

JEFFERSON COLLEGE

COURSE SYLLABUS

HRA230

ADVANCED ELECTRICITY FOR HVAC

3 Credit Hours

Prepared by
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HRA230 Advanced Electricity for HVAC

I. CATALOGUE DESCRIPTION

- A. Prerequisites: HRA125 Refrigeration and A/C Mechanical Systems with a grade of “C” or better
 COMPASS pre-algebra score of at least 33 within the past two years, ACT pre-algebra score of 16 or higher within the past two years, or MTH001 with a grade of “B” or better
 Reading Proficiency
- B. 3 Semester Credit Hours
- C. Advanced Electricity for HVAC is a lecture/lab class including control and power wiring, wiring diagrams, power distribution, ECM motors, and basic and advanced troubleshooting. (F,S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Diagnose power distribution and all of its aspects	Exams Homework Quizzes
Use the National Electrical Code	Exams Homework Quizzes
Diagnose the workings of ECM motors	Exams Homework Quizzes Projects
Draw, read, and construct electrical diagrams	Exams Homework Quizzes Projects Lab
Troubleshoot electrical problems on control and load circuits	Exams Homework Quizzes Projects Lab
Use Simutech program to achieve competency in troubleshooting	Exams Homework Quizzes

III. OUTLINE OF TOPICS

- A. Unit 5 Power Distribution
 - 1. When Did Power Distribution Start
 - 2. Energy Law of Conversion
 - 3. Electrical Distribution Terms and Abbreviations
 - 4. High-Voltage Distribution
 - 5. End Use Distribution by Transformers
 - 6. Commercial Transformers
 - 7. Residential Service
 - 8. Commercial Service
 - 9. What Is the Current Status of Electrical Use

- B. Unit 6 National Electrical Code
 - 1. The NEC at Work
 - 2. Definitions
 - 3. How to find Information in the NEC
 - 4. Electric Heating Equipment
 - 5. Duct Heaters
 - 6. Self-Contained Electric Heating Units
 - 7. Motors
 - 8. Compressor Motors
 - 9. Condensing Units
 - 10. Condensing Unit Nameplate
 - 11. Electrical Conductors in Air Ducts
 - 12. Sizing Conductors
 - 13. Romex
 - 14. Fuse Sizing
 - 15. Branch Circuit

- C. Unit 16 ECM: The Green Motor
 - 1. Industry Standards
 - 2. What is an ECM
 - 3. ECM Wiring
 - 4. Installation Setup
 - 5. Dehumidification and Energy Efficiency
 - 6. Constant-Torque ECM
 - 7. Troubleshooting the Variable-Speed ECM
 - 8. Airflow Problems
 - 9. Motor Resistance
 - 10. Helpful Instruments
 - 11. The Constant-Torque ECM Checklist

- D. Unit 17 Understanding Electrical Diagrams
 - 1. Symbols
 - 2. Circuit Types
 - 3. Types of Electrical Diagrams
 - 4. Wiring Diagrams
 - 5. Schematic Diagrams
 - 6. Identifying the Parts of a Diagram
 - 7. Guidelines for Reading Electrical Diagrams
 - 8. Designing an Electrical Diagram
 - 9. Drawing a Field Diagram
 - 10. Rewiring a System: The Wire and Test Method

- E. Unit 19 Fundamentals of Solid-State Circuits
 - 1. Capacitors
 - 2. Diodes
 - 3. Transistors
 - 4. Integrated Circuits
 - 5. Rectifiers
 - 6. Varistors
 - 7. Microcontrollers and Microprocessors
 - 8. Circuit Boards

- F. Unit 25 How to Start Electrical Troubleshooting
 - 1. What is Troubleshooting
 - 2. Quick Checks for Air Conditioning Problems
 - 3. Heating Systems ACT Troubleshooting
 - 4. Use Your Senses
 - 5. Understanding Basic Troubleshooting by Using a Voltage Meter
 - 6. Methods of Electrical Troubleshooting

- G. Unit 27 Advanced Troubleshooting
 - 1. Review of Troubleshooting Steps
 - 2. Manufacturers Notes Explained
 - 3. Check the Capacitor
 - 4. Check the Voltage
 - 5. Locked Rotor Amps (LRA)
 - 6. Installing a Hard Start Kit
 - 7. Overheating Problems
 - 8. Before Condemning
 - 9. Voltage and Current Imbalances

10. How to Locate the Source of Current Imbalance
11. Megohm Testing as a Troubleshooting Tool
12. Not All Electrical Failures Are Electrical Problems
13. The Mystery Nuisance Trip

H. Unit 28 Practical Troubleshooting

1. Service call: Hopscotch Practice
2. Service call: Inadequate Heating
3. Service call: No Cooling
4. Service call: Inadequate Cooling
5. Service call: Lack of Cooling
6. Service call: No Cooling---Short Cycling Compressor
7. Service call: No Heating
8. Service call: No Chilled Water from Compressor 1
9. Service call: No Chilled Water from Compressor 2
10. Service call: No Chilled Water Pump Operation
11. Service call: No Cooling, Short Circuit
12. Service call: First Steps

IV. METHODS OF INSTRUCTION

- A. Classroom Lecture
- B. Lab Demonstrations
- C. Specialty Lectures by Industry Personnel

V. REQUIRED TEXTBOOKS

Moravek, Joseph; *Electricity for HVACR* (current edition); Pearson Education Inc.

VI. REQUIRED MATERIALS

HRA Tool Kit

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHODS OF EVALUATION

A.	Theory, Tests, Quizzes, Homework	45%
B.	Shop/Lab	45%
C.	Attendance/Participation	10%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website, <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.