current GTAW/TIG welding of aluminum alloy, tensile test, and aluminum vs. titanium in electrolyte; short papers reporting the results of the teams' experiments and research.

Sample writing assignment: Evaluate the results of your team's experiment with aluminum vs. titanium in electrolyte.

EVALUATION

Group experiments, tests, written assignments and final examination.

Sample essay question: Define 1-D stress analysis and it's effect on stress concentration.

TEXTS AND SUPPLIES

Adopted Text: Horath, Larry. Fundamentals of Material Science for Technologies: Properties, Testing and Experiments. 2nd edition. Prentice Hall. 2001.

Other Materials: None

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