The University of Texas at Austin  
Department of Civil, Architectural and Environmental Engineering

**Course Unique Number:** 15115(ARE 346P) / 15735(CE 389H) (3 hrs.)

**Classroom and Time:** ECJ 7.208, Tuesday and Thursday 12:30 p.m. – 2:00 p.m.

**Course Website:** [http://www.ce.utexas.edu/prof/Novoselac/classes/ARE389H](http://www.ce.utexas.edu/prof/Novoselac/classes/ARE389H)

**Prerequisites:** For undergraduate students ARE 346N or consent of instructor

**Instructor:** Dr. Atila Novoselac  
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Phone: 512-475-8175  
e-mail: atila@mail.utexas.edu  
[http://www.ce.utexas.edu/prof/Novoselac](http://www.ce.utexas.edu/prof/Novoselac)

**Office Hours:** Tuesday and Thursday, 11:00 AM - 12:00 PM or by appointment. I have an open door policy – if my office door is open, I will see students without an appointment. If I am busy, we will schedule a convenient time for both of us.

**Course Catalog Description** Fundamentals of design of heating, ventilation, and air conditioning systems

**Academic/Learning Goals & Course Objectives:**
By taking this class you will be able to:

1. Apply fundamental physical principles to HVAC design
2. Describe and size each component in an HVAC system
3. Design HVAC systems based on manufacturer’s datasheets
4. Contrast residential systems with commercial systems and use appropriate design techniques for each type of system
5. Solve HVAC design problems with high-quality references

**Textbook (required):**

**Other References:** (optional – on 2 hour reserve at Engineering Library)

**Topics:**

1. Background, Introduction and Review 2 wks
2. Heating and Cooling Loads 1 wk
3. Psychrometrics and mass transfer 1 wk
4. Air conditioning and refrigerant cycles 2 wks
5. Chillers and Boilers 1 wk
6. Coils and heat exchangers 2 wks
7. Ducts, air, and water systems 2 wks
8. Large HVAC Systems 2 wk
9. HVAC Control 2 wk
10. Final Project, field trip 1 wk

**Grading:**

- Exam 25%
- Project 30%
- Homework Assignments 40%
- Participation 5%

100%

**Course Letter Grades:** (Numerical Grade)

- 90-93, >93 A-, A
- 80-83, >83-86, >86-90 B-, B, B+
- 70-73, >73-76, >76-80 C-, C, C+
- 60-63, >63-66, >66-70 D-, D, D+
- < 60 F

**Attendance Policy:**

Regular attendance and participation are essential and expected. Random attendance will be taken throughout the semester by various means and it can affect your grade up to 5% (participation grade). "A student who is absent from a class or examination for the observance of a religious holy day may complete the work issued within a reasonable time after the absence, if proper notice has been given". The deadline for notification of such an absence is 14 days prior to the class absence.

**Class Participation:**

It is important that you are familiar with the course material as the course evolves. Your ability to answer questions and discuss the material will be part of the overall participation evaluation. Therefore, you should review class material ahead of time.

**Assignments:**

Homework assignments are a central part of this course. Homework will be assigned approximately five times over the course of the semester. All assignments are due at the beginning of the class for the assigned day. Homework assignments should be completed individually.

**Final Project Description:**

There will be one final project assigned at the beginning of April, and it will relate to a design of HVAC system for a commercial building. It will be a group project and student will have a choice to select specific building and HVAC system. Each group will prepare a two page proposal to define the project objectives, scope, methodology, and deliverables. Students are welcome to propose problems from their current research or future career. Based on these proposals the course instructor will refine
the final project scope and deliverables for each group, so that each student will have the same final project work load. Each group member will have the same project grade.

**Midterm Exam:**
This course will have one exam at beginning of April. The exam will cover principles of HVAC systems and components learned in the first 2/3 of the course.

**Final Exam:**
This course will not have a final exam. The final project and the final project presentation will replace the final exam.

**Due Dates Policy:**
All assignments are due at the beginning of class; those turned in late will count 10% off per day.

**Personal Problems:**
If you have illness or personal problems that will affect your performance during the course of the semester, please let me know as soon as possible. “After the fact” provides little protection unless there are extreme circumstances. I have an answering machine and an e-mail address if you need to get in touch with me after hours. Do not hesitate to use them.

