



FERRIS STATE UNIVERSITY

CURRICULUM GUIDE SHEET – ONLINE STUDENTS ASSOCIATE DEGREE -HVACR ENGINEERING TECHNOLOGY

NOTE: Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. Compliance with this curriculum guide sheet will assure the completion of the program in the timeframe indicated. Your advisor is available to assist you.

| REQUIRED | | COURSE TITLE | FSU CH (semester credits) | TRANSFER OR PROGRAM SUBSTITUTIONS | GRADE |
|---|-----|--|------------------------------------|---|-------|
| ASSOCIATE DEGREE TECHNICAL COURSE REQUIREMENTS | | | | | |
| EET | 115 | HVACR ELECTRONICS | 3 | | |
| HVAC | 101 | INTRODUCTION TO REFRIGERATION & A/C SYSTEMS | 4 | | |
| HVAC | 102 | THERMODYNAMICS OF REFRIGERATION (prerequisites: HVAC 101, MATH 116) | 4 | | |
| HVAC | 117 | A.C. ELECTRICAL APPLICATIONS (prerequisites: EET 115, MATH 116) | 5 | | |
| HVAC | 132 | FUNDAMENTALS OF HEATING & MECHANICAL SYSTEMS (prerequisite: MATH 116) | 3 | | |
| HVAC | 207 | COMMERCIAL REFRIGERATION SYSTEMS (prerequisites: HVAC 102 & 117) | 5 | | |
| HVAC | 208 | AIR CONDITIONING APPLICATIONS (prerequisite: HVAC 117) | 5 | | |
| HVAC | 234 | RESIDENTIAL GAS HEATING (prerequisite: HVAC 117) | 3 | | |
| HVAC | 235 | HYDRONIC RESIDENTIAL OIL HEATING (prerequisites: HVAC 117 & 132) | 5 | | |
| | | SUBTOTAL | 42 | | |
| ASSOCIATE DEGREE GENERAL EDUCATION COURSE REQUIREMENTS | | | | | |
| MATH | 116 | Intermediate Algebra & Trigonometry | 4 | | |
| ENGL | 150 | English I | 3 | | |
| ISYS | 105 | Microcomputer Applications | 3 | | |
| | | Science Elective (Physics, Chemistry or Biology – course must have a laboratory) | 4 | | |
| ENGL | 211 | Industrial and Career Writing | 3 | | |
| | | Social Awareness Elective* | 3 | | |
| | | Cultural Awareness Elective* | 3 | | |
| COMM | 121 | Fundamentals of Public Speaking | 3 | | |
| | | SUBTOTAL | 26 | | |
| TOTAL CREDITS REQUIRED FOR ASSOCIATE DEGREE | | | 68 | | |

*See the enclosed listing of course descriptions for an explanation of course requirements for these General Education categories at the associate degree level.



FERRIS STATE UNIVERSITY

CURRICULUM GUIDE SHEET – ONLINE STUDENTS

BACHELOR OF SCIENCE -HVACR ENGINEERING TECHNOLOGY

NOTE: Meeting the requirements for graduation indicated on this sheet is the responsibility of the student. Compliance with this curriculum guide sheet will assure the completion of the program in the timeframe indicated. Your advisor is available to assist you.

