Course Acronym:	ECHT
Course Number:	22
Descriptive Title:	Basic Electronic Fabrication
Division:	Industry and Technology
Department:	Electronics and Computer Hardware Technology
Course Disciplines:	Electronics
Catalog Description:	This course focuses on the materials and the processes used for fabricating electronic systems. The process includes designing, assembling, testing, and documenting a basic electronic fabrication project. Topics covered will include safety, component identification, schematic diagrams, assembly pictorials, soldering (both printed wire boards and terminals), inspection, sheet metal fabrication, hand-tool use, cabling, wire wrapping, printed circuit board construction and repair, Continuous Improvement Techniques (CIT), and Electrostatic Discharge (ESD) awareness. Mass production will be stressed for practical experience in all areas.
Prerequisite:	Electronics and Computer Hardware Technology 11 with a minimum grade of C or equivalent
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	2
Hours Laboratory (per week):	4
Outside Study Hours:	4
Total Course Hours:	108
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	prior to 1992
Transfer UC:	No
Effective Date:	

General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	
Term:	
Other:	
CalGETC:	
Term:	
Other:	
Student Learning Outcomes:	**SLO #1 Tools &Test Equipment** Upon successful completion of this course, students will be able to identify and safely operate/manipulate various types of electronic hand tools and test equipment. **SLO #2 Experimental Data and Analysis Reporting** The students will be able to incorporate experimental data and analysis reporting protocols, using either "paper" or "paperless" environments, similar to data reporting and analysis used by many Electronics Manufacturers and Service Organizations. **SLO #3 Low Voltage Power Supply** Upon successful completion of this course, students will be able to produce a functional low voltage, direct current (DC) power supply project sample that meets predetermined specifications and which could be potentially mass produced.
Course Objectives:	1. Distinguish quality requirements and process techniques involved in soldering: terminals, circuit board assemblies, and removal of components from soldered assemblies. 2. Create mechanical drawings of chassis using perspectives, orthographic projections, and wiring diagrams. 3. Reproduce methods utilized in modern printed circuit board construction. 4. Create systematic construction steps for the fabrication process. 5. Identify schematic symbols and reference designators used in various schematic diagrams. 6. Duplicate quality requirements for rework of printed circuit assemblies. 7. Utilize word processing, spreadsheets, and basic computer assisted drafting program in developing a planner's guide, using a pre-established protocol. 8. Identify hazards and hazardous materials involved in manufacturing electronic circuitry. 9. Differentiate between an assembly drawing and schematic diagram. 10. Reproduce conforming methods for fabricating splices and acceptable wire terminations. 11. Relate hardware requirements and develop a Bill of Materials (BOM) for the assigned project.

	12. Define quality fabrication assurance techniques involved for continuous improvement as defined for the assigned project.
Major Topics:	**I. ELECTRONIC FABRICATION OVERVIEW AND SAFETY (4.5 hours, lecture)** A. Introduction of schematic symbols B. Component identification, hand-tool use, basic soldering techniques (soldering and de-soldering) **II. SCHEMATIC - CIRCUIT DESIGN (9 hours, lab)** A. Safety test and hand tool practicum B. Schematic/circuit design laboratory **III. ETCHING PROCESS AND SAFETY (4 hours, lecture)** A. Printed circuit board preparation B. Pad bonding C. Resist D. Etching E. Neutralization and disposal of spent etching and plating techniques **IV. SOLDERING TECHNIQUES FOR PRINTED CIRCUIT BOARDS (PCB's) (12 hours, lab)** A. Types of solder B. Types of fluxes C. Component installation on PCB's D. Component removal on PCB's E. Renewing surfaces on PCB's **V. SCHEMATIC AND PICTORIAL DRAWINGS (6 hours, lecture)** A. Basic circuit layout techniques B. Routing of all traces C. Space allotment concerns, reverse engineering and continuous improvement techniques D. Introduction to basic computerized design tools **VI. INTRODUCTION TO CIRCUIT BOARD LAYOUT (8.5 hours, lecture)** A. Direct transfer, Kodak Photo Resist (KPR), silk screening B. Printed circuit board layout C. Single side, doubles side and multi-layer printed circuit boards

VII. PCB LAYOUT TECHNIQUES (11 hours, lab)

A. Samples
B. Standards
C. Island Fabrication
D. Component choice for PCB Assembly
E. Radial
F. Axial
G. Contact, thermal printing for PCB substrates

