MEC 422 (SBU)

Thermal System Design

------0000------

Class Time and Location: TuTh: 8:00 – 9:20 AM, Online
(Zoom; Meeting ID: 914 9970 7438 Passcode: 389185)

Instructor: Professor Foluso Ladeinde

Office Location: Heavy Engineering 224

Preferred E-mail Address: foluso.ladeinde@stonybrook.edu

Instructor Office Hours (Tentative): Tuesdays, 11:00 AM – 2:00 PM (Online)
Zoom (Meeting ID: 922 9937 8624, Passcode: 612679)

Pre-requisites: MEC 305.
Textbook: Design of Fluid Thermal Systems by William S. Janna, Cengage Learning, Fourth Edition, 2015, ISBN-13:978-1-285-85965-1, ISBN-10:1-285-85965-0.

Course Description: Device design and system design. Quantitative data for system design including operating characteristics of compressors, turbines, heat exchangers, piping systems, internal combustion engines, and other component equipment. Component matching and system simulation. Optimization including thermo-economic evaluation and energy analysis. Case studies: refrigeration and air conditioning systems; combined cycles; steam-injected gas turbines.

Tentative Course Flow (Subject to Change):

WEEK	TOPIC	DATES
Week 1.	Introduction, Basic Equations	8/24-8/28
Week 2.	Basic Equations	8/31-9/4
Week 3.	Piping System I	9/7-9/11
Week 4.	Piping System II	9/14-9/18
Week 5	Flow Measurement and Piping Networks	9/21-9/25
Week 6	**(Midterm I: 9/29/2020; Tuesday)**	9/28-10/2
Week 7.	Economic Pipe Design, Optimization:	10/5 – 10/9
Week 8	Constrained and Unconstrained; Lagrange Multipliers, Search Methods, Linear	10/12 - 10/16

	Programming	
Week 9.	Double Pipe Heat Exchangers	10/19 – 10/23
Week 10.	Shell and Tubes Heat Exchangers	10/26-10/30
Week 11.	**(Midterm II: 11/3/2020; Tuesday)**	11/2-11/6
Week 12.	Plate-Fin/Plate-Frame/Cross Flow HXs	11/9-11/13
Week 13.	Thermal Management of Automotive, Aircraft, and Rocket Combustors	11/16-11/20
Week 14.	**Thanksgiving Break – No Classes**	11/23-11/27
Week 15.	Thermal System Simulation: Examples from Refrigeration and Air-conditioning Systems	11/30-12/4
	Final Exam	**12/9 (11:15 AM – 1:45 PM)**
	Semester End: Official End of Term	12/17
	Commencement	12/18

Online Class Delivery Requirements

Online Live Lectures: All classes in this course will be delivered online as a precaution against infection by the coronavirus. The online classes have been scheduled to take place during the regular class time originally allocated for the course by the university at the beginning of the semester.

The classes will be delivered in the Zoom Web Conferencing software package: Meeting ID: 914 9970 7438 Passcode: 389185

If you experience any technical difficulties that could prevent you from attending the online meetings, please contact the TAs for this course or DoIT. DoIT can be reached by calling (631) 632-9800. The contact emails for the TAs have been given to you in prior communications from me.

Homework assignments will be posted on Blackboard or sent to you by email. You should submit your solutions electronically via Blackboard. All exams will take place online, in either structured or Take-Home format. Details will be provided to you in due course of time.

In summary:

a) I will deliver the lectures online using the Zoom web conferencing software package
b) I will use a whiteboard to display lecture contents and write on the board as I would in a conventional class
c) I will try to record the lectures in Zoom, as backup, and for the benefit of students who might not be able to attend class. However, students are required to attend class, not

only because of the nature of the subject matter of the course, but also because, for technology-related reasons, I cannot guarantee that the lectures will be successfully recorded and available to students

d) Office hours will be conducted using Zoom. The Meeting ID and Passcode are shown on page one of this document (Meeting ID: 922 9937 8624, Passcode: 612679)
e) All exams will be administered via Blackboard, with/without Respondus.

Copyright Statement: Lecture notes, video recordings, examinations, homework problems and their solutions, and other materials shared with you in the course of lecture delivery – be it in-person or online - constitute intellectual properties (IPs). Therefore, sharing these materials in any shape or form without a signed, written permission from me (Professor Foluso Ladeinde) constitute infringement for which a legal recourse is available in the court of law. This option will be exercised in the event of an IP infringement.

