TUSKEGEE UNIVERSITY
COLLEGE OF ENGINEERING
DEPARTMENTS OF CHEMICAL AND MECHANICAL ENGINEERING
CENG 0320 – UNIT OPERATIONS LABORATORY I
MENG 0412 – THERMAL SCIENCES LABORATORY
Spring 2023
2:00 – 5:00 pm (Tuesday) and 2:00 – 4:00 pm (Friday)
Room #151

INSTRUCTOR: Dr. Shamim Ara Begum (T)
OFFICES: 522E Luther H. Foster Hall
OFFICE HOURS: MW: 9:00 -12:00; 1:00 -2:00 and Th: 10:00 -12:00
TELEPHONE: (334) 727-8795 (office)
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E-MAIL: sbegum@tuskegee.edu

INSTRUCTOR: Dr. John Solomon (F)
OFFICE: 237 Luther H. Foster Hall
OFFICE HOURS: TTh: 10:00 – 12:00; 1:00-2:00
TELEPHONE: 334-727-8983
FAX: 334-727-8090
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COURSE OBJECTIVES AND TASKS:

Objectives	Tasks
Students will: 1. Collect and analyze experimental data for the understanding of basic fluid mechanics and heat transfer concepts	1. Conduct Fluid Mechanics experiments. 2. Conduct Heat Transfer experiments.
2. Develop oral and written communication skills by presenting experimental results in the form of written and oral reports	3. Write reports. 4. Give presentations.
3. Work in teams in a safe and productive environment	5. Demonstrate team skills (including leadership, division of labor and responsibility). 6. Develop safe laboratory skills.
4. Apply principles of design	7. Design experiments.
5. Appreciate efforts required to plan and carryout successful laboratory experiments	8. Collect and analyze data, and generate tables and graphs.
6. Learn to use computer software to develop written reports and oral presentations	9. Use computer software, such as Excel, Word, PowerPoint, to develop written reports and oral Presentations.

COURSE OUTCOMES / OBJECTIVES GRID:

Outcome	1	2	3	4	5	6	7
Objective 1	X						
Objective 2			X				
Objective 3					X		
Objective 4		X					
Objective 5						X	
Objective 6							X

1. An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics.
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.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering solutions and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

COURSE REQUIREMENTS AND POLICES:

Credit hour: 1
Contact hour: 3
Pre/co-requisite: MENG 237 (pre-requisite), CENG 310 (co-requisite) for CENG 0320
MENG 0312, MENG 0313, MENG 0317, and MENG 0414 (corequisite) for MENG 0412

Attendance: 100 % required

Grading:

	Percentage	Score	Grade
Report writing	50	90-100	A
Final Exam	20	80-89	B
Lab participation	10	70-79	C
Presentations	10	60-69	D
Design	10	0-59	F

Policies:

- Attend class always. No make-up labs will be conducted.
- If you are not in class within 10 minutes after time for lab to start, you will not be allowed to conduct the experiment and will be given a 0 in lab participation for that day.
- Study lab handouts in advance.
- Conduct experiments very carefully. Do not damage instruments.
- Keep the lab clean and the things in order.
- Be determined to be a good student and a competent engineer.
- No electronic devices (cell phone, iPad, laptop etc.) except calculator will be allowed during class time, and final exam. Students will be asked to leave the class and the class will be counted as an absence if they use the electronic devices (cell phones, laptop, iPad etc.) except calculator.
- Students are not allowed to do other class work during this class.
- Students need to submit their lab/design report etc. by themselves. They should not give their lab/design report etc. to another student to submit to the instructor. The instructor will not accept this type of submission.
- Sign roll each week.
- Obtain Instructor's signature on lab data sheets.
- Reports are due next class.
- No food, drink, candy, chewing gum and cellular phone in the laboratory (see the additional safety policies and regulations).
- The student is expected to attend regularly all classes in an attire that meets the College's Dress Code Policy of Business Casual. Students who are not attired appropriately will be asked to leave class and may return with appropriate dress. Students may return with the tardy noted; however, students who do not return will receive an absence. The instructor has the right to establish the rules and regulations for the classroom for it to be a conductive

place for teaching and learning. The classroom is the place for the beginning of professional training.

- **Effective Spring 2012 <u>ALL</u> Instructional Administrators, Faculty, Staff and Students** are **REQUIRED** to use **Blackboard.**
- Additional policies will be issued, if they are necessary.

Student's responsibilities:

- You are required to submit a copy of each PowerPoint presentation and design report on the blackboard, and also submit a hard copy of design report on the due date in the class.
- You are required to submit a lab report and the Excel spreadsheet containing calculations and graphs for each report on the blackboard. In addition, you need to turn in a hard copy of the lab report with spreadsheet in Appendix during lab class when the report is due.
- Learn techniques and formats of writing good technical reports.
- Experimental data should be presented in a nice tabular form (Excel).
- All figures must be drawn properly with proper symbols, legends, titles, etc. (Excel).
- Report should be typed (or use any word processing on computer) in proper format (see hand-out) and must be submitted on time by the due date. Do not submit loose papers. All papers pertaining to the lab report must be stapled together properly.
- No late reports will be accepted without a valid written excuse.
- If you are unable to attend a class or take an exam, it is your responsibility to present a written valid excuse to your instructor. Valid excuses include serious illness, death in the immediate family, and participation in the University-sponsored events. Any other excuse will be evaluated by the instructor. An excused absence allows you to make up any work you missed without any late penalties. Failure to contact the instructor and present her with a valid excuse will result in an unexcused absence. Students will not be able to make up any assignment/homework and exam for an unexcused absence.
- In the event of an excused absence, make up assignments must be done by the next class meeting following the date of the excused absence (unless scheduled with the instructor). Student is responsible for his/her own missed assignments. Student will receive a full credit for class participation for an excused absence.
- Learn techniques and formats of writing good technical reports
- Develop presentation techniques and skills

Final Examination A final examination is comprehensive, and will be finalized later.