VIII. CHASSIS LAYOUT (4 hours, lecture)

A. Metal forming
B. Drilling
C. Heating and finishes

IX. CHASSIS/PACKAGING FABRICATION (16 hours, lab)

A. Industrial materials: drill types, galvanized steel, cold rolled steel, aluminum sheet stock, thermoset and thermoplastics
B. Basic layout: Layout lines, folding, drilling, breaking sharp edges
C. Chassis finishes and details
D. Product testing and evaluation

X. DOCUMENTATION REQUIREMENTS (5 hours, lecture)

A. Assembly drawings
B. Schematic
C. Parts lists
D. Evaluation tools
E. Test protocols
F. Wire diagrams and assembly procedures

XI. INTRODUCTION TO COMPUTER ASSISTED CIRCUIT DESIGN (12 hours, lab)

A. Circuit to pictorial design lab using circuit board design software
B. Schematic design using circuit board design software
C. Technical drawing import tools, used design tools used to develop PCB masks

XII. TEST AND MEASUREMENT TECHNIQUES (4 hours, lecture)

A. Loading
B. Power dissipation

	C. Methods for reporting data for mass production - student defense of project design **XIII. FINAL BUILD LAB (12 hours, lab)** A. Load testing B. Documenting results for improvement C. Practicum on: 1. Soldering 2. Wiring 3. Metal fabrication sample 4. Plastic fabrication sample
Total Lecture Hours:	36
Total Laboratory Hours:	72
Total Hours:	108
A.1. Primary Methods of Evaluation (Part 1 - CCN courses only):	
A.2. Primary Method of Evaluation (Part 2 - all courses; choose one):	3) Skills demonstration
Typical Assignment Using Primary Method of Evaluation:	Given a schematic drawing and performance objectives, develop a Planners Guide, similar to what is used by many industrial organizations to mass produce a product. Planners Guide will include printed circuit board design, Bill of Materials, chassis fabrication, soldering, wiring, safety, reliability and cost effectiveness. Submit Planners Guide to the instructor.
Critical Thinking Assignment 1:	Given component footprint specifications, successfully place all the required components on a printed circuit card that measures 4 inches by 2 inches, to form a functional predetermined circuit. Submit circuit board to the instructor.
Critical Thinking Assignment 2:	Given a schematic, electronic symbolization, transfer the information from the schematic to a pictorial drawing. Submit drawing to the instructor.
Other Evaluation Methods:	Performance Exams Laboratory Reports Class Performance
Instructional Methods:	Demonstration Guest Speakers Laboratory Lecture

	Multimedia Presentations Simulation
If other:	
Work Outside of Class:	Journal (done on a continuing basis throughout the semester) Required reading Skill practice
If Other:	
Up-To-Date Representative Texts:	Ronald Reis. ELECTRONIC PROJECT DESIGN AND FABRICATION. 6th ed. Prentice Hall, 2009. Discipline Standard. Optional
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	Purchase components and hardware for required project
Requisite:	Prerequisite
Category:	Sequential
Requisite course(s): List both prerequisites and corequisites in this box.	Electronics and Computer Hardware Technology 11
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	**Understand color coding of components.** ECHT 11 - Differentiate color codes and component symbols to build a circuit. **Knowledge of electronic parts and identification.** ECHT 11 - Connect meters to circuits, select proper meter ranges and obtain accurate measurements. **Ability to build simple Direct Alternating (DC) circuits.** ECHT 11 - Apply fundamental circuit theories, Alternating Current (AC) and Direct Current (DC) to compute component values and voltages, resistances, currents, and power in various circuit configurations. **Understand the basics of Ohms Law.** ECHT 11 - Apply fundamental circuit theories, Alternating Current (AC) and Direct Current (DC) to compute component values and voltages, resistances, currents, and power in various circuit configurations. **Ability to use multimeters.**

	ECHT 11 - Demonstrate the use of various types of test equipment, including Digital Multimeter (DMM), signal generators, power supplies, and oscilloscope to make various circuit measurements.
Requisite Skill:	or equivalent
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	This course involves the student in the practical aspects of electronic fabrication from proposal preparation to printed circuit board assembly and tests. It is important that students in this course have prior experience and/or knowledge in basic electricity and electronics to include electronic schematics, parts lists, soldering techniques, and basic electronic parts identification.
Requisite course:	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
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Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Steve Cocca
Date:	09/01/1989
Original Board Approval Date:	03/03/1990
Last Reviewed and/or Revised by:	Arnulfo Runas
Date:	03/08/2025
Last Board Approval Date:	01/21/2026
Effective Term:	FA 2026