MEC 501 Convective Heat Transfer and Heat Exchange

Instructor:  David J. Hwang (david.hwang@stonybrook.edu)

Class hours:  Tuesday 3:50-6:40PM (P117)

Office Hours:  Monday 3-5pm (222 Heavy Engineering)

Catalog 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.

Prerequisites:  MEC 305 (Undergraduate Level Heat and Mass Transfer) or equivalent

Textbook:  Reference [1] was recommended textbook, but not available by publisher at this period of time. Class notes will cover the class contents and will be uploaded in Blackboard (all the students should download and print out).

References:

Grading:  
Homework (weekly or bi-weekly)  -  20%
Midterm (TBA ~late March)  -  40%
Final Exam  -  40%

Course Outline:

1.  Introduction (concepts of convective heat transfer)
2.  Formulation of basic conservation equations
3.  Scaling analysis and similarity variables, and exact/approximate solutions
4.  Convective heat transfer in laminar external boundary layer flow
5.  Convective heat transfer in laminar internal boundary layer flow
6.  Natural convection
7.  Convective heat transfer in turbulent flow
8.  Mass transfer (TBA)
9.  Special topics in convective heat transfer (TBA)

Course Objectives:

- Identify mechanism of convective heat transfer and its relative importance
- Formulate conservation (continuity, momentum and heat) relations
- Determine non-dimensional parameters by scaling analysis
- Apply similarity concepts to proceed for exact and approximate solutions
- Distinguish between external and internal boundary layer flows
- Distinguish between natural and forced convections
• Distinguish between laminar and turbulent flows in terms of heat transfer

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