**Honor Code:**
The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, thrust, fairness, and respect towards peers and community.

**Policy of Scholastic Dishonesty:**
Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information, visit the Student Judicial Services web site http://deanofstudents.utexas.edu/sjs/.

**Privacy – Web Based Class Sites:**
Web-based, password-protected class sites may be associated with all academic courses taught at the University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging email, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information, see: http://www.utexas.edu/student/registrar/catalogs/gi00-01/app/appc09.html.

**Accommodations:**
The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone).

**Dropping the Course:** From the 1st through the 12th class day, an undergraduate student can drop a course via the web and receive a refund, if eligible. From the 13th through the university’s academic...
drop deadline, a student may Q drop a course with approval from the Dean, and departmental advisor. After the academic drop deadline has passed, a student may drop a course only with Dean’s approval, and only for urgent, substantiated, non-academic reasons.

**Course Evaluations:**
Each student will be given the opportunity to evaluate the course and the instructor using the standard course/instructor evaluation form at the end of semester.

**Important Dates:**
- Exam: April 10 (will be confirmed)
- Preliminary results for the final project due: April 24
- Final project due: May 4

**TENTATIVE COURSE SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Reading</th>
<th>Due</th>
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<tbody>
<tr>
<td>01/17</td>
<td>Course introduction and terminology</td>
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<tr>
<td>01/19</td>
<td>Review: Thermodynamics</td>
<td>Chapter 2</td>
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<td>01/24</td>
<td>No class (ASHRAE meeting) make up will be a <em>Field trip</em></td>
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<tr>
<td>01/26</td>
<td>Review: Heat transfer</td>
<td>Chapter 2</td>
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<tr>
<td>01/31</td>
<td>Review: Fluid dynamics</td>
<td>Chapter 2</td>
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<tr>
<td>02/02</td>
<td>Psychrometric chart</td>
<td>Chapters 7&amp;8</td>
<td>HW1</td>
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<td>02/07</td>
<td>AHU &amp; Psychrometrics</td>
<td>Chapters 7&amp;8</td>
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<td>02/09</td>
<td>Psychrometric processes</td>
<td>Chapters 7&amp;8</td>
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<td>02/14</td>
<td>HVAC Systems</td>
<td>Chapters 7&amp;8</td>
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<td>02/16</td>
<td>Cooling towers</td>
<td>Hadouts&amp;Ch.10</td>
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<tr>
<td>02/21</td>
<td>Refrigeration Cycles</td>
<td>Chapter 4</td>
<td>HW2</td>
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<td>02/23</td>
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<td>02/28</td>
<td>Refrigerants</td>
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<tr>
<td>03/01</td>
<td>Refrigeration System Components</td>
<td>Chapter 11</td>
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<td>03/06</td>
<td>Heat Exchangers I</td>
<td>Chapter 11</td>
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<td>03/08</td>
<td>Heat Exchangers II</td>
<td>Chapter 11</td>
<td>HW3</td>
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<td>Heat Exchangers III, Example</td>
<td>Chapter 11</td>
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<td>03/22</td>
<td>Air distribution components</td>
<td>Chapter 18</td>
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<td>03/27</td>
<td>Duct design</td>
<td>Chapter 18</td>
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<td>03/29</td>
<td>Fans</td>
<td>Chapter 18&amp;19</td>
<td>HW4</td>
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<tr>
<td>04/03</td>
<td>Pumps and plumbing sizing</td>
<td>Chapter 18&amp;19</td>
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<td>04/05</td>
<td>Review</td>
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<td>04/10</td>
<td>Course projects and Exam (<em>Exam - out of class time</em>)</td>
<td>Exam</td>
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<td>04/12</td>
<td>Principle of HVAC Control</td>
<td>Handouts</td>
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<td>04/17</td>
<td>Variable air volume systems</td>
<td>Handouts</td>
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<td>04/19</td>
<td>Final Project and Load Calculation</td>
<td>Chapters 15&amp;16</td>
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<td>04/24</td>
<td>Automatic Control for HVAC systems</td>
<td>Handouts</td>
<td>Project</td>
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<td>04/26</td>
<td>Residential vs. Commercial HVAC Systems</td>
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<tr>
<td>05/01</td>
<td>Review (<em>Field trip – out of class time</em>)</td>
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<tr>
<td>05/03</td>
<td>Project discussion</td>
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