FLORIDA STATE COLLEGE AT JACKSONVILLE

COLLEGE CREDIT COURSE OUTLINE

COURSE NUMBER:	ACR 1052
COURSE TITLE:	Air Conditioning and Refrigeration Theory I
PREREQUISITE(S):	None
COREQUISITE(S):	None
CREDIT HOURS:	3
CONTACT HOURS/WEEK:	5
CONTACT HOUR BREAKDOWN:	
Lecture/Discussion:	2
Laboratory:	3
FACULTY WORKLOAD POINTS:	3.5
STANDARDIZED CLASS SIZE ALLOCATION:	24

COURSE DESCRIPTION:

Topics include the refrigeration cycle, heat and its measurement and types, application of latent heat, temperature and its measurement, heat transfer and control, temperature conversion formulas, temperature BTU chart and piping techniques.

SUGGESTED TEXT(S):	Refrigeration and Air Conditioning Technology, 4th Edition Whitman – Johnson – Tomczyk, Copyright 2000
IMPLEMENTATION DATE:	Fall Term, 2004 (20051)
REVIEW OR MODIFICATION DATE:	Fall Term, 2008 (20091) – Outline Review 2007

COURSE TOPICS	CONTACT HOURS PER TOPIC
I. Refrigeration Cycle	5
A. Compressor (purpose)	
B. Condenser (purpose)	
C. Metering device (purpose)	
D. Evaporator (purpose)	
II. Heat--Measurements and Types	10
A. Heat and its flow	
B. "Cold" as it relates to heat and temperature	
C. British Thermal Unit	
D. Characteristics of heat	
E. Sensible heat, specific heat, latent heat	
III. Application of Latent Heat	10
A. Latent heat in the refrigeration cycle	
B. Pressure as it affects the evaporation of a liquid	
C. Calculating refrigeration tonnage	
IV. Temperature and its Measure	10
A. Defining temperature	
B. Standard thermometer	
C. Types of thermometers	
V. Heat Transfer and Control	10
A. Method of heat transfer	
B. Controlled heat transfer in three methods	
VI. Temperature Conversion Formulas	10
A. Celsius to Fahrenheit	
B. Fahrenheit to Celsius	
VII. Temperature BTU Chart	10
A. Sensible heat and latent heat changes	
B. Latent heat in BTUs, changing ice to water	
C. BTUs on changing 32 degrees water to 212 degrees water	
D. Latent heat in BTUs from 212 degrees water to 212 degrees steam	
E. Super heat	
VIII. Piping	10
A. Lines, names and functions	
B. Design factors	
C. Insulation and hangers	
D. Copper tubing and pipe	
E. Piping pressure drops	
F. Suction lines	
G. Suction risers	
H. Piping mufflers	
I. Accessory piping	

PROGRAM TITLE: Air Conditioning, Refrigeration & Heating Systems Technology

COURSE TITLE: Air Conditioning and Refrigeration Theory I

CIP NUMBER: 0615050100

LIST PERFORMANCE STANDARD ADDRESSED:

NUMBER(S): TITLES(S):

01.0 DEMONSTRATE KNOWLEDGE OF ORIENTATION PRACTICES--The student will be able to:
- 01.01 Demonstrate understanding of school and shop policies.
- 01.02 Complete course administrative forms and activities.

02.0 APPLY BASIC AIR CONDITIONING AND REFRIGERATION SKILLS--The student will be able to:
- 02.01 Apply safety practices.
- 02.02 Apply basic mathematics skills.
- 02.03 Apply recordkeeping skills.
- 02.04 Install and service tubing and fittings.
- 02.05 Install and service pipe and fittings.
- 02.06 Identify and use hand and power tools.
- 02.07 Identify and use specialized tools.
- 02.08 Write job specifications.
- 02.09 Read blueprints and mechanical drawings.
- 02.10 Prepare, analyze, and evaluate technical reports and data.

03.0 APPLY TUBING, PIPING, SOLDERING AND BRAZING SKILLS--The student will be able to:
- 03.01 Install and service tubing and fittings.
- 03.02 Install and service pipe and fittings.
- 03.03 Use soft soldering practices.
- 03.04 Use brazing practices.

04.0 APPLY BASIC REFRIGERATION FUNDAMENTALS SKILLS--The student will be able to:
- 04.01 Apply basic refrigeration safety practices.
- 04.02 Identify basic refrigeration cycle.
- 04.03 Compare refrigerant pressure to temperature relationships.
- 04.04 Identify and service refrigeration system and components.
- 04.05 Apply dehydration and evacuation procedures.
- 04.06 Service and charge a basic refrigeration system.
- 04.07 Locate and repair refrigeration system leaks.
- 04.08 Test, analyze and replace compressors.
- 04.09 Apply troubleshooting techniques for refrigeration systems.
- 04.10 Design basic refrigeration.

