

**Heating and Air Conditioning System Design (January 13, 2021)**

**EML 4601**

**Class Periods: MWF, 5<sup>th</sup> Period, 11:45am-12:35pm**

**Location: Online Video Lectures at the link below**

<https://ufedge.video.ufl.edu/Mediasite/Channel/spring2021eml-4601>

**Academic Term: Spring 2021**

**Instructor**

**Dr. S.A. Sherif**

[sasherif@ufl.edu](mailto:sasherif@ufl.edu), 1-352-392-7821

**Office Hours: MWF 5<sup>th</sup> Period (11:45-12:35pm) via Zoom**

**Teaching Assistants/Graders**

- Grader: Mr. Faisal S. Altwijri, [altwijri@ufl.edu](mailto:altwijri@ufl.edu)

**Course Description**

Credits: 3; Heating and air conditioning systems: equipment selection, system arrangement, load calculations, advanced psychrometrics, duct and piping system design, air distribution system design and indoor air quality.

**Course Pre-Requisites**

EML 3100 Thermodynamics.

**Course Objectives**

At the end of the course the students will be able to understand air conditioning theory and perform calculations involving advanced psychrometry and wetted surface heat transfer, cooling and dehumidifying coils, cooling and heating load calculations, duct design and fan sizing, piping design and pump sizing, energy calculations including the Bin and Modified Bin procedures, and indoor air quality calculations. The student will also be able to perform load calculations using the Carrier/HAP software and apply that to designing an HVAC system.

**Materials and Supply Fees:** N/A

**Professional Component (ABET)**

4A. EML 4601 supports several program outcomes enumerated in the Mission Statement of the Department of Mechanical and Aerospace Engineering. Specific ME program outcomes supported by this course include: Being able to work professionally in the thermal systems area (ME Program Outcome M4).

4B. Engineering Sciences (50%), Engineering Design (50%)

**Relation to Program Outcomes (ABET)**

This course achieves the following ABET outcomes [note that the outcome number corresponds to the respective ABET outcomes (1) through (7):

- (1) Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (Method of assessment is one or more exam)
- (2) Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (Method of assessment is an HVAC design project)

**Required Textbooks and Software:** None

**Recommended Materials:** None

**Exam Dates:**

**Exam 1: February 15, 2021, 8:00-10:30pm, Covering Psychrometrics**

**Exam 2: March 18, 2021, 8:00-10:30pm, Covering Solar Radiation, Heating/Cooling Loads, IAQ**

**Exam 3: April 21, 2018, 8:00-10:30pm, Covering Duct Design/Fans, Pumps, Energy Calculations**

**Final Exam: April 30, 2021, 7:30-9:30am, Comprehensive**

All exams are open book and notes and require attendance via both Zoom and Honorlock. Make sure your desktop or laptop is equipped with a webcam.

**Course Schedule**

<u>Lecture #</u>	<u>Topic Covered</u>	<u>Lecture #</u>	<u>Topic Covered</u>
Lecture 1	Introduction to air conditioning	Lecture 21	Space Heating Load
Lecture 2	Moist air properties/psychrometry	Lecture 22	Space Heating Load/Indoor Air Quality
Lecture 3	Psychrometric processes 1	Lecture 23	Indoor Air Quality 1
Lecture 4	Psychrometric processes 2	Lecture 24	Indoor Air Quality 2
Lecture 5	Psychrometric processes 3	Lecture 25	Heat Transfer in Building Sections/Cooling Load
Lecture 6	Psychrometric processes 4	Lecture 26	Airflow in ducts/duct design 1
Lecture 7	Solved problems in psychrometry 1	Lecture 27	Airflow in ducts/duct design 2
Lecture 8	Solved problems in psychrometry 2	Lecture 28	Airflow in ducts/duct design 3
Lecture 9	Solved problems in psychrometry 3	Lecture 29	Airflow in ducts/duct design 4
Lecture 10	Solved problems in psychrometry 4	Lecture 30	Fan Sizing/Selection
Lecture 11	Solved problems in psychrometry 5	Lecture 31	Pumps and Piping Design 1
Lecture 12	Solved problems in psychrometry 6	Lecture 32	Pumps and Piping Design 2
Lecture 13	Solved problems in psychrometry 7	Lecture 33	Pumps and Piping Design 3
Lecture 14	Solved problems in psychrometry 8	Lecture 34	Pumps and Piping Design 4
Lecture 15	Solved problems in psychrometry 9	Lecture 35	Energy Calculations 1
Lecture 16	Solar Radiation (Solar Angles)	Lecture 36	Energy Calculations 2
Lecture 17	Solar Radiation (Solar Angles)	Lecture 37	Energy Calculations 3
Lecture 18	Solar Radiation (Direct/Diffuse/Reflected)	Lecture 38	Energy Calculations 4/Course Review
Lecture 19	Solar Radiation Computation/Fenestrations	<b>Exam 1</b>	<b>Covers Lectures 1 through 15</b>
Lecture 20	Solar Radiation (Fenestrations/Ext. Shading)	<b>Exam 2</b>	<b>Covers Lectures 16 through 24</b>
		<b>Exam 3</b>	<b>Covers Lectures 25 through 38</b>
		<b>Final Exam</b>	<b>Covers Lectures 1 through 38</b>
		<b>Project</b>	<b>Covers Lectures 1 through 38</b>

**Miscellaneous Policies**

Students will be held responsible for knowledge of all scheduling and policy announcements made in class. You may call Dr. Sherif or send him an e-mail 24/7 at 352-392-7821. Please make sure you leave a phone number if you call and cannot find him. If you send an Email please also list a phone number where you could be reached. Dr. Sherif will return your call within a few hours. Sending an Email along with the voice message can also help alert him to your request.

Excused absences are consistent with university policies in the undergraduate catalog at the following URL:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Excused absences require appropriate documentation.

**Grading Policy**

<b>Assignment</b>	<b>Percentage of Final Grade</b>
<b>Homework</b>	<b>10%</b>
<b>Design Project</b>	<b>10%</b>
<b>Exam 1</b>	<b>20%</b>
<b>Exam 2</b>	<b>20%</b>
<b>Exam 3</b>	<b>20%</b>
<b>Final Exam</b>	<b>20%</b>
<b>Total Score</b>	<b>100%</b>

**More information on UF grading policy may be found at:**

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Percent	Grade	Grade Points
90 - 100	A	4.00
86 - 90	A-	3.67
82 - 86	B+	3.33
78 - 82	B	3.00
74 - 78	B-	2.67
70 - 74	C+	2.33
66 - 70	C	2.00
62 - 66	C-	1.67
58 - 62	D+	1.33
54 - 58	D	1.00
50 - 54	D-	0.67
0 - 50	E	0.00

### **Students Requiring Accommodations**

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### **Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### **Commitment to a Safe and Inclusive Learning Environment**

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **Software Use**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual

violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### **Student Privacy**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### **Campus Resources**

#### **Health and Wellness**

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### **Academic Resources**

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.