Mechanical Engineering Department
Convective Heat Transfer and Heat Exchange | MEC 501 | 3 Credits
Prerequisite: None
Class Time: Tu: 4:00 - 6:50 PM
Classroom: Frey Hall 216

Instructor: Dr. Wenhai Li
Email: wenhai.li@stonybrook.edu
Office Location: Light Engineering 139
Office Hours (Tentative): Tu: 2:00 – 3:00 PM

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

Textbook:
Adrian Bejan, Convection Heat Transfer, 3rd or 4th Edition, Wiley

Class Schedule (Subject to Change):

Topic	Details
Fundamental Principles (01/28, 02/04)	Continuity, momentum, energy equations and their derivations in different coordinate systems; scaling and non-dimensional analysis. (Bejan, Chapter 1)
Laminar Boundary Layer Flow (02/11, 02/18)	Laminar bounary layer approximations; similarity solution for flow over flat plate; integral method solutions for flow over flat plate. (Bejan, Chapter 2)
Laminar Duct Flow (02/25, 03/03, 03/10)	Exact solutions for flow through 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)
Spring Break (03/17)	No class
Midterm (03/24)	Materials from fundamental principles, laminar boundary layer flow, and laminar duct flow
External Natural Convection (03/31, 04/07)	Governing equations for natural convection; Boussinesq approximation; similarity solution for laminar flow past a vertical plate with constant wall temperature and heat flux conditions; integral method for natural convection flow past vertical plate. (Bejan, Chapters 4)
Internal Natural Convection (04/14)	Nature convection in enclosures; mixed convection heat transfer (Bejan, Chapters 5)
Turbulent Convection (04/21, 04/28)	Governing equations for turbulent flow; turbulent flow and heat transfer across flat plate and circular tube; turbulent nature convection heat transfer;

	empirical correlations for different configurations (Bejan, Chapters 7, 8)
Convection with Change of Phase (*05/05*)	Flow regimes for boiling (pool boiling, nucleate boiling, film boiling); film condensation. (Bejan, Chapter 10)
Final Exam (Date: To be announced)	Comprehensive

Homework:
Approximately one homework assignment per week or fewer. Homework will be due one week after it is assigned. Late homework will receive half credit before the solutions are posted and will not be accepted after that.

Exam:
All exams will be scheduled in class, unless otherwise stated
No makeup exam unless arranged prior to the exam.

Grading Scale:
Will grade on a curve

Grading Scheme:

Homework Assignments	30%
Midterm Exam	30%
Final Exam	40%
Total	**100%**

Homework is 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.

Americans with Disabilities Act

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Disability Support Services (DSS) Statement

ABILITY SUPPORT SERVICES (DSS) STATEMENT If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (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 Disability Support Services. 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 are 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/uaa/academicjudiciary/

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 Judicial Affairs 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.

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 that is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, designs, 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.

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.