You are expected to take the final exam at the appointed time. So plan ahead. **Collaboration on test/exam is strictly prohibited. All cell phones will need to be turned off and put away during the exam. Make-up test/exam will not be given except in situations that are beyond your control.**

<u>EXPERIMENT TOPICS, OBJECTIVES, AND TENTATIVE SCHEDULES</u>

SESSION	**TOPICS**	**DESCRIPTIONS**
1	CALIBRATION OF A ROTAMETER and VENTURI & ORIFICE METERS	Perform experiments to calibrate the rotameter, orifice and venturi meters and learn about the application of continuity and Bernoulli's equations to such flow meters. Learn how to use manometers to measure pressure difference.
2	FLUID FLOW THROUGH PIPES, VALVES, FITTINGS & ELBOWS	Conduct experiments on pipe flow to determine the friction factor and use Moody chart to compare the results Conduct experiments to determine the minor head losses in pipe fittings and valves and compare

		results with published data
3	CENTRIFUGAL PUMP SYSTEMS	Conduct experiments to determine the performance characteristics of a centrifugal pump
4	RADIAL HEAT CONDUCTION	Perform experiments in conduction and learn the principles behind these experiments
5	EXTENDED SURFACE HEAT TRANSFER	Conduct experiments on heat transfer using an extended surface and compare results with published data
6	LINEAR HEAT CONDUCTION	Perform experiments on conduction heat transfer and learn the principles behind these experiments
7	TUBULAR HEAT EXCHANGER	Conduct experiments on a tubular heat exchanger to learn about principles associated with the heat exchanger
8	UNSTEADY STATE HEAT TRANSFER - CROSSFLOW HEAT EXCHANGER	Conduct experiments on unsteady heat transfer using a heated rod in an air stream and an extended surface and compare results with published data
9	FREE AND FORCED CONVECTION	Perform experiments on free and forced convection and learn the principles behind these experiments (see notes below)
10	DESIGN OF AN EXPERIMENT	Learn the principles of experimental design by designing an experiment
11	DESIGN OF A SYSTEM	Design a fluid flow/heat transfer system using the knowledge gathered in the theory and laboratory courses
12 - 13	PRESENTATIONS	Develop presentation techniques and skills
14	REVIEW FOR A FINAL EXAMINATION	
15	FINAL EXAMINATION	

Notes: Depending on availability of equipment, some of the experiments above may not be conducted and others may be done in their place.

Each person will make three oral presentations – one individual presentation, two team presentations. The individual presentation will be on any of the lab experiments that have been conducted. The team presentations will be on the design projects – one on the design of an experiment, the other on the design of a system.

REFERENCES:

The syllabus, lab handouts, and other information will be put on Blackboard. Download the lab handouts ahead of time and bring to class. Your Tuskegee email needs to work and you need to use it.

1. "**Heat Transfer**" by J.P. Holman, McGraw-Hill Book Company, New York, ISBN: 0072406550; 9th Edition, 2002

2. "**Fundamentals of Fluid Mechanics**", by B.R. Munson, D.F. Young and T.H. Okiishi, John Wiley, 5th Edition, 2006
3. Noel D. Nevers, Fluid Mechanics for Chemical Engineers, Second Edition, McGraw-Hill, 1991.
4. J. H. Perry and C.H. Chilton, Chemical Engineers' Handbook, 5th Edition, Mcgraw-Hill.
5. W. L. McCabe, J. C. Smith and Peter Harriott, Unit Operations of Chemical Engineering, 5th Edition, McGraw-Hill, 1993.
6. Any other references books or textbooks, which are applicable.

COVID Policy:

"Excuses related to **Covid infection** as well as exposure have to be received from the Dean of Students office. Students should request the excuse for absence from the Dean of Students office as soon as they become aware of covid infection or exposure. Students may request a classes missed memo by completing this form (https://forms.gle/4ozusHX2tTCUW4yK6) and then contact the Office of the Dean of Students and Student Conduct (334) 727-8421, via e-mail THarper@Tuskegee.edu or by going into the office located in suite 203 Tompkins Hall."

Additional policies will be issued, if they are necessary.

STATEMENTS OF COE EXPECTATIONS REGARDING STUDENTS' ACADEMIC PROFICIENCY

Academic excellence is a tradition of the Tuskegee University College of Engineering, (COE). Students and faculty must collectively and proactively guard this tradition. The college hereby renews its commitment to the tradition by stating as follows:

1. Students are expected to develop self-confidence through acquisition of in-depth knowledge in all subjects through, as a minimum:
    a. Studying to understand rather than studying to get by.
    b. Challenging oneself to solve problems independent of textbooks or formulae sheets
    c. Attempting diverse and multiple problems, multiple times, for depth and breadth of knowledge

2. Students are expected to be self-motivated through setting their own goals & schedules, spending time to study, and sharing their knowledge with peers.
    a. Students should invest a minimum of two hours of study-time per week for every credit hour taken.
    b. Students should seek or establish environments that encourage positive social interaction and engages in active learning.

3. COE is committed to providing support systems to students for higher achievement through the following avenues:
    a. Direct access to instructors
    b. Archives of faculty recorded course lectures
    c. Dedicated peer tutors by fellow students at all academic levels
    d. Periodic visits by alumni and industry subject matter experts
    e. Opportunities for local and national academic related competitions

4. All COE students are expected to take advantage of all support systems. Students are particularly expected to adopt the notions of “self-confidence through knowledge acquisition” and “self-motivation to bring out best in self” as the COE fundamental culture for success.