05.0 APPLY BASIC ELECTRICAL SKILLS--The student will be able to:
- 05.01 Apply basic electrical safety practices.
- 05.02 Identify the nature of electricity.
- 05.03 Identify magnetism and electromagnetism induction.

LIST PERFORMANCE STANDARD ADDRESSED: (continued)

NUMBER(S): TITLES(S):

05.04 Identify electrical components symbols and diagrams.
05.05 Apply basic electrical theory and calculations.
05.06 Calculate and measure electrical valves in series and parallel circuits.
05.07 Compare alternating to direct current.
05.08 Test electrical components.
05.09 Test single and three phase motors.
05.10 Test capacitors.
05.11 Test solid state components
05.12 Troubleshoot/diagnose electrical circuits.
05.13 Read schematics and diagrams.
05.14 Design electrical systems.

06.0 INSTALL AND SERVICE AIR CONDITIONING AND REFRIGERATION ELECTRICAL SYSTEMS--The student will be able to:
06.01 Install and service electrical components.
06.02 Install and service electrical controls.
06.03 Troubleshoot/diagnose electrical components and controls.
06.04 Test, analyze, remove and replace single phase motors.
06.05 Test, analyze, remove and replace three phase motors.
06.06 Test, analyze, remove and replace thermostatic controls.

07.0 INSTALL, MAINTAIN AND REPAIR RESIDENTIAL AIR CONDITIONING SYSTEMS--The student will be able to:
07.01 Install, test, analyze and repair air to air systems.
07.02 Install, test, analyze and repair water to air systems.
07.03 Install, test, analyze and repair heat pump systems.
07.04 Test and analyze air movement systems.
07.05 Apply local and national codes.
07.06 Design, construct, install and service comfort systems.
07.07 Calculate job cost estimates.

08.0 INSTALL, MAINTAIN AND REPAIR COMMERCIAL AIR CONDITIONING SYSTEMS--The student will be able to:
08.01 Install, test, analyze and repair air to air systems.
08.02 Install, test, analyze and repair water to air systems.
08.03 Install, test, analyze and repair heat pump systems.
08.04 Install, test, analyze and repair chiller systems.
08.05 Test and analyze air movement systems.
08.06 Apply local and national codes.
08.07 Install, service and repair cooling towers.
08.08 Install, service and repair water cooled condensers.
08.09 Install, service and repair water treatment systems.
08.10 Apply accepted industry pipe sizing and installation procedures.
08.11 Calculate, design and layout environmental systems.
08.12 Calculate job cost estimates.

LIST PERFORMANCE STANDARD ADDRESSED: (continued)

NUMBER(S): TITLES(S):

09.0 INSTALL, MAINTAIN AND REPAIR COMMERCIAL REFRIGERATION SYSTEMS--The student will be able to:

- 09.01 Install, test, analyze and adjust refrigerant pressure regulating devices.
- 09.02 Test, analyze and replace electrical controls and components.
- 09.03 Test, analyze and replace defrost systems.
- 09.04 Test, analyze and replace pump down systems.
- 09.05 Use various refrigeration equipment electrical diagrams.
- 09.06 Apply industry accepted piping installation procedures.
- 09.07 Apply industry pipe sizing standards.
- 09.08 Install, service and repair ice machines and specialty systems.
- 09.09 Apply local and national codes.
- 09.10 Calculate loads, design and layout refrigeration.
- 09.11 Calculate job cost estimates.

10.0 INSTALL, MAINTAIN AND REPAIR HEATING SYSTEMS--The student will be able to:

- 10.01 Install, service and repair a gas furnace.
- 10.02 Install, service and repair an oil furnace.
- 10.03 Install, service and repair electric furnace.
- 10.04 Install, service and repair duct heaters.
- 10.05 Install, service and repair auxiliary heat strips.
- 10.06 Design, install, service and repair solar heating systems.
- 10.07 Install, service and repair miscellaneous heating equipment.
- 10.08 Apply local and national codes.
- 10.09 Install, service and repair hydronic systems.
- 10.10 Test and analyze heating air movement systems.
- 10.11 Calculate loads, design and layout heating systems.
- 10.12 Calculate job cost estimates.

11.0 DEMONSTRATE BASIC HEAT GAIN, HEAT LOSS AND DESIGN SKILLS--The student will be able to:

- 11.01 Calculate heating and cooling requirements from specifications.
- 11.02 Calculate and design air distribution systems.
- 11.03 Determine air properties by use of psychrometerics.
- 11.04 Calculate cooling and heating equipment sizes.
- 11.05 Design, construct and install air movement systems.