| REQUIRED | | COURSE TITLE | FSU CH (semester credits) | TRANSFER OR PROGRAM SUBSTITUTIONS | GRADE |
|--|-----|---|------------------------------------|---|-------|
| BACHELOR DEGREE TECHNICAL COURSE REQUIREMENTS | | | | | |
| HVAC | 332 | Secondary Equipment Selection and Design | 4 | | |
| HVAC | 333 | Secondary Equipment Laboratory | 1 | | |
| HVAC | 342 | HVAC Load Calculations and Energy Code (prerequisite: HVAC 332) | 3 | | |
| HVAC | 313 | HVAC Control Theory and Applications (prerequisite: HVAC 332) | 3 | | |
| HVAC | 314 | HVAC Control Laboratory (prerequisite: HVAC 313) | 1 | | |
| HVAC | 416 | HVAC Digital Control Systems (prerequisite HVAC 313, MATH 1126, ISYS 204) | 3 | | |
| HVAC | 417 | HVAC Digital Control Laboratory (prerequisite: HVAC 416) | 1 | | |
| HVAC | 462 | Primary HVAC Equipment Selection (prerequisite HVAC 342) | 4 | | |
| HVAC | 451 | Energy Analysis and Audit (prerequisite: HVAC 313 and 342) | 5 | | |
| HVAC | 499 | System and Energy Analysis (prerequisite: HVAC 451) | 5 | | |
| | | SUBTOTAL | 30 | | |
| BACHELOR DEGREE GENERAL EDUCATION COURSE REQUIREMENTS | | | | | |
| ISYS | 204 | Visual Basic Programming | 3 | | |
| MATH | 126 | Algebra and Analytic Trigonometry | 4 | | |
| | | Science Elective (prerequisite: Physics, Chemistry or Biology) | 3 | | |
| ARCH | 110 | AutoCAD | 2 | | |
| ECON | 221 | Principles of Economics 1 | 3 | | |
| COMM | 221 | Small Group Decision Making | 3 | | |
| | | Cultural Enrichment Elective* | 3 | | |
| | | Cultural Enrichment Elective (200 level)* | 3 | | |
| | | Social Awareness Elective (300 level)* | 3 | | |
| | | Directed Elective | 3 | | |
| | | SUBTOTAL | 30 | | |

TOTAL CREDITS REQUIRED FOR JUNIOR AND SENIOR YEARS 60

TOTAL CREDITS REQUIRED FOR BACHELOR DEGREE

128

*See the enclosed listing of course descriptions for an explanation of the course requirements for these General Education categories at the bachelor degree level.

GENERAL EDUCATION PROGRAM REQUIREMENTS/COURSE DESCRIPTIONS

MATH 116 Intermediate Algebra and Numerical Trigonometry (4 ch)

Special factoring forms, exponents, roots and radicals, scientific notation, fractions, first and second degree equations and inequalities, functions and graphs, logarithms and solutions of logarithmic and exponential equations, systems of equations up to 3x3 and Cramer's Rule, numerical trigonometry including vectors, Law of Sines and Cosines and graphs of trigonometric functions.

ENGL 150 English I (3 ch)

Organize and develop papers for diverse audiences and purposes; including how to discover and focus on a topic; develop ideas, gather support and draft and revise papers effectively. Fundamental language skills and introduction to library research and argumentation

ISYS 105 Introduction to Microcomputer Systems and Software (3 ch)

Use of common micro application software, including: windows type operating systems, word processing, spreadsheets, presentation software and the Internet.

ENGL 211 Industrial and Career Writing (3 ch)

This is a basic course designed to prepare the student to write successfully on the job as an employee or a first-line supervisor. It includes basic forms of business and technological writing to assist the student in developing sound communication practices.

COMM 121 Fundamentals of Public Speaking (3 ch)

Training and experience in preparation and delivery of short speeches with emphasis on the clear, concise, logical communication of ideas. Emphasis on informative and persuasive speaking.

ISYS 204 Visual Basic Programming (3 ch)

Visual BASIC, an Object-Oriented Event Driven (OOED) Programming language, interwoven with logical problem solving will be used to create programs for Windows-based applications that are used in industry today. The program will include multiple forms, buttons, input boxes, IF then ELSE and loop processing, frames and option buttons. (prerequisite: recommend ISYS 105 Introduction to Microcomputer systems and Software)

MATH 126 Algebra and Analytic Trigonometry (4 ch)

Analytic trigonometry and trigonometric equations, the j-operator, DeMoivre's Theorem, non-linear inequalities, applications of logarithmic and exponential equations and plane analytic geometry with polar sketching. Equations of higher degree including the remainder theorem, factor theorem, synthetic division, rational and irrational roots of polynomials. (prerequisite: grade of C- or better in MATH 116, or equivalent).

