Mec501: Convective Heat Transfer and Heat Exchange

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Office Hours: Wednesdays 04-06 pm

Catalog Course Description:
Diffential and integral formulation. Exact and approximate solutions. Topics include parallel and boundary layer flows, similarity solutions, external and internal flows, laminar and turbulent convection, and forced and free convection.

Course Learning Objectives:
1. Understand the fundamentals of forced, free, and mixed convection heat transfer.  
2. Analyze external and internal forced convective flows using differential and integral solutions.  
3. Analyze external and internal natural convective flows using differential and integral solutions.  
4. Understand the effects of turbulence to heat convection.

Textbook:  

Course Prerequisites: None

Class schedule
Lectures: Tuesdays at 04:45 pm – 07:35 pm.  
Location: Frey Hall 224

Grading and Class Policies
Final grade is determined based on your performance in the following areas:  
Homework: 30%  
Midterm 1: 35% (March 07, 2022)  
Midterm 2: 35% (May 02, 2022)

Tentative Course Outline:

<table>
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<tr>
<th>Topic</th>
<th>Details</th>
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<tr>
<td>Fundamental Principles (01/24, 01/31)</td>
<td>Continuity, momentum, energy equations and their derivations in different coordinate systems; scaling and non-dimensional analysis. (Bejan, Chapter 1)</td>
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<td>Laminar Boundary Layer Flow (02/07, 02/14)</td>
<td>Laminar boundary layer approximations; similarity solution for flow over a flat plate; integral method solutions for flow over a flat plate. (Bejan, Chapter 2)</td>
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<td>Laminar Duct Flow (02/21, 02/28, 03/07)</td>
<td>Exact solutions for flow through the circular pipe; fully developed forced convection in pipes with different wall boundary conditions; forced convection in thermal entrance region; integral method for internal flows. (Bejan, Chapter 3)</td>
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<td>Spring Break (03/14)</td>
<td>No Class</td>
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<tr>
<td>Midterm (03/21)</td>
<td>Materials from fundamental principles, laminar boundary layer flow, and laminar duct flow</td>
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Course Policies:
1. Lecture notes will be posted on the brightspace prior to class.
2. Brightspace will be used for posting lectures, making course announcements, grading, and communicating with the class.
3. All lectures shall be held in class every tuesdays from 04:45 PM to 07:35 PM
4. All midterms are purely online and shall be uploaded under the Assignments folder

Special Needs/Disabilities
If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Disabled Student Services office (DSS), ECC (Educational Communications Center) Building, Room 128, (631)632- 6748. DSS will review your concerns and determine with you what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

Statement on Academic Dishonesty
“Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, design, computer programs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.”

Calculator Policy
“Effective Spring, 2008 only the following calculators will be permitted to be used on all midterm and final exams in the department of Mechanical Engineering. 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 now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators as of spring, 2008:

► 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.

The NCEES policy on calculators can be found here: [http://www.ncees.org/exams/calculators/](http://www.ncees.org/exams/calculators/).

Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed lectures or labs, the student is responsible for review posted powerpoint slides under the Documents folder and the recorded lecture videos under the Lecture Videos folder. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information click here.