12.0 DEMONSTRATE APPROPRIATE COMMUNICATION SKILLS--The student will be able to:

- 12.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
- 12.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
- 12.03 Read and follow written and oral instructions.
- 12.04 Answer and ask questions coherently and concisely.
- 12.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
- 12.06 Demonstrate appropriate telephone/communication skills.

LIST PERFORMANCE STANDARD ADDRESSED: (continued)

NUMBER(S): TITLES(S):

13.0 DEMONSTRATE APPROPRIATE MATH SKILLS--The student will be able to:

- 13.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
- 13.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
- 13.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
- 13.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
- 13.05 Demonstrate an understanding of federal, state and local taxes and their computation.

14.0 DEMONSTRATE APPROPRIATE UNDERSTANDING OF BASIC SCIENCE--The student will be able to:

- 14.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
- 14.02 Draw conclusions or make inferences from data.
- 14.03 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
- 14.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.

15.0 DEMONSTRATE EMPLOYABILITY SKILLS--The student will be able to:

- 15.01 Conduct a job search.
- 15.02 Secure information about a job.
- 15.03 Identify documents which may be required when applying for a job interview.
- 15.04 Complete a job application form correctly.
- 15.05 Demonstrate competence in job interview techniques.
- 15.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
- 15.07 Identify acceptable work habits.
- 15.08 Demonstrate knowledge of how to make appropriate job changes.
- 15.09 Demonstrate acceptable employee health habits.
- 15.10 Demonstrate a knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442.

16.0 DEMONSTRATE AN UNDERSTANDING OF ENTREPRENEURSHIP--The student will be able to:

- 16.01 Define entrepreneurship.
- 16.02 Describe the importance of entrepreneurship to the American economy.
- 16.03 List the advantages and disadvantages of business ownership.
- 16.04 Identify the risks involved in ownership of a business.
- 16.05 Identify the necessary personal characteristics of a successful entrepreneur.
- 16.06 Identify the business skills needed to operate a small business efficiently and effectively.

Florida State College At Jacksonville

Course Learning Outcomes & Assessment For All College Credit Courses

NOTE: Use either the Tab key or mouse click to move from field to field. The box will expand to accommodate your entry.

Section 1	
COURSE PREFIX AND NUMBER: **ACR 1052**	SEMESTER CREDIT HOURS: **3**
COURSE TITLE: **Air Conditioning and Refrigeration Theory I**	

Section 2

TYPE OF COURSE: (Click on the box to check all that apply)

- ☐ **AA Elective**
- ☐ **AS Professional Elective**
- ☐ **Other** _____
- ☐ **AS Required Professional Course**
- ☒ **AAS Required Professional Course**
- ☐ **General Education: (For General Education courses, you must also complete Section 3 and Section 7)**
- ☐ **College Prep**
- ☒ **Technical Certificate**

Section 3 (If applicable)

INDICATE BELOW THE DISCIPLINE AREA FOR GENERAL EDUCATION COURSES:

- ☐ **Communication**
- ☐ **Natural Sciences**
- ☐ **Social & Behavioral Sciences**
- ☐ **Humanities**
- ☐ **Mathematics**

Section 4

INTELLECTUAL COMPETENCIES:

- ☒ **Reading**
- ☐ **Speaking**
- ☐ **Critical Analysis**
- ☐ **Quantitative Skills**
- ☐ **Scientific Method of Inquiry**
- ☒ **Writing**
- ☒ **Listening**
- ☐ **Information Literacy**
- ☐ **Ethical Judgment**
- ☒ **Working Collaboratively**

Section 5 **LEARNING OUTCOMES**		**METHOD OF ASSESSMENT**
•	Utilize manual and power tools.	ARI Module Certification Score 70% or better
•	Apply basic electrical skills.	ARI Module Certification Score 70% or better
•	Read and interpret basic building codes.	ARI Module Certification Score 70% or better
•	Read basic blueprints.	ARI Module Certification Score 70% or better
•	Apply basic refrigeration skills.	ARI Module Certification Score 70% or better
•	Apply piping, soldering and brazing skills.	ARI Module Certification Score 70% or better
•	Demonstrate knowledge of basic refrigeration fundamentals.	ARI Module Certification Score 70% or better
•	Communicate effectively.	ARI Module Certification Score 70% or better
•	Demonstrate problem solving skills.	ARI Module Certification Score 70% or better
•	Identify safe working conditions and observe safety precautions.	ARI Module Certification Score 70% or better

Section 6 Name of Person Completing This Form: Jim Yurko