

Building Management Systems

Course Outcome Summary

Course Information

Organization	Madison Area Technical College
Developers	William Lorenz
Development Date	2/5/2006
Revised Date	2/5/2006
Course Number	10-462-315
Instructional Level	Associate Degree
Potential Hours of Instruction	72
Total Credits	3

Description

Studies computer-based energy and building control systems in detail. Includes sensing devices, pneumatic and otherwise, as well as basic energy efficiency calculating. Also presents and discusses cost- and energy-saving ideas and plans.

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	36	3
On-Campus Lab	36	

Textbooks

---. *Understanding Building Automation Systems*. ISBN: 0-876-29-211-2.

Learner Supplies

safety glasses. **Manufacturer:** ---.

Three ring binder.

calculator. **Manufacturer:** ---.

Prerequisites

Heating and Air Conditioning 2 (32-462-309)

OR instructor consent

Competencies

A. Investigate control theory as it applies to energy management systems

Competence will be demonstrated:

- A.1. by submitting heat definition assignment
- A.2. by submitting BTU definition assignment
- A.3. by submitting heat load definition assignment
- A.4. on a written evaluation

Criteria - Performance will be satisfactory when:

- A.1. Heat definition assignment includes distinguishing between temperature and BTUs

- A.2. Heat Definition assignment includes the direction that heat travels
- A.3. Heat Definition assignment includes the method that heat travels
- A.4. Heat Definition assignment includes the calculation of the speed that heat travels
- A.5. BTU Definition assignment includes identification of units of measure for BTU and horse power
- A.6. BTU Definition assignment includes the calculation of specific heat
- A.7. BTU Definition assignment includes calculation of the effect humidity on psychometrics
- A.8. heat load definition assignment includes calculation of heat loss
- A.9. heat load definition assignment includes identification of R values
- A.10. heat load definition assignment includes the identification of heat load zones
- A.11. heat load definition assignment includes the determination of the size of heating source needed
- A.12. heat load definition assignment include the identification types of heat sources
- A.13. you relate the building control theory as it applies to energy management systems
- A.14. you relate the psychometric theory as it applies to energy management systems
- A.15. you explain closed loop building management control
- A.16. you relate psychometrics as it applies to building comfort heat load
- A.17. you distinguish between the sensing devices used to control building comfort
- A.18. you examine air distribution balance
- A.19. you explore the applications of the input and output control devices
- A.20. you explore the applications of the stationary engineering plants

B. Examine commercial heating process plants

Competence will be demonstrated:

- B.1. by submitting steam heating assignment
- B.2. by submitting hydronic heating assignment
- B.3. by submitting solar heating assignment
- B.4. by submitting infrared radiant heating assignment
- B.5. by submitting forced hot air heating assignment
- B.6. by submitting types of fuel assignment
- B.7. on a written evaluation

Criteria - Performance will be satisfactory when:

- B.1. steam heat assignment includes exploring stationary engineering power plants
- B.2. steam heat assignment includes calculating saturation energy content
- B.3. steam heat assignment includes examining safety controls
- B.4. steam heat definition assignment includes exploring the duties of the operator
- B.5. hydronic heating assignment includes exploring stationary engineering power plants
- B.6. hydronic heating assignment includes calculating energy content
- B.7. hydronic heating assignment includes examining safety controls
- B.8. hydronic heating assignment includes exploring the duties of the operator
- B.9. solar heating assignment includes examining heat capture
- B.10. solar heating assignment includes examining electrical conversion
- B.11. infrared radiant heating assignment includes exploring uses and the application of such heat sources
- B.12. infrared radiant heating assignment includes calculating energy content
- B.13. infrared radiant heating assignment includes examining safety controls
- B.14. infrared radiant heating assignment includes the examination of appropriate environments for the use of forced air heating
- B.15. forced hot air heating assignment includes the commercial application of these heat sources
- B.16. forced hot air heating assignment includes calculating energy content

- B.17. forced hot air heating assignment includes examining safety controls
- B.18. types of fuel assignment includes examining the cost per heat content values
- B.19. types of fuel assignment includes examining storage of and supply of a particular fuel
- B.20. types of fuel assignment includes exploring shelf life of different fuels
- B.21. types of fuel assignment includes exploring procurement of different fuels
- B.22. types of fuel assignment includes the identification types of fuel used for process plants
- B.23. types of fuel assignment includes the identification types of fuel heating costs for process plants
- B.24. you relate how steam heat relates to stationary engineering power plants
- B.25. you relate how hydronic heat relates to stationary engineering power plants
- B.26. you relate how solar heat relates to stationary engineering power plants
- B.27. you determine how infrared radiant heating relates to stationary engineering power plants
- B.28. you relate how forced hot air heating relates to stationary engineering power plants
- B.29. you differentiate between types of fuel types and cost of heat content values
- B.30. you identify the procurement of different fuels

C. Examine cooling process plants

Competence will be demonstrated:

- C.1. by submitting cooling process assignment
- C.2. by submitting cooling heating assignment
- C.3. by submitting solar heating assignment
- C.4. by submitting infrared radiant heating assignment
- C.5. by submitting forced hot air heating assignment
- C.6. on a written evaluation

Criteria - Performance will be satisfactory when:

- C.1. cooling process plant assignment includes calculating the cooling needs of a given environment
- C.2. cooling process plant assignment includes the identification of the types of cooling machinery used for process plants
- C.3. cooling process plant assignment includes the calculations of the cooling costs for a given environment
- C.4. cooling heating assignment includes
- C.5. cooling heating assignment includes
- C.6. solar heating assignment includes
- C.7. solar heating assignment includes
- C.8. infrared radiant heating assignment includes
- C.9. infrared radiant heating assignment includes
- C.10. forced hot air heating assignment includes
- C.11. forced hot air heating assignment includes
- C.12. you examine the appropriate environment for the use of evaporative cooling
- C.13. you explore the devices used to supply evaporative cooling
- C.14. you examine the appropriate environment for the use of air conditioners
- C.15. you explore the devices used to supply air conditioning
- C.16. you examine the appropriate environment for the use of water chillers
- C.17. you explore the various types of water chillers
- C.18. you examine the appropriate environment for the use of chillers and cooling towers
- C.19. you explore the various types of water chillers and cooling towers

D. Examine humidifying processes

Competence will be demonstrated:

- D.1. by submitting human comfort assignment

D.2. by submitting humidifying processes assignment

D.3. on a written evaluation

Criteria - Performance will be satisfactory when:

D.1. human comfort assignment includes exploring human comfort levels

D.2. humidifying processes assignment includes exploring psychometrics and humidity control

D.3. humidifying processes assignment includes exploring the different types of humidifiers

D.4. humidifying processes assignment includes examining humidity control

D.5. you investigate human comfort levels for temperature and humidity

D.6. you explore psychometrics and humidity control

D.7. you explore the different types of humidifiers

D.8. you explore the operation of Pan Humidifiers (Electric/Steam/Hot Water)

D.9. you explore the operation of Spray and Air Wash Humidifiers

E. Investigate air distribution systems within structures

Competence will be demonstrated:

E.1. by submitting air distribution homework assignment

E.2. by submitting air balancing homework assignment

E.3. by submitting air filters homework assignment

E.4. by submitting fans and blowers homework assignment

E.5. on a written evaluation

Criteria - Performance will be satisfactory when:

E.1. air distribution assignment includes exploring Air Handlers and climate changers types used in a Forced Air distribution system

E.2. air distribution assignment includes exploring Constant Air Volume and climate changers in a Forced Air systems

E.3. air balancing assignment includes exploring Variable Air Volume and climate changers in a Forced Air systems

E.4. air balancing assignment includes exploring filtering Air Handlers and climate changers in a Forced Air systems

E.5. air filters assignment includes exploring types and make up of Duct Systems

E.6. air balancing assignment includes exploring air system balancing

E.7. you explore Air Handlers and climate changers types used in a Forced Air distribution system

E.8. you explore Constant Air Volume and climate changers in a Forced Air systems

E.9. you explore Variable Air Volume and climate changers in a Forced Air systems

E.10. you explore filtering Air Handlers and climate changers in a Forced Air systems

E.11. you explore air system Balancing

E.12. you compute air system Duct Sizes

E.13. you demonstrate air system Balancing

F. Explore control devices within specific structures

Competence will be demonstrated:

F.1. by submitting homework assignment

F.2. on a written evaluation

Criteria - Performance will be satisfactory when:

F.1. assignment includes exploring Pneumatic Controls for a building environment

F.2. assignment include exploring Electric and electronic controls a building environment

F.3. assignment include exploring the use of direct digital controls automation

F.4. you explain how Pneumatic Controls are used for a building environment

F.5. you explain how Electric and electronic controls a building environment

F.6. you summarize the use of direct digital controls automation

G. Examine environmental computer controlled automation systems of various types

Competence will be demonstrated:

- G.1. by submitting homework assignment
- G.2. on a written evaluation

Criteria - Performance will be satisfactory when:

- G.1. assignment includes identifying Elementary computer controlled systems
- G.2. assignment includes identifying complex computer controlled systems
- G.3. assignment includes exploring fire and smoke control programming
- G.4. assignment includes exploring security control programming
- G.5. assignment includes exploring energy management control programming
- G.6. you explain the computer controlled systems
- G.7. you explore fire and smoke control programming
- G.8. you explore security control programming

H. Examine indoor air quality**Competence will be demonstrated:**

- I.1. by submitting homework assignment
- I.2. on a written evaluation

Criteria - Performance will be satisfactory when:

- H.1. assignment includes exploring indoor air quality issues
- H.2. assignment includes identifying indoor air quality monitoring devices
- H.3. assignment includes identifying indoor air quality monitoring procedures
- H.4. you identify causes air quality complaints or problems
- H.5. you select changes to remedy problems with indoor air quality
- H.6. you utilize indoor air quality monitoring procedures