ARCH 110 Computer Graphics in Architecture (3 ch)

Development of architectural graphic concepts using microcomputer CADD (Computer Aided Design/Drafting systems)

ECON 221 Principles of Economics I (3 ch)

Scope and meaning of economic principles basic to a free market economy. Equilibrium price formation and the efficiency of resource allocation in a market economy. National income accounting; determination of equilibrium national income, recession and expansion. Government policy toward economic fluctuation; unemployment and inflation. The role of money and banking in recession and inflation.

COMM 221 Small Group Decision Making (3 ch)

Decision making and problem solving in small groups. Students participate in groups and evaluate group functioning from the perspective of small group communication concepts.

SCIENCE ELECTIVES (7-8 ch) (Physics, Chemistry or Biology-one must have a laboratory)

Category Description: Graduates should have a basic understanding of scientific concepts, scientific methods and contemporary issues in science and technology. They should also be able to read, understand, and assess medical and environmental issues they may encounter as well as community or political issues in involving science, technology and medicine. These competencies are developed through courses in the following areas:

| | | | |
|------------------|-----------------|--|-----------------------------|
| Astronomy | Biology | Chemistry | Geography (physical) |
| Geology | Physics* | Physical Sciences (Interdisciplinary) | |

*preferred science class

NOTE: Four credit hours (a science course with a laboratory) are required for the associate degree and an additional three (3) credit hours are required for the bachelor degree.

CULTURAL ENRICHMENT ELECTIVES – ONE AT 200 LEVEL OR ABOVE (9 ch)

Category Description: Graduates should be able, through the humanities, arts and literature, to enrich their own lives, to increase their understanding of themselves and their culture, and to expand their understanding of others' experience and cultures, including the experience and cultures of other nations and cultural traditions. These competencies are developed through courses in the listed below.

| | | | |
|--------------------|---------------------------------------|---------------|----------------|
| Art History | Art (Studio) | French | German |
| History | Literature | Music | Spanish |
| Theater | Humanities (Interdisciplinary) | | |

NOTE: The Cultural Awareness category requires you to complete nine (9) credit hours. Three credit hours are required for the associate degree and an additional six (6) semester credits are required for the bachelor degree. Three (3) credit hours must be taken at a 200 level or above.

SOCIAL AWARENESS ELECTIVE (9 ch)

Category Description: Graduates should be able to understand and address issues involving social institutions, interpersonal and group dynamics, social tradition and change, cultural diversity, and human development and behavior. These competencies are developed through courses in the areas listed below.

| | | | |
|-----------------------|--------------------------|---|-----------------------------|
| Anthropology | Economics | Psychology | Geography (cultural) |
| Sociology | Political Science | Social Awareness (Interdisciplinary) | |
| Social Science | | | |

NOTE: The Social Awareness category requires you to complete nine (9) credit hours. Six (6) credit hours are required for the associate degree and an additional three (3) credit hours are required for the bachelor degree. Three (3) credit hours must be taken at a 300 level or above. You will have earned three (3) credit hours in this category through completion of the required ECON 221 Principles of Economics (Macroeconomics) class.

NOTE: The Cultural and Social Awareness requirements expect that at least one three (3) credit hour course should speak to a “global consciousness” and one three (3) credit hour course needs to reflect race, ethnicity, gender awareness. See below for further clarification.

Global Consciousness

Each student must complete one course from the global consciousness group that may also count toward fulfilling the cultural enrichment or social awareness requirement. Global consciousness courses deal specifically with contemporary cultures, languages, and societies outside North America.

Race/Ethnicity and/or Gender

Each student must complete one course from the race/ethnicity/gender group that may also count toward fulfilling the cultural enrichment or social awareness requirement. Race/ethnicity/gender courses approach the subject of race/ethnicity and/or gender from a theoretical framework. These courses can address a single category or any combination of categories (race, ethnicity and gender).

DIRECTED ELECTIVE (3 ch) (selected in consultation with advisor)