Course Grand Rules:

- Participation in the online live class meetings is required. Attendance will constitute 5% of the final grade
- You will need to learn to use Blackboard and Zoom. Please visit SBU's DoIT to do this: https://sites.google.com/stonybrook.edu/keeplearning
- Please keep abreast of class announcements, which would come from emails and/or Blackboard

Homework: Approximately one homework assignment in two weeks.
Homework will be due one week after it has been assigned.
Late homework will receive half credit before the solutions are posted and will not be accepted after that.

Exams: All exams will be scheduled as described above
No makeup exam unless arranged prior to the exam.

Grading Scale: Will grade on a curve

Grading Scheme (Subject to Change):

Midterm I: 25%
Midterm II: 25%
Final (Cumulative): 35%
Homework Assignments: 10%
Attendance: 5%

Homework and exams are to be done individually. Homework must be neat and orderly so that your work can be followed clearly. Solutions which are not clearly written and easy to follow (based on the judgment of the instructor) will not be graded.

MEC 422: Thermal System Design	
Credits: 3	Contact Hours: 3 hour lectures per week
LEAD COORDINATOR: TBD	**TEXTBOOK:** Design of Fluid Thermal Systems by William S. Janna **SUPPLEMENTAL MATERIAL:** Supplementary lecture notes on system simulation and optimum design
BULLETIN DESCRIPTION: Device design and system design. Quantitative data for system design including operating characteristics of compressors, turbines, heat exchangers, piping systems, internal combustion engines, and other component equipment. Component matching and system simulation. Optimization including thermo-economic evaluation and energy analysis. Case studies: refrigeration and air conditioning systems; combined cycles; steam-injected gas turbines.	
PREREQUISITES: MEC 305	**THIS COURSE IS** Required

STUDENT OUTCOME SUPPORTED	PIs	ASSESSMENT TOOLS
2. An 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.	2a. Identify need for the design.	Exams, Homework
	2b. Identify multiple, realistic constraints on the design.	Exams, Homework
	2c. Identify appropriate engineering standards for the design.	Exams, Homework
	2d. Based on knowledge and skills acquired in earlier course work, create a design that satisfies needs and constraints, and that conforms to engineering standards.	Exams, Homework
	2e. Compare design with other potential solutions.	Exams, Homework
	2f. Evaluate the feasibility and effectiveness of the design, and extent to which the design satisfies needs, constraints, and engineering standards.	Exams, Homework
	2g. Demonstrate design on a completed prototype.	Exams, Homework
	2h. Present results clearly and professionally.	

STUDENT OUTCOME SUPPORT	**1**	**2**	**3**	**4**	**5**	**6**	**7**				
		3									
	3 – Strongly supported 2 – Supported 1 – Minimally supported										

Student Accessibility Support Center Statement

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what

accommodations, if any, are necessary and appropriate. All information and documentation is confidential.
Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities

Academic Integrity Statement
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Allowed Calculators
Following the Mechanical Engineering Department's mandatory calculator policy, **only** the following calculators will be allowed to be used on the midterm and final exams. There will be no exceptions. This list of calculators is identical to that allowed for the *National Council for Examiners for Engineering and Surveying* (NCEES) Fundamentals of Engineering (FE) exam that many of you will take in your senior year, as well as the Professional Engineering (PE) exam that you may take several years from now. The sooner you become comfortable on one of these calculators, the better. If you have any questions on this policy please feel free to contact me. The NCEES policy on calculators can be found here: http://www.ncees.org/exams/calculators/ .

Casio:	All **fx-115** models. Any Casio calculator must contain **fx-115** in its model name.
Hewlett Packard:	The **HP 33s** and **HP 35s** models, but no others.
Texas Instruments:	All **TI-30X** and **TI-36X** models. Any Texas Instruments calculator must contain either **TI-30X** or **TI-36X** in its model name.

Make-up classes:

In the event that I travel during the semester and not able to attend one or more of our regularly scheduled classes, I will make these classes up at a mutually convenient time. I will announce suggested make up times well in advance, and make sure that they are reasonable for everyone.