Course Outcomes [Related ME Program Outcomes in brackets]

1. Integration of fundamentals (thermodynamics, heat transfer, fluid mechanics, numerical methods) to solve practical problems. [A2, A3, A5, A7]
2. Provide fundamental understanding necessary to design and analyze systems and equipment used in conditioning buildings. [A2, A3, A5, A7]

Fundamentals (4 wks)

1. Numerical Methods & Systems' Analysis
2. Thermodynamics (1st Law Performance Limits, Psychrometrics)
3. Heat & Mass Transfer (applied to building energy analysis and dry and “wet” heat exchangers)
4. Fluid Mechanics (pipe and duct flow)
5. Economics (life-cycle cost analysis)
6. Overview of HVAC Systems

Building Energy Analysis (3 wks)

1. Occupant Comfort and Indoor Air Quality
2. Energy Flows in Buildings
3. Design Heating and Cooling Reqs
4. Annual Heating and Cooling Energy Usage

Equipment Analysis (8 wks)

1. Air Handling Equipment
2. Heat Exchangers (Dry and Wet)
3. Vapor Compression Equipment
4. Pumping Systems
5. Cooling Towers
6. Thermal Storage
7. Absorption Cooling Equipment

Sample Design Projects

1. Optimal Design of Cooling Coils
2. Solar Powered Ventilator for an Automobile
3. Design of an HVAC System for a Library
4. Optimal Design of a Room Air Conditioner

Revision Date: June 26, 2012
### COURSE NUMBER AND NAME: ME 41800  Engineering of Environmental Systems and Equipment

### CREDITS AND CONTACT HOURS: 3 credits
- **Lecture**: 3 days per week at 50 minutes for 16 weeks

### COURSE COORDINATOR OR INSTRUCTOR:
- J.E. Braun

### TEXTBOOK:

### SPECIFIC COURSE INFORMATION:
**a. Catalog Description:** This course is designed to give students the fundamental understanding necessary to design and analyze systems and equipment used in conditioning buildings. Topics include: review of fundamentals in thermodynamics, heat transfer, fluid mechanics, economics, non-linear equation solving, optimization; analysis of building heating and cooling requirements for design and annual energy use; design and selection of equipment, including ducts, fans, cooling coils, chillers, air conditioners, piping, pumps, cooling towers, thermal storage. Typically offered in spring.

**b. Prerequisites:**
- ME 30000 – Thermodynamics II
- ME 31500 – Heat and Mass Transfer

**c. Status:** Elective

### SPECIFIC GOALS FOR THE COURSE
**a. Course Outcomes:**
[Related ME Program Outcomes in Brackets]
1. Integration of *fundamentals* (thermodynamics, heat transfer, fluid mechanics, numerical methods) to solve practical problems. [A2, A3, A5, A7]
2. Provide fundamental understanding necessary to design and analyze systems and equipment used in conditioning buildings. [A2, A3, A5, A7]

**b. Related ME Program Outcomes:**
[Related ABET Outcomes Listed in Brackets]
- A1. Engineering Fundamentals; B3. Prof/Ethical Responsibility;
- A3. Experimental Skills; B5. Life-Long Learning;
- A4. Modern Engr Tools; C1. Leadership,
- A5. Design Skills; C2. Global Engineering Skills;
- A6. Impact of Engr Solns; C3. Innovation;
- B1. Communication Skills; C4. Entrepreneurship

**b. Related ME Program Outcomes:**
- A1. Engineering Fundamentals; B3. Prof/Ethical Responsibility;
- A3. Experimental Skills; B5. Life-Long Learning;
- A4. Modern Engr Tools; C1. Leadership,
- A5. Design Skills; C2. Global Engineering Skills;
- A6. Impact of Engr Solns; C3. Innovation;
- B1. Communication Skills; C4. Entrepreneurship

### LIST OF TOPICS: See following page.

**PREPARED BY:** Jim Braun  
**REVISION DATE:** June 26, 2012